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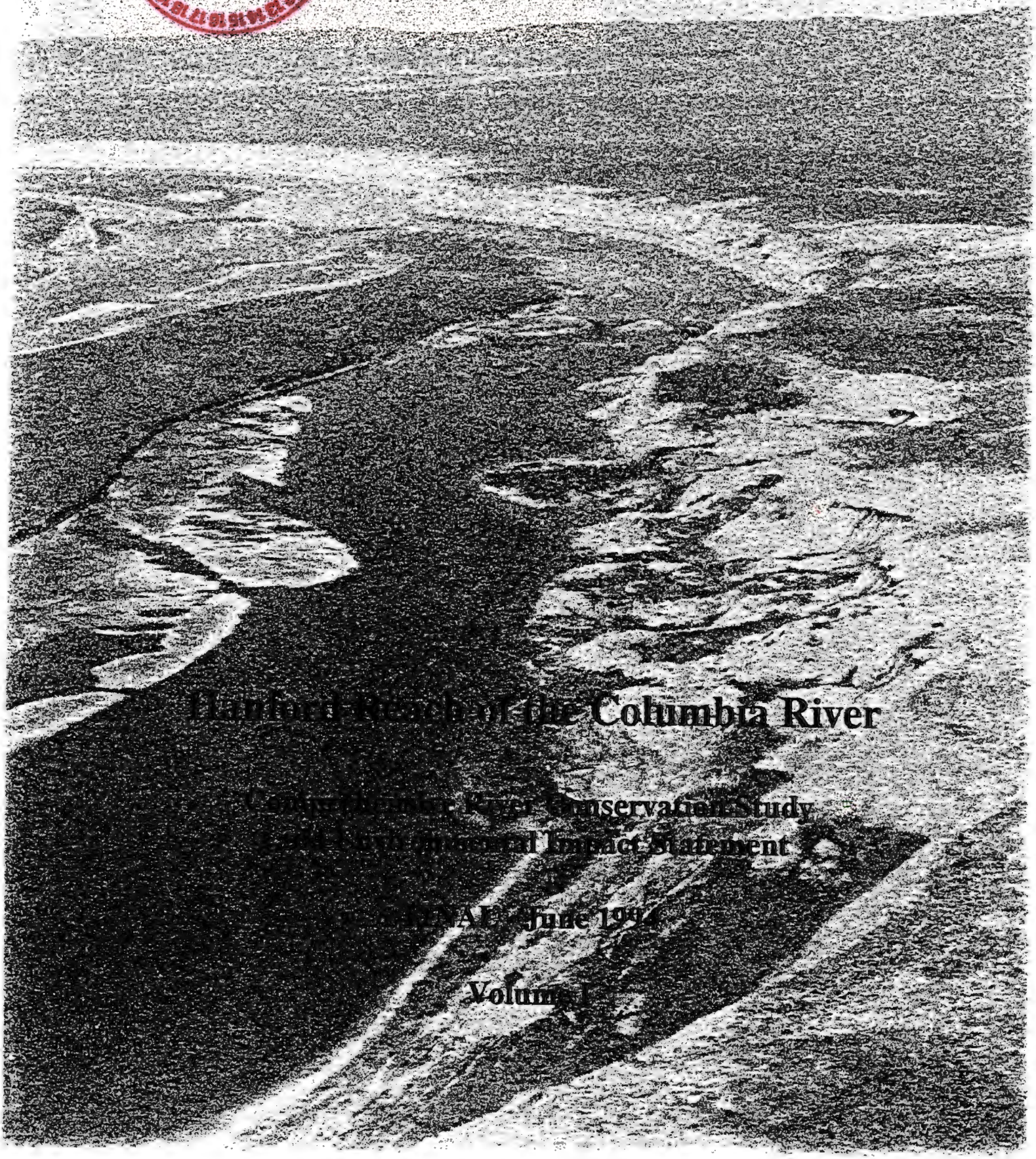

Hanford Reach of the Columbia River

Comprehensive River Conservation Study
and Environmental Impact Statement

DRAFT June 1994

Volume I

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Dedication

During the course of the Hanford Reach study, two distinguished and highly dedicated scientists lost their lives in a tragic airplane accident while performing sensitive species studies, including sage grouse and ferruginous hawk. Doctors Richard (Dick) Fitzner and Les Eberhardt aptly devoted their lives to the advancement of knowledge and sound management of the natural resources of the shrub-steppe environment and the Hanford Reach of the Columbia River. Their research was relied upon in the preparation of this document. The Study Team dedicates their efforts in preparing this document and further dedicates the Proposed Action to Dick and Les, their wives, and mostly their children in the hope that our generation will manage these lands wisely for the benefit of their generation and for those who follow. It is significant, if not ironic, to note that Dick and Les lost their lives while studying sage grouse. The decline of this once abundant species to dangerously low levels in eastern Washington is a clarion warning of the tremendous loss of shrub-steppe habitat on which this and other species survive. The Hanford Reach is one of the last remaining intact ecosystems of this type large enough to be self-sustaining. It is the fervent hope of the Study Team that it will remain protected for the benefit of all.

HANFORD PROJECT OFFICE
JUL 15 1994
ENVIRONMENTAL PROTECTION AGENCY

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The Hanford Reach of the Columbia River

Final River Conservation Study and Environmental Impact Statement

Type of Action:	*( ) Administrative* *(X) Legislative*
Lead Agency:	National Park Service Pacific Northwest Regional Office 909 First Avenue Seattle, WA 98104
Responsible Official:	Charles H. Odegaard Regional Director Pacific Northwest Regional Office

Abstract:

This final Comprehensive River Conservation Study Report and Environmental Impact Statement documents the significant resources and protection alternatives developed for the Hanford Reach of the Columbia River. The Hanford Reach is the last free-flowing non-tidal segment of the Columbia River in the United States. It extends one mile below Priest Rapids Dam (river mile 396), downstream approximately 51 miles to the McNary Pool north of Richland, Washington (river mile 345). Congress authorized this study to identify alternatives to prevent adverse impact to the significant resources within the Reach, some of which include critical fall chinook salmon spawning and rearing habitat, historic and archaeological sites, a biodiversity representative of the original Columbia Basin, threatened and endangered plant and animal species, and recreational activities. In addition to the No Action alternative (Alternative B) required by the National Environmental Policy Act, five management alternatives were developed. The Proposed Action recommends designation of the 49.5 miles of the Columbia River as a National Wild and Scenic River and approximately 102,000 acres of adjacent lands as a National Wildlife Refuge. The river and refuge would be administered by U.S. Fish and Wildlife Service (USFWS). The USFWS is responsible for the protection of habitats and providing recreational opportunities such as hunting, fishing, and swimming. The other alternatives considered include: Alternative A (National Wildlife Refuge with National Wild and Scenic River overlay but excluding private lands from the Wild and Scenic River boundary), Alternative C (legislation to prohibit dams and limit water resource development projects, no additional designation), Alternative D (National Conservation Area), and Alternative E (National River). Alternatives D and E also include legislation to prohibit dams and limit water resource development projects. The managing agency and degree and emphasis of resource protection and management vary depending on the alternative.

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ACRONYMS AND ABBREVIATIONS

BLM	*Bureau of Land Management*
BR	*Bureau of Reclamation*
CERCLA	*Comprehensive Environmental Response Compensation Liability Act*
ACOE	*Army Corps of Engineers*
CRFMP	*Columbia River Fisheries Management Plan*
CTUIR	*Confederated Tribes and Bands of the Umatilla Indian Reservation*
DEIS	*Draft Environmental Impact Statement*
DOE	*United States Department of Energy*
EPA	*Environmental Protection Agency*
FEIS	*Final Environmental Impact Statement*
NCA	*National Conservation Area*
NEPA	*National Environmental Policy Act*
NPDES	*National Pollution Discharge Elimination System*
NPS	*National Park Service*
NR	*National River*
PNL	*Pacific Northwest Laboratory*
PUD	*Public Utility District*
RCRA	*Resource Conservation Recovery Act*
RM	*River Mile*
SEPA	*State Environmental Policy Act*
SOR	*System Operation Review*
USFWS	*United States Fish and Wildlife Service*
WSDFW	*Washington State Department of Fish and Wildlife*
WDOE	*Washington Department of Ecology*
WDOT	*Washington Department of Transportation*
WPPSS	*Washington Public Power Supply System*
YIN	*Yakama Indian Nation*

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SUMMARY

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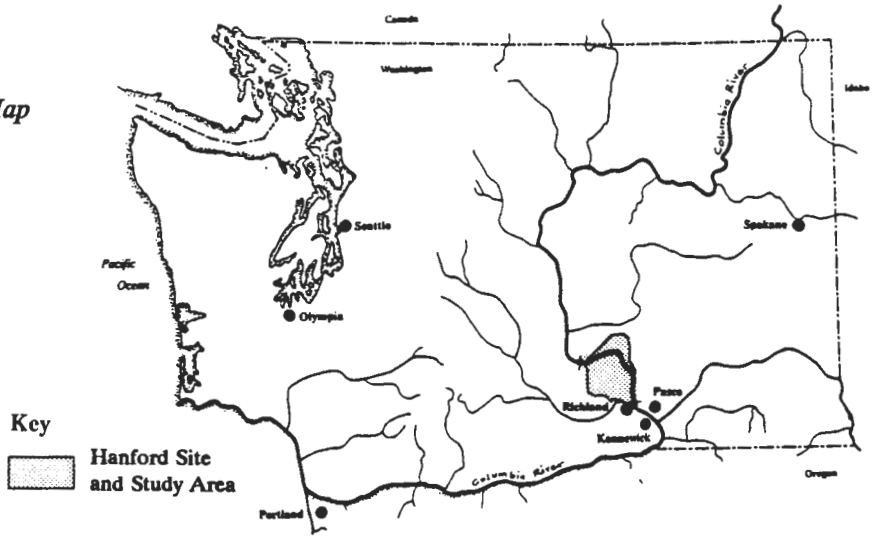
The Hanford Reach of the Columbia River is renowned for its extraordinary natural, recreational, cultural and historical values. To date the Reach has escaped major alterations, such as dams and water resource development projects because of inadequate economic justification, environmental impacts, and the existence of the Hanford Site. But there have been ongoing efforts to develop the river and its banks through the years, and the pressure is expected to continue in the future. As late as 1988, a major navigation dredging project was proposed for the reach and an earlier proposal for a dam would have eliminated the free-flowing character of the river. A more recent concern involves the change of the primary mission of the Department of Energy Hanford Site from defense production to environmental restoration. Because the security buffers north and east of the river will no longer be needed, the Department of Energy anticipates excessing the land. The long-term resource protection provided by government ownership of this expansive area of significant shrub-steppe and wetland habitat could be forever lost if government ownership is terminated.

Location Map



The Study Legislation

In November 1988, Congress recognized the growing concerns for the future of the Hanford Reach and passed Public Law 100-605 (see Appendix B), known as the Comprehensive River Conservation Study Act. The Act required the Secretary of the Interior, in consultation with the Secretary of Energy, to prepare a study that would evaluate the outstanding features of the Hanford Reach and its immediate environment (including fish and wildlife, geologic, scenic, recreational, natural, historical, and cultural values), and examine alternatives for preserving those values. The alternatives would include, but not be limited to, inclusion of the Reach in the National Wild and Scenic Rivers System. The study would be conducted in cooperation with state, local and tribal governments and with participation from the public and would conclude with a recommendation to Congress of a preferred alternative for the protection of the outstanding resource values of the Reach.

To avoid further degradation of the Reach during the study and planning process, the legislation also provided for interim protection. For a period of eight years, or until 1996, federal agencies are prohibited from constructing dams, channels or navigation projects in the Reach. All other new federal and non-federal projects and actions are required to avoid or minimize impacts to the resources of the Reach. Consultation with the Department of the Interior is required prior to the initiation of projects to assure that adverse impacts are avoided, minimized, and mitigated.

Study Area

The study area terminal boundaries extend from one mile below Priest Rapids Dam (river mile 396) downstream approximately 51 miles to the McNary Pool north of Richland, Washington (river mile 345). Lateral boundaries include approximately 1/4 mile on the south side of the river and approximately 105,000 acres north and east of the river (incorporating the river itself, islands, Wahluke State Wildlife Recreation Area, Saddle Mountain National Wildlife Refuge, and state and privately-owned lands).

The Study Process

The Secretary of the Interior designated the National Park Service (NPS) as the lead agency in the study. A study team was organized with representatives from the NPS, the Department of Energy (DOE), and the U.S. Fish and Wildlife Service (USFWS). Their job was to conduct the study, prepare the necessary documentation, including the environmental analysis, and develop the agencies' recommendations for protection of the Reach.

In order to encourage a variety of viewpoints, strengthen the coordination effort, and ensure public participation in the process, the NPS organized a Study Task Force made up of over forty representatives from federal, state and local governments, Indian tribes, local landowners, and organizations interested in the future of the Reach. The Task Force met every six to eight weeks to advise and assist the Study Team on all important decisions. A list of the Task Force members is included in Appendix C.

A major responsibility of the Task Force was to develop a resource assessment which was completed in February 1990. This assessment identified the important resources of the Reach and established a basis for further protection of those resources. The Task Force categorized the important resources as either nationally significant or regionally significant. The nationally significant resources include fall chinook salmon, the intact ecosystem (including the river, its banks, and the adjoining habitat to the north), American Indian cultural resources, archaeological sites, hydrology and geology, and federally recognized threatened or endangered plant and animal species. The regionally significant resources include the White Bluffs fossils, Ringold agriculture, waterfowl hunting, salmon and steelhead fishing, flatwater boating, historic sites, scenery in the White Bluffs segment, and state recognized rare plant and animal species.

The next step of the study process was to consider the range of alternatives that would provide resource protection. While the Task Force was unable to reach consensus on certain points, such as the specific legislative designation, the principal managing agency, or specific management actions, it was unanimous that dams and water resource development projects which adversely affect resources should be prohibited and that a formal legislative designation would provide the only permanent protection. Substantial agreement was reached on the following points: management of the area should focus on the identified nationally significant resources, and the boundaries should include the areas currently in the Saddle Mountain National Wildlife Refuge and the Wahluke State Wildlife Recreation Area.

Because a major federal action is proposed, a draft report/EIS was published in June 1992. Public meetings to discuss the report/EIS and solicit comments were held in Richland, Basin City, Mattawa, and Seattle, Washington in September of 1992. The public comment period was extended three times and finally closed November 9, 1992.

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In response to the public review and comment, this final report/EIS contains a number of changes and additional information not included in the draft. The No Action Alternative is revised to reflect the DOE's changing mission at Hanford (from defense production to environmental restoration and waste management). As a result of the changed mission, it is expected that the lands north and east of the river will be excessed by the DOE because they are no longer needed as a security and safety buffer. The discussion of contaminants and cleanup activities has been expanded considerably. More detailed maps have been provided. Concerns raised by utilities, primarily the Bonneville Power Administration and the Grant County Public Utility District, have been addressed. The overall operation of the Columbia River system has been reviewed and clarification provided to indicate that no alternative would affect existing laws, agreements, plans, or policies with regards to instream flows.

In addition, two options were considered in the draft report/EIS for the boundaries of the Wild and Scenic River designation; Option 1 would include only land that was currently in public ownership and Option 2 would include all land, including privately owned land, within 1/4 mile of the river. In the final EIS, Option 2 was selected as the Proposed Action and Option 1 is now Alternative A.

Alternatives

During the study process, a number of management scenarios were considered. Six were focused upon in the development of this Study/EIS and are described and analyzed later in this document. The summary below outlines important distinctions among them.

PROPOSED ACTION: NATIONAL WILDLIFE REFUGE WITH NATIONAL WILD AND SCENIC RIVER OVERLAY, INCLUDING PRIVATE LANDS - The refuge boundaries would generally include the area described in the study legislation (49.5 miles of the river, all federally owned lands within 1/4 mile of the river on both banks), and would also include all land currently in the Saddle Mountain National Wildlife Refuge and the Wahluke State Wildlife Recreation Area. The latter lands are currently part of the Hanford Site but managed under permit by the USFWS and Washington State Department of Fish and Wildlife (WSDFW). The Wild and Scenic River boundaries would average approximately 1/4 mile on both sides of the river including the refuge and private lands. This private land is located at the upstream and downstream ends of the study area, and consists of approximately 2% of the total area in the proposed boundaries. These upstream and downstream sections are adjacent to those sections of the river which contain significant fall chinook salmon spawning areas. The land would remain in private ownership. Existing land uses would not be affected, but new land uses would be evaluated for compatibility with Wild and Scenic River goals which would be established during development of the river management plan.

The Reach would be designated and classified as a Recreational River under the National Wild and Scenic Rivers Act of 1968. This designation recognizes the outstanding qualities of the Reach yet acknowledges that portions of the shoreline have been developed. Primary management emphasis would be directed towards fish and wildlife habitat protection and enhancement and recreation and educational uses would be encouraged.

The DOE cleanup of Saddle Mountain National Wildlife Refuge and Wahluke State Wildlife Recreation Area will be completed by October 1994. Certification of the lands as suitable for transfer to the USFWS would occur shortly thereafter. Contaminated sites will be transferred only after they have been remediated and certified to be clean by the Environmental Protection Agency (EPA) and the Washington State Department of Ecology (WDOE), and are determined to be suitable for refuge status. The DOE will retain full liability and cleanup responsibility in perpetuity for current and future contamination problems which originate prior to DOE's disposal of the land in the Hanford Site.

ALTERNATIVE A: NATIONAL WILDLIFE REFUGE WITH NATIONAL WILD AND SCENIC RIVER OVERLAY, EXCLUDING PRIVATE LANDS - This was option 1 of the Proposed Action in the draft EIS. This alternative is the same as the Proposed Action, except that private lands within 1/4 of a mile of the river would be excluded from the National Wild and Scenic River boundaries. Future management and land use on the private lands would be the responsibility of the private owners and state and local governments through regulations.

ALTERNATIVE B: NO ACTION - Under this alternative, no specific protective measures beyond those that presently exist, would be authorized, and no new legislatively designated areas would be created. Existing legislation, policies, and procedures would continue to provide a minimum level of protection to the biological and cultural resources of the area. Major federal projects, such as the Mid-Columbia Navigation Project considered by the ACOE in 1988, would not be prohibited but would continue to be subject to existing laws, regulations, and policies. Future ownership, management and use of the public and private lands would be subject to change.

The No Action Alternative has been modified since the draft EIS was written. The draft EIS projected scenario for the study area assumed that land ownership and administration would remain essentially the same, though it recognized the changing primary mission of the DOE at the Hanford Site, and potential shifts in land ownership. At present, the DOE intends to divest itself of all unnecessary land, including the Saddle Mountain National Wildlife Refuge and Wahluke State Wildlife Recreation Area, because it is no longer needed as a safety and security buffer. While the future of this land is uncertain, it has become clear that it will not continue to be a part of the Hanford Site. The most probable scenario is that the land will remain in public ownership.

ALTERNATIVE C: DAMS PROHIBITED, LIMITATIONS ON WATER RESOURCE DEVELOPMENT PROJECTS, NO ADDITIONAL DESIGNATIONS - This alternative is similar to the No Action Alternative, with a major distinction; dams and water resource development projects which have an adverse effect on resources would be prohibited by law. There would be no further protection from other types of development or activities beyond those contained in existing laws and regulations. Future ownership, management, and land use of the public and private lands would be subject to change.

ALTERNATIVE D: NATIONAL CONSERVATION AREA - Under this alternative, the Bureau of Land Management (BLM) would manage the site. A broader range of public uses than proposed under the National Wildlife Refuge alternative, such as grazing and mineral leasing would be allowed, but there would still be an emphasis on protecting the resource values. As with the Proposed Action, dams and water resource development projects which would adversely affect the resource values would be prohibited by law. The designated area would be the same as for the Refuge alternative (49.5 miles of the river, publicly-owned lands within 1/4 mile of the river on both banks, and lands currently in the Saddle Mountain National Wildlife Refuge and Wahluke State Wildlife Recreation Area). No private lands would be included. The DOE would continue to be responsible for contaminant cleanup on the site.

ALTERNATIVE E: NATIONAL RIVER - Under this alternative, the NPS would administer the site as a unit of the National Park System. Management emphasis would be on resource protection, recreation and education. The boundaries would be the same as with alternatives A and D (49.5 miles of the river, publicly-owned lands within a 1/4 mile wide strip on both banks, and the area presently in the Saddle Mountain National Wildlife Refuge and Wahluke State Wildlife Recreation Area). Some recreational activities could be enhanced, while others, such as hunting, could be eliminated. As with the Proposed Action, dams and water resource development projects which would adversely effect the resource values would be prohibited by law. No private lands would be included. The DOE would continue to be responsible for contaminant cleanup on the site.

Selection Of The Preferred Alternative

A National Wildlife Refuge with a Wild and Scenic River overlay (recreational classification), including private lands, is the Proposed Action. The basis for this selection is summarized in the following statements: The additional resource protection afforded by Wild and Scenic River designation made the Proposed Action the most desirable choice for protection of the Reach. Including the private lands within the boundaries adds another important increment of protection with minimal impacts to the landowners. The USFWS is the nation's primary agency for the management of fish and wildlife (including threatened, endangered, and sensitive species) and their habitat. Approximately one third of the land within the proposed boundaries is presently administered as a national wildlife refuge, and contains large numbers of federal (13) and state listed (59) rare wildlife and plants. The Hanford Reach is also an important area for large concentrations of migratory waterfowl and other birds, and is the last major spawning area for fall chinook salmon in the mainstem of the Columbia River.

Congressional designation of the federally-owned lands within the study area as a National Wildlife Refuge, and designation of the river corridor as a Wild and Scenic River, would guarantee perpetual protection of the important natural resources.

The Proposed Action, Alternatives A, D and E would have similar boundaries, and would offer greater protection and public use of the Reach and its resources. Each would protect the river from major projects, such as dams and water resource development projects, provide improved control over development and use of the area to avoid impacts adversely affecting natural, cultural, and recreational values, and secure the intact native habitat north of the river for the future. With the exception of the Proposed Action, all of the land is already in federal ownership. The principle difference is the addition of private lands to the Wild and Scenic River overlay in the Proposed Action and the management emphasis of the three respective federal agencies.

Alternative B, the No Action Alternative, would not provide long-term protection of river resource values. Existing laws and regulations would not provide adequate protection for the Reach and its resources after 1996 from dams and other water resource development projects. Lands in the Saddle Mountain Refuge and Wahluke State Wildlife Recreation Area would be subject to federal excess property disposal procedures.

Alternative C would protect areas that might otherwise be inundated by dams or adversely affected by water resource development projects, but would not prevent the cumulative impacts of future shoreline and in-water developments. Lands in the Saddle Mountain Refuge and Wahluke State Wildlife Recreation Area would be subject to federal excess property disposal procedures.

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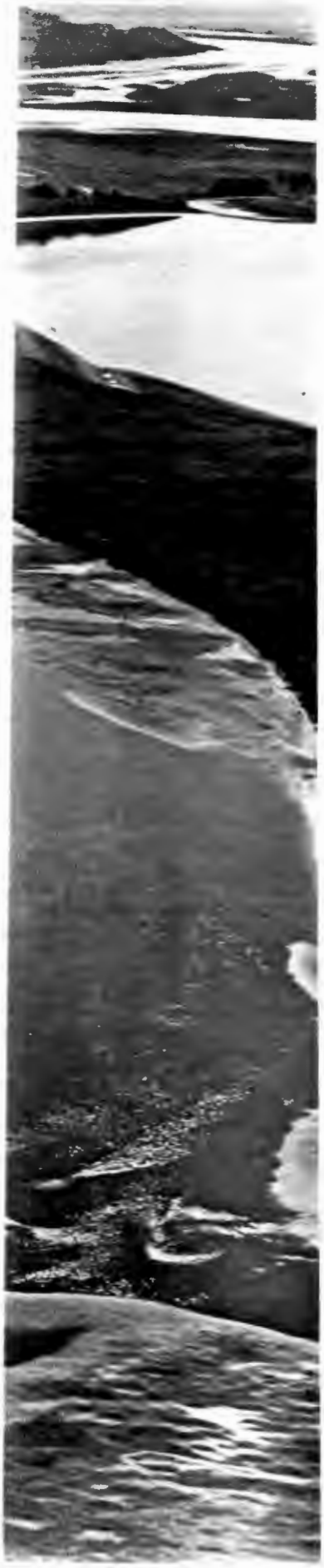

CHAPTER I
PURPOSE AND NEED

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A. Purpose of the Study Report/EIS:

The study report and environmental impact statement analyze the potential impacts of six different alternatives for future management of the Hanford Reach of the Columbia River. The analysis was conducted in response to Public Law 100-605, which directs the Secretary of the Interior, in consultation with the Secretary of Energy, to conduct the Hanford Reach study and make a recommendation to Congress.

B. Need for the Study Report/EIS:

In Public Law 100-605, Congress directed the Department of the Interior, in consultation with the DOE, to recommend appropriate methods of preservation for the river features identified as outstanding. The study needs to consider all or part of the river for addition into the National Wild and Scenic Rivers System to comply with PL 100-605. Because of its oversight of the Wild and Scenic Rivers Program, the National Park Service was designated by the Secretary of the Interior as the responsible agency to conduct the study.

During public meetings, concern was expressed for many resources in the area. These concerns formed the foundation of the inventory of outstanding river features and constraints. The outstanding river features for which preservation options are considered in this EIS were determined to be either nationally or regionally significant. These features meet the "outstandingly remarkable" criteria referenced in the National Wild and Scenic Rivers Act.

Nationally significant features include:

- *Fall chinook salmon and their spawning and rearing habitat*
- *The intact ecosystem of the river and its adjacent land north to the ridgetop (Wahluke Slope)*
- *Federally recognized threatened or endangered plant and animal species*
- *Archaeologic artifacts of many indigenous cultures preserved along the river*
- *Hydrology and geology suitable for siting of nuclear reactors and radioactive wastes*

Regionally significant features include:

- *The White Bluffs along 31 miles of the north bank of the Hanford Reach*
- *The Ringold agricultural area*
- *Sport Fishing*
- *Hunting*
- *State endangered plants and animals*
- *Historic sites*
- *Flatwater Recreation*

The potential for a proposal to dam or dredge the Reach still exists posing a threat to the river's outstanding features. For example, the Federal Energy Regulatory Commission (FERC) is not prohibited from reviewing and approving a license application to build a dam and/or hydroelectric generator in the Hanford Reach, posing yet another potential threat.

Another concern addressed by the study responds to the changing primary mission of the DOE which now manages the land through which the river flows. Since the initiation of the study, DOE's primary mission at Hanford has changed from production of plutonium for weapons to cleanup. The DOE must justify its land holdings annually to the General Services Administration. Given the mission change at Hanford, the original justification for the 90,000 acre Wahluke Slope as a safety and security buffer is no longer valid and the DOE is considering excessing this land.

The Wahluke Slope adjoins the Hanford Reach and is ecologically connected to the river. Subsequent to the scoping meetings, the Study Team together with members of the Task Force determined during the study process to include the Wahluke Slope to protect the intact ecosystem, a resource identified in the scoping process as significant. Thus, the study needs to assess both the value of the Wahluke Slope as a component of river protection and preservation alternatives, and the appropriateness of a variety of Federal agencies as managers of the land.

C. History of Development Proposals

While the Hanford Reach Study officially began in 1988 with the passage of Public Law 100-605, the origins of the study go back more than 30 years. Following a Congressional resolution of May 28, 1959, the ACOE began a study in the late 1960s concerning the construction of the Ben Franklin Lock, Dam and Reservoir at RM 348 (Battelle 1980). This dam would have created a reservoir occupying the entire Hanford Reach, with a normal full pool elevation of 400 feet above mean sea level. Many agencies and organizations reacted with concerns about the environmental impacts of the proposal, and suggested giving the Hanford Reach permanent protection from dam development. The public concern over the project and lack of economic feasibility caused the ACOE to suspend action on the Ben Franklin Dam in the early 1970s. Following this suspension, the urgency for securing permanent protection of the reach waned.

In 1987, the ACOE initiated the public scoping process for the Mid-Columbia Navigation Study, a proposal to develop a series of barge lifts and dredged channels through a large segment of the middle Columbia River, including the Hanford Reach. Again, agencies and organizations objected to development of the Reach and renewed calls for permanent protection. Congress responded with the passage of Public Law 100-605, the Hanford Reach Study Act.

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D. The Study Process

Study Act

The Hanford Reach Study was authorized by Congress in November, 1988 (Public Law 100-605, see Appendix B). The Act directs the Secretary of the Interior, in consultation with the Secretary of Energy, to conduct a study which includes the following components:

1) An inventory and evaluation of outstanding fish and wildlife, geologic, scenic, recreational, natural, historical, and cultural values of the river and its "immediate environment";

2) The development and analysis of an array of preservation alternatives, including designation of the segment into the National Wild and Scenic Rivers System (for eligibility criteria refer to page 17);

3) The development of a preferred alternative; and

4) Consultation with the State of Washington, local and tribal governments, and "other interested entities."

In addition to mandating the study, Public Law 100-605 established interim protections for the Hanford Reach for eight years (expiring in November, 1996). These provisions include:

1) A prohibition on channelization and navigation projects;

2) Requirements that all new projects be designed and constructed to minimize adverse impacts, and use existing facilities whenever possible;

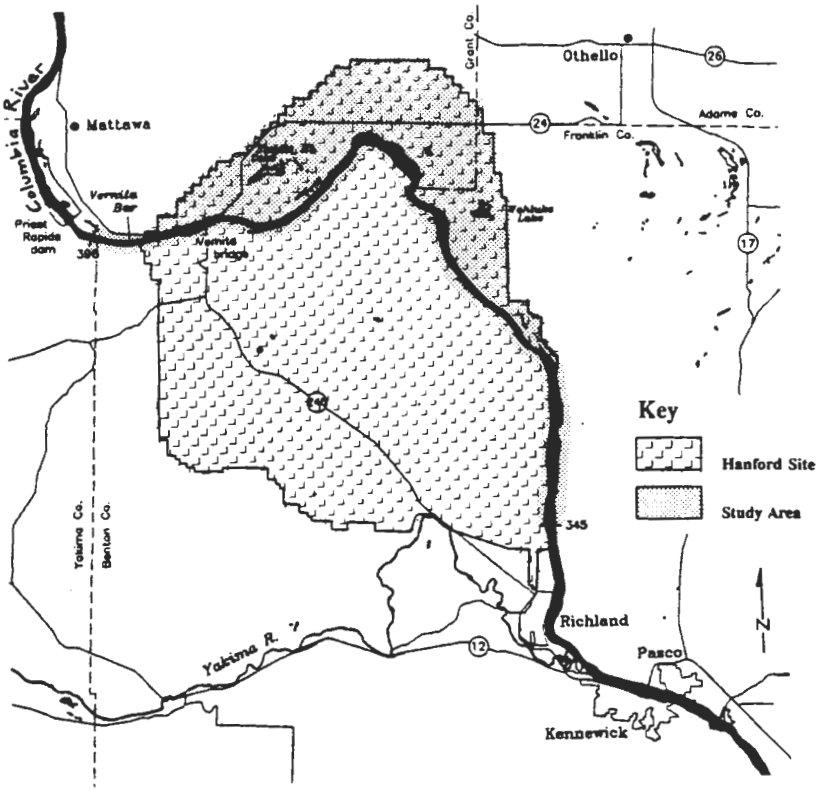
3) Requirements that existing projects be operated and maintained to minimize adverse impacts; and

4) Establishment of a consultation process between project applicants and the Secretary of the Interior on mitigation of adverse impacts.

Study Area

The study area extends from one mile below Priest Rapids Dam (river mile 396) downstream approximately 51 miles to the McNary Pool north of Richland, Washington (river mile 345). Lateral boundaries were not established in the legislation. However, in May 1989 the NPS set them at a quarter mile on either side of the river (a total area of 16,320 acres) the convention for Wild and Scenic River studies and which was determined to incorporate important resources of the Reach. Lateral boundaries were later adjusted during the study process as a result of public concern to include those resources identified during the scoping process which extend beyond the quarter mile boundary and are federally owned. These resources are in an area known as the Wahluke Slope, consisting of approximately 90,000 acres located north and east of the river. This land is currently administered by the USFWS as the Saddle Mountain National Wildlife Refuge and the Washington State Department of Fish and Wildlife (WSDFW) as the Wahluke State Wildlife Recreation Area. The total study area consists of approximately 105,000 acres and includes the river itself, islands, Wahluke State Wildlife Recreation Area, Saddle Mountain National Wildlife Refuge, and state and privately-owned lands.

Study Area



Development of the Report/EIS

The study authorized by Public Law 100-605 was conducted by the NPS with full support from the USFWS and the DOE. These three agencies provided an interdisciplinary study team (Ch. V, List of Preparers). The team was assisted by a 44 member Task Force composed of government officials, agency staff, native Americans, representatives of private organizations, and riverfront landowners (see Appendix C). The Task Force gathered and compiled environmental documentation into technical reports in order to evaluate the resources of the Reach. The Task Force also advised the study team on major decisions during the study process.

The study process was divided into four major phases: scoping, resource assessment, development of alternatives, and documentation. Each of the phases incorporated procedures to encourage the participation of the Task Force and the general public.

Scoping

One of the major tasks of the Hanford Reach Study was to identify the potential significant resources and issues that would need to be considered for analysis of potential impacts in the Proposed Action and alternatives. This effort, a part of the scoping process, was comprised of three activities: a formal public scoping meeting conducted early in the study, an ongoing program of consultations with interested parties which extended throughout the study, and advice from technical staff specialists.

The initial scoping meetings commenced in April 1989 with publication of a preliminary scoping document and public meetings in Basin City, Richland, and Seattle, Washington and Portland, Oregon. The document and the first part of each public meeting focussed on an explanation of the study authorization and the intended study process. The latter part of each public meeting was devoted to public comment.

In May 1989, a Notice of Intent to prepare an environmental impact statement and to formally initiate public scoping, was published in the Federal Register (Federal Register, Vol. 54. No. 91, Friday, May 12, 1989). The notice requested comments to the NPS on issues of concern.

The preliminary scoping document was revised based on comments received in the public meetings and distributed in June 1989. The formal scoping process concluded on July 31, 1989, the deadline for comments established in the revised scoping document and in the Notice of Intent.

The identification and discussion of resources and issues extended well beyond the formal scoping process into a series of ongoing consultations with interested agencies, organizations, and individuals. The principal vehicle for these consultations was the study Task Force. Task Force meetings included discussions of resource and land use issues. For a more complete discussion of the task force process, see the discussion of the overall study process in Chapter VI., Consultation and Coordination.

Resource Assessment

The focus of the resource assessment phase was to identify and evaluate the significant natural, cultural, scenic, and recreational characteristics of the study area. The Task Force was divided into working groups for the assessment, each of which analyzed one category of resources. Each working group was responsible for three products: a **description** of the resources in the category, an **evaluation** of their significance, and a **discussion of trends** affecting the significant resources. The results of the evaluation were reviewed by an independent group of resource experts (see Chapter V, List of Preparers). The assessment was documented in the Summary of the Resource Assessment and herein in Chapter III, Affected Environment. Public meetings to discuss the resource assessment were held in Richland and Basin City, Washington in April 1990.

Analysis of Alternatives

The Study Team and Task Force identified reasonable alternatives which would provide some measure of long term protection to the significant resources described in the resource assessment. Based on an analysis of the conditions necessary to maintain significant resources and the adequacy of existing controls to provide these conditions and through public scoping, an array of protection alternatives was developed. The six alternatives described in this document represent this array.

The Task Force was again divided into working groups to develop a preferred alternative, as directed by Congress. After several reviews of working group proposals, the Task Force was able to reach substantial agreement on the major parameters of the Proposed Action as described in this report.

Documentation

The final phase of the study process was the development of the Study Report and Environmental Impact Statement (Report/EIS). Following the release of the draft Report/EIS in July 1992, a Task Force meeting and four public meetings were held during the comment period. The review period for final comments on the draft Report/EIS was extended three times and finally closed November 9, 1992. Upon conclusion of the comment period, this final Report/EIS was prepared. It will be filed with the Environmental Protection Agency and distributed to the public. No earlier than 30 days after this has occurred, the Secretary of the Interior will issue a Record of Decision (ROD) indicating his preference for a Proposed Action. His recommendation will be sent to Congress with the final Report/EIS for its consideration. For additional discussion of the process, see Chapter VI, Consultation and Coordination.

E. Issues And Concerns

Issues for Analysis in the Study Report/EIS

The following eleven issues were raised in the scoping process and are addressed at length in the report/EIS.

1. Impacts on Fall Chinook Salmon: The fall chinook salmon is widely regarded by sportsmen, fish and wildlife agencies, and Indian Tribes as one of the most significant natural resources of the Hanford Reach. The Hanford Reach is the last section of the Columbia River where salmon can build redds. Up to 90 percent of the 530,000 Fall Chinook harvested in 1989 were spawned in the Hanford Reach. Two issues related to protection of the salmon were raised repeatedly in the scoping process. The first is **fish passage**, or the ability of adult fish to migrate upstream to the Hanford Reach to spawn and juvenile fish to migrate downstream to the ocean. Particular concerns were raised about the potential for construction of a new dam in the Hanford Reach and the impacts it would have on fish migration and habitat.

The second major concern expressed about the fall chinook salmon focussed on **spawning and rearing habitat**. The availability of high quality habitat is critical to the survival of the salmon, and concerns were raised about activities or projects which would disturb habitat. Of particular concern is the prospect of a major water resource development project, such as dredging, in the Hanford Reach to allow upstream navigation.

2. Impacts on Cultural Resources: The protection of significant **archaeological sites** and resources of importance to the **culture of American Indians** were the principal issues raised. The archaeology of the Hanford Reach is regarded as exceptional by historic preservation organizations, agencies and tribes of the region. The closure of the Reach and its environs for defense production has protected cultural resources from disturbance for the last 50 years. The study area contains historic sites demonstrating the progression of land use associated with historic tribal settlements, European settlers' towns and farms which displaced tribal settlements, and the Hanford Site facilities which replaced the towns and farms.

More than 100 sites in nine districts are listed in the National Register of Historic Places. American Indians generally define cultural resources more broadly than non-Indians, and view the entire Hanford Reach as a cultural resource. Concerns were expressed about the protection of these sites from inundation, development, artifact collecting, and casual recreational use.

The future of the **B Reactor** was the other principal cultural resource issue which arose in the scoping process. The building has been placed in the National Register of Historic Places due to its role in the development of the atomic bomb. Several options are being considered by the DOE for the future of the B Reactor ranging from demolition along with the other defunct reactors along the Hanford Reach, to preservation of the structure as a possible interpretive museum.

3. Impacts on Biodiversity: The terms "intact ecosystem", "biodiversity", and "site integrity" have been used frequently in the scoping process to describe the unique assemblage of plant communities and animals found within the Hanford Reach. This ecosystem includes a gradation of aquatic, riverine, cobble, riparian, wetland, bluff, and shrub-steppe habitats. The gradation of habitats is continuous, i.e. all of the components are present and found in an undisturbed sequence. The habitats are also contiguous; there are no disturbances which separate habitats from one another. The study area is a largely intact example of the biodiversity once found along most of the Columbia River. Concerns were expressed about maintaining the exceptional diversity and integrity of **fish and wildlife habitat** within the study area.

Habitat integrity and diversity is reflected in another issue related to biodiversity, maintaining the **diversity in animal species** found within the study area. The final issue of biodiversity is **species abundance** for species of particular biological or recreational importance. Besides the fall chinook salmon and rare and endangered species addressed in separate issues, these species include several species of waterfowl, steelhead trout, resident fish, deer, and other biota.

4. Impacts on Threatened and Endangered Species: The study area supports a variety of federal and state listed endangered, threatened, candidate and sensitive species. Species include but are not limited to peregrine falcons, bald eagles, American white pelican, trumpeter swan, common loon, sandhill crane, Lewis's woodpecker, persistentsepal yellowcress, and Merriam's shrew. The reach is also an important resting place for migratory birds in the Pacific Flyway. Preservation of the river and Wahluke Slope would provide an ecosystem approach to species protection. The principal issue related to threatened and endangered species is **maintenance and enhancement of populations** of the six species of plants and the 53 species of wildlife that are on federal or state lists of threatened and endangered species.

5. Impact on the White Bluffs: The White Bluffs are a unique, scenic geologic feature as well as a geologic hazard. Visible for many miles, the bluffs are siltstone and claystone laden with fossilized remains from the Miocene, Pliocene, and Pleistocene epochs. Two different issues related to the White Bluffs arose in the scoping process. The first is **stability**. Concerns were raised about the sloughing of the bluffs and the impacts to water quality in the river and land use on the benches below the bluffs. The second issue is the **condition of fossils**. Instability of the bluffs and casual artifact collecting are detrimental to the integrity of the regionally-significant fossils in the White Bluffs.

6. Impacts on Water Quality: The principal issue related to water quality was the potential for **contamination from nuclear and hazardous waste storage facilities** on the Hanford Site. Concern was expressed about existing seepage of radionuclides at several identified locations along the river and about

the potential for increased contamination from groundwater in the future. Concerns were also raised about the water quality of irrigation return flows and sedimentation from shoreline development and bluff erosion.

7. Impacts on Instream Flows: Two different issues related to instream flows were discussed in the scoping process. The first is the maintenance of **flows for significant resources.** Many of the resources of the Hanford Reach, including fall chinook salmon, rare and endangered plant and animal species, and others, are dependent on certain river flows. Fish and wildlife agencies, hunting and fishing groups, environmental organizations, and the tribes are particularly concerned about maintenance of instream flows for important resources of the Hanford Reach.

The other instream flow issue relates to **power production** upstream of the reach. The Grant County Public Utility District is especially concerned that changes in instream flow needs in the Hanford Reach or management policy which might adversely affect their ability to generate power at Priest Rapids Dam immediately upstream of the reach. There is concern about the inability to construct new or expand existing powerlines across the river.

8. Impacts on Native American Access and Use: The Yakama Indian Nation (YIN), Confederated Tribes of the Umatilla Indian Reservation (CTUIR), and the Nez Perce Tribe have **access and use rights protected by law** and reserved in their treaties with the United States. These rights include access for fishing, hunting, gathering foods and medicines, grazing of livestock, and conducting traditional religious and cultural practices. The YIN, CTUIR, and Nez Perce tribes are particularly concerned about their continued access to the Hanford Reach for these activities.

9. Impacts on Land Ownership and Use: No set of issues received more thorough discussion than those related to agricultural use of the river corridor. Three distinct issues were discussed. The first was **continuation of existing practices.** Private landowners are concerned about their ability to continue their existing farming and grazing activities on their land and on public lands which are currently leased for grazing.

The second issue of particular concern is the **conversion of agricultural lands to other uses.** There are two distinct perspectives on this issue. Private landowners are concerned about retaining rights to convert agricultural land to other uses. Many environmental organizations, fish and wildlife agencies, and the Yakama Indian Nation are concerned about conversion to uses which may threaten important resources of the Hanford Reach.

The third issue related to agriculture is the **conversion of public lands into private agricultural use.** Again, there are two distinct points of view. Local government officials and private landowners have proposed that some public lands which are currently within the Hanford Site be made available for cultivation. This has been resisted by environmental organizations, fish and wildlife agencies, and the Yakama Indian Nation, who are concerned about impacts to fisheries, habitat, slope stability, and water quality. The potential for conversion is explained in the description of the No Action alternative.

10. Impacts on DOE Activities (1)on the Hanford Site: One of the more prominent issues to arise in the scoping process has been the impact of the protection alternatives on the operations of the Hanford Site. The effects on **site cleanup** have been mentioned most frequently. Concerns were expressed that the protection alternatives not prevent or complicate actions which are necessary to clean up prior contamination of the site. Some concern has also been expressed about the impacts of cleanup activities themselves on the important resources of the reach.

Many local residents and the DOE are also concerned about the impacts of protection alternatives on **existing operations** and **future missions** for the Hanford Site. A wide range of future missions are possible for the site, including expanded roles in energy production, research and development, and other activities. The DOE is particularly concerned about access to water from the Hanford Reach for industrial processes.

11. Impacts on Recreational Access and Use: The Reach is one of the most heavily used sport fishing and hunting areas in the State. Anglers seek anadromous fish such as fall chinook salmon, steelhead, sockeye salmon, coho salmon, and summer chinook salmon which spawn and migrate through the reach. Excellent hunting opportunities exist with over 150,000 waterfowl, primarily Canada geese and mallards migrating through or wintering in the Reach. Hunting is further enhanced since the Reach is frequently the only open water available in the area during extended cold weather. Swimming, boating, waterskiing, canoeing, and kayaking are also popular activities in the Hanford Reach during summer months. Two major concerns regarding future recreational use of the Hanford Reach were discussed in the scoping process. The first focused on **continuing access** for present recreational uses. Recreational users are particularly concerned about continued access for boating and hunting. The second recreational concern is potential control over the **amount of recreational use**. Recreational users are concerned that some uses may be controlled or prohibited in future management of the reach.

1 *This subheading was identified in the draft report/EIS as "Industrial Activities". In order to clarify its meaning, it has been revised to "DOE Activities".*

Issues Not Analyzed

The following issues were identified but not fully analyzed.

1. Future Plans for the Hanford Site: There has been considerable speculation about future land use on the Hanford Site in the course of the study. This report partially addresses this issue in the discussions of the potential for development and limitations on use within the boundaries of each alternative. While future development and land use elsewhere on the site could have an indirect impact on resources of the river and corridor, the future use of the Hanford Site is subject to many factors, including DOE missions and laws mandating cleanup of hazardous waste sites. Public Law 100-605 establishes a narrow geographical and topical focus for this study, and it would be inappropriate and probably fruitless to address land use issues for the entire Hanford Site. The DOE has recently completed a study of potential future uses of the Hanford Site, the Hanford Future Site Uses Working Group, to be included in the Hanford Remedial Action Environmental Impact Statement (HRA/EIS) in determining appropriate cleanup levels.
The Hanford Future Site Uses Working Group was convened in April 1992 by the DOE to encourage input from the federal, tribal, state, and local governments with an interest in the cleanup and possible future use of the Hanford Site. The Working Group was comprised of these entities and additional representatives from several constituencies with crucial interests in the successful cleanup of Hanford and in the possible future use of the site after cleanup. These constituencies included representatives of labor, environmental, agricultural, economic development, and citizen interest groups. The Working Group was charged with three related tasks:

- To examine Hanford and identify a range of potential future uses for the site;
- To select appropriate cleanup scenarios necessary to make these future uses possible in light of potential exposure to contamination, if any, after cleanup; and
- To probe for convergences among the Group's cleanup scenarios for any priorities or criteria which could prove useful in focusing or conducting the cleanup of Hanford.

The Working Group was <u>not</u> charged with making choices or recommending specific future uses for Hanford lands. The Group's final report is considered a "vision of possible future uses and an examination of what the cleanup needs to accomplish in order to make those uses possible." (U.S. DOE, 1992)
Of particular significance to this study of the Hanford Reach are the Working Group's findings and recommendations concerning the Columbia River:

- "Cleanup of sediments in the river or of contaminants in the riparian zone or on the islands should be undertaken only if the cleanup can occur without causing more harm than good.
- There should be no damming or dredging in the Hanford Reach.
- Sloughing of the White Bluffs should be stopped, but cleanup funds should not be used for this purpose.
- All cultural and archaeological resources and areas of cultural significance should be protected.
- Wildlife habitat should be protected.
- Class A water quality should be maintained, over the long term, with reasonable efforts made to improve the quality over time (Class A water quality is defined in the Washington Admin. Code Chapter 173-201 and is intended to support all beneficial uses of water.).

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2. Project Operations Outside the Study Area: The operation of federal and nonfederal dams on the Columbia River has received a great deal of attention during the study period, largely as a result of concerns about the decline in wild salmon stocks in the Columbia Basin. Many of the important resources of the Hanford Reach are dependent on the flow regime of the river, and changes in the operations of upstream and downstream dams could have significant impacts to the area. Given the complexity of the framework of laws, regulations, and vested rights under which these dams operate, a thorough analysis of revisions to project operations is beyond the scope of this study. This analysis is the subject of the Systems Operation Review, a multi-year study by the Bonneville Power Administration, the U.S. Bureau of Reclamation, and the Corps to review project operations. This issue is addressed in several of the alternatives by proposing that representative of the agency selected to manage the area participate in the various flow negotiations on the Columbia River to ensure the protection of significant resources of the Hanford Reach.

3. The Viability and Impacts of New Dams and Water Resource Development Projects: There was considerable debate during the study process about whether a new dam or water resource development project is likely to occur. Previous development proposals for the reach are indicative that the area is threatened. The setting aside of these same projects could be a sign that such proposals are extremely unlikely to be implemented. Based on the technical, environmental, economic, and political constraints of these projects, their size and complexity, they are viewed as potential scenarios. A more systematic analysis of the prospects for a new dam or dredging project is outside the scope of the study.

The impacts of a dam or water resource development project are considered as potential actions in Alternative B. These impacts would be avoided in the Proposed Action, Alternatives A, C, D, and E. The planning studies for the Ben Franklin Dam and the Mid-Columbia Navigation Project offer much more intensive analyses of impacts, and are not the subject of this study. The bibliography contained in Appendix A includes references where additional information can be located.

Alternatives Considered but Dismissed

Two alternatives were considered but dismissed during the course of evaluating all possible alternatives for the Hanford Reach. The first alternative considered local management of the river and lands north and east of the river. This alternative was eventually disregarded because it would not provide long-term protection of the Hanford Reach, specifically local communities would not have the authority to prohibit federal activities which would adversely affect resource values. The second alternative, would have been to place the refuge boundary on the north side of the river at Highway 24. Because the lands which would have been excluded contain valuable shrub-steppe habitat, including habitat for threatened and endangered species, this alternative was dismissed.

F. National Wild and Scenic River Eligibility

National Wild and Scenic River designation is one of the options that the Secretary of the Interior is directed to investigate in the authorizing legislation for the Hanford Reach. The following documents the eligibility and classification stages of the Wild and Scenic River evaluation.

Eligibility

There are two criteria for eligibility for Wild and Scenic River status:

1. The river must be "free-flowing."

2. The river and/or corridor must have at least one "outstandingly remarkable" resource value.

Classification:

Three classifications are possible for rivers in the Wild and Scenic Rivers System: wild, scenic, and recreational. The terms indicate the degree of land use development along the river at the time of the evaluation and also serve as a prescription for future management.

- Wild rivers have shorelines and watersheds which are essentially primitive and are generally inaccessible except by trail. Wild river areas have little or no evidence of human activity along them.
- Scenic rivers have shorelines and watersheds which are largely primitive and shorelines which are largely undeveloped. Structures must be limited to relatively short reaches of the segment under evaluation. Scenic rivers may be accessible in places by roads.
- Recreational rivers may have a substantial amount of land use development along their shorelines and within their watersheds and may be readily accessible by roads. Unlike other classifications, recreational rivers may have a wide variety of timber and agricultural activities along them.

The classification process consists of an evaluation of the type and extent of development and access along the river and corridor. On-site visits, maps, and aerial photography are commonly used for the evaluation. The evaluation focusses on conditions within the study area, although adjacent land uses may be considered if they have a direct impact on the character of the river and corridor. The river may be segmented, with each segment separately classified.

Findings

Free-Flowing Criterion: Under the Wild and Scenic Rivers Act (P.L. 90-542, as amended), the term free-flowing is defined as "existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway." (section 15(b)) Through its actions in designating rivers, Congress has shown that the definition allows for prior impoundments and diversions upstream and downstream of the designated segment, even if they result in modifications of the natural flow regime.

While the flow within the Hanford Reach is modified by Priest Rapids Dam and other upstream facilities, the river is without impoundments, substantial diversions, and straightening within the immediate study segment. The Hanford Reach is therefore found to be free-flowing under the definitions of the Wild and Scenic Rivers Act.

Outstandingly Remarkable Value Criterion: The Act specifies that eligible rivers must possess at least one of the following values to an "outstandingly remarkable" degree: scenic, recreational, geologic, fish and wildlife, historic, or cultural. The term "outstandingly remarkable" is not further defined, but has been interpreted to indicate resource values which are exceptional in quality or rarity in a regional or national context.

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The resource assessment phase identified seven resources of the Hanford Reach which are nationally important by virtue of their rarity or exceptional quality. The resources are:

- Fall Chinook Salmon
- Intact Ecosystem
- American Indian Cultural Resources
- Archeological Sites
- Hydrology and Geology (for Energy Facility Siting)
- Federally Recognized Rare Plant Species
- Federally Recognized Rare Animal Species

All of these resources can be defined as "outstandingly remarkable" under the Wild and Scenic Rivers Act. These resources are described in greater detail in Chapter III., Affected Environment.

Conclusions: The Hanford Reach is found to be free-flowing and to possess more than one outstandingly remarkable values. Therefore, it is eligible for Wild and Scenic River status. The governing factor in classification of the Hanford Reach must be the evidence of human use and activity along the river. Despite the low density of development and access, the size of the facilities which are present and the topographic characteristics of the corridor make the existing development highly evident to the visitor. The even distribution of these facilities prevents segmentation. For this reason, the proper classification for the entire study area is **recreational**. This is the least restrictive in terms of future management of Wild and Scenic River designation along the river (For further discussion of Wild & Scenic River eligibility, refer to Appendix F).

G. Decisions To Be Made Upon Completion Of The Study

In accordance with Public Law 100-605, the Secretary of the Interior will transmit the final report/EIS to Congress with his recommendation for protection. The recommendation by the Secretary will occur after consultation with the Secretary of Energy. The Congress may determine the disposition of the study area through legislative action, however, if Congress passes no legislation, the No Action scenario would become effective (see Alternative B).

H. Legislative And Other Constraints On All Alternatives

Under all alternatives, the administering agency must conform to a variety of existing laws including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA aka Superfund); the Resource Conservation and Recovery Act (RCRA); the National Historic Preservation Act; The Treaties of 1855; the American Indian Religious Freedom Act; the Pacific Northwest Electric Power Planning and Conservation Act; the National Environmental Policy Act; and the Endangered Species Act. In addition, no alternative which limits or closes existing hydroelectric operations would be recommended. Compliance with laws and regulations will occur in the following actions which are common to all alternatives: Hanford Site cleanup, management of Columbia River flows, access for American Indians, law enforcement, protection of cultural resources, environmental review of proposals for use and development, and protection of threatened, endangered, candidate, and sensitive species. For further information refer to Chapter II., Alternatives, Existing Legal Requirements Common to All Alternatives, page 22.

I. Other Relevant Studies and Plans

The following ongoing studies and planning processes have direct relevance to the future management of the Hanford Reach.

Columbia River System Operation Review

The System Operation Review (SOR) is a comprehensive study of the operation of the 14 federal hydropower projects on the Columbia River System, including the dams upstream and downstream of the Hanford Reach. The goal of the SOR is to achieve a coordinated system operation for the river that better meets the needs of all river users. The study will evaluate alternatives for operating the dams to better meet the competing demands of irrigation, power production, navigation, flood control, fish and wildlife habitat, recreation, and other uses. The project is being sponsored by the Bonneville Power Administration, the U.S. Bureau of Reclamation, and the Corps; the National Marine Fisheries Service and NPS are cooperating agencies in this process, and the USFWS has participated throughout the review pursuant to the Fish and Wildlife Coordination Act.

Five Year Plan

The five year plan is a DOE document which addresses nationwide priorities for projects. The plan provides additional detail on staffing and budget needs for projects which are identified in DOE's long term planning. Unless Congress acts on the DOE's request to be relieved of the obligation to prepare the five year plan, the plan will continue to be updated annually. Projected actions on the Hanford Site are addressed in the five year plan.

Columbia Basin Anadromous Fish Recovery Actions

As discussed in numerous locations throughout this report/EIS, anadromous fish stocks in the Columbia River system are declining at an alarming rate. Several studies and plans are underway to reverse this trend and begin the recovery of this important resource. These actions are totally independent of the proposals contained in this study/EIS.

Endangered Species Act (ESA) - In 1991, the National Marine Fisheries Service (NMFS) listed the Snake River sockeye salmon as an endangered species. In 1992, the NMFS listed the Snake River spring/summer chinook and fall chinook salmon as threatened species. Recovery plans are currently being developed for these stocks of fish. None of the stocks are found in the Hanford Reach; however, the recovery plan or other proposals to benefit stock improvement may cause flows through the Hanford Reach to be further altered. A further discussion of the Endangered Species Act is included in Ch. II, Alternatives, Existing Legal Requirements Common to all Alternatives.

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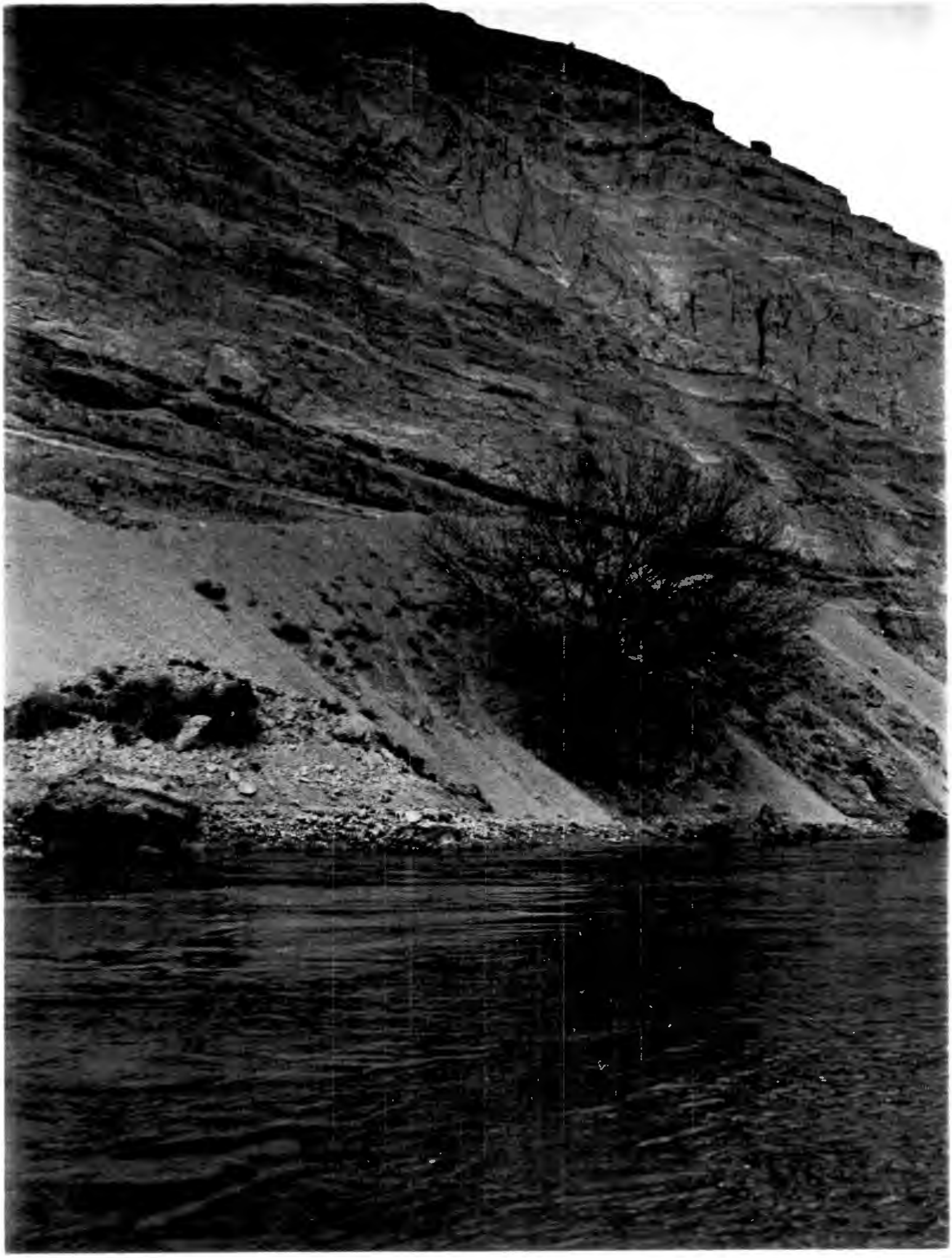
System Operation Review (SOR) - The SOR is defined above and described in more detail in Ch. III, Affected Environment. The decline of anadromous fish stocks in the Columbia River system was a prime motivation behind the initiation of the SOR.

System Configuration Study (SCS) - The SCS is a reconnaissance level study by the ACOE which seeks to evaluate potential physical changes to the Columbia River system in order to improve the survival of anadromous fish. Alternatives being considered by the ACOE include the modification of spillways, powerhouses and associated structures, the construction of a migratory canal or floating pipe and associated diversion and bypass structures to transport juvenile fish from the lower Snake River to below Bonneville Dam on the lower Columbia River, drawing down John Day Reservoir, and providing additional storage on the upper Snake River. The SCS is concerned with the Snake River and Columbia River downstream from the confluence with the Snake River, and is not expected to directly affect the Hanford Reach.

Northwest Power Planning Council's Fish and Wildlife Program - The Northwest Power Act directs the Council to develop a "program to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat on the Columbia River and its tributaries". In 1987, the Council adopted the goal of doubling salmon and steelhead runs within the Basin. In 1988, the Council amended the Fish and Wildlife Program to designate Protected Areas, areas that represented the region's most valuable fish and wildlife habitat. The purpose of the Protected Area designation is to discourage hydropower development in these areas by prohibiting the Bonneville Power Authority from acquiring power from such developments and by denying them access to the intertie. The Federal Energy Regulatory Commission, which issues licenses to hydropower developers, has honored the Protected Areas amendment as a comprehensive plan, and has not issued a license or exemption that conflicts with the amendments. The Hanford Reach is designated as a Protected Area.

Planning for Hanford Site Cleanup Activities

Cleanup actions are specified in Records of Decision issued by the lead regulatory agency under the Tri-Party Agreement. The DOE is providing for National Environmental Policy Act (NEPA) requirements through a three-tiered process. The first tier is comprised of national programmatic environmental impact statements (EIS) on environmental restoration and waste management and on the reconfiguration of defense production, both of which are in process. The middle tier is provided by a remedial action EIS which is specific to the Hanford Site. The lowest tier comprises remedial action studies for specific waste sites. Each tier defines proposed actions and anticipated consequences in varying degrees of detail, and incorporates a public and/or agency review process.



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CHAPTER II
ALTERNATIVES

Six alternatives were developed for protection and preservation of the Hanford Reach of the Columbia River in accordance with Public Law 100-605. Each of the alternatives describes varying degrees of protection for significant resources. The alternatives provide a range of options for legislative designation for preservation and protection, and a No Action alternative providing no additional protection than what currently exists. The Proposed Action was considered to be the course of action best fulfilling Congressional intent. The draft report/EIS included two options in the Proposed Action, Option 1 which excluded private lands within the designated area, and Option 2 which included them. In this final report/EIS, Option 2 was selected as the Proposed Action and Option 1 is analyzed as Alternative A.

Existing Legal Requirements Common to all Alternatives

Seven legal requirements, described below, apply regardless of which alternative is selected. The degree of influence that an alternative would exert on these requirements will vary from minor in the cases of the Hanford Site Cleanup and Management of Columbia River Flows to more significant in the cases of the remaining five requirements. The purpose of this discussion is to point out the similarities that would exist regardless of the alternative selected. Differences associated with these requirements are explained in the discussions of each alternative.

1. Hanford Site Cleanup

The Hanford Reach is part of the Hanford Site, however, only a portion of the Reach is included in the Hanford Site cleanup activity described below.

The Hanford Site is owned by the Federal government and managed by the U.S. Department of Energy (DOE). Since 1943, facilities at the Hanford Site were built and operated primarily to produce nuclear materials for national defense and manage the waste generated by those facilities. Nine production reactors were built along the Hanford Reach.

Production of defense nuclear materials at the Hanford Site has left a mixed legacy. The exclusion of public access and commercial development along the Hanford Reach has given a degree of protection for the natural and cultural resources that is unparalleled elsewhere on the Columbia River. However, the defense production mission has left the Hanford Site with environmental contamination that will take years to remedy. The current DOE mission at the Hanford Site is environmental restoration, waste management, and research.

In 1989, the DOE, US Environmental Protection Agency (EPA), and Washington Department of Ecology (WDOE) entered into the Hanford Federal Facility Agreement and Consent Order which committed the three agencies to a long term cooperative program for cleaning up the Hanford Site. The purposes of the "Tri-Party Agreement" (TPA), as it is commonly known, are to investigate hazardous and nuclear waste contamination on the site, develop and implement appropriate response actions to remedy contamination problems, and coordinate agency actions under state and federal environmental laws and regulations. The TPA is in the process of being renegotiated with the final agreement expected to be completed by early 1994. The revised TPA will have an increased focus on restoration and remediation, with activities along the river given highest priority, and actions to slow or halt groundwater migration to the river.

For at least the next 30 years, the agencies will be actively involved in identifying and cleaning up waste sites that pose a risk to human health, welfare, and the environment. This work is expected to involve both non-intrusive and intrusive investigations. Non-intrusive investigation includes biological and ecological sampling, spring and seep sampling along river beds, geophysical methodologies (i.e ground penetrating radar), soil gas sampling, and surface soil sampling. Intrusive investigation includes installing ground water monitoring wells, soil borings, and excavations for analysis. Once contamination has been identified and quantified, actions may begin, if necessary, to stabilize or remove contaminants. This may include removal of soil, pumping and treating of ground water, various containment activities, or capping of contaminated areas. Most contamination is found in the 200-Area Plateau, outside of the study area. Areas within the study area are mostly confined to the 100-Area (B-Reactor to F-Reactor) where soils are contaminated. Groundwater contamination also occurs within this area and from Hanford Townsite to the southern boundary of the study area. Please refer to Ch. III, Affected Environment, Hanford Reach Contamination, page 75, for a more detailed description of contamination.

Land use decisions will determine clean-up levels required under the Tri-Party Agreement. Congressional designation of either a National Wildlife Refuge with National Wild and Scenic River overlay, National Conservation Area, or National River would establish land use and appropriate clean-up levels could be determined. The No Action Alternative and Alternative C would not determine land use for the Hanford Reach as quickly or decisively as Congressional action. Therefore, Congressional designation may expedite Hanford Reach clean-up. No additional areas of the Hanford Site will be open to public use until a thorough evaluation of the extent and potential hazard of wastes is conducted and safe use can be ensured in the area.

The DOE will retain full liability and cleanup responsibility in perpetuity for current and future contamination problems which originate prior to DOE's disposal of the land in the Hanford Site. Language would be included in the designating bill which explicitly releases the future managing agency from liability and cleanup responsibility of contamination which originates prior to DOE's disposal of the land.

The DOE Pacific Northwest Laboratory (PNL), operated by Battelle Memorial Institute, currently performs environmental monitoring sitewide. PNL is presently tasked by the DOE to monitor the overall impact of Hanford activities on the environment, inside and outside the study area.

2. Management of Columbia River Flows

The Columbia River supports a variety of uses dependent on the flow regime of the river. Of the four primary uses of the river which include fisheries, power generation, navigation, and flood control, fisheries and power generation are located within the Hanford Reach.

Fisheries:

The Hanford Reach is the only portion of the Columbia River that supports healthy populations of native fish species. Spawning habitat for anadromous fish within the mainstem Columbia is limited to the Hanford Reach. Due to the variety of competing uses on the Columbia River, numerous plans and laws have been adopted to try and protect the fisheries resource, particularly the anadromous fish. They include, but are not limited to, the Northwest Power Planning Council's Fish and Wildlife Program, which calls for rebuilding of salmon and steelhead runs to the Columbia River as mitigation for losses accrued from hydropower development; National Marine Fisheries Service Recovery Plan for Snake River salmon which is planning for recovery of salmon stocks in accordance with the Endangered Species Act; U.S. - Canada Pacific Salmon Interception Treaty of 1985 which sets controls on ocean harvest of Columbia River chinook runs; upholding the Treaties of 1855 which protect fishing rights for certain Columbia River Indian Tribes; Columbia River Fisheries Management Plan which establishes management guidelines for habitat protection enhancement efforts, hatchery production techniques, escapement levels, and harvest allocation requirements such as season lengths and bag limits; the Vernita Bar Agreement which provides for minimum flow releases below Priest Rapids dam for the protection of fall chinook salmon spawning areas on the Vernita Bar. The System Operation Review, discussed earlier, will consider operational and physical changes to federal dams that would encourage the recovery of endangered and threatened anadromous fish stocks in the Columbia River system.

The plans, actions, studies, and laws discussed above could cause alteration of the flows in the Hanford Reach for improved fish production or passage. None of the alternatives considered in this Report/EIS would affect existing laws, agreements, plans, and policies with regards to instream flows.

Power Generation:

Economically significant hydroelectric and nuclear generators that support the energy needs for the Pacific Northwest are located above, below, and within the Hanford Reach.

Nuclear Energy

The Washington Public Power Supply System (WPPSS) generates nuclear energy, and has facilities located near the southern boundary of the study area. Of the three facilities, WNP-2 is the only nuclear reactor generating electricity at this time. WPPSS depends on water withdrawals from the Reach for operation of the reactor. It is not the intent of any of the alternatives to affect WPPSS's existing water rights. Any legislative proposal would include language which explicitly authorizes the continued withdrawal of water for these facilities.

Hydroelectric Power

Priest Rapids Dam (Grant County Public Utility District) and McNary Dam (U.S. Corps of Engineers) are two hydroelectric generators which are located upstream and downstream of the Hanford Reach. Each depends on continuation of present water rights and operating licenses. It is not the intent of any of the alternatives to affect the existing water rights of these facilities. Should an alternative other than the No Action alternative be selected, language would be recommended in the designating legislation which explicitly authorizes the continued operation of these facilities. Furthermore, the recommended legislation would explicitly allow the Federal Energy Regulatory Commission (FERC) to issue a new license at Priest Rapids Dam when the existing license expires, in accordance with appropriate FERC regulations. Unless this provision is included in the legislation, designation under the Wild and Scenic Rivers Act could prohibit FERC from issuing a new license for an existing dam on a National Wild and Scenic River.

3. Access for American Indians

The Yakama Indian Nation (YIN), the Confederated Tribes and Bands of the Umatilla Indian Reservation (CTUIR) and the Nez Perce Tribe, under separate treaties (12 Stats., 945,951 & 957) with the United States, have the right to fish at traditional fishing sites, known as "usual and accustomed places." All three Tribes have access rights to the Columbia River under these provisions and none of the alternatives would affect these access rights.

Additionally, these treaties reserved for the Tribes the privilege of hunting, gathering roots and berries, and pasturing of horses on open and unclaimed lands. The area of the Hanford Reach is on the land ceded by the YIN and CTUIR in their respective treaties. For approximately 50 years the DOE (and its predecessor agencies) has maintained strict access controls for security and safety reasons. As a result, access was severely limited for tribal members as well as the general public.

The recent change in the primary DOE mission at Hanford has resulted in more relaxed security controls. A change of ownership and/or governmental use of these lands could further reduce or eliminate the need for limiting access.

The American Indian Religious Freedom Act of 1978, (P.L. 95-341) established "the policy of the United States to protect and preserve for Native Americans their inherent right of freedom to believe, express and exercise their traditional religions....including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites." The law required Federal agencies to evaluate their policies and procedures in consultation with native traditional religious leaders in order to determine appropriate changes necessary to protect and preserve American Indian religious cultural rights and practices.

The Hanford Reach has many places of religious significance to American Indians. Access is necessary to properly perform important ceremonies. So long as the lands remain in federal ownership, reasonable access for religious activities by American Indians would be assured.

4. Law Enforcement

State and federal law enforcement agencies have concurrent jurisdiction over the Hanford Reach area, with shared authority for the enforcement of state laws and regulations. This would continue in all alternatives.

Enforcement of federal laws and regulations would be the responsibility of the managing federal agency only, unless state law enforcement personnel are deputized by the managing agency to enforce federal law. Tribes have the primary authority for enforcement of tribal laws and regulations over their members.

5. Protection of Cultural Resources

In accordance with Section 110 of the National Historic Preservation Act of 1966, federal agencies will identify, evaluate, register, and protect properties of historic, archaeological, architectural, engineering, or cultural significance. The resulting inventories would provide the substantive data for nominating resources to the National Register of Historic Places; for general planning and specific cultural resource management proposals; development, interpretation, and maintenance activities; and for compliance with legal requirements.

In Section 106 of the same Act, federal agencies are required to consider what effects their actions, and actions where they may assist, permit, or license, may have on historic properties listed in, or eligible for listing in, the National Register of Historic Places. Projects must also be in compliance with the Archaeological Resource Protection Act and the American Indian Religious Freedom Act.

The following management actions for cultural resources are common in each of the alternatives.

1) The lead managing agency would be responsible for ensuring compliance with Section 106 and other cultural resource laws and regulations. Projects proposed for construction or development would be reviewed by a qualified cultural resource specialist. Sites for proposed projects would be thoroughly investigated before any work is begun in the field. Investigations may require literature and records review, field surveys, and interviews with tribal elders. If a site contains evidence of cultural significance, the proposed project would be relocated or mitigating actions would be required.

2) Law enforcement staff would be trained in cultural resource law and management, and would be responsible for investigating and prosecuting any violations of the Archaeological Resource Protection Act and other cultural resource laws and regulations.

In addition, all planning for land management, site cleanup, and other actions would undergo environmental review in compliance with the National Environmental Policy Act.

6. Environmental Review of Proposals for Use and Development

Existing federal laws, regulations, and agency authorities which provide for environmental protection, including but not limited to the Clean Air Act, the Clean Water Act, the National Environmental Policy Act, and the Federal Power Act (as amended by the Electric Consumers Protection Act), the Fish and Wildlife Coordination Act, and the Endangered Species Act would continue to be in effect under this proposal.

7. Protection of Threatened, Endangered, Sensitive, and Candidate Species

The Endangered Species Act of 1973, as amended, was established as a means of identifying species threatened with extinction, and providing for the protection and recovery of those species and their habitat. Administration of the Act is delegated to two federal agencies; the National Marine Fisheries Service has jurisdiction over anadromous fish and the USFWS has jurisdiction over all other plants and animals.

Two sections of the Act are particularly pertinent to the Hanford Reach study:

Section 7 requires all federal agencies to insure that their actions do not jeopardize the continued existence of listed species, and to use their authorities to conserve listed species. Conservation efforts may include avoiding or modifying actions that would negatively affect listed species. Section 7 also requires federal agencies to consult with the USFWS and National Marine Fisheries Service when any activity which is permitted, funded or conducted by that agency may affect a listed species or designated critical habitat. The roles of the USFWS and National Marine Fisheries Service are primarily advisory and aimed at minimizing impacts to listed species. A proposed action by any federal agency is prohibited by the Act only if the future existence of a listed species would be in jeopardy if the action were carried out.

Section 9 prohibits the "take" of listed species. "Take" is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." "Harm" is further defined as an act "which actually kills or injures" listed wildlife. Harm may include "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter" (50 CFR 17.3), but this definition of harm has been rarely used in the past. While Section 7 pertains only to federal agencies, Section 9 applies to federal, state, and private.

Candidate species are those currently under consideration for future designation as threatened or endangered. They possess no additional protection as a result of their candidate status. However, protection provided to candidate species now may preclude possible listing in the future. For a discussion of the species listed as threatened, endangered, or candidates under the Endangered Species Act, please refer to Appendix H.

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PROPOSED ACTION:
National Wildlife Refuge with National Wild and Scenic River overlay

This alternative was "Option 2" of the Proposed Action in the draft Environmental Impact Statement. "Option 1" of the draft EIS is now Alternative A, being analyzed in this document.

1. Focus of Management

This alternative would provide permanent protection for salmon and cultural resources, enhance wildlife habitats and populations, and improve visitor access and interpretation.

2. Designations and Boundaries

This alternative would require legislative action by Congress to designate a new National Wildlife Refuge and National Wild and Scenic River.

The new Congressionally authorized National Wildlife Refuge would include the river and islands (49.5 miles, from RM 396 to RM 346.5 at the northern tip of Johnson Island), all federally-owned lands within 1/4 mile of the river on both banks, and all lands currently within Saddle Mountain National Wildlife Refuge and Wahluke State Wildlife Recreation Area, a total of approximately 102,000 acres. The Wild and Scenic River overlay would encompass the river (49.5 miles, from RM 396 to RM 346.5), and extend inland an average of one quarter mile on both sides of the river. Private and state owned lands would be included in the designation and consist of approximately 2,600 acres (approximately 1,870 of which is privately-owned). The river management plan would establish precise lateral boundaries. The southern boundary, RM 346.5, was revised to exclude the DOE "300" Area because of extensive cleanup activities.

3. Management Agencies

The U.S. Fish and Wildlife Service (USFWS) would be the administrator and would oversee all resource and use management actions under the laws and guidelines of the national refuge and national wild and scenic rivers systems. Administration of all Federal lands within the boundary would transfer to USFWS after certified as acceptable for refuge purposes.

During the cleanup and until such time that lands are officially transferred upon certification by the Tri-Party Agreement regulators to the USFWS, the DOE would continue to maintain responsibility and liability for all cleanup activities and contaminated land. In accordance with the requirements of CERCLA, the DOE would perform site cleanup, environmental monitoring and research, site security, cultural resource management, and other missions as assigned by Congress for the Hanford Site. The USFWS is prohibited by Secretarial Order 3127 from acquiring contaminated land.

A Memorandum of Agreement may be established between Federal agencies in order to specify exact responsibilities for management of the area prior to and subsequent to any official land transfer. Washington State Department of Fish and Wildlife (WSDFW) would continue to review resource management actions and employ agents to patrol and enforce state hunting and fishing laws and regulations. The National Marine Fisheries Service would continue to oversee Endangered Species Act activities for Columbia River salmon.

Uses on private and state property would continue to be the responsibility of local and state governments.

4. Mission and Goals of the U.S. Fish and Wildlife Service

The 1991 document "Vision for the Future" provides the most recent articulation of the USFWS mission: "To provide leadership to achieve a national net gain of fish and wildlife and the natural systems which support them. " The mission of the National Wildlife Refuge system as stated in the Refuge Manual, (USFWS, 1982) is "to provide, preserve, restore, and manage a national network of lands and water sufficient in size, diversity and location to meet society's needs for areas where the widest possible spectrum of benefits associated with wildlife and wildlands is enhanced and made available." The goals of the National Wildlife Refuge system are:

a. To preserve, restore, and enhance in their natural ecosystems (when practicable) all species of animals and plants that are becoming endangered or threatened with becoming endangered;

b. To perpetuate the migratory bird resource;

c. To preserve a natural diversity and abundance of fauna and flora on refuge lands; and

d. To provide an understanding and appreciation of fish and wildlife ecology and man's role in his environment and to provide refuge visitors with high quality, safe, wholesome and enjoyable recreational experiences oriented toward wildlife to the extent these activities are compatible with the purposes for which the refuge was established.

The following descriptions of actions are reflective of typical administrative actions for refuges in the Columbia Basin pursuant to these stated missions and goals. However, because the Service implements management programs only after in-depth planning with public involvement, the specifics of administration, staffing, and management which follow should be considered the most reasonable projections based on current information.

5. Administration and Staffing

Initially, administration of the Refuge/Wild and Scenic River would be as a substation of the Columbia National Wildlife Refuge Complex, based in Othello, which presently operates Saddle Mountain National Wildlife Refuge. The USFWS staff, to be assigned on a full time basis, may include a refuge manager (administrative and technical), wildlife biologist (technical), several public use specialists (interpretive and law enforcement), clerical person, and maintenance staff. Initially, cultural resources would be managed out of the USFWS Regional Office in Portland. Final staffing needs would be determined following development of a refuge and river management plan. Daily operations would also utilize the existing

administrative and support facilities of Columbia National Wildlife Refuge and its additional equipment and administrative, technical, and maintenance personnel as needed. The support staff of the USFWS's regional office would also be available as needed.

6. Planning and Public Participation

A comprehensive refuge management and development plan would be prepared. A river management plan (RMP), a requirement of the National Wild and Scenic Rivers Act, would identify the river values to be protected and the measures necessary to do so. The USFWS would work with the local jurisdictions to develop guidelines for zoning on or through private lands which would restrict specified new disturbance and development activities in the corridor. Emphasis would be placed on protecting those aesthetic, scenic, historic, cultural, archaeological, and scientific features which made the Hanford Reach eligible for designation. Zoning responsibilities would be reviewed with Benton, Grant, and Franklin Counties. Public participation processes would be integrated into all major planning and development activities for these areas. The process would include formal notice of the activity, hearings or meetings as needed.

7. Resource Management Actions

Some management actions have been rephrased from the draft report/EIS. This was done for clarification in response to public comment. There are no entirely new management actions and no significant changes from the draft report/EIS. The following descriptions of actions are reflective of typical administrative actions for refuges in the Columbia Basin. Because the USFWS implements management programs only after in-depth planning with public involvement, the specifics of administration, staffing, and management which follow should be considered the most reasonable projections based on current information.

Fisheries Management:
This alternative would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse effect on fishing resources would also be prohibited through provisions in the designating legislation.

The USFWS would:

- Evaluate instream flow proposals for the Columbia River.
- Work with all appropriate federal, state, and local agencies to protect flow needs for fish passage and production.
- Monitor and, if necessary, control nuisance aquatic macrophytes, such as Eurasian milfoil.
- Emphasize maintenance of riparian vegetation on private and state-owned lands through recommendation of standards for local land use ordinances.
- Consider acquisition of an easement to private property where proposed development would have a significant adverse effect on salmon habitat and cannot be mitigated through other measures.

Habitat and Wildlife Management:

In order to maintain and enhance shrub-steppe and riparian habitats, USFWS would:

- Suppress wildfires through accepted techniques.
- Manage non-native vegetation and noxious weeds (including Russian olive trees, salt cedar, purple loosestrife, and common white mulberry trees), with the exception of those that provide needed benefits to wildlife such as bald eagles, hawks, and other species.
- Enforce the laws which prohibit off-road vehicle use in unauthorized areas, such as along the White Bluffs.
- Cease grazing on federal land throughout the designated area, except for habitat management purposes.
- Limit public access in key habitat areas through frequent patrols and signs.

In order to maintain and enhance riverine and aquatic habitats, USFWS would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse effect on riverine and aquatic habitats would also be prohibited through provisions in the designating legislation.
- Patrol frequently to protect island habitat for wildlife, such as Forster's terns.
- Evaluate instream flow proposals for the Columbia River.
- Work with all appropriate federal, state, and local agencies to protect flow needs for riverine and aquatic habitats.
- Retain or replant riparian trees for heron nesting and eagle roosting.

In order to maintain and enhance wildlife populations, USFWS would:

- Maintain and enhance habitats, as explained above.
- Maintain the wintering waterfowl sanctuaries within the Saddle Mountain National Wildlife Refuge and along the river above the wooden pole powerlines.
- Continue sharecropping opportunities on federal lands where appropriate for wildlife purposes.
- Maintain the raptor prey base through maintenance of native upland habitat.
- Conduct population restoration and enhancement projects on specific species identified in management planning.
- Conduct baseline biological inventories and establish long-term monitoring programs, in conjunction with other established DOE programs. The refuge contaminant monitoring manual will be utilized to identify and develop a long term monitoring program for the area.
- Encourage voluntary habitat restoration projects on private lands through technical assistance and educational programs.
- Review existing protections (i.e. Growth Management Act, Shorelines Management Act) and recommend standards for local land use ordinances which would emphasize maintenance of native riparian and upland habitat on private and state-owned lands.
- Consider acquisition of an easement to private property where proposed development would have a significant adverse effect on significant habitat areas and could not be mitigated through other measures.

Threatened, Endangered, Sensitive, and Candidate Species Management:
In addition to the actions mandated by the Endangered Species Act, which are discussed in actions common to all alternatives, the following would be considered in a refuge and river management plan. Federal and state listed species are identified in Appendix H. The following management actions could take place:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse effect on threatened and endangered species would also be prohibited through provisions in the designating legislation.
- Determine population numbers and trends for species along the Hanford Reach.
- Investigate habitat needs and evaluate the availability of suitable habitat for the species; initiate an active habitat restoration or enhancement program for all species which are limited by the current availability of suitable habitat.
- Maintain the amount and quality of existing habitat (see habitat and wildlife management actions above).
- Establish reintroduction programs for native species which have been extirpated along the Hanford Reach.
- Reduce disturbance of species by preventing inappropriate activities in sensitive habitats.

Cultural Resources Management:
Upon transfer of management jurisdiction, cultural resource management responsibility would be transferred from the DOE to the USFWS. The USFWS would work closely with tribal governments and would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse effect on cultural resources would also be prohibited through provisions in the designating legislation.
- Implement Section 110 and Section 106 of the National Historic Preservation Act (for list of specific activities, refer to Existing Legal Requirements Common to All Alternatives, Protection of Cultural Resources).
- Train resource management staff in cultural resource laws and applicable management policies.
- Manage site records and curate artifacts.
- Monitor significant cultural resource properties to evaluate the effectiveness of cultural resource management and protection policies.
- Conduct archeological surveys to augment the inventory of sites along the river.
- Provide the interpretation of cultural values through an educational outreach program.
- Restrict unauthorized public access in sensitive cultural areas through signing and patrolling.
- Continue the frequent random surveillance of culturally sensitive areas.
- Suppress wildfires through accepted techniques.
- Consider acquisition of an easement to private property where proposed development would have a significant adverse effect on cultural resources and could not be mitigated through other measures.

Geologic Resources Management:
The USFWS would:

- Seek the voluntary participation of other agencies, organizations, and individuals to remedy sloughing of the White Bluffs.

- Enforce the closure of the White Bluffs to off-road vehicle use.

The USFWS would not:

- permit or initiate any actions which would contribute to the sloughing of the White Bluffs.

8. Management of Human Uses and Activities

Water Development, Water Rights, and Power Generation:
This alternative would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse effect on the natural and cultural resources would also be prohibited through provisions in the designating legislation.
- Preclude expansion of the Columbia Basin Project into the study area. The Bureau of Reclamation previously determined that lands within the red zone (an area of approximately 36,000 acres) would not be useable for agricultural purposes. In 1993, they determined that it would not be cost effective to provide irrigation water to the remaining 54,000 acres and this area is not included in their current planning efforts.
- Include a recommendation by the Secretary of the Interior that the Federal Energy Regulatory Commission (FERC) or any other regulatory agency, maintain the authority to relicense Priest Rapids Dam and Washington Public Power Supply System facilities.

This alternative would not:

- Preclude relicensing eligibility for the Priest Rapids Dam based on Wild & Scenic River designation.
- Preclude the relicensing of the Washington Public Power Supply System facilities based on Wild & Scenic River designation.
- Impact Grant County PUD, WPPSS, or BPA's ability to maintain existing transmission and generation facilities (including transmission lines, substations, access roads, and generating facilities and their water intakes and outfalls) or upgrade these facilities within existing facility boundaries.
- Impact the BR ability to maintain existing facilities.
- Affect existing water rights.

The USFWS would:

- Evaluate instream flow proposals for the Columbia River.
- Work with all appropriate federal, state, and local agencies to protect flow needs for significant natural, cultural, and recreational resources.
- Evaluate, through the NEPA process, proposals for new transmission facilities for their compatibility with National Wild and Scenic River and National Wildlife Refuge regulations.
- Encourage the use of existing transmission line corridors and the expansion of existing facilities over the siting of entirely new corridors and/or facilities when the use of the existing corridors and facilities would be less harmful to the resources being protected.

Recreation Management:
The USFWS would:

- Provide for fishing, hunting, and trapping opportunities.
- Provide for continued waterfowl sanctuary areas (Map #8).

- Enforce state hunting and fishing laws and regulations through frequent patrols in conjunction with WSDFW.
- Enforce trespass laws on closed refuge lands.
- Upgrade the existing boat access at Ringold with a surfaced boat ramp, a parking lot, an unimproved camping area, and an informational kiosk.
- Improve boat access areas at White Bluffs Landing, and Vernita Bridge only if unacceptable adverse impacts to significant resources of the sites and adjacent river areas could be avoided or otherwise mitigated.
- Maintain public access roads.
- Limit motorized recreational vehicles, including cars and motorcycles, to designated travel routes. Other vehicle uses would be prohibited. Enforcement would be aggressive.
- Establish hiking trails.
- Close areas such as the south bank, some islands, and areas within the present Saddle Mountain National Wildlife Refuge to protect resource values of the area.
- Prohibit the unauthorized collection of plants, animals, archeological artifacts and fossils.
- Prohibit access to restricted Hanford Site areas through patrolling, fencing, and signing. DOE security patrols would be supplemented by USFWS patrols.
- Develop and recommend specific language for use by Congress to ensure that hunting, fishing, and existing levels of water based recreation be continued.
- Prohibit public use of fire trails.

This alternative would <u>not</u>:

- Open private lands to recreational use or overland river access unless expressly approved by the landowners.
- Limit boating use unless determined to have an adverse impact on resource values or management policy.

Interpretation and Education:

The USFWS would:

- Develop unstaffed information and interpretive displays at locations, such as the Ringold, White Bluffs Landing, and Vernita boat launches, the Washington Department of Transportation (WDOT) Vernita Rest Area on Highway 24, and at the Hanford Science Center in Richland.
- Establish a self-guided auto tour through the existing Wahluke State Wildlife Area via the Bluffs Road. Interpretation would focus on all nationally and regionally significant resources.
- Provide tours and programs by special arrangement with the refuge staff.
- Develop interpretive and informational leaflets to be distributed on tours and at interpretive sites.

Uses on Private and State-Owned Lands:
This alternative would not:

- Give the federal government the authority to regulate state, county, and private lands.

The USFWS would:

- Encourage local jurisdictions to adopt ordinances which incorporate land use controls for protection of significant cultural and natural resources. Condemnation authority for easement acquisition would not exist within a county with shoreline and zoning ordinances which meet standards for resource protection. These standards, which would be developed by the USFWS in cooperation with local governments, would emphasize the protection of significant areas and prevention of incompatible uses. The USFWS would review local ordinances to determine if standards are met.
- Acquire fee title only when offered by willing sellers as funding becomes available. Easements may be acquired when necessary to protect critical areas or stop clearly incompatible development. An easement is a legal agreement made between the USFWS and a landowner regarding specific uses of the property. There are three types of easements which the USFWS can acquire: conservation, scenic, and public use. All of these types of easements are negotiated with each owner before the sale or donation takes place. Conservation easements generally restrict or preclude new disturbance, new activities and new development within the agreed upon area, usually to protect habitat. Existing uses in the Wild and Scenic corridor are left intact unless the land owner wishes otherwise. Scenic easements restrict new activities which would degrade the view, but do not affect current uses. Public use easements, essentially easements to cross private land, are acquired where no other access points exist. Easements could be acquired from willing sellers or by condemnation. Condemnation would be exercised only when absolutely necessary to protect critical areas or stop clearly incompatible development.

Uses on Federally-Owned Lands:
This alternative would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which adversely impact resources would also be prohibited through provisions in the designating legislation.
- Prohibit new structures within approximately 1/4 mile of the river which are deemed by the USFWS to be incompatible with the purposes for which the National Wild and Scenic River and National Wildlife Refuge was established, with the exception of buildings essential to cleanup of the Hanford Site.
- Allow the DOE and its contractors to conduct a broad range of activities, including construction of facilities, related to cleanup of the Hanford Site.
- Cease grazing on refuge lands, except when beneficial to wildlife purposes.
- Allow the DOE to construct new water intake and outfall structures and the access and utilities necessary to use and service them, within the designated area.
- Allow the maintenance, modification, and upgrading of existing water intakes and outfalls.
- Establish an advisory project review process to allow USFWS to review cleanup activities, construction and operation of water intake and outfall structures, and transmission lines affecting the designated area in order to reduce impacts on significant resources. The project review process would be concurrent with other review processes under NEPA, CERCLA, and RCRA.
- Suggest specific language in the proposed legislation to effectuate the Proposed Action to provide that designation as a Wild and Scenic River shall not increase cleanup standards for remedial activities at Hanford.

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The USFWS would:

- Evaluate sharecropping leases on federal lands to determine whether beneficial impact on wildlife values.
- Review all other proposed uses within the designated boundaries.
- Consult with other agencies on impacts and mitigation measures.

Mining and Mineral Leasing:
This alternative would:

- Withdraw all federal lands within the designated area, including mineral estates, from settlement, sale, location, or entry under the general land laws, including the general mining laws of the United States, subject to any and all valid existing rights. Mineral rights vested prior to the designation would remain valid, however, there are no known mineral leases or outstanding mineral rights.
- Prohibit, under Fish and Wildlife Service policy and regulations, all mineral material sales (gravel, sand, etc) and mineral leasing, except those activities conducted in conformance with the refuge management plan for the benefit of refuge resources. Currently, mineral leasing on refuges is closed by regulation for oil and gas (43 CFR 3101.5), except in the case of drainage (43 CFR 3100.2) and for geothermal resources (43 CFR 3201.1-6(c)). No activities would be allowed unless they are deemed compatible, as provided in 50 CFR 29.1, "with purposes for which the refuge was established".

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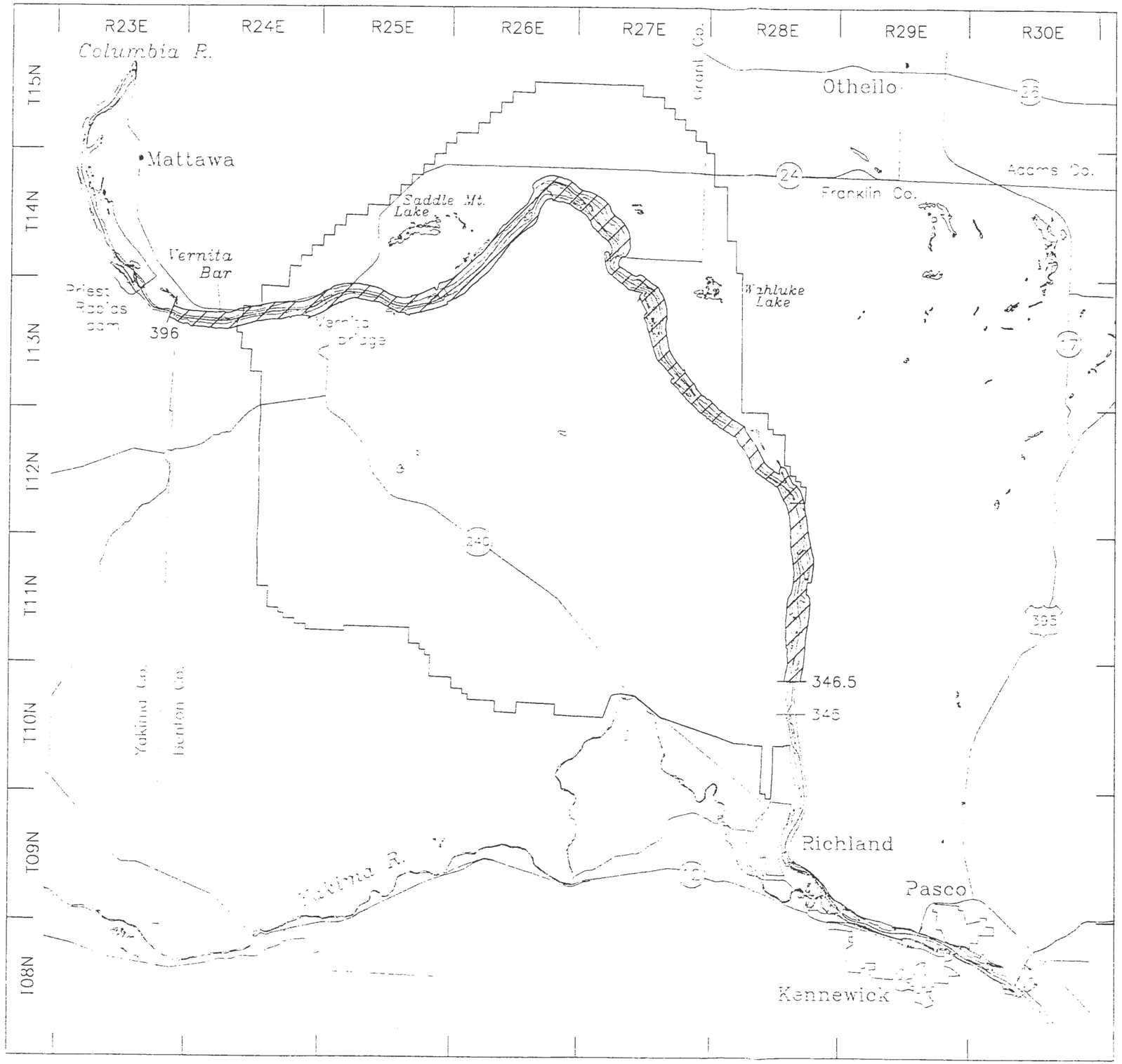

Proposed Action: National Wildlife Refuge with Wild and Scenic River Overlay

KEY

National Wildlife Refuge (RM346.5 to RM396)

Wild and Scenic River (RM346.5 to RM396 including private lands)

*NOTE: lateral boundaries for the W&SR would be established during development of the River Management Plan. This boundary cannot exceed an average of 1/4 mile on either side of river.

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HANFORD REACH STUDY / EIS

National Park Service 1994

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ALTERNATIVE A:
National Wildlife Refuge with National Wild and Scenic River overlay, excluding private lands

This alternative was "Option 1" of the Proposed Action in the draft Environmental Impact Statement.

1. Focus of Management

This alternative, like the Proposed Action, would provide permanent protection for salmon and cultural resources, enhance wildlife habitats and populations, and improve visitor access and interpretation. The major distinction between this alternative and the Proposed Action is that private and state-owned lands are excluded from the designation. This exclusion would warrant a significant commitment by the USFWS to work with non-federal interests to assure total resource protection.

2. Designations and Boundaries

The boundaries for the National Wildlife Refuge are the same as the Proposed Action. The only change in the boundaries for the National Wild and Scenic River is the exclusion of approximately 2,600 acres of private and state-owned lands. Total acreage for the designated area is approximately 102,000 acres.

3. Management Agencies

The USFWS would manage the refuge and the Wild and Scenic River (recreational classification). Management objectives on the federally-owned lands are the same as the Proposed Action. Private and state-owned lands are excluded from designation. The USFWS would have no jurisdiction over these lands, however, establishment of management objectives would be shared with local governments and land owners in an attempt to protect resource values on those lands.

4. Mission and Goals

Under this alternative the mission and goals of the USFWS as discussed in the Proposed Action would remain unchanged.

5. Administration and Staffing

Under this alternative, administration and staffing as discussed in the Proposed Action would remain unchanged.

6. Planning and Public Participation

As in the Proposed Action, planning and public participation play a significant role under this alternative. The USFWS would place additional emphasis on working with local jurisdictions and the land owners to insure that current activities and any projected land use changes would minimize impacts to resources. Service staff would actively participate in all local jurisdictional decision-making processes which would impact the Reach.

7. Resource Management Actions

In addition to those actions discussed under the Proposed Action, the USFWS would work with a local jurisdiction, authorities, land trusts and interest groups to encourage the development of agreements and purchase easements from willing sellers. The more resource protection afforded through agreements, easements, and zoning the less likelihood that development, mining or mineral extraction, agricultural use or grazing would impact resources within the designated area.

8. Management of Human Use and Activity

Like the Proposed Action, this alternative would not give the Federal Government the authority to regulate state, county and private lands. Unlike the Proposed Action, private lands would not be included in the Wild and Scenic River boundary. As a result, the USFWS would encourage the same activities as discussed under the Proposed Action, but its ability to insure long-term resource protection might be limited or non-existent due to the private lands being excluded from the designation area. The USFWS would have no authority to acquire any type of easement, even from a willing seller. The USFWS would encourage development of protection standards which could be enforced through existing political, legislative, and administrative processes.

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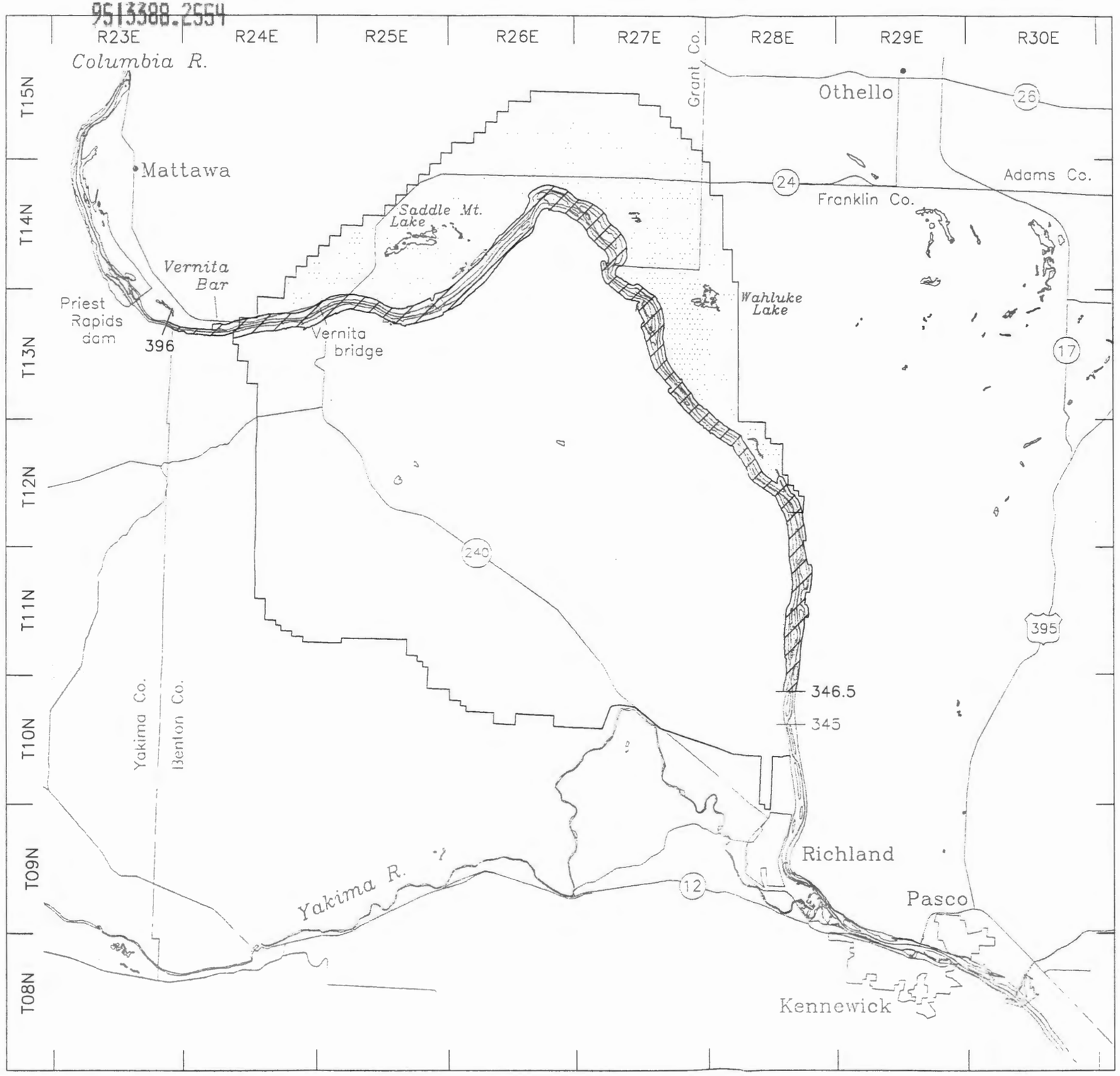

Alternative A: National Wildlife Refuge with Wild and Scenic River Overlay

KEY

National Wildlife Refuge (RM346.5 to RM396)

Wild and Scenic River (RM346.5 to RM396 excluding private lands)

*NOTE: lateral boundaries for the W&SR would be established during development of the River Management Plan. This boundary cannot exceed an average of 1/4 mile on either side of river

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National Park Service 1994

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ALTERNATIVE B:
No Action

Analysis of a No Action alternative is required by the National Environmental Policy Act (NEPA). Certain assumptions have been revised from those in the draft to reflect the U.S. Department of Energy's (DOE) changing mission at Hanford from defense production to environmental restoration and waste management. This alternative illustrates the scenario for the study area most likely to occur if there is no legislation.

As a result of the changed mission, it is expected that the lands north and east of the river (Wahluke Slope) will be excessed by the DOE because they are no longer needed as a security and safety buffer. Lands on the south side of the river would remain under DOE management at this time. The disposition of the lands declared excess by the DOE would vary. Lands which were withdrawn from the public domain for the Columbia Basin Project and property originally acquired by the Bureau of Reclamation (BR) would return to BR jurisdiction. Administration of the remaining public domain lands would revert to the Bureau of Land Management. Lands acquired in fee by the DOE (approximately 50% of the north slope) would be disposed of according to procedures established by the General Services Administration (GSA), the federal agency responsible for the disposal of excess federal real property. The following discussion outlines the GSA disposal process.

GSA follows an established process for disposing of excess property. The first step is to screen the property for use by other federal agencies and for other potential public benefit uses. Under the federal screening process, requests are solicited from other federal agencies wishing to utilize all or part of the property.

Concurrent with the federal screening process a federal agency may provide GSA with a recommendation, together with supporting rationale, to justify that the highest and best use of a property is for a specific public benefit purpose; conservation and recreation are considered public benefit purposes. Federal agencies have priority over state, county, local governments and private parties wishing to use or obtain the property. A federal agency is generally required to pay fair market value for real property excessed by another federal agency. However, Public Law 537 (amended P.L. 92-432), provides for the acquisition of real property, that is valuable for wildlife conservation purposes, by state agencies or by the Secretary of the Interior without reimbursement or transfer of funds.

ALTERNATIVE C:
Dams Prohibited, Limitations on Water Resource Development Projects, No Additional Designations

Certain assumptions have been revised from those in the draft to reflect the U.S. Department of Energy's (DOE) changing mission at Hanford from defense production to environmental restoration and waste management. This alternative would protect river resources from impact by prohibiting new dams and limiting water resource development projects. Impacts to land resources would be similar to the Alternative B, No Action. Please refer to this alternative for a discussion of potential impacts.

1. Focus of Management:

Under this alternative, the DOE would continue to manage the reach and adjacent areas as part of the Hanford Site. The DOE would continue existing programs to maintain natural and cultural resources and comply with federal resource protection laws and regulation. New dams would be prohibited and those water resource development projects which would adversely impact resources would also be prohibited.

2. Designations and Boundaries

This alternative would require legislative action by Congress to prohibit new dams and water resource development projects that have an adverse impact on resources. It would also continue existing administrative designations until the DOE identified specific portions of the site as excess and the disposal process was completed. The disposition of the lands declared excess by the DOE would vary. Lands which were withdrawn from the public domain for the Columbia Basin Project and property originally acquired by the Bureau of Reclamation (BR) would return to BR jurisdiction. Administration of the remaining public domain lands would revert to the Bureau of Land Management. Lands acquired in fee by the DOE (approximately 50% of the north slope) would be disposed of according to procedures established by the General Services Administration (GSA); the federal agency responsible for the disposal of excess federal real property.

Existing administrative designations which apply to all or part of the study area include National Environmental Research Park (DOE), Areas of Critical Environmental Concern (BLM), Wildlife Recreation Area (WSDFW), and National Wildlife Refuge (USFWS). Because these are administrative designations, they would be subject to modification or elimination at the discretion of the designating agency. The Wildlife Recreation Area and National Wildlife Refuge could also be modified or eliminated if the DOE revised or terminated the permits under which they are currently administered.

3. Management Agencies

The DOE would continue to manage the Hanford Site and perform site cleanup, environmental monitoring and research, site security, and other missions as assigned by Congress.

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4. Mission and Goals of the Department of Energy

The DOE is entrusted to contribute to the welfare of the nation by providing the scientific foundation, technology, policy and institutional leadership necessary to achieve efficiency in energy use, diversity in energy sources, a more productive and competitive economy, improved environmental quality, and a secure national defense.

5. Administration and Staffing

In the short term, the current staff of the DOE and contractors, WSDFW, and USFWS would continue to manage natural and cultural resources of the Hanford Reach at current levels for the period of time that the DOE maintains administrative responsibility of the federally owned lands north and east of the river. In the long term with transfer of lands to a single resource management agency, it is assumed that agency would provide staff.

6. Planning and Public Participation

While each managing agency would continue to develop plans for the areas within their current jurisdictions, no comprehensive resource management plan is likely to be developed for the Hanford Reach, until the lands are excessed to a single public agency. Planning activities would incorporate public participation.

7. Resource Management Actions

In the short term while the federally-owned lands north and east of the river controlled by the DOE are being managed by the USFWS and WSDFW, the following will occur:

Fisheries Management:
This alternative will:

- Prohibit new dams and water resource development projects until November 1996, when the existing moratorium expires (Public Law 100-605), and require consultation with the Dept. of the Interior for any projects affecting the resources within the study area. After this date, such activities would be subject to environmental review but not prohibited.

Habitat and Wildlife Management:
The managing agencies will:

- Monitor the number and distribution of wildlife species.
- Minimize disturbance in wildlife habitats.
- Manage noxious weeds in compliance with state regulations.
- Retain the existing wintering waterfowl sanctuaries within the Saddle Mountain National Wildlife Refuge and along the river above the wooden pole power line crossing.

- Continue the sharecropping of federal lands which are currently in crop production.
- Enforce access prohibitions with signs and patrols at existing levels and locations.

Threatened, Endangered, Sensitive, and Candidate Species Management:
The managing agencies will:

- Manage species according to mandates of federal and state laws and regulations, as indicated in Existing Legal Requirements Common to All Alternatives. Federal and state listed species are identified in Appendix H.

Cultural Resources Management:
The DOE will:

- Manage site records and curate artifacts.
- Monitor significant cultural resource properties to evaluate the effectiveness of cultural resource management and protection policies.
- Conduct archeological surveys to augment the inventory of sites along the river.
- Restrict unauthorized public access in identified sensitive cultural areas through signing and patrolling.
- Consider options for stabilizing significant cultural sites from erosion damage through accepted low visual impact techniques, such as establishing deep rooted vegetation on shorelines.
- Consider options for stabilizing and/or restoring the B Reactor and Bruggeman Warehouse.
- Continue the random surveillance of culturally sensitive areas.
- Provide cultural resource laws and regulations training for site personnel.

In the long term, most of these activities would be continued by the managing agency with the exception of:

- Prohibition on new dams and water resource development projects would terminate in 1996.
- DOE would continue to be responsible for the B Reactor and Bruggeman Warehouse.
- patrols to enforce prohibitions on trespass and unauthorized access and use may be reduced or eliminated.

8. Management of Human Uses and Activities

In the short term while the federally owned lands north and east of the river controlled by the DOE are being managed by the USFWS and WSDFW, the following will occur:

The Department of the Interior (DOI) will:

- Review all proposed federal and nonfederal projects proposed for the study area until November 1996 in order to determine compliance with the provisions of the study legislation (Public Law 100-605). Project review functions would terminate after this date.

The DOE will:

- Manage uses on federally-owned lands in accord with present and future Hanford Site missions.

- Maintain existing permit agreements with the USFWS and the WSDFW for management of Saddle Mountain National Wildlife Refuge and the Wahluke State Wildlife Recreation Area for the period of time that DOE maintains administrative responsibility.
- Review all proposals for uses by entities other than the DOE.

Water Development, Water Rights, and Power Generation:
This alternative will:

- Prohibit new dams and water resource development projects until November 1996 when the existing moratorium (Public Law 100-605) expires, and require consultation with the Dept. of the Interior for any projects affecting the resources within the study area. After this date, there would be no prohibition on new dams and water resource development projects.

This alternative will not:

- Affect the construction, operation, or maintenance of transmission lines.
- Affect the siting of new transmission line corridors.
- Affect existing water rights and controls on instream flows.

Recreation Management:
This alternative will not:

- Affect existing fishing, hunting, and trapping activities.
- Affect the closure of the river upstream of the wooden pole powerlines for waterfowl hunting (Map#8).
- Affect existing closures of the south bank, islands, and areas within the present Saddle Mountain National Wildlife Refuge.

The managing agencies will:

- Prohibit the unauthorized collection of plants, animals, archeological artifacts and fossils.
- Allow improvement of boat access areas at Vernita Bridge if unacceptable impacts to the resources can be avoided.
- Enforce state hunting and fishing laws and regulations through patrols by WSDFW.
- Enforce trespass laws on closed federally-owned lands.

The managing agencies may:

- Maintain existing public access roads at or near their present condition and capacity.
- Restrict unauthorized motorized vehicles, including cars and motorcycles, to designated travel routes. Other uses would be prohibited.

Interpretation and Education:
Interpretation and education would be expected to continue at present levels and may include:

- Publish and distribute brochures and videotapes regarding wildlife and cultural resources.
- Continue to provide periodic articles on the Hanford Site environment in the Tri-City Herald.
- Maintain displays related to the Hanford Reach at the Hanford Science Center.

Mining and Mineral Leasing:
This alternative will:

- Not affect the withdrawal of federal lands from settlement, sale, location, entry, or leasing under the general land laws, include the U.S. mining and mineral leasing laws.
- Not affect the prohibition on mineral leasing and sale.

In the long term, most of these actions would be continued by the managing agency with the exception of:

- Prohibition on new dams and water resource development projects would terminate in 1996.
- Patrols to enforce prohibitions on trespass and unauthorized access and use may be reduced or eliminated.

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ALTERNATIVE C:
Dams Prohibited, Limitations on Water Resource Development Projects, No Additional Designations

Certain assumptions have been revised from those in the draft to reflect the U.S. Department of Energy's (DOE) changing mission at Hanford from defense production to environmental restoration and waste management. This alternative would protect river resources from impact by prohibiting new dams and limiting water resource development projects. Impacts to land resources would be similar to the Alternative B, No Action. Please refer to this alternative for a discussion of potential impacts.

1. Focus of Management:

Under this alternative, the DOE would continue to manage the reach and adjacent areas as part of the Hanford Site. The DOE would continue existing programs to maintain natural and cultural resources and comply with federal resource protection laws and regulation. New dams would be prohibited and those water resource development projects which would adversely impact resources would also be prohibited.

2. Designations and Boundaries

This alternative would require legislative action by Congress to prohibit new dams and water resource development projects that have an adverse impact on resources. It would also continue existing administrative designations until the DOE identified specific portions of the site as excess and the disposal process was completed. The disposition of the lands declared excess by the DOE would vary. Lands which were withdrawn from the public domain for the Columbia Basin Project and property originally acquired by the Bureau of Reclamation (BR) would return to BR jurisdiction. Administration of the remaining public domain lands would revert to the Bureau of Land Management. Lands acquired in fee by the DOE (approximately 50% of the north slope) would be disposed of according to procedures established by the General Services Administration (GSA); the federal agency responsible for the disposal of excess federal real property.

Existing administrative designations which apply to all or part of the study area include National Environmental Research Park (DOE), Areas of Critical Environmental Concern (BLM), Wildlife Recreation Area (WSDFW), and National Wildlife Refuge (USFWS). Because these are administrative designations, they would be subject to modification or elimination at the discretion of the designating agency. The Wildlife Recreation Area and National Wildlife Refuge could also be modified or eliminated if the DOE revised or terminated the permits under which they are currently administered.

3. Management Agencies

The DOE would continue to manage the Hanford Site and perform site cleanup, environmental monitoring and research, site security, and other missions as assigned by Congress.

For the period of time that the DOE maintains administrative responsibility of the federally owned lands north and east of the river, the USFWS and the WSDFW would actively manage Saddle Mountain National Wildlife Refuge and Wahluke State Wildlife Recreation Area, respectively, pursuant to the existing agreements.

The Bureau of Land Management would continue management of the McCoy Canyon Area of Critical Environmental Concern, which is managed for sensitive plant species, and the Columbia River Area of Critical Concern, which is managed for wildlife and plant habitat. The latter area includes the southern third of island #11, the northern half of island #12, and a small portion of the southern end of island #13.

4. Mission and Goals of the Department of Energy

The DOE is entrusted to contribute to the welfare of the nation by providing the scientific foundation, technology, policy and institutional leadership necessary to achieve efficiency in energy use, diversity in energy sources, a more productive and competitive economy, improved environmental quality, and a secure national defense.

5. Administration and Staffing

This alternative assumes that the current staff of the DOE and contractors, WSDFW, and USFWS would continue to manage natural and cultural resources of the Hanford Reach at current levels, for the period of time that the DOE maintains administrative responsibility of the federally owned lands north and east of the river,

6. Planning and Public Participation

While each managing agency would continue to develop plans for the areas within their current jurisdictions, no comprehensive resource management plan is likely to be developed for the Hanford Reach unless the lands are excessed to a public agency. The level of public participation in planning and management of the area will depend on the significance of the planning activity.

7. Resource Management Actions

In the short term while the federally-owned lands north and east of the river controlled by DOE are being managed by the USFWS and WSDFW, the following would occur:

Fisheries Management:
This alternative would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which would have a direct and adverse impact on fishery resources would also be prohibited through provisions in the designating legislation.

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Habitat and Wildlife Management:
This alternative would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which would have a direct and adverse impact on riverine and aquatic habitats would also be prohibited through provisions in the designating legislation.

The managing agencies would:

- Monitor the number and distribution of wildlife species.
- Minimize disturbance in upland wildlife habitats through protection from development, fire protection, and enforcement of protective laws and regulation.
- Manage noxious weeds in compliance with state regulations.
- Retain the existing wintering waterfowl sanctuaries within the Saddle Mountain National Wildlife Refuge and along the river above the wooden pole power line crossing.
- Continue the sharecropping of federal lands which are currently in crop production.
- Enforce access prohibitions with signs and patrols at existing levels and locations.

Threatened, Endangered, Sensitive, and Candidate Species Management:
This alternative would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which would have a direct and adverse impact on threatened and endangered species would also be prohibited through provisions in the designating legislation.

The managing agencies would:

- Manage species according to mandates of federal and state laws and regulations, as indicated in Existing Legal Requirements Common to All Alternatives. Federal and state listed species are identified in Appendix H.

Cultural Resources Management:
This alternative would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which would have a direct and adverse impact on cultural resources would also be prohibited through provisions in the designating legislation.

The DOE would:

- Manage site records and curate artifacts.
- Monitor significant cultural resource properties to evaluate the effectiveness of cultural resource management and protection policies.
- Conduct archeological surveys to augment the inventory of sites along the river.

- Restrict unauthorized public access in identified sensitive cultural areas through signing and patrolling.
- Consider options for stabilizing significant cultural sites from erosion damage through accepted low visual impact techniques, such as establishing deep rooted vegetation on shorelines.
- Consider options for stabilizing and/or restoring the B Reactor and Bruggeman Warehouse.
- Continue the random surveillance of culturally sensitive areas.
- Provide cultural resource laws and regulations training for site personnel.

In the long term, most of these activities would be continued by the managing agency with the exception of:

- DOE would continue to be responsible for the B Reactor and Bruggeman Warehouse.
- Patrols to enforce prohibitions on trespass and unauthorized access and use may be reduced or eliminated.

8. Management of Human Uses and Activities

In the short term while the federally-owned lands north and east of the river controlled by the DOE are being managed by the USFWS and WSDFW, the following would occur:

Water Development, Water Rights, and Power Generation:
This alternative would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which would have a direct and adverse impact on natural and cultural resources would also be prohibited through provisions in the designating legislation.

This alternative would <u>not</u>:

- Affect existing water rights and controls on instream flows.
- Affect the construction, operation, or maintenance of transmission lines.
- Affect the siting of new transmission line corridors.

Recreation Management:
This alternative would:

- Not affect existing fishing, hunting, and trapping activities.
- Not affect the closure of the river upstream of the wooden pole powerlines for waterfowl hunting (Map #8).
- Not affect existing closures of the south bank, islands, and areas within the present Saddle Mountain National Wildlife Refuge.

The managing agencies would:

- Prohibit the unauthorized collection of plants, animals, archeological artifacts and fossils.
- Allow improvement of boat access areas at Vernita Bridge if unacceptable impacts to the resources can be avoided.
- Enforce state hunting and fishing laws and regulations through patrols by WSDFW.
- Enforce trespass laws on closed public lands and all private lands.

The managing agencies may:

- Restrict unauthorized motorized vehicles, including cars and motorcycles, to designated travel routes. Other uses would be prohibited.
- Maintain existing public access roads at or near their present condition and capacity.

Interpretation and Education:
Interpretation and education would be expected to continue at present levels and may include:

- Publish and distribute brochures and videotapes regarding wildlife and cultural resources.
- Continue to provide periodic articles on the Hanford Site environment in the Tri-City Herald.
- Maintain displays related to the Hanford Reach at the Hanford Science Center.

Uses on Private and State-Owned Lands:

- There are no private or state-owned lands included in this alternative.

Uses on Federally-Owned Lands:
The Department of the Interior (DOI) would:

- Review all proposed federal and non-federal projects proposed for the Hanford Reach in order to determine compliance with the legislation.

The DOE would:

- Manage uses on public lands in accord with present and future Hanford Site missions.
- Maintain existing permit agreements with the USFWS and the WSDFW for management of the Saddle Mountain National Wildlife Refuge and the Wahluke State Wildlife Recreation Area for the period of time that the DOE maintains administrative responsibility.
- Review all proposals for uses by entities other than the DOE.
- Continue Hanford Site cleanup activities.

Mining and Mineral Leasing:
This alternative would:

- Not affect the withdrawal of lands from settlement, sale, location, entry, or leasing under the general land laws, including the U.S. mining and mineral leasing laws.
- Not affect the prohibition on mineral leasing and sale.

In the long term, most of these actions would be continued by the managing agency with the exception of:

- patrols to enforce prohibitions on trespass and unauthorized access and use may be reduced or eliminated.

ALTERNATIVE D:
National Conservation Area

1. Focus of Management

This alternative would provide permanent protection for all significant natural and cultural resources.

2. Designations and Boundaries

This alternative would require action by Congress to establish a new National Conservation Area and to prohibit new dams and water resource development projects that would have an adverse effect on resource values.

The National Conservation Area (NCA) designation would include the river throughout the study reach (49.5 miles, from RM 396 to RM 346.5 at the northern tip of Johnson Island), all federally-owned lands within 1/4 mile of the river on both banks, and all lands currently within the Saddle Mountain National Wildlife Refuge and Wahluke State Wildlife Recreation Area, a total of approximately 102,000 acres. The southern boundary was revised to exclude the DOE "300 Area" because of extensive cleanup activities. No private lands would be included in this designation.

3. Management Agencies

The Bureau of Land Management (BLM) would be the administrator and would oversee all resource and use management actions under the designating legislation and within the existing policies of the BLM. Administration of all federal lands within the boundary would transfer to BLM after certified as acceptable for NCA purposes.

During the cleanup and until such time that lands are officially transferred upon certification by the Tri-Party Agreement regulators, the Department of Energy (DOE) would continue to maintain responsibility and liability for all cleanup activities. In accordance with the requirements of Comprehensive Environmental Response Compensation Liability Act, the DOE would perform site cleanup, environmental monitoring and research, site security, cultural resource management, and other missions as assigned by Congress for the Hanford Site.

A Memorandum of Agreement may be established between Federal agencies in order to specify exact responsibilities for management of the area prior to and subsequent to any official land transfer.
The WSDFW would continue to enforce hunting and fishing laws and regulations within the designated area.

4. Mission and Goals of the Bureau of Land Management

The BLM is responsible for balanced management of public lands and resources and their various values so that they are considered in a combination that will best serve the needs of the American people. Management is based upon the principles of multiple-use and sustained yield; a combination of uses that takes into account the long term needs of future generations for renewable and non-renewable resources. These resources include recreation, range, timber, minerals, watershed, fish and wildlife, wilderness and natural, scenic, scientific, and cultural values.

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5. Administration and Staffing

The NCA would be administered under the Border Resource Area of the Spokane District, with headquarters in Spokane. An office may be established in Richland. Staff may include an assistant area manager (administrative and technical), ranger (law enforcement, technical, interpretive) and maintenance staff. Interpretive, recreation, fish and wildlife, and cultural resource staff would be available from the resource area, district, and state offices as needed. Final staffing levels will be defined in the management plan for the area.

6. Planning and Public Participation

A comprehensive management and development plan would be prepared. Public participation processes would be integrated into all major planning and development activities for this area. In addition, an ongoing advisory committee would be established to advise the BLM in management of the area. The Committee would include representatives of federal, state, and tribal governments, local agencies, recreational user groups, environmental groups, agricultural organizations, and private landowners.

7. Resource Management Actions

Fisheries Management:
This alternative would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse effect on fishery resources would also be prohibited through provisions in the designating legislation.

The BLM would:

- Work with all appropriate federal, state, and local agencies to protect flow needs for fish passage and production.
- Monitor and, if necessary, coordinate with other efforts to control nuisance aquatic macrophytes on the entire river, such as Eurasian milfoil.

Habitat and Wildlife Management:
In order to maintain shrub-steppe and riparian habitats, BLM would:

- Suppress wildfires through accepted techniques.
- Control non-native vegetation and noxious weeds (including Russian olive trees, salt cedar, purple loosestrife, and common white mulberry trees), with the exception of those that provide needed benefits to wildlife such as bald eagles, hawks, and other species.
- Enforce the laws which prohibit off-road vehicle use in unauthorized areas, such as along the White Bluffs.
- Limit public access in key habitat areas through patrols and signs.

In order to maintain riverine and aquatic habitats, BLM would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse effect on riverine and aquatic habitats would also be prohibited through provisions in the designating legislation.
- Patrol and sign islands to protect island habitat for wildlife, such as Forster's terns.

- Work with all appropriate federal, state, and local agencies to protect flow needs for riverine and aquatic habitats.
- Retain riparian trees for heron nesting and eagle roosting.

In order to maintain wildlife populations, BLM would:

- Maintain habitats, as explained above.
- Maintain the wintering waterfowl sanctuaries within Saddle Mountain National Wildlife Refuge and along the river above the wooden pole powerlines.
- Continue sharecropping opportunities on federal lands where appropriate for wildlife purposes.
- Maintain the raptor prey base through maintenance of the native upland habitat.
- Conduct baseline biological inventories and establish long-term monitoring programs.

Threatened, Endangered, Sensitive, and Candidate Species Management:
In addition to the actions mandated by the Endangered Species Act which are discussed in Existing Legal Requirements Common to all Alternatives, the following would be considered in development of a National Conservation Area management plan. Federal and state listed species are identified in Appendix H. The BLM could take the following actions with <u>all</u> listed species:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse effect on threatened and endangered species would also be prohibited through provisions in the designating legislation.
- Determine population numbers and trends for species along the Hanford Reach.
- Investigate habitat needs and evaluate the availability of suitable habitat for the species.
- Maintain the amount and quality of existing habitat (see habitat and wildlife management actions above).
- Reduce disturbance of species by preventing inappropriate activities in sensitive habitats.

Cultural Resources Management:
Upon transfer of management jurisdiction, cultural resource management responsibility would be transferred from the DOE to the BLM. The BLM would work closely with tribal governments and would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse effect on cultural resources would also be prohibited through provisions in the designating legislation.
- Train resource management staff in cultural resource laws and applicable management policies.
- Manage site records and curate artifacts.
- Monitor significant cultural resource properties to evaluate the effectiveness of cultural resource management and protection policies.
- Conduct archeological surveys as staffing levels allow.
- Maintain the educational/interpretive program for cultural resources at existing levels.
- Prohibit unauthorized public access to sensitive cultural areas through signing, patrolling, and enforcements.
- Protect significant archaeological and cultural sites from erosion damage through accepted low visual impact techniques, such as establishing deep rooted vegetation on shorelines.
- Continue the random surveillance of culturally sensitive areas.
- Encourage DOE to require that site subcontractors meet cultural resource qualifications and be knowledgeable of NCA management policies.

Geologic Resource Management:
BLM would:

- Seek the voluntary participation of other agencies, organizations, and individuals to remedy sloughing.
- Enforce the continued closure of the White Bluffs to off-road vehicle use.

The BLM would <u>not</u>:

- Permit or initiate actions that would contribute to the sloughing of the White Bluffs.

8. Management of Human Uses and Activities

Water Development, Water Rights, and Power Generation:
This alternative would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse affect on natural and cultural resources would also be prohibited through provisions in the designating legislation.
- Preclude expansion of the Columbia Basin Project into the study area. The Bureau of Reclamation previously determined that lands within the red zone (an area of approximately 36,000 acres) would not be useable for agricultural purposes. In 1993, they determined that it would not be cost effective to provide irrigation water to the remaining 54,000 acres and this area is not included in their current planning efforts.

This alternative would not:

- Impact Grant County PUD, WPPSS, or BPA's ability to maintain existing transmission and generation facilities (including transmission lines, substations, access roads, and generating facilities and their water intakes and outfalls) or upgrade these facilities within existing facility boundaries.

- Impact the BR ability to maintain existing facilities.
- Affect existing water rights.

BLM would:

- Work with all appropriate federal, state, and local agencies to protect flow needs for significant natural, cultural, and recreational resources.

Recreation Management :

This alternative would:

- Assure continued fishing, trapping, and hunting opportunities in designated areas and during established seasons in the NCA.
- Provide for continued waterfowl sanctuary areas (Map #8).
- Allow trapping, hunting, and non-consumptive recreational uses (such as nature study, bird watching, photography, camping, hiking, and picnicking) in all areas except where closures are necessary for site security or resource protection purposes. Closed areas would be defined in the management plan.

The BLM would:

- Prohibit vehicle use off designated travel routes.
- Prohibit the unauthorized collection of plants, animals, archeological artifacts and fossils.
- Coordinate and cooperate with Washington State Department of Fish and Wildlife to enforce laws and regulations on hunting and fishing, off-road vehicle use, trespass, and unauthorized collection of artifacts through increased on-river patrols.
- Improve boat access areas at Ringold, White Bluffs Landing, and Vernita Bridge as funding levels permit and only if adverse impacts to significant resources of the sites and adjacent river areas could be avoided.
- Prohibit public use of fire trails.

Interpretation and Education:

BLM would:

- Establish unstaffed information and interpretive displays at locations such as Vernita Bridge and Ringold boat launches.
- Establish a self-guided auto tour through the existing Wahluke State Wildlife Recreation Area via the Bluffs Road. Interpretation would focus on all nationally and regionally significant resources.
- Provide tours and programs by special arrangement with the National Conservation Area staff.
- Develop interpretive and informational leaflets to be distributed on tours.

Uses on Private and State-Owned Lands:

- There are no private or state-owned lands included in this alternative.

Uses on Federally-Owned Lands:
This alternative would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse affect on natural and cultural resources would also be prohibited through provisions in the designating legislation.
- Prohibit new permanent structures within 1/4 mile of the river.
- Allow the DOE to construct new water intake and outfall structures, and the access and utilities necessary to use and service them, within the designated area.
- Allow the maintenance, modification, and upgrading of existing water intakes and outfalls.
- Allow the DOE and its contractors to conduct a broad range of activities including construction of facilities related to cleanup of the site.
- Continue sharecropping of federal lands within the management plan parameters.
- Establish an advisory project review process to allow BLM to review cleanup activities, the construction and operation of water intake and outfall structures and transmission lines affecting the designated area in order to reduce impacts on significant resources. This project review process would be concurrent with other review processes under NEPA, CERCLA, and RCRA.

The BLM would:

- Consult with appropriate agencies, organizations, and the public on issues, resource impacts, and mitigation measures.
- Review all other proposed uses within the designated boundaries.

Mining and Mineral Leasing Actions:
This alternative would:

- Withdraw all public lands and interests in lands (mineral estate) within the designated area from entry under the 1872 Mining Law. Mineral rights vested prior to the designation would remain valid. All mineral activity must be conducted in a manner that minimizes surface disturbance, stream sedimentation, pollution, and visual impairment.
- Allow mineral leasing under the Mineral Leasing Act of 1920. The areas which would be open to mineral leasing and the terms under which exploration and development would be allowed would be developed in the management plan for the area
- Allow the removal of saleable minerals only if the mineral resource could be explored and developed without adverse impacts to the significant resources.

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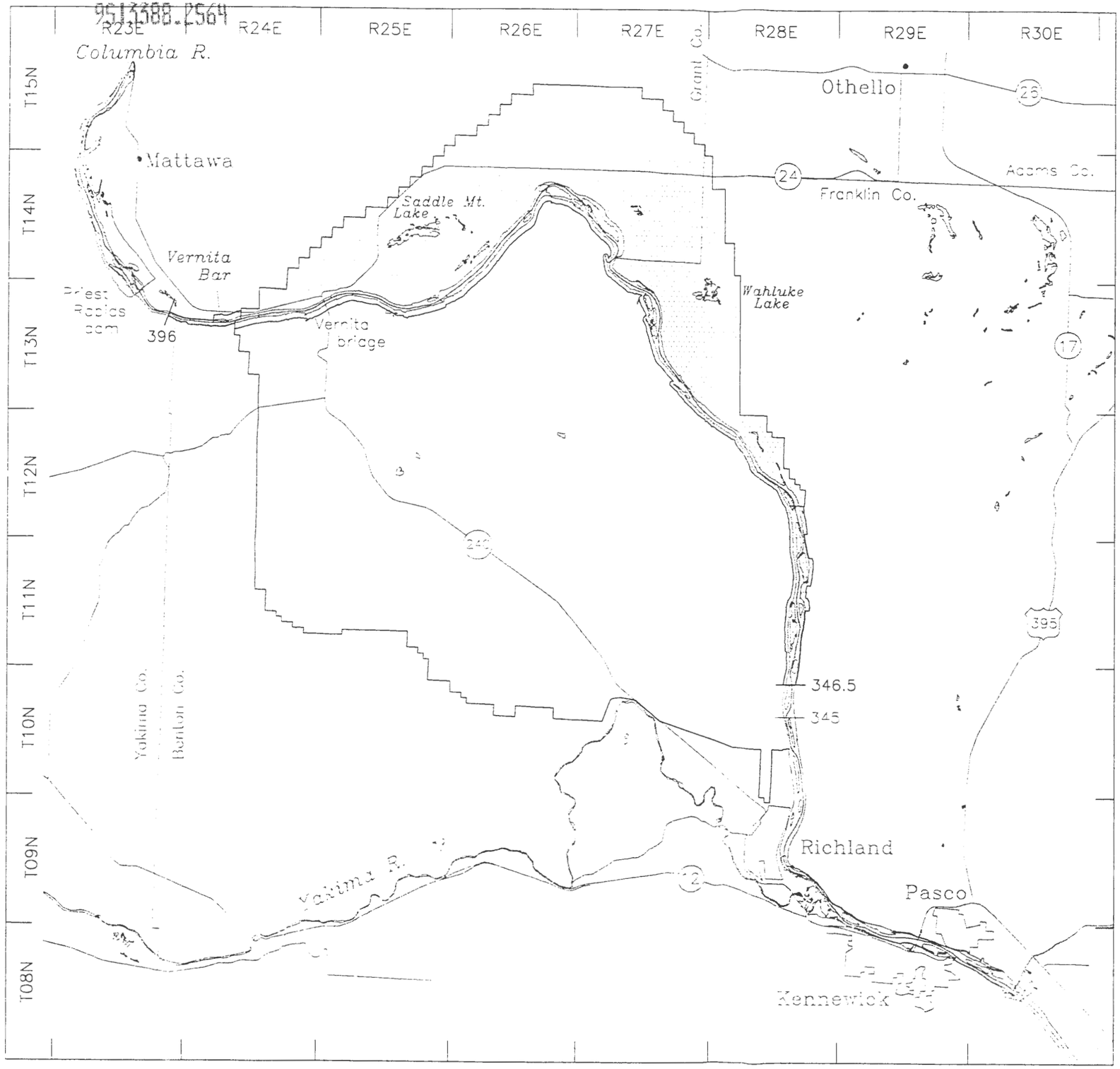
Alternative D: National Conservation Area



KEY

National Conservation Area

KILOMETERS 0 10 20

0 5 10 MILES

N

HANFORD REACH STUDY / EIS

National Park Service 1994

ALTERNATIVE E: National River

1. Focus of Management

This alternative would provide permanent protection for all significant natural and cultural resources and enhance visitor use, interpretation, and recreational opportunity.

2. Designation and Boundaries

This alternative would require action by Congress to establish a National River and prohibit water resource development projects with an adverse impact on resource values.

The National River (NR) designation would include the river throughout the study reach (49.5 miles, from RM 396 to RM 346.5 at the northern tip of Johnson Island), all publicly-owned lands within 1/4 mile of the river on both banks, and all lands currently within the Saddle Mountain National Wildlife Refuge and Wahluke State Wildlife Recreation Area, a total of approximately 102,000 acres. The southern boundary was revised to exclude the DOE "300 Area" because of extensive cleanup activities. No private or state-owned lands would be included in this designation.

3. Management Agencies

The National Park Service (NPS) would be the administrator and would oversee all resource and use management actions under the designating legislation and within the existing policies of the NPS. Administration of all federal lands within the boundary would transfer to NPS after certified as acceptable for National River purposes.

During the cleanup and until such time that lands are officially transferred upon certification by the Tri-Party Agreement regulators to the NPS, the Department of Energy would maintain responsibility and liability for cleanup. In accordance with the requirements of Comprehensive Environmental Response Compensation Liability Act, the DOE would perform site cleanup, environmental monitoring and research, site security, cultural resource management, and other management functions as assigned by Congress for the Hanford Site.

A Memorandum of Agreement may be established between Federal agencies in order to specify exact responsibilities for management of the area prior to and subsequent to any official land transfer.

The WSDFW would continue to enforce hunting and fishing laws and regulations within the designated area.

4. Mission and Goals of the National Park Service

The NPS shall promote and regulate the use of the federal areas known as national parks, monuments, and reservations...by such means and measures to conform to the fundamental purpose of the said parks, monuments and reservations, which purpose is to conserve the scenery and the natural and historic objects

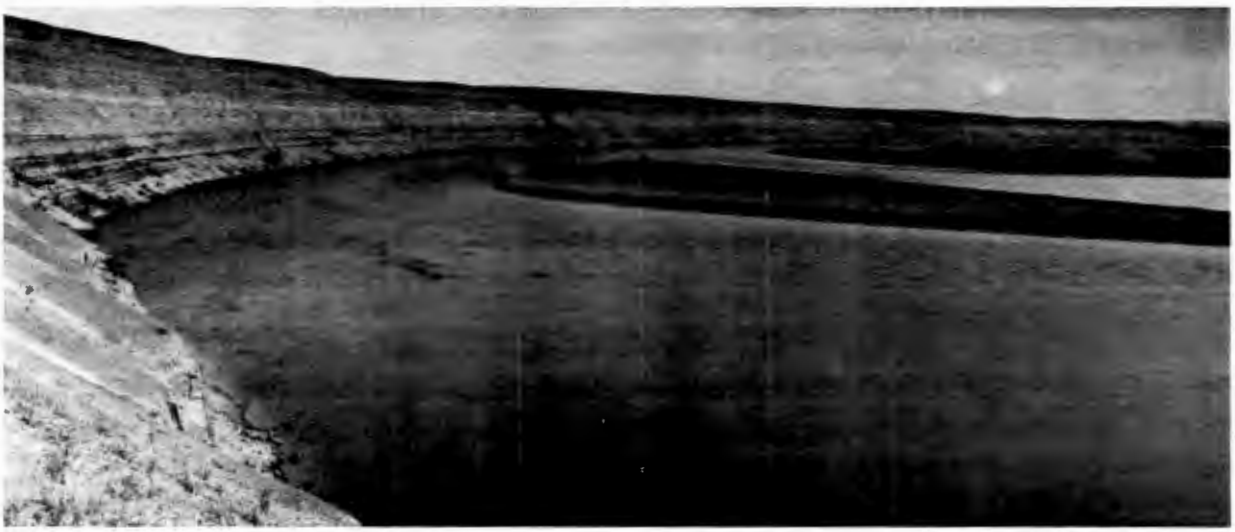
and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

5. Administration and Staffing

The NR may be administered as a subunit of the Coulee Dam National Recreation Area. A satellite office may be established in Richland. Staff may include a unit manager (administrative), administrative clerk, several rangers (law enforcement, resource management, interpretive) and maintenance staff, all of whom would be located in Richland. Additional seasonal staff may be hired to assist with operating a visitor center, hosting interpretive programs, and maintaining facilities. Interpretive and resource management specialists might be made available from Coulee Dam National Recreation Area or the regional office as needed. Final staffing levels will be defined in the management plan for the area.

6. Planning and Public Participation

A general management and development concept plan would be prepared. Public participation processes would be integrated into all major planning and development activities for this area. The process would include formal notices, public hearings, and additional public meetings as needed.



7. Resource Management Actions

Fisheries Management:
This alternative would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which would have a direct and adverse impact on fishery resources would also be prohibited through provisions in the designating legislation.

The NPS would:

- Work with all appropriate federal, state, and local agencies to protect flow needs for fish passage and production.
- Monitor and, if necessary, control nuisance aquatic macrophytes, such as Eurasian milfoil.

Habitat and Wildlife Management:
In order to maintain shrub-steppe and riparian habitats, NPS would:

- Suppress wildfires through accepted techniques.
- Manage exotic vegetation and noxious weeds (including Russian olive trees, salt cedar, purple loosestrife, and common white mulberry trees), with the exception of those that provide needed food and cover benefits to wildlife such as bald eagles, hawks, and other species.
- Prohibit grazing.
- Enforce the laws which prohibit off-road vehicle use in unauthorized areas, such as along the White Bluffs.
- Limit public access in key habitat areas through patrols and signs.

In order to maintain riverine and aquatic habitats, NPS would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse effect on riverine and aquatic resources would also be prohibited through provisions in the designating legislation.
- Patrol and sign islands to protect island habitat for wildlife, such as Forster's tern.
- Work with all appropriate federal, state, and local agencies to protect flow needs for riverine and aquatic habitats.
- Retain riparian trees for heron nesting and eagle roosting.

In order to maintain wildlife populations, NPS would:

- Maintain habitats, as explained above.
- Maintain the existing wintering waterfowl sanctuaries within the Saddle Mountain National Wildlife Refuge and along the river above the wooden pole powerlines.
- Evaluate areas for closure to hunting on part or all of the designated area.
- Continue sharecropping opportunities on federal lands where appropriate for wildlife purposes.
- Maintain the raptor prey base through maintenance of the native upland habitat.
- Enhance endemic wildlife species.
- Conduct baseline biological inventories and establish long-term monitoring programs.

Threatened, Endangered, Sensitive, and Candidate Species Management:
In addition to the actions mandated by the Endangered Species Act which are discussed in Existing Legal Requirements Common to all Alternatives, the following would be considered in development of a management plan. Federal and state listed species are identified in Appendix H. The NPS could take the following actions with <u>all</u> listed species:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse effect on threatened and endagnered species would also be prohibited through provisions in the designating legislation.
- Determine population numbers and trends for species along the Hanford Reach.
- Investigate habitat needs and evaluate the availability of suitable habitat and initiate an active habitat restoration or enhancement program.
- Maintain the amount and quality of existing habitat (see habitat and wildlife management actions above).

- Establish reintroduction programs for native species which have been extirpated.
- Reduce disturbance of species by preventing inappropriate activities in sensitive habitats.

Cultural Resources Management:
Upon transfer of management jurisdiction, cultural resource management responsibility would be transferred from the DOE to the NPS. The NPS would work closely with tribal governments and would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse effect on cultural resources would also be prohibited through provisions in the designating legislation.
- Train resource management staff in cultural resource laws and applicable management policies.
- Manage site records and curate artifacts.
- Monitor significant cultural resources to evaluate the effectiveness of management and protection policies.
- Conduct archeological surveys to augment existing site inventories.
- Establish an educational/interpretive program.
- Restrict unauthorized public access to sensitive cultural areas through signing and patrolling.
- Attempt to stabilize significant archeological and cultural sites from erosion damage through accepted low visual impact techniques, such as establishing deep rooted vegetation on shorelines.

Geologic Resource Management:
The NPS would:

- Seek the voluntary participation of other agencies, organizations, and individuals to remedy sloughing.
- Enforce the closure of the White Bluffs to off-road vehicle use.

The NPS would <u>not</u>:

- Permit or initiate any actions which would contribute to the sloughing of the White Bluffs.

8. Management of Human Uses and Activities

Water Development, Water Rights, and Power Generation:
This alternative would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have a direct and adverse affect on natural and cultural resources would also be prohibited through provisions in the designating legislation.
- Preclude expansion of the Columbia Basin Project into the study area. The Bureau of Reclamation previously determined that lands within the red zone (an area of approximately 36,000 acres) would not be useable for agricultural purposes. In 1993, they determined that it would not be cost effective to provide irrigation water to the remaining 54,000 acres and this area is not included in their current planning efforts.

This alternative would not:

- Impact Grant County PUD, WPPSS, or BPA's ability to maintain existing transmission and generation facilities (including transmission lines, substations, access roads, and generating facilities and their water intakes and outfalls) or upgrade these facilities within existing facility boundaries.

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- Impact the BR ability to maintain existing facilities.
- Affect existing water rights.

NPS would:

- Work with all appropriate federal, state, and local agencies to protect instream flow needs for significant natural, cultural, and recreational resources.

Recreation Management:
This alternative would:

- Assure continued fishing opportunities.
- Prohibit hunting and trapping activities within the designated area unless such uses are specifically authorized by the enabling legislation.
- Allow non-consumptive recreational uses (such as nature study, bird watching, photography, camping, hiking, and picnicking) except where closures are necessary for site security or resource protection purposes. Closed areas would be defined in the management plan.

The NPS would:

- Develop facilities for non-consumptive uses, including hiking trails, picnic areas, and scenic overlooks, as defined in the management plan. Accordingly, consideration would be given to develop at least one semi-primitive campground in the designated area, at a location defined in the management plan, and upgrade the Vernita Bridge, White Bluffs, and Ringold boat accesses with accessible surfaced ramps and parking areas, interpretive kiosks, and picnic areas. Improvements would only be initiated if unacceptable adverse impacts to significant resources could be avoided or otherwise mitigated.
- Prohibit vehicle use off designated travel routes.
- Prohibit public use of fire trails.
- Prohibit the unauthorized collection of plants, animals, archaeological artifacts and fossils.
- Coordinate and cooperate with Washington State Department of Fish and Wildlife to enforce laws and regulations on hunting and fishing, off-road vehicle use, trespass, and unauthorized collection of artifacts.

Interpretation and Education:
The NPS would:

- Establish a fully staffed visitor center within the designated area.
- Provide tours and interpretive programs on a regular schedule and by prior arrangement in other seasons.
- Develop unstaffed information and interpretive kiosks at locations such as the Vernita Bridge, White Bluffs Landing, and Ringold boat launches, at the WDOT Vernita Rest Area on Highway 24, and at the Hanford Science Center in Richland.
- Develop and install interpretive signs and displays at key locations along upgraded and maintained travel routes.
- Insure safe access and establish a self-guided auto tour through the existing Wahluke State Wildlife Recreation Area via the Bluffs Road.
- Provide rangers on the river and throughout the site to provide information and services to visitors.
- Develop and distribute interpretive and informational brochures, videotapes, and slide shows.

Uses on Private and State-Owned Lands:

- There are no private or state-owned lands included in this alternative.

Uses on Federally-Owned Lands:
This alternative would:

- Prohibit new dams. Water resource development projects, such as dredging and channelization, which have an adverse impact on resources would also be prohibited through provisions in the designating legislation.
- Prohibit new permanent structures within 1/4 mile of the river.
- Prohibit grazing within the designated area.
- Allow the DOE to construct new water intake and outfall structures, and the access and utilities necessary to use and service them, within the designated area.
- Allow the maintenance, modification, and upgrading of existing water intakes and outfalls.
- Allow the DOE and its contractors to conduct a broad range of activities including construction of facilities related to cleanup of the site.
- Continue sharecropping of federal lands within the management plan parameters.
- Establish an advisory project review process to allow NPS to review cleanup activities, the construction and operation of water intake and outfall structures and transmission lines affecting the designated area in order to reduce impacts on significant resources. This project review process would be concurrent with other review processes under NEPA, CERCLA, and RCRA.

The NPS would:

- Consult with appropriate agencies, organizations, and the public on issues, resource impacts, and mitigation measures.
- Review all other proposed uses within the designated boundaries.

Mining and Mineral Leasing:
This alternative would:

- Withdraw all federal lands within the designated area, including mineral estates, from settlement, sale, location, or entry under the general land laws, including the general mining laws of the United States, subject to any and all valid existing rights.
- Allow mineral leasing under the Mineral Leasing Act of 1920 only if the mineral resource could be explored and developed without adverse impacts to the significant resources. The areas which would be open to mineral leasing and the terms under which exploration and development would be allowed would be developed in the management plan for the area
- Prohibit removal of saleable minerals.

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ISSUES	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	of the sites and adjacent river areas could be avoided. Lands currently within the Saddle Mountain National Wildlife Refuge, the riverbank and upland areas on the south and west sides of the river, and the river islands would continue to be closed to public access unless deemed otherwise during development of the refuge and river management plans. Recreational access and activities could be enhanced elsewhere if found compatible with other refuge policies. Wildlife habitat protection and restoration programs would help maintain existing wildlife viewing opportunities. The expanded interpretive program, which would include publications, displays, a self-guided auto tour, and direct contact between visitors and field staff, could increase visitor enjoyment and reduce illegal and inappropriate uses. Prohibition on dams and limitations on water resource development projects would protect salmon and steelhead stocks for the recreational fishery. Increased patrols and resource management staff will result in greater resource protection and educational opportunities.		Inappropriate recreational activities, including off-road vehicle use and artifact collection, would continue. In addition, it is expected that the lands north and east of the river would be declared excess by the DOE resulting in transfer to another entity. For purpose of analysis, it is assumed that lands would continue in public ownership (federal, state, local) and be managed for recreation and/or conservation purposes. Access to lands currently available to recreational users may be limited.			displays, and publications would increase awareness and enjoyment of the area and reduce illegal and inappropriate uses. Hunting would be prohibited unless specifically authorized in the designating legislation.

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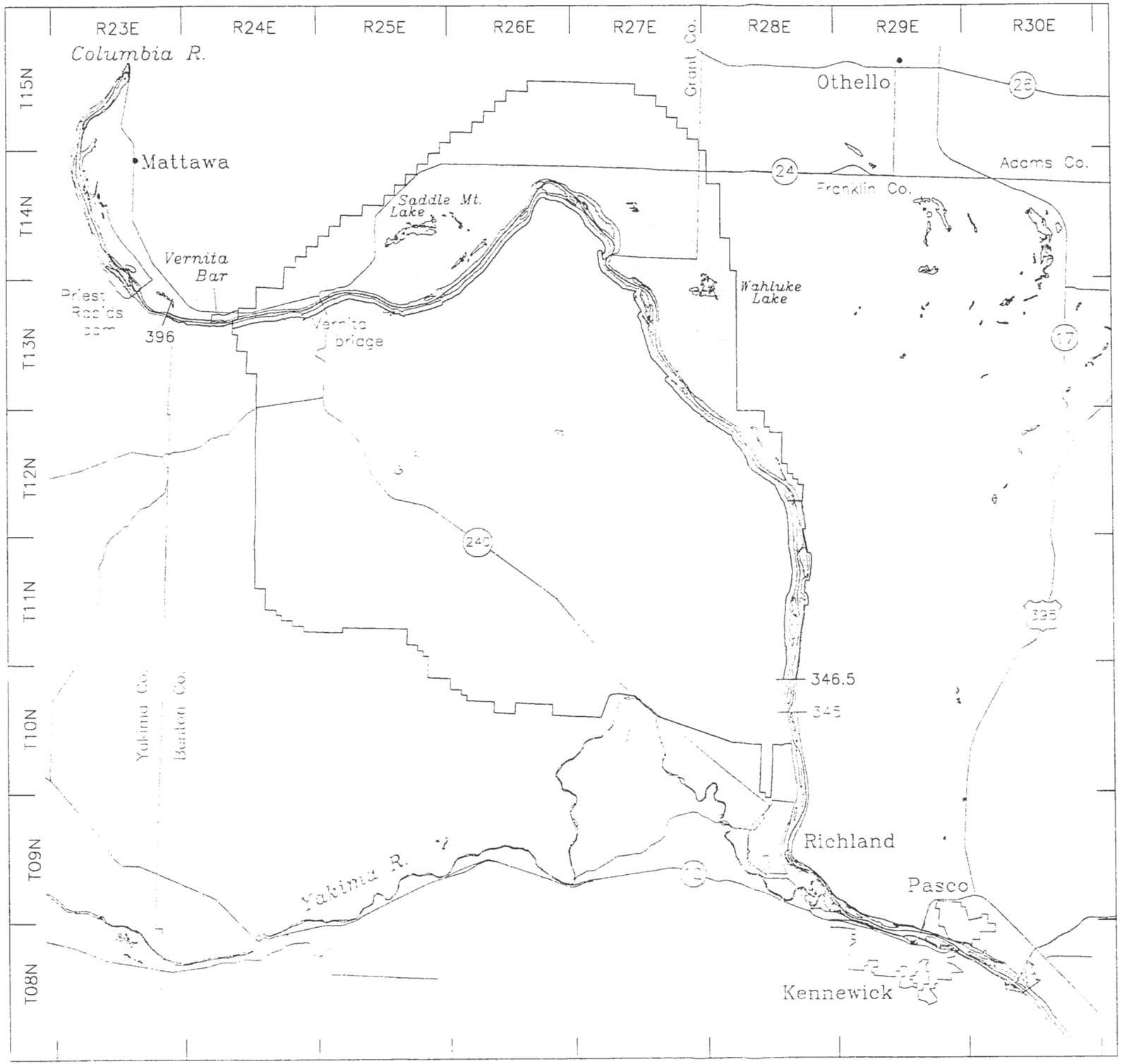

Alternative E: National River

KEY

National River Area

KILOMETERS 0 10 20

0 5 10 MILES

N

HANFORD REACH STUDY / EIS

National Park Service 1994

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COMPARATIVE SUMMARY OF IMPACTS

ISSUES	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
1. Fall Chinook Salmon	1. Prohibitions on dams and limitations on water resource development projects would prevent obstructions to fish passage and disturbance to spawning habitat. Retention of the existing federal land base and controls on development on federal and private lands would prevent siltation from excavation, filling, and runoff which would adversely affect spawning habitat. Instream flows may be influenced yet would not be dictated by designation as a National Wildlife Refuge and Wild and Scenic River. Aquatic conditions for salmon may be enhanced through the control of nuisance aquatic macrophytes. Populations of fall chinook salmon would continue to vary due to activities outside the Hanford Reach.	1. Same as the Proposed Action, except there would be no additional controls on private land uses. Mining and mineral development, expansion of agricultural activities, conversion of existing agricultural lands to non-agricultural uses, and grazing on private lands could have an impact on water quality and disturb spawning habitat for the fall chinook salmon.	1. After November 1996, dams and water resource development projects would not be prohibited and obstructions to fish passage and disturbance of spawning habitat would be possible. Existing conditions for salmon habitats and populations would continue in the short term. In the long term, these type of projects may occur and reduce or eliminate salmon migration and spawning habitat. In addition, it is expected that the lands north and east of the river would be declared excess by the DOE. For purpose of analysis, it is assumed that lands would continue in public ownership (federal, state, local) and impacts to salmon would be minimal.	1. Same as Alternative B, except that the prohibition on dams and limitations on water resource development projects would be permanent, with long term protection of fish passage and spawning habitat.	1. Same as Alternative A.	1. Same as Alternative A.
2. Cultural Resources	2. On federal lands, programs to inventory and investigate archaeological sites may result in additional sites being nominated to the National Register of Historic Places. The prohibition on dams and limitations on water resource development projects would prevent disturbance to sites. Frequent river patrols and increased resource management field staff would greatly reduce the incidence of disturbance of significant sites. The interpretive program would promote greater awareness of cultural resources and potentially reduce unauthorized collection of artifacts. Controls on development would prevent disturbance of archaeological sites.	2. Same as the Proposed Action, except there would be no additional controls on private land uses. Mining and mineral development, expansion of agricultural activities, conversion of agricultural lands to non-agricultural uses, and grazing on private lands could result in disturbance and loss of significant archaeological sites.	2. While DOE controls the lands north and east of the river, the DOE programs to inventory, investigate, monitor, and interpret archaeological sites will continue at existing levels, increasing documentation on significant sites. Additional sites could be nominated to the National Register of Historic Places. Limitations of law enforcement will result in continued unauthorized collection activities at some archaeological sites. Legal mandates to protect cultural resources, other than graves and cairns, would not apply to private lands, allowing uses which could be detrimental to cultural resources. After November 1996, construction of a dam or water resource development project would not be prohibited and adverse impacts on archaeological sites near the present high water line would be possible.	2. Same as Alternative B, except that permanent prohibitions on damming and limitations on water resource development projects would provide partial protection to archaeological sites.	2. Programs to inventory and investigate archaeological sites would result in possible additional sites being identified and nominated to the National Register of Historic Places. Monitoring and interpretation would be enhanced by increases in field staff and new programs and facilities for visitors, but not to the extent possible in the Proposed Action. Cultural resources on private lands, other than graves and cairns, would remain vulnerable to corridor development. Controls on use on public lands would provide substantial protection to significant cultural sites.	2. Same as Alternative A.

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ISSUES	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
3. Biodiversity	3. Prohibitions on dams, limitations on water resource development projects, and control of nuisance aquatic macrophytes would contribute to the maintenance of aquatic and riverine habitat. Controls on development and reductions in grazing would protect riparian and upland habitats. Activities which would accelerate sloughing of the White Bluffs would not be allowed. Protection of these habitats would maintain or enhance populations of fish, wildlife, and plants dependent on them. Management of non-native plants and a program to revegetate disturbed areas with native species (approx. 3200 acres) would enhance the diversity and abundance of endemic plant and animal species and improve chances of reintroduction of rare species. Restrictions on public access and off-road vehicle use, combined with increased patrols and field staff, would reduce disturbance in critical habitat areas. Frequent and varied interpretive programs would increase awareness of native ecosystems.	3. Same as the Proposed Aciton, except there would be no additional controls on private land uses. Mining and mineral development, expansion of agricultural activities, conversion of existing agricultural lands to non-agricultural uses, and grazing on private lands could result in disturbance to shrub-steppe and riparian habitats and reduction in species.	3. After November 1996, dams and water resource development projects would not be prohibited and impacts to aquatic and riverine habitats would be possible. However, nuisance aquatic macrophytes would continue to increase in population with the potential to degrade aquatic habitats. The diversity of habitats and animals would be maintained in the short term. In the long term, construction of a dam or water resource development project would reduce or eliminate aquatic and riverine habitat. Continued grazing, off-road vehicle use, and the spread of non-native plants would reduce endemic plant communities on upland habitats. Modification of habitats would reduce the populations and viability of endemic fish, wildlife, and plants. In addition, it is expected that the lands north and east of the river would be declared excess by the DOE resulting in transfer to another entity. For purpose of analysis, it is assumed that lands would continue in public ownership (federal, state, local) and impacts to wildlife habitats would be minimal.	3. Same as Alternative B, except that permanent prohibitions on damming and limitations on water resource development projects would provide significant protections to aquatic and riverine habitats. However, nuisance aquatic macrophytes would continue to increase in population with the potential to degrade aquatic habitats.	3. Prohibitions on dams, limitations on water resource development projects, and control of nuisance aquatic macrophytes would contribute to the maintenance of aquatic and riverine habitat. Grazing, while allowable, would be subject to BLM review and approval, which would minimize impacts to riparian and upland habitats. Activities which would accelerate sloughing of the White Bluffs would not be allowed. Protection of these habitats would maintain or enhance populations of fish, wildlife, and plants dependent on them. Programs to revegetate disturbed areas (approx. 500 acres) and control of non-native plants would be initiated, but implemented at a somewhat lower level than in the Proposed Action. These programs would enhance the diversity and abundance of endemic plant and animal species and improve chances of reintroduction of rare species. Public access in critical habitat areas and off-road vehicle use would be prohibited, with monitoring and enforcement dependent on staffing levels. Disturbance from unauthorized use would be reduced, although not to the extent possible in the Proposed Action. Interpretive programs would increase awareness of native ecosystems.	3. Same as the Proposed Action, except that programs to revegetate disturbed areas and control non-native plants would not be as intensive. As a result, this alternative would achieve less enhancement in the diversity and abundance of endemic plants and animals.
4. Rare and Endangered Species	4. Prohibition on dams, limitations on water resource development projects, controls on development, and controls on public access in critical habitat areas would contribute to the maintenance of aquatic habitat for the Columbia pebblesnail; riverine habitat for persistentsepal yellowcress and Columbia milkvetch, white pelicans, and sandhill cranes; and riparian habitat for bald eagle roosting. Controls on development, non-native species,	4. Same as the Proposed Action, except there would be no additional controls on private land uses. Mining and mineral development, expansion of agricultural activities, conversion of existing agricultural lands to non-agricultural uses, and grazing on private lands could result in disturbance of important habitats depended upon by threatened and endangered species.	4. In the short term, existing habitats and populations of listed and candidate species would be maintained. After November 1996, dams and water resource development projects would not be prohibited and potential impacts to aquatic habitat would probably eradicate existing populations of the Columbia pebblesnail, and the reduction in riverine and riparian habitat would threaten the persistentsepal yellowcress and the Columbia milkvetch, white	4. Same as Alternative B, except that the permanent prohibition on dams and limitations on water resource development projects would provide substantial protection for the Columbia pebblesnail.	4. Same as the Proposed Action, except that the continuation of grazing, the reduced species reintroduction program, and the lower level of field staff may result in less enhancement to shrub-steppe habitat and to the threatened and endangered species dependent on this habitat.	4. Same as the Proposed Action, except that species reintroduction programs would receive less attention.

ISSUES	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	and public access and off-road vehicle use, would protect shrub-steppe habitat critical to the pygmy rabbit and used by peregrine falcons and ferruginous hawks for hunting. Activities that would accelerate sloughing of the White Bluffs would not be allowed in order to protect nesting and roosting habitat for peregrine falcons and bald eagles. Preservation of these habitats would result in maintenance or enhancement of threatened and endangered plants and animals. Active species reintroduction would be initiated following more detailed studies of species status and the availability of suitable habitat.		pelicans, and sandhill cranes within the reach. Continued sloughing of the White Bluffs would result in the deterioration of nesting and roosting habitat for peregrine falcons and bald eagles, which may result in a reduction of returning populations to the Hanford Reach. In addition, it is expected that the lands north and east of the river would be declared excess by the DOE resulting in transfer to another entity. For purpose of analysis, it is assumed that lands would continue in public ownership (federal, state, local) and impacts to habitats depended upon by threatened and endangered species would be minimal. With existing limitations in patrolling, disturbances to sensitive habitats would continue.			
5. White Bluffs	5. Activities which may accelerate sloughing of the White Bluffs would be limited which may result in partial stabilization of the formation. Prohibitions on off-road vehicle use, increases in interpretation and education programs, and increased patrols would reduce damage caused by illegal vehicle use and unauthorized collection of paleontological fossils.	5. Same as the Proposed Action.	5. No actions would be taken to limit and reduce activities which could have an impact on the White Bluffs. With existing limitations in patrolling, off-road vehicle use and unauthorized collection of paleontological fossils would continue.	5. Same as Alternative B.	5. Same as the Proposed Action, except that the somewhat reduced level of monitoring and enforcement would reduce the effectiveness of programs to stop off road vehicle use and unauthorized collection of fossils.	5. Same as the Proposed Action.
6. Water Quality	6. Prohibition on dams and limitations on water resource development projects would prevent changes to river equilibrium, maintain free-flowing character, and prevent significant impacts to water quality. Controls on development on federal and private lands would prevent siltation and other water pollution. DOE cleanup activities in the corridor may result in localized and temporary siltation and potential for chemical and radiological contamination. If unsafe levels	6. Same as the Proposed Action, except there would be no additional controls on private land uses, particularly with the corridor. This may result in increased sedimentation and other water pollution.	6. After November 1996, dams and water resource development projects would not be prohibited and impacts to water quality would be possible. Adverse impacts would result from a change in the equilibrium of the river. No additional controls on corridor development on private lands could result in development which would contribute to siltation and other water pollution.	6. Same as Alternative B, except there would be a prohibition on dams and limitations on water resource development projects which could result in changes to river equilibrium, eliminate the free-flowing character of the Reach, and consequently have a significant impact on water quality.	6. Same as Alternative A.	6. Same as Alternative A.

ISSUES	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	of contamination are identified in groundwater monitoring, DOE would take actions to reduce contamination to acceptable levels or restrict the use of groundwater.					
7. Instream Flows	7. Prohibition on dams and limitations on water resource development projects would prevent significant alteration of existing instream flows. Instream flow needs for salmon, critical habitats, and rare plant and animal species would continue to be determined through discussions and negotiations among parties representing various river uses. These determinations may be influenced but would not be dictated by designations. Existing water rights would not be affected, and flow fluctuations based on the exercise of these water rights would continue.	7. Same as the Proposed Action.	7. After November 1996, dams and water resource development projects would not be prohibited. Therefore, fluctuations and major alterations in flow regime would be possible, with potential for adverse consequences to anadromous fish, threatened and endangered plants and animals, recreation, and archaeological sites.	7. Same as Alternative B, except dams would be prohibited and there would be limitations on water resource development projects.	7. Same as the Proposed Action.	7. Same as the Proposed Action.
8. Tribal Access & Use	8. Tribal members would be assured access in order to fish at all usual and accustomed places in accordance with the Treaty of 1855. The prohibition on dams and limitations on water resource development projects would help protect existing salmon populations by maintaining unimpeded migration for salmon and protecting spawning and rearing habitat. In addition, this prohibition would protect riverine medicinal plants which would otherwise be inundated. Access to grazing would be dependent on whether the USFWS decides to continue grazing. Conflicts could arise between tribes and sport fishermen with regards to usual and accustomed fishing places.	8. Same as the Proposed Action.	8. After November 1996, dams and water resource development projects would not be prohibited and adverse impacts to traditional tribal uses such as fishing and collecting of medicinal plants in the Hanford Reach would be possible. Fish populations would be drastically reduced or eliminated and medicinal plants would be inundated. Grazing by the tribes and access to fishing and hunting areas may be limited or precluded by a future managing entity.	8. Same as the Proposed Action, except grazing and access to fishing and hunting may be limited or precluded depending on the future managing entity.	8. Same as the Proposed Action, except grazing would be allowed on public lands subject to BLM review and approval and additional areas could be opened to grazing and other agricultural uses.	8. Same as the Proposed Action.
9. Land Ownership and Use	9. Prohibition on dam construction would eliminate possible impacts from inundation of private lands. Existing agricultural practices would not	9. Same as the Proposed Action, except there would be no additional controls on private land uses.	9. It is expected that the lands north and east of the river would be declared excess by the DOE. For purpose of analysis, it is assumed that lands would	9. Same as Alternative B.	9. Private agricultural lands in the corridor could be converted to non-agricultural uses. Grazing would be allowed on public lands subject to BLM review and	9. Same as the Proposed Action except there would be no additional constraints to the conversion of existing

ISSUES	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	be affected. Expansion of agricultural practices would only be impacted if they were degrading the natural values of the Reach. Existing grazing on federal lands would most likely be reduced unless determined by the USFWS to serve wildlife purposes.Changes in land use may be subject to compatibility with Wild and Scenic River. Existing power production would not be affected. However, new or expanded facilities may be affected or precluded.		continue in public ownership (federal, state, local) and be managed for recreation and conservation purposes. If mining and mineral withdrawals were not continued, mining activities could result in a beneficial effect on federal, state, and local revenues. Existing power production would not be affected. Construction of a dam could result in inundation of lands located along the river.		approval and additional areas could be opened to grazing and other agricultural uses.	privately-owned agricultural lands to non-agricultural uses.
10. Department of Energy Activities on the Hanford Site	10. The DOE would be able to conduct all cleanup activities and install new intake and outfall structures along the river in support of continuing and future site missions. An advisory project review process by the USFWS would reduce impacts to significant resources from these activities. Aside from intakes and outfalls, new permanent facilities would not be constructed within the designated corridor. Existing power production would not be impacted, however, new or expanded facilities may be impacted. Designation would not impact DOE's ability to maintain existing transmission lines or upgrade within existing corridors. The prohibition on dams would prevent impacts from inundation to buildings and waste burial grounds, particularly in the 100 Area. Wild and Scenic River designation would not impose any additional contraints on Hanford Site cleanup.	10. Same as the Proposed Action.	10. There would be no additional controls on industrial activities on the Hanford Site in this alternative. If a dam were built after November 1996, it could have significant impact on DOE industrial activities on the Hanford Site, particularly those buildings and waste burial grounds in the 100 Area which would be vulnerable to inundation.	10. Same as Alternative B, except that permanent prohibition on dams would protect DOE activities on the Hanford Site from inundation.	10. Same as the Proposed Action, except that the project review function would be conducted by the BLM.	10. Same as the Proposed Action, except that the project review function would be conducted by the NPS.
11. Recreational Access and Use	11. The improvement of boat access and other facilities at Ringold could increase recreational use of the site and the river in the immediate area. Improvements would only be initiated at the Vernita and White Bluffs sites if adverse impacts to significant resources	11. Same as the Proposed Action.	11. Existing conditions would continue in the near future. If a dam were built or water resource development projects occurred after November 1996, loss of suitable flow conditions and habitats would result in a loss of fishing and hunting opportunities. No improvements to existing recreational facilities would result in use levels which would be stable or slowly increasing.	11. Same as Alternative B, except that permanent prohibition on dams and limitations on water resoruce development projects would provide partial protection to anadromous fish and waterfowl and the fishing and hunting activities which depend on them.	11. Same as the Proposed Action, except that lower staffing levels would reduce visitor-field staff contact in the interpretive program and the enforcement of inappropriate and illegal recreational uses.	11. Same as the Proposed Action with the following exceptions. The Ringold boat launch would also be improved. The additional facilities for interpretation and nonconsumptive recreational activities which would be developed at key viewpoints and resource sites throughout the designated area would enhance the visitor experience. The entire interpretive program, which includes a visitor center, guided and self-guided tours,

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ISSUES	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
	of the sites and adjacent river areas could be avoided. Lands currently within the Saddle Mountain National Wildlife Refuge, the riverbank and upland areas on the south and west sides of the river, and the river islands would continue to be closed to public access unless deemed otherwise during development of the refuge and river management plans. Recreational access and activities could be enhanced elsewhere if found compatible with other refuge policies. Wildlife habitat protection and restoration programs would help maintain existing wildlife viewing opportunities. The expanded interpretive program, which would include publications, displays, a self-guided auto tour, and direct contact between visitors and field staff, could increase visitor enjoyment and reduce illegal and inappropriate uses. Prohibition on dams and limitations on water resource development projects would protect salmon and steelhead stocks for the recreational fishery. Increased patrols and resource management staff will result in greater resource protection and educational opportunities.		Inappropriate recreational activities, including off-road vehicle use and artifact collection, would continue. In addition, it is expected that the lands north and east of the river would be declared excess by the DOE resulting in transfer to another entity. For purpose of analysis, it is assumed that lands would continue in public ownership (federal, state, local) and be managed for recreation and/or conservation purposes. Access to lands currently available to recreational users may be limited.			displays, and publications would increase awareness and enjoyment of the area and reduce illegal and inappropriate uses. Hunting would be prohibited unless specifically authorized in the designating legislation.

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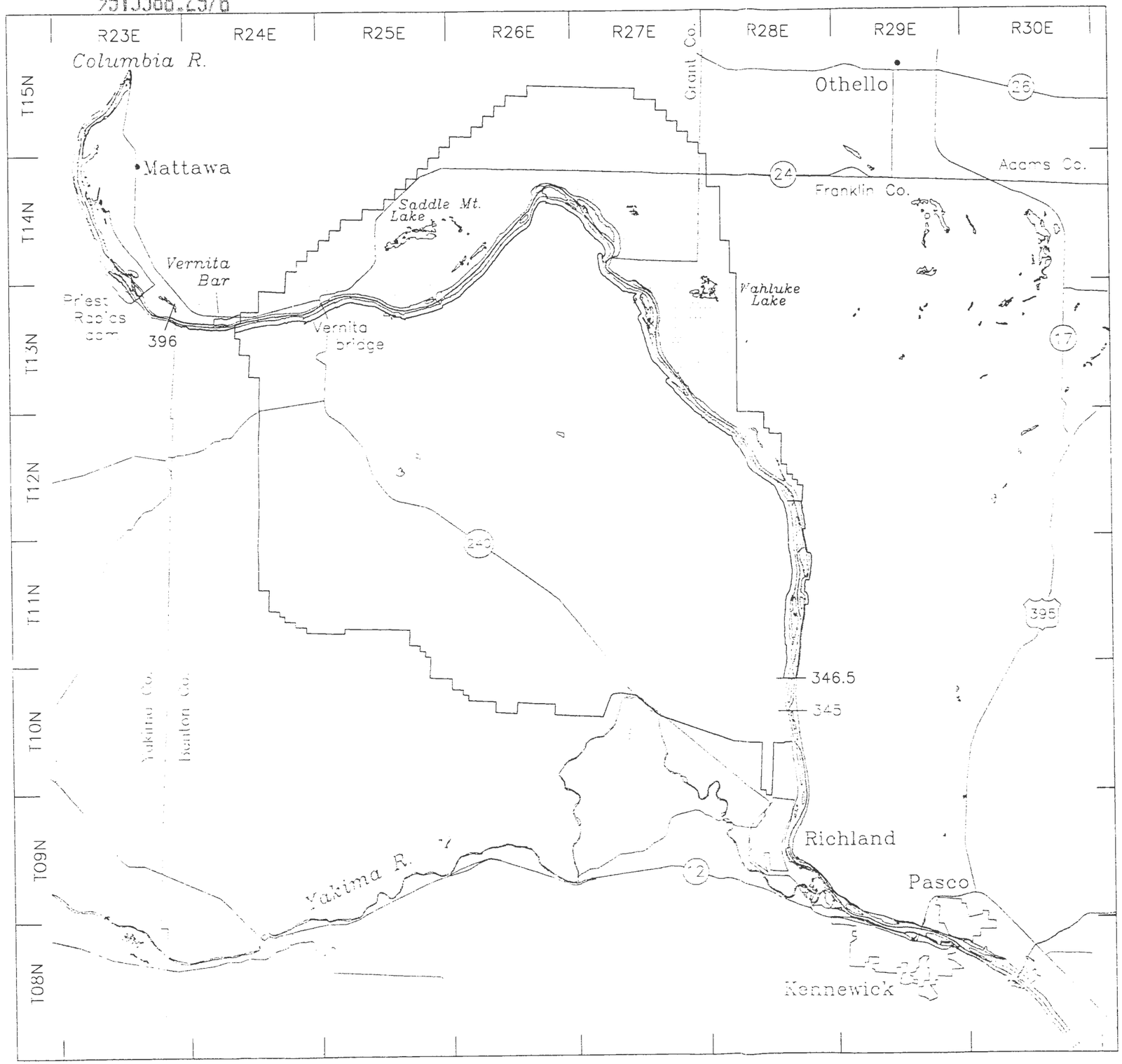

Alternative E: National River

KEY

National River Area

KILOMETERS 0 10 20

MILES 0 5 10

N

HANFORD REACH STUDY / EIS

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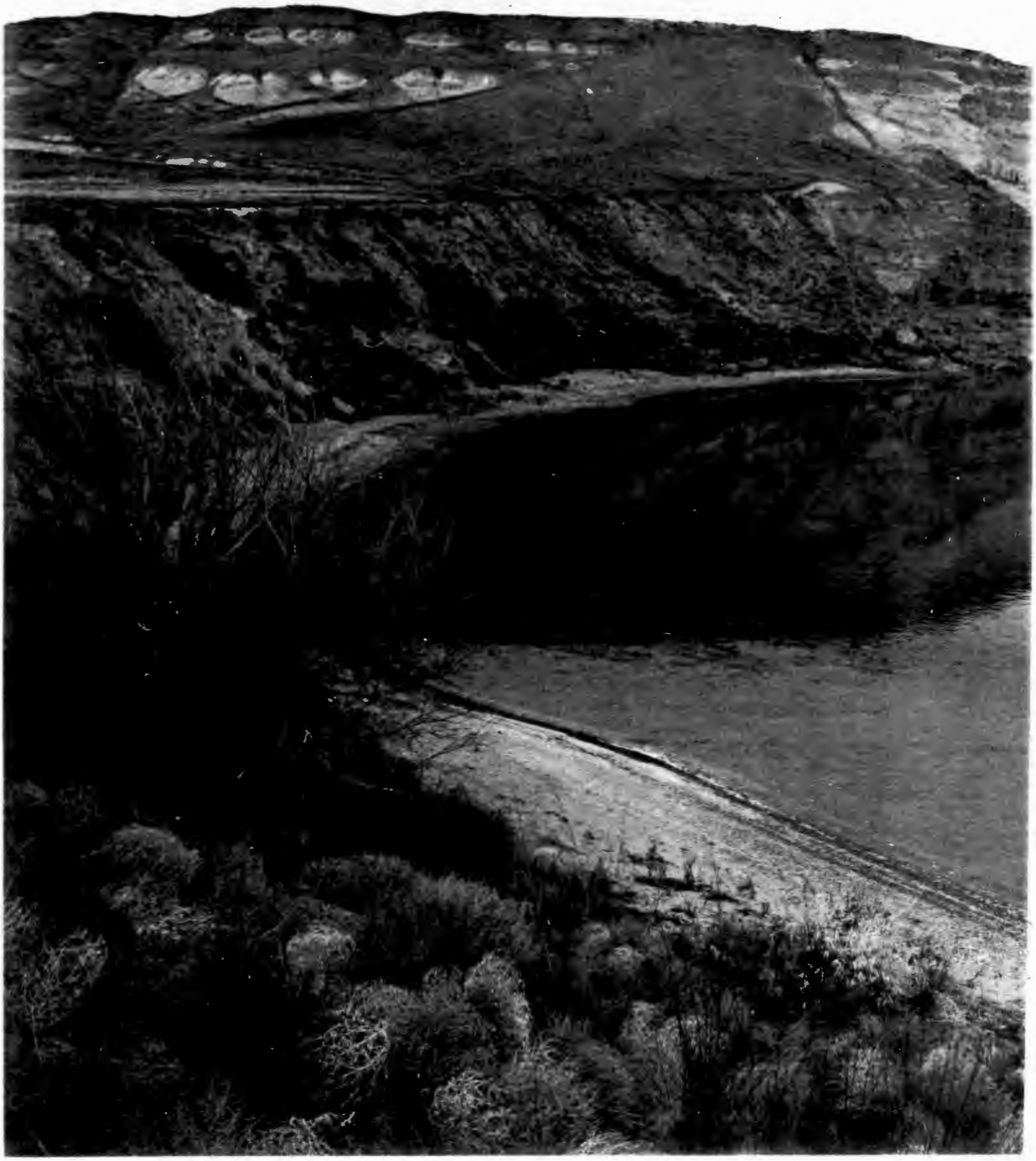

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CHAPTER III
AFFECTED ENVIRONMENT

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III. AFFECTED ENVIRONMENT

A. STUDY AREA

The study area is located in southeast Washington and lies within portions of Benton, Grant, Franklin, and Adams counties (Map #1). It extends from one mile below Priest Rapids Dam (river mile 396) downstream approximately 51 miles to the McNary Pool north of Richland, Washington (river mile 345). This segment of the Columbia River is considered the last free-flowing, non-tidal segment of the Columbia in the United States. The river flows east and south through the 353,000-acre Hanford Site, established in 1943 and administered by the Department of Energy (DOE) (Map #9). Total acreage of the study area is approximately 105,000 acres and includes the river itself, islands, Wahluke State Wildlife Recreation Area, Saddle Mountain National Wildlife Refuge, and state and privately-owned lands.

The study area lateral boundaries were undefined by the legislation. However, the NPS set them at a quarter mile on either side of the river (a total area of 16,320 acres) the convention for Wild and Scenic River studies which was determined to incorporate important resources of the Reach. Lateral boundaries were later adjusted during the study process to include those resources identified during the scoping process which extend beyond the quarter mile boundary and are in federal ownership. These resources are in an area known as the Wahluke Slope, consisting of approximately 90,000 acres located north and east of the river. This land is currently administered by the USFWS as the Saddle Mountain National Wildlife Refuge and the WSDFW as the Wahluke State Wildlife Recreation Area. Both of these administratively designated wildlife areas are within the boundaries of the Hanford Site, but are operated through permits by the U.S. Fish and Wildlife Service (USFWS) and the Washington State Department of Fish and Wildlife (WSDFW), respectively.

South of the study area, the cities of Richland, Kennewick, and Pasco, commonly known as the Tri-Cities, form the nearest population center, one of ten major population centers in Washington state (Clements 1989). Other land within the study area is owned and managed by Grant County Public Utility District, the WSDFW, Washington Department of Natural Resources (WDNR), Bureau of Land Management (BLM), USFWS, and Bureau of Reclamation (BR). The remaining acreage is managed by the DOE.

There are approximately 2,600 acres of land within one-quarter mile of the river along the 51-mile study segment that is not federally-owned (this figure includes state and privately-owned lands)(Map #4). Private lands represent approximately two percent of the total study area and approximately 9.8 miles of the shoreline (6.3 miles at the north end and 3.5 miles at the southern end). All of the private land parcels are located outside of the Hanford Site and are concentrated in two areas: 1) on the north and south sides of the Columbia River between the north study area boundary and the west boundary of the Hanford Site; and 2) on the east side of the River from the south boundary of the Wahluke State Wildlife Recreation Area and the south study area boundary.

Land Uses in the Hanford Site

The Hanford Site is owned by the federal government and managed by the DOE. From 1943, facilities at the Hanford Site were built and operated to produce nuclear materials for national defense, and to manage the nuclear waste generated by those facilities. Nine production reactors were built along the Hanford Reach (Map #5). The first, B Reactor, was completed in 1945 and supplied nuclear materials for the first test atomic explosion and the atomic bomb, *Fat Man*. The last, N Reactor, continued operations until 1987 (Cushing 1988).

Operation of eight of the plutonium production reactors began in the 1940's and 1950's and ended in the 1960's. Operation of the ninth reactor, N-Reactor, began in the 1960's and ended in 1987 (U.S. Department of Energy, June 1989). Two reactors are located within the study area, N and H Reactors, on the south shoreline of the Columbia River. Radioactive and solid waste were also disposed of in these areas. Eight of these reactors are being decommissioned by the DOE. N Reactor has not yet been proposed for decommissioning by the DOE.

Only about six percent of the Hanford Site land has been disturbed and is actively used for production of nuclear materials, waste storage, and waste disposal (Cushing 1988). The remaining land has been used as a buffer for security and safety reasons and is in its natural condition. Immediately after the establishment of the Hanford Site in 1943, the Columbia River between Priest Rapids and Richland was closed to public use. Strict control was maintained until the late 1960's when the river was opened for public boating upstream from Richland to the abandoned townsite at Hanford. In 1978, the entire Reach of the Columbia was opened to daytime public boating use. The Hanford Site lands were also closed to the public until 1978 when the Wahluke State Wildlife Recreation Area was established and opened for daytime recreational use.

The Bonneville Power Administration (BPA) owns several transmission facilities on the Hanford Site. Three of BPA's major 500-kV substations - Hanford, Ashe, and Midway - are located on the Hanford Site, as well as several other lower voltage substations. These substations support interregional power transmission and form a major hub of the Pacific Northwest's transmission system. Three of the substations are located within the Hanford Reach study area -- Hanford, Midway, and Benton. BPA also owns eleven transmission lines that cross the Hanford Site and the study reach of the river: three 500 kV lines, four 230-kV lines, and four 115-kV lines (Map #5). The transmission line crossings are paralleled by roads that provide access to the lines for repair and maintenance purposes.

The Washington Public Power Supply System (WPPSS) has facilities located near the southern boundary of the study area. WNP-2 is the only nuclear reactor generating electricity at this time; however, this plant typically generates about 9% of the electricity generated for the BPA (BPA supplies approximately 45% of the region's electricity). WNP-1 is 65% complete and is being preserved for possible future energy generation. WNP-4 was 20% complete when it was terminated. (Mills 1991)

There are currently eight special resource management designations that are wholly or partially located within the Hanford Site, six of which are wholly or partially contained within the study area (Map #9). The Congressionally established McNary National Wildlife Refuge is located partially within the study area. The remaining resource management designations were created by administering federal agencies.

The Arid Lands Ecology Reserve (also designated as the Rattlesnake Hills Research Natural Area) and the National Environmental Research Park were designated by the DOE in 1968 and 1976, respectively. The Arid Lands Ecology Reserve is managed as a Research Natural Area by DOE. The Columbia Islands and McCoy Canyon Areas of Critical Environmental Concern were established by the BLM in 1981 and 1987, respectively. The BLM considered the designation of Badger Slope and Rattlesnake Ridge as Areas of Critical Environmental Concern; this proposal is no longer being pursued (Aldrich 1993).

Saddle Mountain National Wildlife Refuge and the Wahluke State Wildlife Recreation Area are operated under the terms of a permit issued by the Atomic Energy Commission (now the DOE) on November 30, 1971, to the U.S. Bureau of Sport Fisheries and Wildlife (USFWS) and the Washington Department of Game (WSDFW) to provide for management of the Hanford lands north and east of the Columbia River. According to the terms of this permit, the Bureau of Sport Fisheries and Wildlife was required to keep the lands managed as Saddle Mountain National Wildlife Refuge closed to all public access. The closure ensured a security zone for N Reactor, and encompassed an area within a five and one-half mile radius of the reactor. To date, the permit has not been modified even though the N Reactor has been shut down and nuclear fuel rods have been removed.

The closure to public use has had a substantial benefit for migratory birds in that it has provided a sanctuary for nesting and use during migration, primarily for ducks and geese, around Saddle Mountain Lake. Future management of the area under the Proposed Action is expected to maintain the area as a sanctuary. However, potential recreational uses within the Saddle Mountain National Wildlife Refuge will be considered as part of a management planning process that will include public involvement and input.

Land Uses on Adjacent Lands

On lands adjacent to the Hanford Site, agriculture is the predominant land use (Map #10). An estimated 61, 65, and 79 percent of the land in Benton, Grant, and Franklin Counties, respectively, is classified as farmland (Clements 1989).

The Hanford Reach study area includes lands that were originally part of the Columbia Basin Project, a multipurpose development administered by the Bureau of Reclamation (BR) for power production, flood control, recreation, fish and wildlife, as well as irrigation. The Project's key structure, Grand Coulee Dam, is on the main stem of the Columbia River about 90 miles west of Spokane, Washington. Project irrigation works extend southward on the Columbia plateau for 125 miles to the vicinity of Pasco, Washington, at the confluence of the Snake and Columbia Rivers. Beginning near Quincy, the Columbia River forms the western Project boundary; the eastern Project boundary is about 60 miles east near the communities of Odessa and Lind. Columbia Basin Project lands include portions of Grant, Lincoln, Adams, and Franklin Counties, with some northern facilities located in Douglas County.

The Columbia Basin Project area is part of the vast Columbia River system that produces an abundance of hydroelectric power, fish, wildlife, recreational opportunities, and agricultural products sold in the United States and overseas. Business and industry in the towns scattered throughout the Basin are related primarily to the predominantly agricultural economy. Ample water from the Columbia River, a growing season that extends from March through October, and excellent soils make the area ideally suited for irrigated agriculture. In the 1940s when the project was originally formulated, a total of approximately 1,095,000 acres was envisioned to be irrigated by the Columbia Basin Project. Currently approximately 640,000 acres are being irrigated. The BR through an environmental impact statement is presently considering expansion of the Columbia Basin Project by approximately 87,000 acres, none of which include the Wahluke Slope. Full expansion to the 1,095,000 acres was one alternative considered, but the 87,000 acre expansion alternative was selected as the preferred alternative because of its feasibility.

All basic irrigation facilities (canals, laterals, wasteways, pumping plants) are used by the three Columbia Basin irrigation districts (Quincy, East, and South) and are operated and maintained by the districts. An irrigation district is a quasi-governmental agency chartered by the state to deliver water under contract with the United States and to operate and maintain federally constructed facilities. Irrigation districts act as the fiscal agent for the repayment of the construction charges for the Columbia Basin Project. The South Columbia Basin Irrigation District in Pasco is the closest to the Hanford Reach study area. Project facilities within the proposed study area include over 2,500 miles of delivery facilities and seven major wasteways. Irrigation facilities operated by BR include Grand Coulee Dam (powerplants and pumping plant), Banks Lake, Dry Falls Dam, Main Canal, Potholes Reservoir, and Potholes Canal headworks. Operation and maintenance costs of the reserved works attributed to irrigation are paid by the districts.

When the Hanford Site was established, the Wahluke Slope was identified as a safety and security buffer zone on the north or left side of the river directly across from the nuclear reactors. In order to secure these lands, the Atomic Energy Commission (AEC, now the DOE) had to address a variety of ownership scenarios. Some of the lands were privately owned and the remainder were owned by the federal government, administered by either the BLM or the BR, the latter as part of the Columbia Basin Project. The BR owned in fee most of the lands under their control. These are subject to a Memorandum of Agreement signed in 1957 by the AEC and BR (see Appendix K) which states that when these lands are no longer needed as a buffer zone by the Atomic Energy Commission, they will be returned to the BR for reincorporation into the Columbia Basin Project. A Congressional designation would supersede this agreement.

Commercial and residential land uses are concentrated near the southern boundary of the study area in the Tri-Cities adjacent to the southeast portion of the Hanford Site. The Tri-Cities, form the largest population center in southeast Washington (Washington State Office of Financial Management 1990) comprised of Richland (30,250) and Kennewick (37,910) in Benton County, and Pasco (17,820) in Franklin County. The populations of nearby Benton City (1,835), Prosser (4,090), and West Richland (3,690), all in Benton County, total 9,615. Approximately 7,000 people live outside the Pasco city limits in the West Pasco/Riverview area (Cushing 1988). The total population of this regional area was 102,595, approximately 71 percent of the combined populations of Benton (110,000) and Franklin (34,600) Counties. The 1990 population of Grant County was 53,100.

The 261,451-acre Yakima Firing Center Military Reservation nearly abuts the west boundary of the Hanford Site (Map #9). This Department of Defense facility is used by the army and reserved for maneuvers and weapons training (U.S. Department of Army 1990).

Water Rights

Water rights in the state of Washington are determined by the Washington State Superior Courts and regulated by the Washington Department of Ecology (WDOE). Water sources relevant to the discussion in this document include the Columbia River and underground aquifers in the study area.

The DOE's past and present water withdrawals at the Hanford Site are based on the "federal reserved water rights" doctrine. This doctrine, developed as case law from U.S. Supreme Court rulings, holds that the federal government, when it withdraws public lands for the purpose of the creation of a federal reservation, necessarily withdraws unappropriated water rights sufficient to meet the needs for which the reservation was created. The date of priority of these rights is the date of creation of the reservation. In the case of the Hanford Site, this date is 1943. It is the general rule that federal reserved water rights cease to exist when the federal reservation ceases to be used for the purposes for which it was created. The limited exception to this rule is reflected in the case of U.S. v. Powers, 305 U.S. 527 (1939), wherein the Court allowed that a purchaser of agricultural land on an Indian reservation may be entitled to a portion of federal reserved water rights where the use of the property did not change.

The federal government has not established its own water rights regulation. Instead, it uses the regulatory procedures outlined in the State water rights laws to document the extent of its rights. There has been no general adjudication in the State of Washington of the water rights in the Columbia River and, therefore, the reserved water right of the Hanford Site has not been documented. The quantity of that right, however,

would be equal to the maximum amounts used at Hanford during its operation, up to the amount of unappropriated water in the Columbia as of 1943.

The WDOE, in a report titled "Hanford Land Transfer" (March 1993), has indicated that, if water rights were attached to privately owned parcels of land acquired in fee by the federal government for the creation of Hanford in 1943, those water rights may continue to be attached to these parcels of land. Ecology has indicated that it has not taken action to extinguish these rights although under Washington law appropriative water rights are subject to be extinguished if unused for a period of five years.

Further complications exist regarding non-federal water rights claims at the Hanford Site. The first is the issue of groundwater contamination at the Hanford Site. The second is that the date for filing a water rights claim in the Hanford sub-basin, for both Columbia River water and ground water, expired in 1992. No claims for water rights under state law appear to have been filed within the required time period.

B. NATURAL RESOURCES

PHYSICAL FEATURES

Climate

The study area is within Washington's Central Basin climatological region (Clements 1989). The Central Basin is the driest climate region in eastern Washington with annual precipitation ranging from 7 to 15 inches. The prevailing winds are from the west during the winter and from the west northwest during the summer.

Median annual temperature is 54 degrees Fahrenheit near the southern boundary of the study area (McNary Pool/Richland). January is the coldest month, with median temperatures of 32 degrees at this location and July is the hottest month, with median temperatures of 75 degrees. Richland annually receives 6-7 inches of rain and only 5 inches of snow. Prevailing wind directions at the Hanford Site are generally from the northwest (Cushing 1988). Monthly average wind speeds are lowest during the winter (averaging 6 to 7 miles per hour), and highest during the summer (averaging 8 to 10 miles per hour). Summertime drainage winds, also out of the northwest, can often reach speeds of 31 miles per hour.

Air quality in the vicinity of the study area is generally classified as good. Wind-eroded dust is an occasional problem with respect to suspended particulates. Local agricultural fields provide the source of the dust, which can become airborne in the arid climate during high wind periods (Cushing 1988). The burning of crop residues is also believed to occasionally contribute to airborne irritants.

Soils

Fifteen soil types have been identified on the Hanford Site (Hajek 1966). Sands and silt loams are the predominant soils (a loam is defined as having 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles (U.S.D.A. Soil Conservation Service 1984). Sand and loamy sand soils tend to cover the low-lying areas in the central part of the Hanford Site, while the silt loam soils can be found in the higher elevations in the southwest and north portions of Hanford.

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Geology

The study area is located in the physiographic province known as the Columbia Plateau, the boundaries of which are defined by the lateral extent of the Columbia River Basalt Group (east of the Cascade Mountains) (Fenneman 1931). The continental flood basalts that comprise this Group were extruded during the Miocene epoch, between approximately 17 and 6 million years ago, and cover an area more than 100,000 square miles between central Washington, Idaho, and Oregon (Table 1). The nearly horizontal lava flows are stacked on top of each other, and are between 10 and 200 feet thick.

Table 1: Stratigraphic Column (Source: Cushing, C.E., PNL-6415 Rev. 3, 1990)

Period	Epoch	Group	Subgroup	Formation	K-Ar Age Years x 10^6	Member or Sequence	Sediment Stratigraphy or Basalt Flows		
QUATERNARY	Pleistocene/ Holocene					Surficial Units	Loess		
							Sand Dunes		
							Alluvium and Alluvial Fans		
							Landslides		
							Talus		
							Colluvium		
	Pleistocene			Hanford		Touchet Beds/ Pasco Gravels			
							Plio-Pleistocene Unit		
TERTIARY	Pliocene			Ringold			Upper Ringold	Fanglomerate	
							Middle Ringold		
							Lower Ringold		
							Basal Ringold		
	Miocene	Columbia River Basalt Group	Yakima Basalt Subgroup	Saddle Mountains Basalt	8.5	Ice Harbor Member	Goose Island Flow		Ellensburg Formation Tel
							Martindale Flow		
							Basin City Flow		
						Elephant Mountain Member	Levey Interbed		
					10.5		Upper Elephant Mountain Flow		
							Lower Elephant Mountain Flow		
						Pomona Member	Rattlesnake Ridge Interbed		
					12.0		Upper Pomona Flow		
							Lower Pomona Flow		
						Esquatzel Member	Selah Interbed		
							Upper Gable Mountain Flow		
							Gable Mountain Interbed		
							Gable Mountain Interbed		
						Asotin Member	Cold Creek Interbed		
							Huntzinger Flow		
						Wilbur Creek Member	Wanapum Flow		
						Umatilla Member	Silusi Flow		
							Umatilla Flow		
					13.6		Mabton Interbed		
				Wanapum Basalt		Priest Rapids Member	Lolo Flow		
							Rosalia Flows		
							Quincy Interbed		
						Roza Member	Upper Roza Flow		
							Lower Roza Flow		
							Squaw Creek Interbed		
						Frenchman Springs Member	Aphyric Flows		
							Phyric Flows		
					15.6		Vantage Interbed		
				Grande Ronde Basalt		Sentinel Bluffs Sequence	Undifferentiated Flows		
							Rocky Coulee Flow		
							Umtanum Flow		
							Cohassett Flow		
							Undifferentiated Flows		
							McCoy Canyon Flow		
							Intermediate-Mg Flow		
						Schwana Sequence	Low-Mg Flow Above Umtanum		
							Umtanum Flow		
							High-Mg Flows Below Umtanum		
							Very High-Mg Flow		

The Hanford Reach is located in the 40,000 square mile Walla Walla Section of the Columbia Plateau Province, which is the largest and most diverse of the five province sections. It occupies all of the province north and west of the Blue Mountains, located in northeast Oregon. The even crested, smooth sided, east-west-trending transverse ridges that rise up to between 1,000 and 3,000 feet above the intervening valley floors are characteristic of the Yakima District of the Walla Walla Section. These ridges, vegetated mostly by grasses and sagebrush are the characteristic landforms of the Hanford Reach.

The topographic and structural depression which the study area is located within is known as the Pasco Basin (Map #6). The Pasco Basin is bounded by several ridges: Saddle Mountains, Umtanum Ridge, Yakima Ridge, Rattlesnake Hills, and Horse Heaven Hills (Map #12). In this 1,900 square mile area the basaltic rock can be more than 1.8 miles thick. Underneath the basalt, Eocene nonmarine sedimentary and volcanic rocks may occur extensively, overlying Jurassic and Cretaceous metamorphic rocks. Eocene rocks can be quite thick locally (4,000-20,000 feet) and Eocene lacustrine and fluvial shales and coal beds are potential source rocks for gas. Average porosity of sandstones is estimated at 6-18 percent with potential recovery of up to 60 percent of available gas.

Within the Pasco Basin the lava flows are covered by younger sedimentary rocks. The late Miocene to late Pliocene Ringold Formation (locally known as the White Bluffs) was formed from river and lake sediments deposited by the ancestral Columbia River and its tributaries. The White Bluffs rise up to almost 600 feet in the study area, and represent the single outcrop of the Ringold formation in the Pasco Basin. Besides being the most striking landform on the Hanford Reach, the White Bluffs are also regionally significant as a paleontological resource. Fossil remains from rhinoceros, camel, deer, horse, mastodon, bear, coyote, fossil fishes, turtles, and rodents are found in the Ringold Formation. An especially significant feature of the White Bluffs is the mammalian fauna preserved in the sediments of the Ringold Bar.

A late Pliocene to early Pleistocene unit rests above the Ringold formation, and was formed during a period of regional incision on the Columbia Plateau, and is reflected by the abrupt termination and eroded nature of the top of the Ringold Formation. The sedimentary Hanford Formation lies above this unit, varies from 15 to 210 feet in thickness, and is a record of late Pleistocene cataclysmic floods. Younger Quaternary age sedimentary features in the study area were formed from wind and landslide processes.

Wind locally reworked and redistributed late-Pleistocene flood deposits to produce loess, dune sand, and sheet sand. Northeast-trending, longitudinal shaped dunes are found in the south-central and eastern parts of the Pasco Basin. The Hanford Dunes and others in the Basin are indicative of the predominantly southwest direction of strong winds.

The Hanford Dune Field is one of three great dune fields in the Columbia River Basin. It is an active area of migrating barchan dunes and partially stabilized transverse dunes derived from alluvium, with bare rock-rubbled areas between dunes. In the late 1970s, a study done by the Heritage Conservation and Recreation Service determined this dune field to be of national significance, and proposed a 6,320-acre protected area for inclusion into the National Natural Landmark system. For security and other reasons, the DOE requested that the site not be designated as such, and its request was honored (Fitzsimons 1979).

In summary, the study area landscape looks much as it did during the late Pleistocene epoch. Basaltic volcanic flows produced the gentle sloping terrain found throughout the Hanford Site. The east-west trending ridges previously mentioned form the dominant landscape features. Elevation within the Hanford Site ranges from about 360 feet at the river near the south study boundary, to 3,600 feet at the Rattlesnake

Hills in the southwest corner of the Site, and to over 2,000 feet at the Saddle Mountains in the north-central part of the Site (Map #12).

Geologic Hazards

Landslides, commonly referred to as sloughing, are a common geologic hazard in the White Bluffs vicinity, and have been reported to be up to 1.2 miles wide (Marratt 1988). Landslides occurred in this area during the Pleistocene epoch, a result of saturation and undercutting by glacial-related floodwater.

The White Bluffs are comprised of claystones and siltstones which are relatively strong when dry but lose considerable strength when wet. Visual evidence of recent, suspected human-induced landslide activity has developed over the past two decades, and includes one slide involving 6,600 feet of the southern end of the White Bluffs (Marratt 1988). Irrigation water being applied to croplands immediately east of the White Bluffs has raised the water table significantly, resulting in local saturation, increased pore pressures, reduced shear strength, and instability of slopes above the river (Schuster et al. 1987). Leaks in local irrigation canals and irrigation wastewater are believed to be contributing groundwater to the slide area, but a regional aquifer may also be responsible.

Water currently flows from the slide area at an average of 240 gallons per minute and carries an average of 31 tons of sediment per day into the Columbia River (Marratt 1988). Improved water management, relocation of some canals, and conservation techniques have been recommended to help mitigate this problem.

Mineral Development

Within the Hanford Site and surrounding vicinity, there is potential for a variety of geologic resources that could be viable for commercial extraction. The study area has abundant economic sources of aggregate (sand, gravel, and quarry stone). Large quantities of crushed stone and fill material have been used at Hanford since the 1940s. The study area has 21 existing gravel pits, including 7 within the southern river corridor, 5 within the northern and eastern river corridor, and 9 north of the corridor. Clay resources are present along the eastern margin of the study area and one pit was developed at Hanford. Pumicite may be present within the study area and at least five pumicite deposits have been developed in the surrounding vicinity. These resources are within hauling range of the Tri-Cities, a major local market. As the population continues to grow in this area, demand for these materials will increase to support construction activities.

Yakima Ridge, Rattlesnake Hills, and Saddle Mountains are all sources of petrified and opalized wood, high unit value commodities. The sediments of the White Bluffs contain agate and jasper. These resources can be produced directly by small mining operations, and they can generate secondary revenues from the activity of recreational collectors.

River gravels along the Columbia River have potential for placer gold. Between Vantage and Alderdale, Washington, at least seven sites along the Columbia River have had past placer mining activity and gold production. The Chinaman's Bar Placer, within the western edge of the study area, supported a small operation from 1939 to 1941 with an unknown amount of production. The economics of production depends on the characteristics of each deposit. These sites can also become popular recreational areas for gold panning and suction dredging.

The potential exists for economic low temperature (less than 90 degrees centigrade) geothermal resources in the confined aquifer system under the Pasco Basin. Rapid vertical migration of geothermally heated water toward the surface and into near-surface aquifers could result in quantities of the thermal water being stored at reasonable drilling depths (Murphy and Johnpeer, 1981). This resource would require direct use applications.

The resource with the greatest future economic development potential at Hanford is natural gas. In 1913, the Rattlesnake Hills gas field was discovered. The small, shallow field was developed in 1929 and produced until it was closed in 1941, yielding a total of about 2.5 billion cubic feet of gas. Elevated levels of dissolved gas also occur in groundwater throughout much of the central part of Hanford. Thin coal and carbonaceous shale interbeds within the basalt which occur from intervals between 2,000 and 4,950 feet deep are probably the source of this shallow gas. The coal subbitumous appear to be marginal quality, discontinuous, and are probably too deep and too thin to be economic under foreseeable market conditions.

In the 1950s, renewed interest in oil and gas exploration in the Columbia Plateau led to drilling of two exploratory wells outside of the study area that were unsuccessful (Cushing 1988). Exploration resumed in the 1980s, and more than 10 million acres of lands in the Columbia Basin were leased to oil and gas development companies. Recent deep exploration wells drilled by Shell Oil Company indicate potential for commercial development within and beneath the Columbia River Basalt Group. Shell drilled four, deep, exploration wells to the north and northwest of the study area, and one to the southeast. Gas was present in several of the wells. The Shell BN 1-9 well on Saddle Mountains seven miles west of Hanford had twelve gas zones, two of which yielded 2, 4, and 3.1 million cubic feet of gas per day. To date, no commercially viable gas supplies have been found, and there is no natural gas production in Washington state.

The study area is within a U.S. Geological Survey designated oil and gas play area, with potential for major deposits of gas. Gas might occur within large anticlinal traps, fault traps or stratigraphic traps. Lingley and Walsh (1986) note that trap areas could range from 3,000 to 25,000 acres, and each trap might contain from 40 billion to 1 trillion cubic feet of gas. This could equate to an in-place value of about $1 to 3 billion per trap, although deposits might be sub-commercial at the low current prices because of the lack of infrastructure, distance to markets and great depth needed for wells.

There has been no active mineral exploration within the Hanford Site for over fifty years, and no formal evaluation of potential for mineral resources has been prepared for this study and environmental impact statement. Mineral potential might be evaluated as part of a legislative transfer of jurisdiction, or for continuation of withdrawals. Currently, the Hanford Reach study area contains no known outstanding mineral leases.

Hydrology

Before dams were built on the Columbia River, its great volume and seasonal patterns combined with substrate and climate to shape the ecosystems along its shore. The Columbia flowed from its source through relatively steep-walled topography, one that lent itself to the construction of hydroelectric dams.

Numerous hydroelectric dams have altered the historic patterns of the river, and transformed the Columbia, for most of its length, into a series of reservoirs (Map #3). The river's vast flow is now tightly choreographed by a network of agencies striving to maximize power production, meet irrigation needs of desert farms, and support remnants of the once abundant salmon fisheries. Except for the fact that the seasonal patterns no longer occur due to hydroelectric development, the Hanford Reach is all that remains to suggest the appearance of the pre-settlement, mid-Columbia ecosystem. This, combined with the fact that it is the last free-flowing non-tidal segment of the Columbia River, make it a nationally significant resource.

A complex framework of laws, regulations, and contracts governs the operation of federal and non-federal dams in the Columbia River Basin. These include: project authorizing legislation; project operating licenses; the Pacific Northwest Coordination Agreement; the mid-Columbia Hourly Coordination Agreement; the Columbia River Treaty between the U.S. and Canada; the Boundary Water Treaty and International Joint Commission requirements governing trans-boundary operations; and many other special operation agreements, such as the Vernita Bar Agreement. Historically, the dominant functions of the reservoir system have been flood control, power generation, irrigation, and navigation. In fact, under the Columbia River Treaty, Canadian storage projects (with over 15 million acre-feet of storage) were constructed and are operated primarily for flood control and power generation downstream. Today, agreements have been reached to provide high flows in certain seasons to aid downstream migration of juvenile salmon and steelhead, and maintain higher reservoir levels for resident fish and summer recreation.

The dams on the Columbia River and its tributaries are categorized as either storage or run-of-river projects. Storage projects adjust the river's natural flow patterns to conform more closely to current water uses. Storage dams hold back the heavy spring and summer snow melt runoffs to help prevent flooding. Grand Coulee Dam, approximately 160 river miles upstream from the Hanford Reach, is an example of a storage project. Run-of-river projects have limited storage and were developed primarily for navigation and hydropower generation. Run-of-river projects pass water at the dam at nearly the same rate it enters (inflow equals outflow). Priest Rapids Dam approximately 1 mile upstream of the Hanford Reach is an example of a run-of-river project.

Nearly all major dams and reservoirs in the Columbia River system are operated in coordination with one another to maximize the benefits provided by the storage reservoirs. The river is a complex multiple-use system: no single use has precedence over another, and no single reach of the river can be operated without affecting or being affected by another reach.

Columbia River System Operation Review

The System Operation Review is a multi-agency effort conducted by the U.S. Army Corps of Engineers, BR, and the BPA. The result will be a strategy for future operation of the Columbia River system. It began in 1990 and focuses on the 14 federal hydro projects that play a key role in the multi-purpose use of the Columbia River system. Features of these projects include dams and reservoirs, navigation channels and

locks, hydroelectric power plants, high-voltage power lines and substations, fish ladders and bypass facilities, irrigation diversions and pumps, parks and recreation facilities, boat launches, lands that are dedicated to the projects, and areas set aside to replace wildlife habitat.

The catalyst for undertaking the System Operation Review was the forthcoming expiration of several important multi-agency contracts involving power production rights and obligations. In order to responsibly address the needs of all the users of the Columbia River system, the System Operation Review provides a public forum where individuals and organizations representing all interests can express their concerns and recommendations for system operation. The System Operation Review will culminate in the preparation of an Environmental Impact Statement (EIS) considering certain aspects of the multiple-purpose management of the Columbia River System. The public review and the EIS will allow the agencies to make major decisions regarding power contracts and future operation of the Columbia River System (Columbia River SOR Scoping Document, May 1991). The draft EIS is anticipated for release by mid-1994.

Surface Water

The Columbia River enters the Pasco Basin at Sentinel Gap in the Saddle Mountains. The Yakima, Snake, and Walla Walla Rivers join the Columbia within the Pasco Basin downstream of the study area. No perennial streams originate within the Basin. River flow along the Hanford Reach is controlled by the series of upstream dams which make up the Columbia River system. Just upstream of the Hanford Reach is the Priest Rapids Dam which is coordinated with other dams on the Columbia and regulated by numerous laws and legal agreements, including a minimum instream flow right for 36,000 cubic feet per second.

The Vernita Bar Settlement Agreement - executed June 16, 1988 between the three mid-Columbia Public Utility Districts (PUD's), Bonneville Power Administration, fish and wildlife agencies, and Indian Tribes - established an additional minimum flow to protect salmon spawning habitat. This minimum is in effect from approximately December 15 to May 31 each year, and will likely be set between 50,000 and 70,000 cubic feet per second each year (for further discussion of the Vernita Bar Agreement see page 121).

The river downstream of Priest Rapids dam is subject to large, daytime water-level fluctuations. These fluctuations influence the shoreline configuration and expose river gravel and periphyton (microorganisms that cover rocks and plants on river and lake bottoms) to alternate periods of wetting and drying. Flows in the Hanford Reach are also regulated when possible to accommodate special requests including the Tri-cities hydro boat races, barging operations, or special studies. Depending upon the type of operation, the resulting flows could range from extended periods of minimum flows to a sudden surge of high flows to extended high flows. An average of 87 million acre-feet of water annually flow from the gauge below Priest Rapids Dam (RM 394), located approximately two mile upstream of the north study area boundary. Tributary flows (44 million acre-feet per year) and irrigation return flows (225 thousand acre-feet per year) increase the Columbia River's volume between Priest Rapids and McNary Dams. Average annual flow at the gauge below McNary Dam (RM 292) is 134 million acre-feet.

Groundwater discharges to the river are difficult to ascertain because of the large flow volumes of the Columbia. Leonhart (1979) estimated that groundwater discharges 2.9 million acre-feet per year into the Hanford Reach. Sources of discharge include the unconfined aquifer, shallow basalts, and shoreline springs.

Ground Water

The aquifers of the Pasco Basin can be correlated with four primary geohydrologic units. From oldest to youngest, these include the: 1) Grande Ronde Basalt, 2) Wanapum Basalt, 3) Saddle Mountain Basalt, and 4) Hanford/Ringold Formations. Recharge and discharge areas are generally located coincident with topographic highs and lows. Precipitation and ephemeral streams are the primary sources of natural recharge which mainly occur along the periphery of the Pasco Basin. Artificial recharge occurs within and outside of the study area. Cooling water is currently recharged to the aquifer within the Hanford Site. In the future, wastewater treated to comply with applicable standards may be discharged. Recharge from agricultural irrigation occurs east and north of the Columbia River and in the valleys west of the Hanford Site (Gephart, et al. 1979). The upper basalt aquifers are also believed to be recharging the unconfined aquifer in the north and east areas of the Hanford Site (Department of Energy 1982).

Water Quality

The Columbia River from Grand Coulee Dam to the mouth of the river near Astoria, Oregon has been designated by the WDOE as a Class A (excellent) surface water body (Table 2). This designation requires all industrial surface water uses to be compatible with other uses, including drinking water, wildlife, and recreation. The WDOE reviews and revises water quality standards every 3 years. The most recent review was 1992 which maintained the Class A standard for the Columbia River.

Table 2: Water quality standards for surface waters of the State of Washington (WAC 173-201).

Constituent	Class AA Extraordinary	Class A Excellent	Class B Good
Dissolved Oxygen	9.5 ppm	8.0 ppm	6.5 ppm
pH	6.5-8.5	6.5-8.5	6.5-8.5
Fecal Coliform	50/100 ML	100/100 ML	200/100 ML

Surface water sampling stations on the Hanford Reach are located throughout the study area (Map #6). Samples are collected by the U.S. Geological Survey, Pacific Northwest Laboratory, and formerly by the Basalt Waste Isolation Project. Monitoring results indicate that the Columbia River, especially along the Hanford Reach is of high quality. In general, this river segment can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants.

The Columbia River exhibits minimal seasonal variation in chemical composition. A summary of mean and extreme values of major water quality parameters sampled below Priest Rapids Dam (RM 395) and at Pasco, Washington for different periods between 1957 and 1973 are summarized in Table 3. All measured parameters within the Reach are consistent with other segments of the Columbia with the exception of dissolved oxygen (which is below state standards - 8.0 mg/l) and coliform levels (which are less than half of levels measured at upstream sites).

Table 3: Columbia River water quality data, upstream and downstream of the Hanford Site, calendar year 1985, (Price, 1986, p. 48)

Analysis	Units	Upstream (Vernita Bridge)				Downstream (Richland, Washington)				State standard[b]
		Number of samples	Maximum	Minimum	Annual average[a]	Number of samples	Maximum	Minimum	Annual average[a]	
PNL Environmental Monitoring										
pH	pH units	13	8.6	6.4	N/A	13	8.7	6.7	NA	6.5 - 8.5
Fecal coliform	#/100 mL	13	8	2	2[c]	13	350	2	8[c]	100
Total coliform	#/100 mL	13	920	8	27[c]	13	>2,400	8	130[c]	
Biological oxygen demand	mg/L	13	4.7	2.4	3.3 ± 0.4	13	3.6	1.3	2.5 ± 9.5	
Nitrate	mg/L	13	0.55	0.03	0.13 ± 0.08	13	0.32	0.02	0.10 ± 0.05	
USGS Sampling Program[d]										
Temperature[e]	°C	330	20	1.7	11 ± 3.8	351	21	0.9	11 ± 3.9	20 (maximum)
Dissolved oxygen	mg/L	6	14.8	9.8	12 ± 1.5	4	14	9.9	12 ± 1.6	8 (minimum)
Turbidity	NTU[f]	5	2.4	0.7	1.4 ± 0.6	3	2.9	1.3	1.9 ± 1.0	5 + background
pH	pH units	6	8.2	6.8	N/A	4	8.3	6.4	N/A	6.5 - 8.5
Fecal coliform	#/100 mL	5	10	1	1[c]	3	13	<1	6 ± 7	100
Suspended solids, 105 °C	mg/L	5	7	1	2.4 ± 2.3	3	7	5	6.0 ± 1.2	
Dissolved solids, 180 °C	mg/L	5	93	66	76 ± 9	3	85	68	75 ± 10	
Specific conductance	(micron) mhos	6	160	130	140 ± 9	4	160	130	140 ± 18	
Hardness, as $CaCO_3$	mg/L	5	79	62	69 ± 7	3	78	60	67 ± 12	
Phosphorus, total	mg/L	6	0.03	0.01	0.02 ± 0.007	4	0.02	0.01	0.015 ± 0.006	
Chloride, dissolved	mg/L	5	2.1	1.0	1.3 ± 0.4	3	1.1	1.0	1.1 ± 0.07	
Chromium, dissolved	µg/L	3	1	<1	91.0 ± 1.2	3	<10	<10	<10	
Nitrogen, Kjeldahl	mg/L	6	0.40	0.20	0.30 ± 0.08	4	0.40	<0.20	0.28 ± 0.09	
Total organic carbon	mg/L	4	4.6	1.4	3.1 ± 1.5	4	6.1	1.0	3.2 ± 2.5	
Iron, dissolved	µg/L	3	11	6	8 ± 3	3	11	<3	6 ± 5	
Ammonia, dissolved (as N)	mg/L	6	0.04	0.01	0.03 ± 0.008	4	0.04	0.02	0.035 ± 0.010	

Source: Price (1986, p. A.48).

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[a]Average values ± two standard error of the calculated mean
[b]See Price (1986, Appendix C)
[c]Annual median.
[d]Provisional data subject to revision
[e]Maximum and minimum represent daily averages. Missing data due to equipment failures.
[f]Nephelometric turbidity units
[g]Signifies that the uncertainty associated with the value is greater than or equal to the value.
N/A = Not applicable.

Hanford Reach Contamination

Historical Background

The Hanford Reach Study Area of the Columbia River extends downstream from river mile (RM) 396, one mile downstream of Priest Rapids Dam, to the head end of McNary Pool at RM 345, just north of the city of Richland. Flows through this 51-mile stretch of the Columbia River are dictated primarily by operations at Priest Rapids Dam and fluctuate significantly as a result of the relatively small storage capacity of the dam.

The Washington Public Power Supply System (WPPSS) operates the WNP-2 nuclear power plant and discharges cooling tower blowdown and treated effluents to the Columbia River in the Hanford Reach. Such discharges are permitted, regulated, and monitored.

The eight DOE production reactors (B, C, KW, KE, D, DR, H, and F) that operated between 1944 and 1971 along the Hanford Reach have been deactivated and retired (Figure 1 (**Figures 1-23 are located in Appendix N**)). These reactors used once-through-cooling systems that released radionuclides, chemicals that inhibited corrosion, and heated water into the Hanford Reach of the Columbia River. Direct discharge of radionuclides to the river by the DOE reactors was virtually eliminated when the last of the reactors (KE) using the once-through-cooling system was shut down in 1971. Contaminant levels measured in the Columbia River responded very quickly to the shut-down of the reactors, as indicated in Figure 2 which shows annual average total beta concentrations in Columbia River water at Pasco, Washington (downstream from the reactors) from 1945 through 1971.

The N reactor, which used a closed-loop cooling system, segregated potentially contaminated recirculating reactor cooling water from a separate loop of river water that drew away heat. This reactor operated between 1963 and 1987. It has been defueled and is in the process of deactivation. This reactor discharged a significant amount of heat to the river while in operation but very little radioactivity was associated with the cooling water effluent. Contaminants, primarily strontium-90 and tritium currently do enter the Columbia River at N-Springs as described later in this section.

As previously stated, when the reactors were shut down, the direct discharge of radionuclide and chemical contaminants to the Columbia River was significantly reduced. Afterwards, the primary source of Columbia River contamination from the Hanford Site was from contaminated groundwater plumes. Relatively small amounts of contaminated ground water continues to be discharged to the river via seeps and springs (Dirkes 1990, DOE-RL 1992, McCormack and Carlile 1984, Peterson and Johnson 1992). Contamination releases from the Hanford Site to the Columbia River and its immediate environs have also been greatly diminished by the reduction of contaminated discharges to the soil column, better management of discharge of uncontaminated cooling water to the soil, and the change in the Hanford mission to clean-up.

Various radionuclide and hazardous chemical contaminants are present in the Columbia River environs as a result of past and present operations at Hanford as well as from other sources (such as natural uranium, metals from upstream mining districts and nitrates from agricultural practices). Extremely low concentrations of tritium (H-3), strontium-90 (Sr-90), iodine-129 (I-129), and natural uranium (U-total) are consistently measured in the Columbia River water. Tritium and Sr-90 occur as global fallout and in effluents associated with the Hanford facility. These and other constituents are monitored in springs, seeps, sediments, vegetation and biota associated with the Hanford Reach. The Columbia River and associated environment are routinely monitored as part of the Hanford Site Environmental Monitoring Program; results are prepared by the Pacific Northwest Laboratory of Battelle. The following sections provide brief summaries of selected contaminant concentrations in media of concern. Unless otherwise specified, data discussed in the following sections were generated by the Hanford Site Environmental Monitoring Program and reported in annual Hanford Site Environmental Reports. Specific analytical results are discussed in detail in referenced documents.

Department Of Energy Cleanup Activities

In May 1989, the U. S. Environmental Protection Agency (EPA), the WDOE and the DOE entered into the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) to provide a legal and procedural framework for cleanup and regulatory compliance at the Hanford Site under the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by Titles I and II of the Superfund Amendments and Reauthorization Act (SARA) and the Resource Conservation and Recovery Act (RCRA), including the federal RCRA/Hazardous and Solid Waste Amendments (HSWA) program. Four subareas of the Hanford Site (the 100, 200, 300, and 1100 Areas) have been included on the EPA's National Priorities List (NPL). Only a small portion of the 100 Area is within the Hanford Reach Study Area, the 1/4 mile strip along the south shore of the Columbia River. Under the Tri-Party Agreement, the inactive waste disposal and unplanned release sites have been grouped into operable units; active disposal sites have been grouped into RCRA treatment, storage, or disposal (TSD) facilities. Contamination at Hanford is in the form of solely radioactive waste, solely hazardous waste, and wastes that are a mixture of radioactive and hazardous.

While the EPA maintains authority for CERCLA, the WDOE has received authorization from EPA to implement the state's dangerous waste program in lieu of the federal RCRA program. In addition, the state has received authorization to implement the EPA's radioactive mixed waste program. The state does not yet have HSWA authority and that authority remains under EPA.

Significant cleanup work is underway or planned within the Hanford Reach Study Area which would permit the transfer of property to the Department of Interior under the Proposed Action. DOE would also maintain liability for clean-up of hazardous or radionuclide contamination found in the future, above levels of regulatory limits, that are present as a result of DOE or it's predecessors activities.

The DOE has begun an expedited response action (ERA) to perform final cleanup of the "North Slope" so the ownership of this land may be transferred either by Congressional action as proposed by the preferred action of this EIS or through the standard Government Services Administration (GSA) excess land disposal process. The "North Slope" occupies approximately 190 square miles of the northern and eastern-most portions of the Hanford Site (north and east of the Columbia River). This area is currently permitted to the USFWS and the WSDFW for wildlife management purposes. The southwestern portion is designated as a wildlife refuge with limited public access. The remainder of the North Slope is open to the public for recreational use during daylight hours.

The North Slope, also commonly known as the Wahluke Slope, was not used for plutonium production or support facilities, but was used for military air defense of the Hanford Site and vicinity. Seven antiaircraft gun emplacements and three Nike-Ajax missile positions were located on the North Slope. These military positions were vacated in 1960-1961 as the defense requirements at Hanford changed and eventually demolished in 1974. Prior to government control in 1943, the North Slope was homesteaded. Physical and possible environmental hazards (e.g. landfills, asbestos, and possible ordnance and explosive wastes) exist as a result of these activities; no radioactive contamination is expected in this area. Response actions to be taken at the sites will be dependent upon the results of the sampling efforts. If hazardous substances are discovered in volumes which pose a significant threat to the public and/or environment, the hazards will be removed and buried in the central plateau of the Hanford Site (200-Area) and/or treated in-place. Physical hazards will also be removed and/or minimized concurrent with the ERA. This will include the backfilling of cisterns, underground structures, and disposal pits. Exposed debris associated with each site will also be removed (these efforts will begin during the characterization phase). Data collected during the ERA will be used by the EPA and WDOE to certify, through the CERCLA process that risks are within established acceptable levels for a wildlife refuge and recreational river, under the National Wild and Scenic Rivers Act.

In 1989 and 1990, an investigation of the North Slope area was performed to assess potential health, safety, and environmental concerns raised to DOE by Ecology and the public. As a result of this survey, 39 sites associated with either military or homesteading activities were identified.

Military Sites

Military records from the U.S. Army Corps of Engineers identify three Nike missile battery sites (H-06 [Battery "A"], H-12 [Battery "B"], and H-83 [Battery "C"]) and seven antiaircraft battery sites (PSN-01, PSN-04, PSN-07/10, PSN-12/14, PSN-72/82, PSN-80, and PSN-90) positioned on the North Slope. Evidence remaining of these sites includes reinforced-concrete foundation pads, scattered bottles and metal cans, gravel walkways, building rubble, dry wells, and solid waste landfill disposal areas. Aboveground structures have been demolished. Seven water well structures made of reinforced-concrete remain. Other underground structures have been destroyed or filled in. Exceptions are two rooms associated with an antiaircraft site (PSN-04) and a few small structures at other sites.

During the military occupation of the North Slope, nine water wells were installed but only eight have been found. Seven of eight the water wells (for location see Table 2-2) are covered by concrete wellhead structures. The wells were installed in the early 1950's and water production was permanently discontinued in the early 1960's. Two wells were investigated by video in early December 1993. The well at site PSN 07/10 had a plug at 208' below the surface and was dry. The well at site PSN 72 had a plug 370' below the surface with 16' of water above the plug.

The concrete water well structures are typically 2 to 3 ft tall and extend into subsurface chambers approximately 6 by 8 by 10 ft deep. The well shaft is located on the floor of the chamber. The well at site PSN-90 is being utilized by the local irrigation district and will not be addressed in this ERA.

Many of the buildings and permanent structures associated with these sites remained in place until they were demolished in 1974. These structures were demolished under AEC direction as they were determined to be a liability. Demolition debris was typically landfilled onsite.

Each military site contains scraps of asbestos-transite siding from building structures. The pieces are generally small, apparently overlooked as materials were being removed from the sites during the demolition activities. Personnel associated with site demolition activities indicate that building structures were knocked down and buried in pits near the original locations.

Each military site was reported to have had its own small motor pool. Major, nonroutine vehicle maintenance were completed at the main-Hanford motor pool located across the Columbia River. Only routine maintenance was performed at the military sites. Reports indicate that standard procedure at that time was to use used oil for dust control on roadways. Some of the military sites have maintenance areas with sunken grease pits and concrete ramps for convenient access by mechanics to the underside of vehicles.

Construction drawings indicate the use of underground fuel tanks. Geophysical surveys (including magnetometer and electromagnetic induction) failed to detect the presence of these tanks. An interview with a former soldier stationed at Nike position H-83-C indicated that the tanks were not underground but rather of the skid-mounted variety. It may also be possible that the tanks were removed during the deactivation activities.

Non-military Sites

Prior to the federal government's acquisition of the North Slope, the area was used for orchards and row crops near the Columbia River, wheat on the high ground away from the river, and as a grazing area where soil conditions would not allow the raising of crops.

Homestead structures (e.g., homes and outbuildings) were leveled and removed in 1974 along with the military structures by the AEC. Typically, homestead locations can be identified by scattered cans, bottle shards, and pieces of weathered lumber. Occasionally, a section of fenceline, a water cistern, or disposal pit may remain.

Cisterns were structures used for the storing of water for domestic and livestock use. Seven cisterns have been located on the North Slope. They are typically concrete- or mortar-lined and range in size from 3 to 10 ft in diameter and 4 to 14 ft deep.

No specific environmental hazards have been found associated with the homestead disposal pits. Historic usage of pesticides included lime sulphur and lead arsenate. In latter years, DDT and other pesticides may have been used. No areas have been found that are suspected of being pesticide disposal areas.

"Potential" Contaminants

Operations at Nike missile batteries required assembly, maintenance, and storage of components of military hardware as well as handling, disposal, and storage of fuels, cleaners, solvents, hydraulic fluids, and other materials. As with any use of military or industrial hardware, the generation of hazardous waste materials was a typical byproduct. Studies of continental U.S. Nike missile batteries completed for the U.S. Army (LETC 1986), to assess hazardous waste contamination potential, indicated that the chemicals and materials listed in Table 4 were typically in use at the Nike batteries.

Table 4. "Potential" Contaminants for Nike Sites.

Area Activity	Potential Contaminant
Missile maintenance and assembly area transformer pad	Polychlorinated biphenyls (PCB)
Missile assembly area	Petroleum distillates; chlorinated solvents; alcohols
Missile fueling and warheading area	Unsymmetrical dimethyl hydrazine (UDMH); inhibited red fuming nitric acid (IRFNA); aniline; furfuryl alcohol; ethylene oxide; hydrocarbons such as jet fuel (JP-4)
Missile maintenance and testing	Phosphoric acid; alodine powder; chromium trioxide; sodium dichromate; petroleum distillates; carbon tetrachloride; trichloroethene; trichloroethane; alcohol; acetone; paints containing chromium and lead; missile hydraulic fluid; tricresyl phosphate
General launcher and magazine maintenance	Hydraulic fluid; paints; solvents
Control center operations maintenance	Solvents used for cleaning electrical parts; ethylene glycol
Vehicle maintenance	Petroleum, oils, and lubricants
Facility maintenance	Lead paints; pesticides and herbicides
Utilities	Transformers (PCBs); above and below ground storage tanks used for gasoline or fuel oil; hydraulic fluid
Deactivation	Solvents; fuels; paints; asbestos-containing debris

Landfills

It is estimated that there are at least 10 landfills associated with the former military installations on the North Slope. The burial grounds in these 10 landfills total approximately 38 acres. The specific contents of the military landfills are unknown. It is probable, based on debris scattered on the surface, that domestic trash and demolition debris were disposed of at these sites. It is possible that the landfills contain quantities of hazardous wastes based on operational information. Limited vehicle maintenance activities may have contributed used motor oil to the landfills. Demolition wastes likely include asbestos-based materials such as transite.

Limited environmental sampling activities conducted at the landfill locations were performed using an analogous approach. One Nike missile position (H-83), one antiaircraft position (PSN-04), and one combination Nike/antiaircraft (H-06) landfill were selected for investigation. Landfill trench locations at each of these sites were determined by the geophysical surveys. The survey areas were determined based on surface characteristics such as stressed vegetation, subsidence, and surface and partially buried debris.

Areas where the geophysical surveys (including magnetic and electromagnetic induction surveys) indicated trenches and disposal sites were staked and marked. The surface of these areas were evaluated for signs of subsidence/stressed vegetation/presence of partially buried debris. Sampling locations were selected as close as possible to the center of the more significant anomalies and near areas of subsidence or stressed vegetation.

A hollow-stem auger rig was used to obtain the samples. Cuttings from the auger were screened for organic vapors at 2-ft intervals using an organic vapor monitor (OVM). Debris associated with the cuttings included wood, metal drums and cans, and transite.

Field screening was used extensively to determine the exact scope of sampling at each location. Screening samples were taken at approximately the 6- and 10-ft levels (bottom of the landfill was estimated to be 9 to 11 ft). At least one sample per anomaly (area where the geophysics indicate a the possible presence of a buried object) was taken for analysis at an offsite laboratory.

Field screening analysis routinely included pH, heavy metals, and volatile organic compounds depending on characteristics of the sample (i.e., color and OVM readings). Offsite laboratory analysis included volatile and semivolatile analysis; pesticide/herbicide, and PCB analysis; inductively coupled plasma (ICP) and atomic absorption (AA) metals (including mercury) analysis; and anions, chrome VI, total petroleum hydrocarbons, and total activity analysis.

A total of 32 samples from 45 auguring locations were taken from the three landfills for analysis at offsite laboratories. This includes 6 samples from Nike position H-83, 14 from Nike position H-06, from antiaircraft position PSN-04, and 6 quality assurance/quality control samples (taken from the three sites). A total of 90 field screening samples were also taken during this effort (two per auger boring).

No areas of contamination above Model Toxics Control Act (MTCA), Method A regulatory limits were detected as a result of the sampling effort.

Concrete Grease Ramp

A concrete ramp, originally constructed for maintenance of military vehicles was dismantled in August 1992 during site investigation activities. The ramp, located at antiaircraft site PSN-90, was being utilized by the public for performing oil changes on their vehicles. As a result, used motor oil was disposed on the ground beneath the ramp.

An area approximately 15 by 24 ft of obviously contaminated soil was excavated to a depth ranging from 0 to 8 in. The contaminated soil was placed into five, plastic-lined 55-gal drums. Samples were taken from the bottom of the excavation, from the drummed material, and from just outside of the excavation boundary. Field analyses for volatile organics using gas chromatograph and for total petroleum hydrocarbons (TPH) (using immunoassay kit) were performed on these samples. Sample analysis indicated an increased level of total petroleum hydrocarbons in the materials that were removed and in the materials remaining in the excavation. No other contaminants were detected. The immunoassay kit results are as follows:

- drummed material - 100 to 1,000 ppm TPH
- bottom of excavation - < 100 ppm TPH
- outside of excavation - < 100 ppm TPH
- composite sample from excavation - > 100 ppm TPH

Two representative samples were collected from the drums for waste designation using SW-846 protocol for total petroleum hydrocarbons and ICP/AA metals. Two additional soil samples were collected from the scraped area for offsite analysis for total petroleum hydrocarbons, and ICP/AA metals per EPA protocols (1986, 1990a,b). Sample results are summarized in Table 5.

Table 5. Grease Ramp Contaminants

SAMPLE LOCATION	SAMPLE NUMBER	ANALYTICAL PROTOCOL	TPH (μg/g)	Pb-AA (μg/g)	P-ICP (μg/g)
DRUMMED MATERIAL	BO7KR9	SW-846	60,000	1,200	890
DRUMMED MATERIAL	BO7KSO	SW-846	65,000	760	860
BOTTOM OF EXCAVATION	BO7KS1	SW-846	940	120	760
BOTTOM OF EXCAVATION	BO7KS2	CLP	1,700	N/A	1,430

2,4-D Disposal Site

The 2,4-D burial site is located approximately 0.5 mi east of the Columbia River across from and south of the old White Bluffs townsite at the toe of an encroaching sand dune, which is over 60 ft in height. The disposal area is approximately 400 by 60 ft in size and is posted on the northern and southern ends of the burial site. The signs read "2,4-D Burial Site, June 1966." The site is approximately 700 ft above sea level (350 ft above the Columbia River). Groundwater is over 300 ft below grade with the nearest drinking water source located over 3 mi to the east.

The site was used in 1966 to dispose of 2,4-D-contaminated soil generated from leaking storage tanks located at a U.S. Bureau of Reclamation Station in Eltopia, Washington. The leaking tanks were taken out of service, emptied, crushed and then disposed of at the site in 1967. As a result of this disposal technique, only residual amounts of 2,4-D would have been disposed of within the tanks themselves.

2,4-D was used as a commercial herbicide. 2,4-D is one of the only herbicides that is able to be metabolized by bacteria. The breakdown takes approximately 30 days. Additional information indicates a typical 2,4-D half-life of 9.4 to 254 days under dry conditions (Howard 1991). The area was not used for 2,4-D disposal after 1967. The sand dune and disposal site have since stabilized with cheatgrass and sage.

The Waste Information Data System (WIDS) database (WHC 1991) indicates that approximately 50 yd^3 of soil containing 900 gal of 2,4-D were disposed of at the site (a relatively small volume of soil when compared with the areal extent of the site), 4 ft below grade. Discussions with personnel from the U.S. Bureau of Reclamation indicate that the 2,4-D tanks were flattened and disposed of over the 2,4-D contaminated soil. This would indicate that the soil was buried significantly deeper than the 4 ft indicated in WIDS. There should be no traces of the herbicide remaining as the 2,4-D was disposed of over 26 years ago (well over ten half lives).

Prior to performing sampling activities, a magnetometer was used to verify the presence and location of the tanks disposed of at the site.

An auger rig was used to obtain soil samples from eight locations within the boundaries of the disposal site. Auger cuttings were predominantly a fine sand typical of the surrounding geology. Drilling indicated that the disturbed material-native material interface is at approximately 13 to 15 ft below the surface. A readily evident soil moisture horizon was located 3 to 5 ft below grade.

Samples were obtained from the 13- to 15-ft depths at each of these locations using a split-tube sampler. Each sample set consisted of a 60-mL amber glass bottle for total activity analysis, a 250-mL amber glass bottle for offsite laboratory analysis (if required), and a field screening sample. The 250-mL sample was sent offsite for analysis only if field screening indicated the presence of 2,4-D.

A 2,4-D field screening test kit was used to analyze for 2,4-D at each of the sampling locations. The results of this test indicated the presence of 2,4-D at sampling location #8. The test indicated the presence of 2,4-D at approximately 2 ppm, which is near the detection limit of the field test kit. However, 2,4-D was not detected in subsequent field runs of the analysis. A sample from this location was sent to an offsite laboratory for confirmatory analysis under CLP protocol. The offsite laboratory did not report any 2,4-D.

An additional field screening sample was taken at location #7 from the 6-ft level as clay "globules" were seen in the cuttings. Field analysis did not indicate the presence of 2,4-D. Two composite samples (one consisting of soils from locations 1, 2, 3, and 4 and one from locations 5, 6, and 7) were also sent for analysis at an offsite laboratory.

No areas of contamination above regulatory limits were detected as a result of the sampling effort.

Columbia River

Because of the high degree of public interest in the quality of the Columbia River, the EPA, WDOE and DOE have agreed to perform an additional comprehensive evaluation of the cumulative impacts of Hanford-derived contaminants on human health and the environment through risk assessments under the authority of the Tri-Party Agreement. Beginning in late 1993 these agencies began a scoping study of the Columbia River. The scoping study will assemble and review the existing radioactive and hazardous contaminant information. If the existing data base requires additional data to complete human health and environmental risk assessments, a focused field investigation study plan will be initiated in Fiscal Year 1994. The risk assessments are intended to provide the mechanism for EPA and WDOE to certify that risks are within established acceptable levels for management of and use as a wildlife refuge and recreational river.

The DOE has concluded, based on past and present extensive monitoring efforts of the Columbia River environs, that of the constituents measured, no applicable human health or aquatic-based water quality standards are exceeded at this time. Groundwater and spring water that are contaminated with radionuclides and hazardous chemicals does, however, in places, exceed drinking water standards for public water supplies and fresh-water criteria for the protection of aquatic life. This is mitigated by the facts that the groundwater is not used for a drinking water supply, and will not be used as a drinking water supply under the Proposed Action and contamination levels are measured at acceptable levels in the Columbia River. The WDOE has issued a Class A (excellent) quality designation for Columbia River from Grand Coulee Dam, through the Pasco Basin, to McNary Dam, including the Hanford Reach (Washington State Surface Water Quality Standards, F-WQ-91-101, January, 1991, WAC-173-201). This designation indicates that Columbia River water quality supports all uses, including drinking water, wildlife, and recreation.

There are 110 waste sites within the quarter-mile Hanford Reach Study Area within the 100-Area. These sites are between the general locations of B-Reactor and F-Reactor on the south side of the Columbia River. The Tri-Party Agreement schedule for investigations and cleanup gives a high priority to the waste sites near the Columbia River. Nine Operable Unit Work Plans (100-BC-1, 100-BC-5, 100-KR-1, 100-KR-4, 100-DR-1, 100-HR-1, 100-HR-3, 100-FR-1, 100-FR-3) have been approved in this area and field work is nearing completion. This work investigated high-priority waste sites that received significant levels of contamination and the liquids necessary to drive contamination through the soil column to groundwater. Proposed Plans are expected for these sites in October 1994, followed by Records of Decision for remedial actions. Additional investigations for remedial actions will follow for a number of years. Transfer of the ownership of these lands, under the Proposed Action of this EIS would lag far behind other properties in the Hanford Reach Study Area due to the higher number and complexity of waste sites. The DOE has committed to perform an ERA at N-Springs to reduce the flux of groundwater associated contaminants to the Columbia River at that location. Other ERA's presently under negotiation with EPA and WDOE are the removal of outfall structure vent pipes at D-Island, search and removal of activated metallic flakes along the Hanford Reach shoreline, evaluation of remedial actions for outfall pipes associated with the reactors, and the evaluation of D-Island soils contamination levels.

Water Quality Impacted By Hanford Discharges

As previously stated, the state of Washington has designated the Columbia River along this stretch as Class A, Excellent. Water quality criteria have been established and water use guidelines provided for this class designation. As such, the water is suitable for essentially all uses, including drinking water, recreation, and wildlife habitat.

Extremely low concentrations of radionuclides have been reported in the river during recent years. Because of this, special sampling techniques and sensitive analytical procedures are required to measure the radionuclides present in the river. Radionuclides consistently measurable in Columbia River water from 1987 through 1992 were tritium (H-3), strontium-90 (Sr-90), iodine-129 (I-129) and uranium (U-234, U-235, U-238 expressed as U) (Woodruff et al. 1992). Radionuclide concentrations reported in the river water by the Hanford Site Environmental Monitoring Program are generally far below regulatory standards and human health concerns. Additional nearshore Columbia River samples were taken during the low-water period in the fall of 1991 and analyzed for radionuclide and hazardous chemicals; results are plotted (along with seepage, seepage sediment and estimated groundwater data) in Figures 3 through 7 (Peterson & Johnson, 1992).

Radionuclides decay or disintegrate by producing emissions of alpha, beta, or gamma particles, or a combination. It is the interaction of these particles with biological tissues which causes radionuclides to be hazardous. The rate of disintegrations are measured in Curies, where one Curie equals 37 billion disintegrations per second. Environmental levels of radiation are generally measured in picoCuries)pCi). A picoCurie is 10^{-12}, or one-trillionth of a Curie. In the next sections, many levels of radionuclides are given in terms of pCi/g or pCi/L.

Several radionuclides occur naturally at the pico Curie level. Potassium-40, for instance, is measured at approximately 1.7 pCi/g in the human body. Some granite rocks have more than 50 pCi/g natural potassium (Kathren 1991). Potassium-40 was formed as the earth was formed, and has a half-life of 1.3 billion years. A half-life is the time it takes for half of the amount of a particular radionuclide to undergo sufficient disintegrations to decay to another material.

From 1987 through 1992, the annual average concentration of tritium in the river water at Priest Rapids Dam, upstream from the Hanford Site and thus virtually free of Hanford-originated contamination, ranged from 73 pCi/L in 1987 to 45 pCi/L (1991) and from 132 pCi/L (1988) to 101 pCi/L at the Richland Pumphouse, downstream of the Hanford Site (Woodruff et al. 1992). Tritium concentrations, which have been decreasing over recent years at both locations, are consistently higher at the Richland Pumphouse than at Priest Rapids Dam. The difference in H-3 concentrations reported at the two locations is statistically different (5% significance level), indicating a contribution due to Hanford. Figure 8 shows the relative levels of tritium above and below the Hanford Site from 1970 to 1990 (DOE/RL, 1993). All H-3 concentrations during this time period were 1% or less of the state of Washington and EPA Drinking Water Standard (DWS) of 20,000 pCi/L.

During the years 1987 through 1992, annual average uranium concentrations were relatively stable, ranging from 0.46 pCi/L (1987, 1989) to 0.41 pCi/L (1990) at Priest Rapids Dam and from 0.51 pCi/L (1987, 1992) to 0.41 pCi/L (1988) at the Richland Pumphouse. The differences observed at the two locations were generally not statistically significant, except for during 1992 when they were found to be different at the 5% significance level. Figure 9 shows the relative levels of uranium above and below the Hanford Site from 1976 to 1990 (DOE/RL, 1993). Irrigation return water from Franklin County and associated seeps resulting from irrigation practices entering the Columbia River, opposite the Hanford Site, have measured total uranium values of 8.6 pCi/L (Dirkes, 1990). Uranium occurs naturally in soils and in some fertilizers. While there is no established DWS for uranium, the EPA has proposed a DWS of 20 ug/L (This generally equates to 30 pCi/L; however, the specific uranium isotopic ratios at Hanford convert to approximately 14 pCi/L). All uranium concentrations measured during the years 1987 through 1992 were less than the proposed DWS of 20 ug/L.

Annual average concentrations of I-129 were also relatively stable during the years 1987 through 1992, ranging from 0.000023 pCi/L (1992) to 0.000005 pCi/L (1989) at Priest Rapids Dam and 0.00014 pCi/L (1991) to 0.00010 pCi/L (1987, 1988) at the Richland Pumphouse. Iodine-129 concentrations are consistently higher at the Richland Pumphouse than they were at Priest Rapids Dam. The difference in I-129 concentrations reported at the two locations is statistically different (5% significance level), indicating a contribution due to Hanford. All iodine-129 concentrations measured during the years 1987 through 1992 were less than one-tenth of 1% of the DWS (1 pCi/L).

Annual average Sr-90 concentrations ranged from 0.14 pCi/L (1987) to 0.07 pCi/L (1990) at Priest Rapids Dam and 0.13 pCi/L (1987) to 0.07 pCi/L (1990) at the Richland Pumphouse during the years 1987 through 1992. Differences in Sr-90 concentrations measured at the two locations are generally not statistically significant. Sr-90 concentrations in Columbia River water measured by the Hanford Site Environmental Monitoring Program during the years 1987 through 1992 were generally 2% or less than the DWS of 8 pCi/L. Nearshore river samples collected in the fall of 1991 exceeded drinking water standards at two locations (Peterson & Johnson, 1992).

Buske (1989) reported a concentration of cesium-137 (Cs-137) in the river water (one sample) near the Hanford Ferry Landing of 0.068 pCi/L; cobalt-60 (Co-60) concentrations ranged from 0.14 pCi/L near the Vernita Bridge (RM 388) to 1.0 pCi/L near the Port of Benton (RM 344). The concentrations of Co-60 and Cs-137 have typically been below the analytical detection level (1.5 pCi/L) in samples collected and analyzed through the Hanford Site Environmental Monitoring Program. All Co-60 and Cs-137 concentrations measured in the river during recent years have been well below the DWSs of 100 pCi/L and 200 pCi/L, respectively.

Springs and Seeps

Approximately 115 seeps and springs intermittently discharge groundwater from the unconfined aquifer into the river along the Hanford Reach. The DOE and its contractors (Pacific Northwest Lab and Westinghouse Hanford Company) actively monitor and report on spring and seep discharge through the Hanford Site Environmental Monitoring Program and Tri-Party Agreement cleanup programs. Contaminants are known to enter the Columbia River via riverbank springs, sometimes referred to as seeps, along the Hanford Reach (Dirkes 1990, McCormack and Carlile 1984, Rokkan 1988, DOE-RL 1992, WHC-EP-0609). The shoreline springs flow intermittently, influenced primarily by changes in the river level. Shoreline seeps are considered to be just a fraction of the total amount of ground water entering the river along the Reach. Radionuclide concentrations observed in the spring water are generally indicative of those measured in ground water near the spring location. Contaminant concentrations are diluted to levels below any applicable standards or levels of concern rapidly once they enter the river. The primary areas of contaminant discharge via riverbank springs are discussed below. Spring and seep sampling results in the 100-Areas during the low-water period of 1991 are plotted in Figures 10 through 15.

N-Springs:

Tritium ranged from 74,900 pCi/L (1988) to 4900 pCi/L (1992) (drinking water standard is 20,000 pCi/L), at N-Springs (RM 380)(Woodruff et al, 1992). The concentrations of Sr-90 ranged from 4000 pCi/L (1990) to 10,900 pCi/L (1992) during the same period. These concentrations are well above the DWS of 8 pCi/L. The DOE has committed to perform an ERA at N-Springs to reduce the flux of contaminants to the Columbia River at that location.

Hanford Townsite:

Tritium, I-129, and technetium-99 (Tc-99) are the radionuclides of concern in riverbank springs located at the old Hanford Townsite. Tritium concentrations in spring water at the Hanford Townsite (RM 362) ranged from 132,000 pCi/L (1990) to 164,000 pCi/L (1992). The concentration of I-129 was 0.22 pCi/L during 1992. Technetium-99 concentrations were also elevated with respect to the concentration of Tc-99 in the river. The concentrations of Tc-99 has slowly declined throughout this time period, from approximately 225 pCi/L in 1988 to 120 pCi/L in 1991 (Woodruff et al, 1992). The DWSs for H-3, I-129 and Tc-99 are 20,000 pCi/L, 1 pCi/L, and 900 pCi/L, respectively.

100-Area Chromium

Because of its mobility in the aqueous solution, hexavalent chromium predominates, which is toxic to aquatic organisms and is a known carcinogen to humans when inhaled (EPA 1992). The fall 1991 sampling effort, reported in WHC-EP-0609, is the first comprehensive set of data for nearshore river water, shoreline seepage and seepage sediment. Chromium was found to be significantly elevated at the 100-D Area and slightly elevated at 100-B, 100-K and 100-H Areas (Figure 16). Treatability tests are presently being considered in the Hanford clean-up program for 100-D Area groundwater containing elevated levels of chromium.

Columbia River Sediment

Sediments also contain naturally occurring radionuclides. Sediments in the Columbia River are known to contain low levels of radionuclides of Hanford origin and from global atmospheric fallout from nuclear weapons testing (Beasley 1981, Robertson and Fix 1977, Woodruff et al. 1992). Radionuclide concentrations in sediments collected from the sloughs along the Hanford Reach and at Richland were generally comparable to those observed upstream from Hanford at Priest Rapids Dam (Woodruff et al, 1992). The exception to this is uranium, which is present in sediment at Priest Rapids Dam, upstream of Hanford, at 1.79 pCi/g, in sediment at White Bluffs Slough in the Hanford Reach at 4.63 pCi/g, in sediment at Richland at 2.63 pCi/g which are comparable to levels in sediment at McNary Dam below the Hanford Reach Study Area (Bisping and Woodruff, 1992). Localized areas of sediment with elevated levels of contamination are found within the Hanford Reach as plotted on Figures 17 through 23 (Peterson & Johnson, 1992). These levels are not considered to be above human health concern in a recreational scenario. Formal risk assessments will be completed in the Hanford clean-up prior to land ownership transfer.

In general, the level of radioactivity in sediments behind McNary Dam is slightly higher than that behind Priest Rapids Dam. For example, the concentration of Co-60, which is below the analytical detection level (0.05 pCi/g) in Priest Rapids Dam sediments, averaged 0.24 pCi/g in McNary Dam sediments over the years 1989 through 1991 (Woodruff et al, 1992). The 1992 Co-60 concentration in McNary Dam sediment was 0.18 pCi/g. The concentrations of radionuclides in sediments behind McNary Dam have been relatively stable over the past 5 years. The average concentrations of Sr-90, Cs-137, U-238 and Pu-239/40 over the years 1988 through 1991 are 0.036 pCi/g, 0.68 pCi/g, 1.0 pCi/g, and 0.01 pCi/g, respectively. The differences are small between these levels and the levels reported for Priest Rapids sediments, with the analytical uncertainties in reported concentrations generally overlapping these values (Woodruff et al, 1992).

Shoreline Vegetation

Low concentrations of radionuclides (H-3, Co-60, Sr-90, Cs-137, U-total, Pu-238) have been reported in vegetation along the shoreline of Hanford Reach (Antonio et al, In Press). Samples were collected from a variety of plants including mulberry, willow, asparagus, chives, dogbane, and yarrow. Radionuclide concentrations reported in plants are summarized in Table 3. In general, plants collected upstream near HRM 4 had smaller concentrations of radionuclides than plants collected along the Hanford Reach (Table 6).

Table 6: Radionuclide Concentrations of Shoreline Vegetation (from Antonio et al., in press)

	Maximum Shoreline Concentration (pCi/g) except H-3 (pCi/l)			Upstream Reference Site (HRM 4)
Radionuclide	Plant	Conc.	HRM	Concentration
H-3	Mulberry	97000	26	1500
Co-60	Mulberry	0.34	9	
Sr-90	Mulberry	440	9	0.11
Cs-137	Mulberry	0.069	6.5	
Pu-238	Dogbane	0.0005	15	
Pu-238	Yarrow			0.0000323
Cs-137	Yarrow			0.064
Co-60	Willow			0.0029

HRM = Hanford River Mile

Wildlife

Concentrations of radionuclides in wildlife tissue collected from the Hanford Reach are generally low. However, exposure potential exists for wildlife collected near restricted areas along the shoreline and in the 100-N Area from contaminated vegetation and spring water.

Fish

Radionuclides were not detected from muscle tissue of spawned-out salmon collected at Priest Rapids Dam and downstream near White Bluffs (RM 370) (Jaquish and Bryce, 1989). Jaquish and Bryce (1990) reported levels of radioactivity found in sturgeon were comparable to or lower than levels routinely found in other fish from the Hanford Reach of Columbia River. Dauble et al (1992) found no significant difference in contamination in sturgeon from the Hanford Reach compared to upriver (Lake Roosevelt) and downstream (The Dalles and below Bonneville Dam). Woodruff et al (1991) reported the potential annual dose to humans resulting from the consumption of Columbia River fish (40 kilograms per year) was 0.008 mrem. Dauble et al (1992) reported that the expected dose would be even lower if the consumption of sturgeon was equivalent to that of other Columbia River fish.

Whitefish and carp were collected from the Columbia River near the 300 Area and selected 100 Area locations. All muscle and carcass (includes radionuclide absorbing bone) samples were analyzed for Co-60, Sr-90, and Cs-137. Radionuclides (Sr-90, Co-60, Cs-137) were generally not detectable in the muscle tissue of whitefish. Maximum concentrations detected in muscle tissue for Co-60 and Cs-137 were 0.056 pCi/g and 0.06 pCi/g, respectively (Woodruff et al, 1992). Strontium-90 was not detected in any sample. All carcass samples at both locations had detectable concentrations of Sr-90 that ranged from 0.003 pCi/g to 0.017 pCi/g with no distinctive differences with location (Woodruff et al, 1992). Radionuclide concentrations were also generally not detectable in carp muscle. Maximum concentrations were 0.007 pCi/g (Co-60), 0.045 pCi/g (Sr-90), and 0.008 pCi/g (Cs-137). However, whole-carcass samples (includes bones) had detectable concentrations of Sr-90, with the range in the 100-N Area samples (0.010 to 0.26 pCi/g) higher than the 300 Area samples (0.006 to 0.036 pCi/g) (Woodruff et al, 1992).

These results indicate the presence of Sr-90 in fish carcasses and indicate an influence from the 100-N Area operations. Comparison of the 100-N Area carp carcass samples with Sunnyside bass (bass collected in a pond near Sunnyside) also indicate specific contributions from Hanford. However, results are inconclusive due to different feeding habits of the two species (Woodruff et al, 1992).

Clams

Radionuclide analyses of a single clam shell collected from the shoreline near the 100-N Area showed 226 pCi/g Sr-90; Co-60 and Cs-137 were less than the detection limit (Woodruff et al., 1992). Clam tissue collected from the 300 Areas had concentrations of Co-60 and Cs-137 less than 0.005 and 0.008 pCi/g, respectively.

Fowl

No detectable levels of Cs-137 and Sr-90 were reported in mallard ducks (migrating species) collected from the Columbia River near the 100-N Area. Breast muscle from three of eight pheasants (non migrating species), collected from the 100-D to 100-F Areas, had low concentrations of Cs-137 that ranged from 0.013 to 0.035 pCi/g. By comparison, domestic chickens (off the Hanford Site) had less than 0.03 pCi/g Cs-137 (Woodruff et al, 1992). This indicates that the Hanford operations has had a minor impact on non-migratory species (pheasant) habitats along the Hanford Reach.

Rabbits

Woodruff et al. (1992) reported that elevated concentrations of Sr-90 were found in bone samples (maximum 81 pCi/g) collected from a rabbit in the 100-N Area. By comparison, rabbits collected in the 200-West Area had bone concentrations as low as 0.53 pCi/g. Also, elevated levels of Co-60 (14 pCi/g) and Cs-137 (0.14 pCi/g) were reported in the muscle tissue of the rabbit from the 100-N Area. These concentrations exceed levels normally observed and indicate that the rabbits were exposed to elevated levels of radioactivity (Woodruff et al, 1992).

Deer

In general, analytical results of Cs-137 in muscle tissue of all deer collected were below detection limits. Strontium-90 concentrations in deer bone from the 100-N Area are low and range from 1.0 to 1.2 pCi/g (Woodruff et al, 1992).

Predators

Analysis of 11 hawk and owl pellets (undigested and regurgitated bones and hair) and coyote feces from along the 100-Area showed measurable contamination in only two samples. These samples, from near the 100-F Area, had 4.5 and 4.9 pCi/g Sr-90 (Landeen et al, 1993 Draft).

Aerial Radiological Survey

Gamma ray data collected by the Aerial Measuring System showed that radiation levels over more than 95 percent of the Hanford Site are due to normal background exposure rates (Reiman and Dahlstrom, 1990). This system measures terrestrial gamma rays originating on or near the surface. Localized anomalies are associated with the 100-Areas and the 300 Area. Inferred terrestrial external exposure rates were shown to be 150 microroentgens per hour (uR/h_i) along the Hanford Reach in the vicinity of the 100-N, 100-KE, 100-KW, and 300 Areas. Typically, natural terrestrial radiation levels range from 1 to 15 uR/h_i in the United States. Locally, external exposure rates are generally 10 uR/h_i over more than 95 percent of the site (Reiman and Dahlstrom, 1990).

External Radiation Surveillance

External radiation dose rates from natural and manmade sources was measured at 25 locations along the shoreline of the Hanford Reach using thermoluminescent dosimeters (TLDs) (Woodruff et al, 1992). Dose rates at the 100-N shoreline area (four TLD locations) were approximately two to three times greater (Average 268 37% mrem/year) than typical shoreline dose rates (Average 103 5% mrem/year). The average dose rate for all TLD shoreline locations was 125 5% mrem/year. Upwind distant locations from the site (Sunnyside, Yakima, and Moses Lake) averaged 88 3% mrem/year compared to the Hanford Site perimeter TLD stations of 100 6% mrem/year (Woodruff et al, 1992).

Water Use

Ninety-five percent (1.3 million acre-feet per year) of water used in the Pasco Basin is derived from surface water, with the remaining five percent (72 thousand acre-feet per year) derived from ground water (Leonhart 1979).

Less than 10 percent of the total water demand from Benton and Franklin Counties is derived from groundwater. About half of the wells are used for domestic water supplies, with less than 20 percent used for irrigation. Although only 3 percent of the wells are used for industrial needs, industry is the largest user of groundwater. In 1975, industry used over 99 percent (15.4 million acre-feet per year) of the annual total used. For comparison, agriculture used 202,000 acre-feet per year, while municipalities used a mere 8,952 acre-feet per year.

Irrigation uses roughly two-thirds (955,360 acre-feet per year) of the total water supply and 95 percent (907,600 acre-feet per year) of irrigation water is derived from surface water. Most of the irrigation use is concentrated outside of the study area between RM 317 and RM 301. Industry is the other major water user in the Pasco Basin, accounting for 30 percent (419,036 acre-feet per year) of the total supply. Ninety-six percent (403,675 acre-feet per year) of industrial use is derived from surface water. Prior to the shutdown of the N Reactor, 81 percent of the water used for industrial purposes was consumed on the Hanford Site, primarily at the 100 N Area for reactor cooling. Water is currently used for cooling and chemical processing at the 200 East and West Areas, and for cooling and chemical processing at the 300 Area (Map #5).

Municipalities use the remaining 2 percent (29,333 acre-feet per year) of the water supply, deriving 69 percent of their water from surface water.

Nine surface-water intakes are present along the Hanford Reach, including irrigation withdrawals from the Columbia Basin Project (Map #6) and Hanford Site withdrawals for the onsite water supply system (Table 7).

Table 7: Surface water uses in the Hanford Reach (Source: WPPSS (1981) and ERDA (1975)).

User	Location (RM)	Withdrawal (AF)	Type
Hanford Site (200 Areas)	385(R)	(b)	I
Hanford Site (100K Area)	382(R)	2,056	I
Hanford Site (100N Area)	379(R)	460,405	I
Hanford Site (200 Areas)	377(R)	(b)	I
WPPSS	351(R)	65,160	I
Peter Kiewit Sons Co.	351(R)	724	I
L.L. Bailey	347(L)	1,448	A
H.D. Loyd	347(L)	717	A
Central Premix Cement	347(L)	1,448	I

(RM): River Mile; (R): Right Bank; (L): Left Bank
(AF): Acre Feet
(b): Annual water use for the Hanford Site 200 Areas operations withdrawn at river miles 385 and 377, reported as a total figure of 18,166 acre feet.
I: Industrial Use; A: Agricultural Use

BIOLOGICAL FEATURES

Biodiversity is a term which incorporates all species of plants, animals, and microorganisms and the ecosystems and ecological processes which supports them. It is a qualitative measure used to describe the variety and abundance of ecosystems, species or genes in a given assemblage. As one of the last reasonably intact natural areas along the mainstem Columbia River, the biodiversity of the Hanford Reach is truly exceptional.

The Hanford Reach features several habitat types which are rare or are in decline along the mainstem Columbia River. They include the aquatic habitat of the free-flowing river, riverine shoreline habitat, riparian habitat along the river banks, bluff habitat of the White Bluffs, upland shrub-steppe communities, and the various lakes and wetlands located primarily on the Wahluke Slope. The aquatic, riverine, and riparian habitats, once abundant on the mainstem river, have been lost to dam construction and inundation. The White Bluffs are inherently rare as a habitat type. The shrub-steppe habitat along the Hanford Reach is a remnant of the plant communities that historically covered vast areas of the Columbia Basin, but which have largely been lost to agricultural production. The variety and integrity of habitat types along the Hanford Reach is truly exceptional and has resulted in a great diversity and abundance of plant and animal species. These species are the focus of the following sections of this report.

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In 1980, a survey was conducted by the USFWS to identify fish and wildlife habitats within Washington state which are regionally or nationally significant. Of the twenty sites identified as important in the study report, Important Fish and Wildlife Habitat of Washington, the Hanford Reach was ranked second in the state based on fish and wildlife values.

Disregarding arguments for and against the Hanford Site and its nuclear mission, the creation and maintenance of the site has provided a sanctuary for plants and animals which have been lost elsewhere in the Columbia Basin. In addition to the inherent value of this sanctuary in maintaining the biodiversity of the region, the Hanford Reach is a living laboratory for research and scientific study on the native species and communities of the mainstem Columbia River.

Habitat Types

Prior to the damming of the Columbia, the river's natural flow was characterized by violent spring flooding which scoured the river banks and sand bars, eliminating most woody vegetation. Summer brought a gradual and steady decrease in water level. Although winter flows would reflect increases in precipitation, the Columbia River would not peak again until the spring floods associated with snowmelt.

Plant species growing along the shoreline evolved with the Columbia's hydrologic pattern, successfully timing growth, flowering, and fruiting with the natural annual cycles. The cycles of plants, in turn, would influence the cycles of animals dependent upon tender vegetation, nectar from flowers, and seeds.

Hydroelectric dams have altered the ancient annual patterns of the Columbia and transformed it for most of its length into a series of artificial lakes. Because the Hanford Reach is un-impounded and its uplands substantially undeveloped, its plant communities have experienced less alteration than elsewhere on the Columbia. Undammed and largely uninhabited, the Hanford Reach provides a final refuge for native species and communities eliminated elsewhere by permanent flooding, slackwater pools, and land use change. This final refuge is tenuous for many plant species, however, due to the disruption of the seasonal hydrologic patterns and the impact this has had on timing of growth, flowering, and fruiting.

The present generation of riparian growth is largely the result of upstream damming and subsequent elimination of major floods. Increasing riparian habitat will clearly affect the original biodiversity and integrity of the shrub-steppe habitat surrounding this part of the river.

Generally speaking, there are three major habitat types found in the Hanford Reach: aquatic, riparian, and upland (Map #11). Aquatic habitats are primarily wet and covered with water most of the year. They are limited to the Columbia River and to artificial ponds and ditches that drain irrigation waters. Artificial ponds, created for irrigation purposes, are important to waterfowl and other water-dependent species because many natural aquatic environments have been severely degraded or destroyed.

Riparian habitat is considered to be the relatively narrow margin where water meets the land, and tends to experience periods of wet and dry conditions. The riparian habitats adjoining the aquatic environments are comprised of a mosaic of sloughs, slack-water areas, cobble shorelines, islands, and groves of exotic deciduous trees. It supplies a diversity of aquatic habitats important to the life cycles of native fish, birds, and invertebrates. Other species use the vegetation of the riparian zone for food and cover. This is particularly important in the arid climate of the Hanford Reach where vegetation away from the river is sparse. The juxtaposition of the riparian corridor to thousands of acres of undeveloped upland increases its value to wildlife species.

The upland habitats are dominated by shrub-steppe grasses, and in particular, the sagebrush-cheatgrass community. Within the study area, this habitat abuts the riparian habitat on the lands north and east of the Columbia in the Saddle Mountain National Wildlife Refuge and Wahluke State Wildlife Recreation Area. South of the upper half of the Reach, a plant community predominantly comprised of cheatgrass adjoins the riparian community. The west side of the Columbia on the lower half of the Reach is vegetated primarily with big sagebrush and bluebunch wheatgrass. In isolated, but large areas, there are also bluff (White Bluffs and Umtanum Ridge) and dune (Hanford Dunes) habitats of ecological importance.

Riverine and Riparian

Riverine and riparian areas provide valuable nesting, cover, and feeding habitats for many wildlife species. They also serve as transportation corridors for animals during their daily movements and seasonal migrations. Riverine habitat, for the purposes of this study, is defined as that area below mean high water, and is characterized by wetland vegetation, riffles, gravel bars, oxbow ponds, and backwater sloughs. Artificially created aquatic habitats, like Saddle Mountain Lake, have acquired ecological importance because natural aquatic and riparian systems have been lost elsewhere in the western United States.

The physical characteristics and shoreline community of the impoundments above and below the Reach are considerably different than those of the Reach; this difference is reflected by the composition of fish species found in each segment. As natural riverine habitat has been reduced throughout the Columbia Basin, fish species dependent upon this habitat have been eliminated or forced into less desirable areas. As a result, the Hanford Reach is the only segment of the Columbia River that supports healthy populations of those native fish species that evolved to exploit the free-flowing aquatic ecosystem of the Columbia River. Anadromous fish spawning habitat within the mainstem Columbia is essentially limited to the Hanford Reach. The Reach may provide the only significant white sturgeon spawning habitat remaining in the mainstem Columbia River. Mountain whitefish and sandrollers are two native resident species that appear to reach much higher numbers in the Hanford Reach than in the Columbia River impoundments, and in the case of the sandroller, its distribution is restricted outside the reach.

The large and varied fish populations within the Reach are directly attributable to the unique and diversified riverine ecosystem. The river channel within the Reach is braided around islands, submerged rock ledges and gravel bars, which causes pooling and channeling and creates a complex network of unique habitat

features. The river bed typically consists of sand, gravel, cobble and large rock six to twelve inches in diameter (Chapman et al. 1983, 1986). Deposition of sediment within the substrate is limited because of strong currents and retention of bedload in upstream reservoirs, making the gravel composition of the streambed similar to that which existed centuries ago.

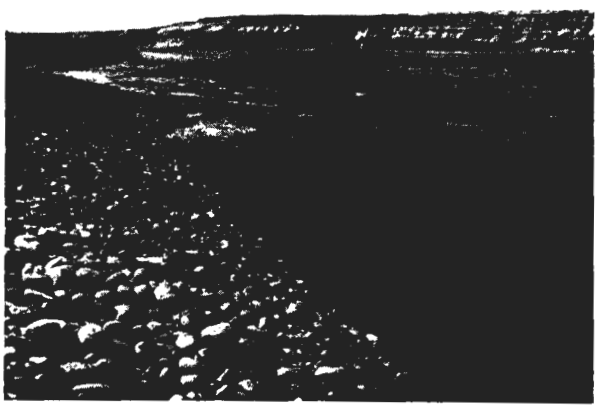
A rich assemblage of hardy, water-tolerant perennial forbs and grasses grows along the river's edge and islands (Becker 1985). Clumps of sandbar willow also grow along the fringes of the high-water mark. The cobblestone substrate and associated riparian plant community of the Hanford Reach are unique in the Columbia River ecosystem (Fickeisen et al. 1980a).

Riparian habitat is defined as the uplands immediately adjacent to the river, sloughs, draws, and Saddle Mountain Lake. In some areas this riparian zone is vegetated by cottonwood trees, willows, and other woody or herbaceous vegetation typical of a high water table. In other areas, this zone is vegetated with grasses and shrubs typical of shrub-steppe habitat, and is considered riparian because of the benefits to wildlife provided by its proximity to the river. A 1980 mapping and classification study of riparian habitats in the Hanford Reach indicates that the most abundant riparian species in this river segment are reed canarygrass, common witchgrass, large barnyard grass, summer blooming forbs, sandbar willow, poplar, white mulberry, and Russian olive. Eurasian milfoil and purple loosestrife are exotic species that have caused problems elsewhere in the Columbia Basin by displacing more valuable native plant species, encroaching upon spawning habitat, depleting dissolved oxygen in the water, slowing stream velocities, and accelerating sedimentation. These species may become a problem in the reach and may need to be controlled.

Shoreline Riparian

A study of shoreline habitats of the Reach documented 46 wildlife species using willows, and 49 species utilizing grass areas (Books 1984). Partially submerged willows act as a trap for food for waterfowl and shorebirds, while the upper branches provide nesting and feeding opportunities for a number of passerines. Different species use the riparian thickets in winter than in summer, indicating that the streamside plant communities are important year round in maintaining wildlife populations. Terrestrial and aquatic insects are especially abundant in water inundated grass, where they are fed upon by various waterfowl, shorebirds, and passerines. Killdeer, spotted sandpipers, morning doves, and other species nest close to the high water level. Mink, raccoons, beaver, mule deer, Canada geese, and other wildlife rely heavily on riparian habitats as foraging sites. A riparian corridor of this size and quality occurring adjacent to an undeveloped upland "buffer zone" the size of the Hanford Site is a combination not found elsewhere in the Columbia Basin.

The extensive cobble shorelines of the Hanford Reach were presumably common elsewhere on the Columbia River's shoreline prior to being inundated by dams. Glacial floods and the Columbia River's great flows originally deposited and maintained these extensive areas of large cobbles. The River's history, size and location (climate and substrate) made the Columbia's cobblestone shoreline habitats relatively unique. Dams on the Columbia and other large rivers, have made the cobble habitats remaining in the Hanford Reach even more rare.



The cobble substrate of the Hanford Reach supports distinct plant communities. Two of particular concern, forb-dominated cobble communities and cobblestone beach communities, have been described in the literature (U.S. Army Corps of Engineers 1981; Fickeisen 1980a). Although the individual plant species within these communities are not rare, the particular assemblages of species are apparently not known to occur elsewhere.

Fickeisen, et al (1980a) surveyed riparian plant communities of the Hanford Reach and compared their findings with those of Tabor et al (1980). Tabor had studied Columbia River riparian vegetation along Wells, McNary, Hanford, John Day, and Bonneville reaches and below Bonneville Dam. The forb-dominated cobble dependent communities found on the Hanford Reach were not described as occurring on these other reaches of the Columbia.

The cobblestone beach community evolved under the rigors of past single-peak spring flooding and is composed of perennial summer-blooming forbs. This is in contrast to the spring-blooming species typical of the area. The cobblestone beach community is found in the moist cobble shoreline throughout the Hanford Reach in a narrow band along the river.

In dryer portions of the riparian zone, two introduced species of trees, Russian olive and mulberry, are becoming established and changing the nature of the habitat, with benefits for some species and adverse impacts for others.

Lakes and Wetlands

Irrigation infrastructure constructed as part of the Columbia Basin Project has contributed to the development of several areas of significant wetland habitat within the study area. The Wahluke Branch Canal crosses the northern part of the study area from east to west, north of state Highway 24. Three main wasteways also send excess irrigation water and return-flow water from irrigated farm fields through the study area to the Columbia River. Approximately 1,500 acres of wetland habitat has developed where water from these facilities has been impounded, along sections of unimproved watercourses, and in areas that have become wet as a result of seepage from the facilities or from the raised water table.

The most important wetland development is directly associated with the Saddle Mountain Wasteway, constructed in 1967, which enters the study area from the northwest and maintains the Saddle Mountain Lake and 20 small impoundments located downstream from the lake. The lake and impoundments were created in 1971 by the BR with the construction of dikes and water control structures along the wasteway. At its maximum level during the peak of the irrigation season, Saddle Mountain Lake covers an area of about 730 acres. At its lowest level, it drops about 8' and downstream wetlands and ponds as such dry up in winter. The associated wetland and riparian vegetation has been developing naturally only since 1971, and the tree and shrub component, in particular, is still in the developmental stage.

A second important area of wetland development is that associated with the WB-10 Wasteway, constructed in 1961, which enters the study area from the east. Originally, the wasteway water was allowed to take its own course, but in 1972 a channel was constructed to carry the water to the Columbia River. At the same time, dikes were constructed to enhance wetland development along the wasteway, including Wahluke Lake, a marshy lake of about 300 acres.

A third wetland area was created by the White Bluffs Wasteway in the north part of the study area, but regular use of the wasteway was discontinued due to its contribution to the White Bluffs slumping problems. Occasional dumping of water during emergencies continues to maintain about 100 acres of wetland and riparian habitat north of the White Bluffs.

Other small, scattered areas of wetland and riparian habitat exist away from the river at points where lesser drainages and seeps surrounding irrigated lands cross through the study area and/or bring water to the surface.

Wildlife and vegetation associated with these wetland and riparian areas are similar to that of riverine areas, but those areas directly associated with wasteways suffer from seasonal availability of water from the irrigation project. After the irrigation season ends in October, some of the smaller wetlands dry out, and water levels of the lakes and larger wetlands recede, leaving large expanses of exposed shoreline which are popular loafing areas for migrating and wintering waterfowl. Saddle Mountain Lake's isolation from human disturbance also contributes to its heavy use by waterfowl. All of the lakes and wetlands supplied directly with water from the irrigation project are heavily infested with carp. This adversely impacts the growth of submerged aquatic plants and reduces habitat for other fish and food supplies for waterfowl and other bird species.

Islands

Depending on water level, there are approximately 18 islands within the Hanford Reach study boundaries. They range in size from approximately one third mile long to over two and one half miles long. These islands provide valuable resting and nesting habitat for a range of wildlife because of the minimal amount of disturbance from humans and mammalian predators. This lack of disturbance especially benefits mule deer, gulls, terns, and Canada geese that use the islands during fawning and nesting, respectively.

The University of Washington conducted the portion of the Inventory of Riparian Habitats (U.S. Army Corps of Engineers 1976) extending along the Columbia River from just north of Richland to the Canadian border, a distance of 400 miles. In the Hanford Reach segment (approximately 50 river miles), they measured 39.3 miles of island shoreline. In contrast, the remaining 350 river miles north of Priest Rapids Dam to the Canadian border included a total of 20.6 miles of island shoreline. The ratio of island shoreline to river mile is .77 to 1 in the Hanford Reach and .06 to 1 north of Priest Rapids Dam. The quantity and quality (natural substrate) of island shoreline in the Hanford Reach far exceeds any remaining elsewhere on large rivers of the Columbia Basin.

Habitat on the islands is a blend of riparian, riverine, and shrub-steppe vegetative cover types (Warren 1980). The outer island riparian community includes the shoreline riparian species previously mentioned. The middle island cobble community is dominated by northern buckwheat, lupine, and absinthium. The cobblestones of these communities originated during the glacial flood period. The assemblages of plant species that have invaded and persisted have adapted to both a cobble substrate and a semi-arid

environment. The arid island cobble community is found extensively only on the Hanford Reach (Fickeisen et al. 1980a). Species like thick-spiked wheatgrass, giant wildrye, yarrow, and cheatgrass occupy central island areas (Warren 1980).

Non-Native Tree Groves

Rickard (1982) notes that the most conspicuous plants along the Hanford Reach are the groves of trees planted by settlers prior to 1943. The groves consist primarily of black locust, Lombardy poplar, white poplar, Chinese elm, and white mulberry trees. Mulberry, Russian olive and cottonwood are aggressive enough to establish seedlings at favorable microsites in the riparian zone.

Trees, where they occur near the shoreline, provide nesting habitat for great blue herons and perching and roosting habitat for birds including bald eagles. Although not native, the trees add to the diversity of habitats in this arid region and are important to key wildlife species.

Rickard (1982) points out that the most striking feature of the Columbia River shoreline plant communities is the paucity of tree corridors that characteristically border most streams and rivers. Instead, the streamside vegetation consists of a narrow zone of shrubs, grasses, and forbes that have the capacity to become established and grow in a rooting substrate consisting mostly of water-worn cobbles and assorted gravels.

Upland Shrub-steppe

Shrub-steppe habitat was once the predominant habitat type throughout the Columbia Basin. Prior to European settlement, there were at least 10.4 million acres of shrub-steppe habitat in eastern Washington. Approximately forty percent of this remains at the present time (Dobler and Eby 1990). Most of the loss is the result of agricultural development, made possible by federal irrigation projects and dryland wheat farming techniques. Sheep and cattle grazing, efforts to control sagebrush, and the introduction of exotic vegetation have further accelerated the conversion of habitat. As a result, many of the wildlife species associated with this habitat type now have limited distributions and numbers, and are of concern to resource agencies. The restricted status of the Hanford Site has largely preserved this habitat within the boundaries of the project, but there have been disruptions.

Beginning in the mid-1880s, the Hanford Reach was used by non-native people for livestock grazing, crop cultivation, and settlement. These uses disrupted the native shrub-steppe plant communities and introduced weedy species including cheatgrass (Bromus tectorum) and tumble mustard (Sisymbrium altissimum). Although human populations were relocated from the Hanford Site in the 1940s, native plants have been slow to reinvade abandoned fields due to intense competition from exotic species (Rickard and Poole 1989). The establishment of cheatgrass in the abandoned agricultural and surrounding areas has greatly increased the susceptibility of the shrub-steppe to wildfire. This, combined with the increased incidence of man-caused fire, threatens to significantly alter the nature of the shrub-steppe through reduction and potential elimination of the sagebrush component unless adequate fire protection is maintained.

Mature shrub-steppe plant communities on the Hanford Site are usually dominated by big sagebrush (Artemisia tridentata), with scattered stands of antelope bitterbrush (Purshia tridentata), rabbitbrush (Chrysothamnus nauseosus), spiny hopsage (Grayia sponosa), or greasewood (Sarcobatus vermiculatus). The most abundant native grasses include bluebunch wheatgrass (Agropyron spicatum), Sandberg's

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bluegrass (Poa sandbergii), needle-and-thread (Stipa comata), Indian ricegrass (Oryzopsis hymenoides), and prairie junegrass (Koeleria cristana)(Rickard and Poole 1989). Washington State Department of Fish and Wildlife studies have identified over 100 wildlife species which use shrub-steppe, some of which depend heavily on this type of habitat for survival (Dobler and Eby 1990).

Bluff

Bluff habitat includes the White Bluffs, on the north (left descending) bank of the river, and Umtanum Ridge on the south (right descending) bank just below Priest Rapids Dam. Bluffs provide valuable nesting habitat for an assortment of wildlife that would not otherwise be able to breed in the Reach. This includes prairie falcons, cliff swallows, bank swallows, and rough-winged swallows. Canada geese use bluffs in addition to islands as nesting sites. Bluffs also provide important perch sites for raptors, including peregrine falcons.

Dune

The Hanford Dunes, located on the west shore of the lower portion of the study area, rise 10 to 16 feet above the ground, creating sandy habitats ranging from 2.5 to several hundred acres in size (Department of Army 1990). The dunes are predominantly vegetated with scurf pea (Psoralea lanceolata) and thick-spike wheatgrass (Agropyron dasytachyum). The dune plant communities are of particular ecological interest in that they can be related to the progressive age of the dune surfaces as they become stabilized.

Fisheries

Anadromous Fish

Anadromous fish, by definition, begin life in fresh water streams and rivers, migrate downstream to the ocean, where they spend two to five years and grow to maturity, and eventually return to their stream of origin to spawn and, in the case of Pacific salmon, die. Anadromous fish of importance to the Hanford Reach include chinook, coho, and sockeye salmon, and steelhead trout. White sturgeon, historically an anadromous species, has suffered from construction of the Columbia River dams and is now represented in the Reach by landlocked, isolated populations.

Historically, annual runs of all salmon and steelhead to the Columbia River ranged from 7.5 to 16 million (Northwest Power Planning Council 1987; Chapman 1986). Today, about 2.5 million salmon and steelhead return to the Columbia River. Even though the runs of the Columbia River Basin have been drastically reduced, the system still produces the world's largest runs of chinook salmon and steelhead trout and major runs of coho and sockeye salmon (Netboy 1980; Chaney and Holubetz 1980). Much of the wild salmon production from the Columbia River comes from fall chinook salmon (Oncorhynchus tshawytscha) that spawn naturally in the Hanford Reach. The Reach is also used for limited spawning by steelhead trout (Oncorhynchus mykiss) and as an important upstream and downstream migration route by spring and summer chinook salmon, coho salmon (Oncorhynchus kisutch), and sockeye salmon (Oncorhynchus nerka).

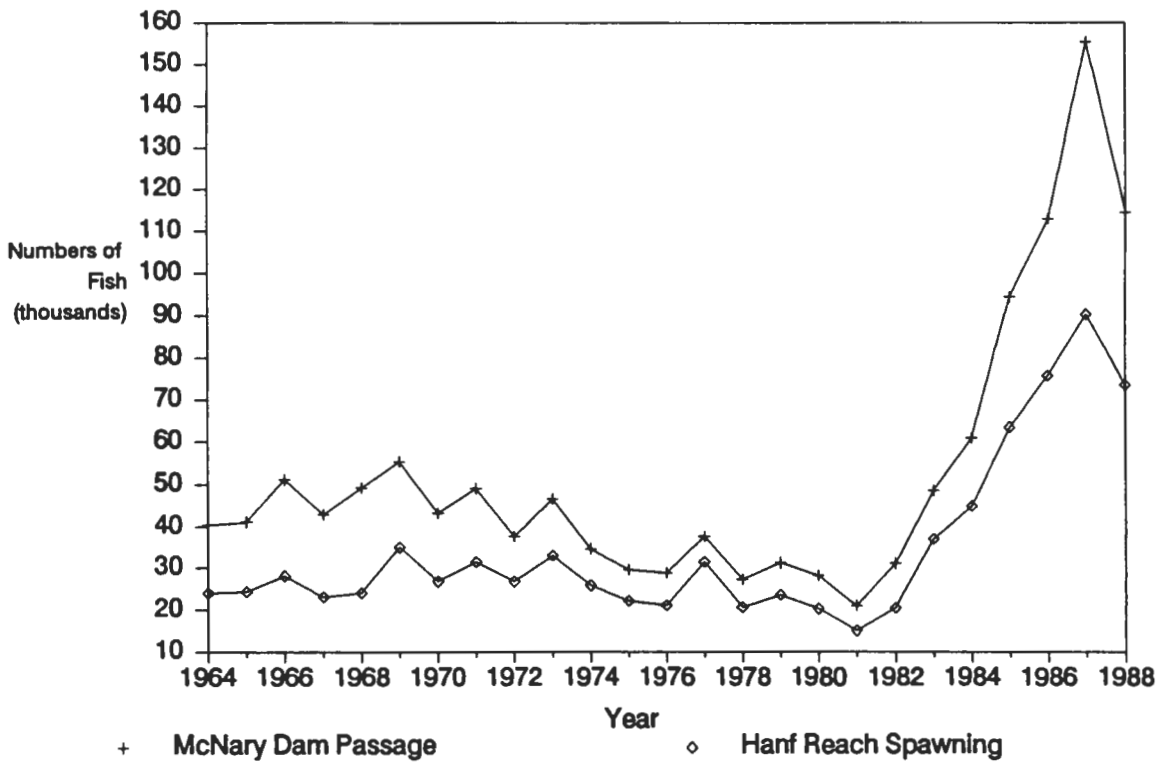
Two hatcheries are located in the Reach which produce salmon and steelhead: Priest Rapids and Ringold hatcheries. Past hatchery production levels have included the following. Fall chinook salmon: approximately 5,404,550 and 6,431,100 smolts (1989, 1990 respectively). Spring chinook salmon: approximately 880,000 yearlings (1990). Steelhead: approximately 172,000 and 184,000 smolts (1989 and 1990 respectively) (Kimball 1991, WDF; Kerwin 1991, WDW).

Fall Chinook

Of the species that pass through or reside in the Hanford Reach, none is more significant than the fall chinook salmon. The fall chinook that spawn above the Bonneville Pool are called "upriver brights" because they retain their color and excellent flesh quality throughout much of their upstream migration. This characteristic, as well as their strength and large size (some reach 60 pounds), make them extremely valuable to the ocean troll and in-river net fisheries, as well as to sport fishermen.

Based on fish passage counts at the Columbia River dams, nearly sixty percent of the fall chinook salmon passing McNary Dam in recent years are returning to attempt to spawn naturally in the Hanford Reach (Carson and Dell, 1992). During the 1970s, the number of fall chinook salmon returning to the Hanford Reach slowly declined, reaching a low of 15,115 adults in 1981. Between 1981 and 1987, the numbers increased dramatically, peaking at just over 90,000 fish before beginning a steady decline through 1991 (Figure 24). This spike is generally attributed to improved outmigration conditions and good ocean circumstances. Aerial surveys, which provide a minimum estimate of spawning activity, indicated that there were at least 8,616 redds (as the gravel nests are termed) in the Reach in 1987. A typical chinook redd contains approximately 5,000 eggs.

Figure 24: Hanford Reach Adult Fall Chinook Return (adapted from Carlson & Dell 1989)



Spawning by fall chinook salmon occurs throughout the Reach (Swan et al. 1988). Major spawning areas include Vernita Bar and the Locke Island area near the White Bluffs. These two areas account for over 60 percent (Becker 1985), and possibly as much as 85-90 percent of the observed spawning within the Reach (Watson 1970, 1976; M. Dell 1989). In fact, with the long spawning season and the large number of spawners congregated on these areas, many areas are mass spawned, with redds being constructed side by side or on top of redds which were made earlier in the season.

Eggs deposited in the redds begin to hatch during December, with the fry emerging in April and May (Chapman et al. 1983). Backwater sloughs and shoreline embayments, which are slower in velocity and rich in food, provide excellent foraging and rearing areas for fry. Juvenile fall chinook salmon originating from the Reach migrate seaward in their first year of life, with the majority of the fish having left the Reach by the end of July.

Columbia River fall chinook salmon are harvested from southeast Alaska and the coast of British Columbia to the coasts of Washington, Oregon, and California, as well as in the main river and a few of its tributaries. The upriver brights spawned in the Hanford Reach comprise a major portion of this harvest. For example, in 1987 approximately 511,000 upriver bright fall chinook salmon were taken in the commercial fishery, with an estimated value of $17 million (National Marine Fisheries Service 1989). In addition, approximately 18,000 upriver bright fall chinook salmon were harvested by recreational fishermen during that same year, generating millions of dollars to the economy of Washington and Oregon.

Steelhead Trout

Steelhead trout follow a life cycle similar to salmon, but with a distinct advantage; salmon die after spawning, but steelhead migrate back to the ocean and a small percentage return in subsequent years to spawn again. Little is known about the quality and quantity of steelhead trout spawning, rearing and adult holding habitat in the Hanford Reach. Counts from 1972 to 1988 indicate about 20,000 steelhead trout passed McNary Dam but did not pass Priest Rapids or Ice Harbor Dam. Some of these fish would enter the Yakima River while others would be caught in the Hanford Reach sport fishery. The remainder represent potential spawners. A substantial number of steelhead do terminate their migration in the Hanford Reach.

Aerial surveys of steelhead trout spawning are difficult, if not impossible, due to high, turbid spring runoff that obscures visibility. However, Eldred (1970) reported that aerial spawning surveys in May and June of 1968 and 1970 at reduced flows showed steelhead trout spawned in the Reach from Ringold to Priest Rapids Dam. A total of 220 redds were counted in 1968 and 95 were counted in 1970. Fickeisen et al. (1980b) indicated potential steelhead trout spawning habitat is present at Vernita Bar, Coyote Rapids, Locke Island, and Ringold. However, if significant steelhead spawning does occur, the failure to capture sub-yearling juveniles during the course of other studies suggests that hatching success may be low. Gray and Dauble (1976) reported that young of the year steelhead were not found in samples collected where steelhead trout juveniles should have been found. Similar studies in which young of the year steelhead should have been captured resulted in little or no success.

The Reach does serve as an important holding area for adult steelhead. Adult steelhead show peaks of migration in August and September, but a large population is present all year, suggesting fish hold over for extended periods of time before moving upstream.

Other Anadromous Species

The Reach serves as an important migration corridor for coho salmon, sockeye salmon and spring and summer chinook salmon. Cutthroat trout and Dolly Varden char have been found in the Reach, but the most recent records were in the mid-1970s (D. Dauble 1989). The once enormous runs of salmon and steelhead in the Columbia River began to decline shortly after settlement of the northwest by Europeans. By 1962, the total Columbia River salmonid run numbered about 1.2 million, a decline of about 84 percent from pre-Anglo settlement times. Overfishing, industrial development, irrigation, and various incremental losses of habitat began to cumulatively impact the Columbia River salmonids. However, most of the decimation of the salmon coincided with the construction of hydropower dams throughout the Columbia River Basin. Four major dams are in place on the river between the Hanford Reach and the ocean, and must be negotiated by both outmigrating juvenile fish and returning spawners. Though all of these dams have fish ladders, adult fish are delayed at each dam. Spawning salmon have limited energy resources because they quit feeding when they leave the ocean to begin their upstream migration. Consequently, delays often result in mortality prior to spawning or reduced spawning success. Outmigrating juveniles pass through turbines, where they can be killed outright or stunned and made easy prey for predators waiting at the base of the dam. Passage mortality has been estimated to average 15 to 39 percent of downstream migrants per dam and 5 to 10 percent of upstream migrants per dam (Northwest Power Planning Council 1987). Furthermore, the reservoirs created by these dams have rendered spawning habitat unusable and created slack water, which slows the outmigration process and favors large numbers of predators that prey on juvenile salmonids.

Resident Fish

Anadromous salmonids share the Hanford ecosystem with nearly forty other native and introduced fish species, including such sport fish of interest as the white sturgeon (Acipenser transmontanus), smallmouth bass (Micropterus dolomieui), and mountain whitefish (Prosopium williamsoni). Species of Special Concern, as determined by the state of Washington, found in the Reach include mountain sucker (Catostomus platyrhynchus), sandroller (Percopsis transmontana), paiute sculpin (Cottus beldingi), and reticulate sculpin (Cottus perplexus). Common carp (cyrinus carpio) are important due to their negative impacts on aquatic vegetation and other species of fish and wildlife.

White Sturgeon

White sturgeon are an anadromous fish that once migrated into the upper reaches of the Columbia River and into Canada. Construction of the dams blocked access to spawning habitat and changed hydrological conditions necessary for egg incubation, rearing of young, and prey production (Coon et al. 1977). As a result, sturgeon now occur sporadically throughout the Columbia River system and (with the exception of below Bonneville Dam) represent landlocked, isolated populations. Sturgeon are long-lived, slow growing, bottom dwelling fish that reach lengths of twenty feet and weights of 1,800 pounds (Wydoski and Whitney 1979). Sturgeon prefer swift and turbulent water for spawning and reside in deep holes if available (Scott and Crossman 1973; Coon et al. 1977).

Sturgeon spawning within the Reach has only recently been documented. In 1993, USFWS biologists collected eggs and larva from two locations in the Reach, just below the dam and above the Vernita Bridge (Miller 1993). Based on their known habitat requirements, probable spawning and rearing areas are dispersed over the entire reach (Battelle 1980). Fry use the shallow bays and slow currents found in the

braided channels and sloughs within the Reach (Gray and Dauble 1979). Sturgeon produced within the Reach may also contribute to downstream fisheries (D. Dauble 1989).

Smallmouth Bass

Smallmouth bass were introduced into the Yakima River in 1925, spread into the Columbia River, and are now dispersed throughout the Hanford Reach (Fickeisen et al. 1980b). Smallmouth bass in the Reach have been studied more than other resident fish because of their importance as a game fish and their unique habitat requirements.

Adult bass migrate from as far as the Yakima River and lower Snake River to spawn in sloughs throughout the Reach (Montgomery et al. 1980). In mid-March, bass move into the sloughs to spawn where water temperatures are warmer than in the main river. Eggs have usually hatched by mid-June and the adult males stay to guard the brood for several days after emergence (Montgomery et al. 1980). After spawning, adults move back into the deeper portions of the main river. Some bass remain in a limited area while others have been found to travel downstream.

Mountain Whitefish

Mountain whitefish are found in the Reach throughout the entire year, with peak abundance during October to January as the fish move upstream towards Priest Rapids Dam to spawn (Fickeisen et al. 1980b). Spawning whitefish require uniform flow, depths of three to six feet, and a substrate ranging from gravel to course rubble (Brown 1952). Adult whitefish use habitat ranging from nearshore riffle areas to deep pools out of the main current. Following emergence in early April or May, fry are found in shallow nearshore pools with a mixed mud-rubble substrate adjacent to areas of strong current and throughout backwater areas. Probable whitefish habitat is scattered throughout the Reach (Fickeisen et al. 1980b).

Common Carp

Common carp are found throughout the Hanford Reach and all of the upland lakes and wetlands which receive their water directly from the Columbia Basin Project. As adults, carp commonly eat submerged aquatic plants, and their bottom feeding habits uproot aquatic plants and increase turbidity of the water, thus reducing light penetration through the water and reducing plant growth. This activity is important in shallow sloughs of the river where carp activity reduced plant foods available for waterfowl and other birds, reduces underwater cover for young fish of all species, and helps spread Eurasian milfoil. In the upland lakes and wetlands where they are present, carp have a devastating effect on submerged aquatic plants and a significant negative impact on other fish and wildlife species that would normally utilize those plants.

Wildlife

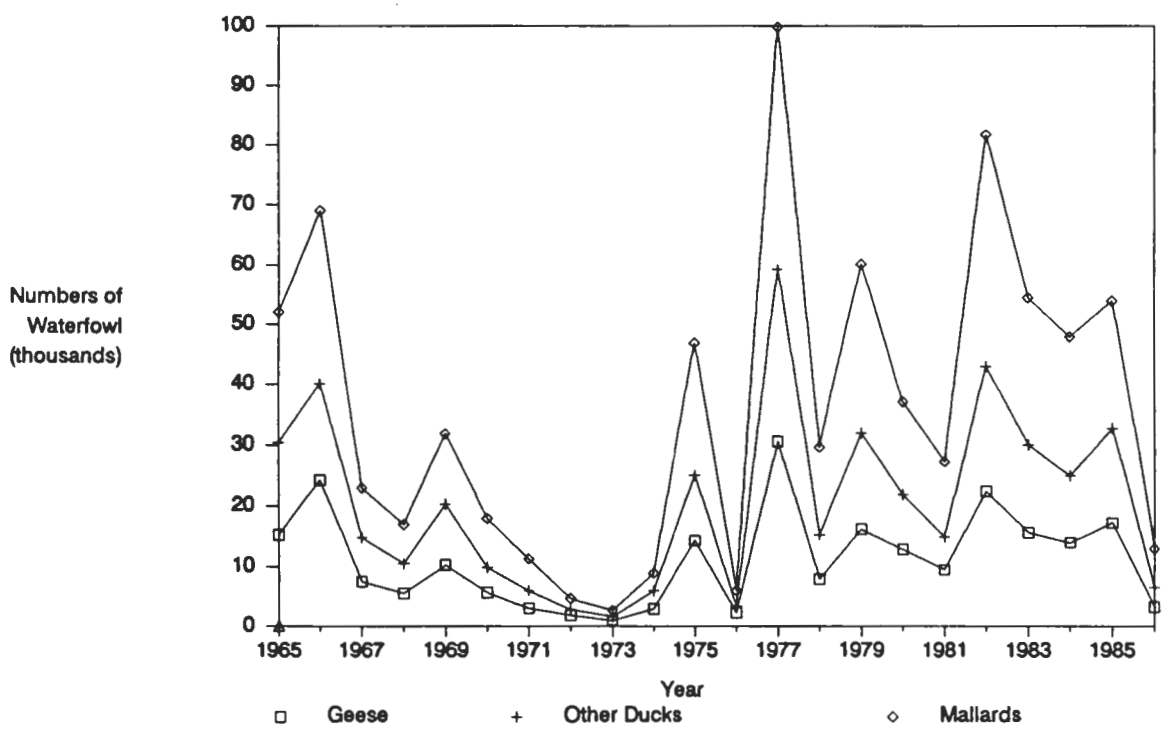
The ecological value of the various habitat types along the Hanford Reach is reflected by the number of wildlife species which utilize the area. At least 184 bird species have been documented, with 74 of these nesting in the area (unpublished, Pacific Northwest Laboratory). In addition, at least 36 species of mammals, 9 species of reptiles, and 4 species of amphibians utilize this area (Rickard, et al. 1988).

The value of the Hanford Reach ecosystem was documented in a study by the USFWS in 1980. The USFWS inventoried exceptional wildlife areas within each state, with the intent of encouraging appropriate actions which would result in the perpetuation of these sites for their wildlife values. Sites were ranked according to a number of considerations, such as their degree of threat, importance to threatened or endangered species or species of concern, wildlife diversities or concentrations, and uniqueness. Of the 44 Washington sites that were evaluated, the Hanford Reach site was ranked as the second most important fish and wildlife habitat area in the state, making it a regionally significant resource.

Birds

Wintering waterfowl represent an important resource on the Reach and associated lakes and wetlands. Wintering waterfowl represent an important resource of the Reach. While recent populations represent about 8 percent of wintering waterfowl in eastern Washington (unpublished, USFWS, Umatilla NWR), the area has the potential to provide for a greater population. The Hanford Reach is surveyed monthly by the USFWS and Battelle, Pacific Northwest Laboratory, during the peak waterfowl use period from October to January. Surveys have indicated that at least 23 different species of waterfowl use the Hanford Reach as a feeding and resting area (Figure 25).

Figure 25: Periodic Waterfowl Counts, Hanford Reach, Columbia River (USFWS 1991)



Much larger numbers of waterfowl used the Reach in the past. The 8-year mean maximum for winters between 1961 and 1969 on the Hanford segment is 250,000 ducks (Payne et al. 1975). By 1975, counts reached a low of 18,032. Reasons for this decline are thought to include unfavorable changes in crop types grown in the surrounding agricultural lands and favorable changes in downstream areas. During the 1980s, populations increased with peaks of over 50,000 ducks and 20,000 geese observed (L.E. Fitzner 1991).

Waterfowl are not evenly distributed over the Reach. During one study, 96 percent (17,185) of the wintering waterfowl along the Hanford Reach were observed between RM 365 and 370, and 3 percent (590) were observed between 350 and 355 (Payne et al. 1975). These segments of the Reach are characterized by an abundance of sloughs and shallow water areas near islands, and the majority of the waterfowl surveyed were in these habitat types. Saddle Mountain Lake, Wahluke Lake, and the associated wetlands are important waterfowl nesting and brooding areas.

Saddle Mountain Lake is also an important sanctuary for wintering waterfowl. The Reach takes on an added importance during cold periods when many lakes and ponds in the Columbia Basin freeze. The Columbia River is the only large water body that offers open water at that time. The importance of wintering habitat on the Hanford Reach has been recognized by its designation as a sanctuary by the WSDFW. No hunting is allowed on the Reach between the wooden powerlines and Vernita Bridge, to provide a quality resting and feeding area for waterfowl. The USFWS regional resource plan identifies wintering habitat for mallards (the dominant species in the Reach) as a priority.

Duck production in the Hanford Reach is low, apparently because the habitat requirements necessary for nesting by most duck species are not available. Mallards, gadwall, teal, and American merganser utilize available cover on islands and shorelines for nesting.

The Hanford Reach is a consistent producer of Canada geese. Nest surveys have been conducted on the Reach annually since 1953 and have found that Canada geese nest on islands throughout the Reach (Hanson and Eberhardt 1971; Ball et al. 1981; Dewaard 1981). The highest number of nests observed was 303 during 1958. Between 1970 and 1980 the number of nests has ranged from a low of 108 to a high of 154 (Dewaard 1981). The 1980 survey found that over 90 percent of the goose nests were located on ten islands. Coyote predation is thought to be the reason for the almost total elimination of nesting on other islands. In 1958, 129 nests were counted on Locke Island, but within the last ten years, no active nests have been established on the island, primarily because of coyotes.

Four species of colonial nesting birds have established significant colonies in the Reach, including the Forster's tern, California gull, ring-billed gull, and the great blue heron. The Hanford population of Forster's tern represents about 20 percent of the nesting Forster's tern colonies in Washington. A fifth species, the black-crowned night heron, formerly nested in the Reach and is likely to reestablish a colony in the future. White pelicans, a state endangered species, are becoming more numerous and use the reach as a summer feeding area. No pelican nesting occurs in Washington, but the Reach does offers excellent nesting habitat. The USFWS and WSDFW plan future efforts to encourage pelican nesting in the Reach.

Mammals

The Saddle Mountain and Wahluke Lakes provide an important source of water and cover for deer. Mule deer (Odocoileus hemionus) are the most common big game animal in the area and they use the Hanford Reach to feed, rest, and fawn. They are found in a variety of habitat types, but appear to use riparian habitat as much or more than adjacent uplands during all seasons. A 1980 aerial survey for the Army Corps of Engineers (ACOE) estimated at least 120 deer using the riparian zone in the Reach. Some deer use the islands for fawning, with the fawns remaining on the islands for approximately one month until they are old enough to swim to the shore (Tabor et al. 1980).

Fawn mortality is largely attributable to predation by coyotes. Steigers et al. (1980) stated that coyotes accounted for 10 of the 14 deaths that occurred among 26 fawns he had fitted with radio transmitters. Because agriculture in the Reach is limited, there is little pressure to remove deer in order to prevent crop damage. Occasionally, single white-tailed deer (Odocoileus virginianus) are observed in the Reach (Fickeisen 1980b). Deer hunting is only permitted on the Wahluke State Wildlife Recreation Area.

Rocky Mountain elk have been nearly absent from the shrub-steppe habitat of the Columbia Basin during recent history, probably due to limited cover and water during the summer when the females are lactating. In 1972, however, a small herd became established on the Arid Lands Ecology Reserve, on the south side of the river. The herd has now grown to 110 animals (Fitzner 1991). The animals tend to prefer low elevations, and in the absence of extensive cover, use topographic features such as ravines and gullies. They avoid the heat of the summer by bedding in sagebrush during the day and feeding at night (McCorquodale et al. 1986). Single elk are seen on rare occasions on the north side of the river.

Coyotes (Canis latrans) are the most common large predator in the study area. As previously noted, they prey heavily on mule deer fawns, and also destroy goose nests. Radio tracking and tagging studies by Battelle have shown coyotes living on Hanford Reach islands to be particularly long-lived (L.E. Fitzner 1991).

Furbearers are present along the Reach and nearby wetlands in relatively small numbers. Beaver (Castor canadensis), muskrat (Ondatra zibethic) and mink (Mustela vison) are generally found in the slack water sloughs. The beaver population appears to be limited by water level fluctuations, which drown out dens and reduce available food supplies, and by predation by coyotes. Otters have been observed in the area with tracks photographed in 1989 and animals photographed in 1991 (Radke and Hill, CNWR, 1991). Raccoon (Procyon lotor), skunk (Mephitis mephitis), long-tailed and short-tailed weasels (Mustela frenata and M. erminea) and bobcat (Lynx rufus) are also found in the area.

The riparian zone along the river harbors a number of small mammal species, including deer mice, house mice, vagrant shrews, Great Basin pocket mice, and Montana meadow mice. Ord's kangaroo rat and Washington ground squirrels are found on the east bank of the river, and bushytail woodrats are found in abandoned buildings of the Hanford Site (Fickeisen et al. 1980b). Black-tailed jackrabbits occur in the sagebrush vegetation, and cottontails are common in the riparian zone.

Reptiles and Amphibians

Relatively few species of reptiles and amphibians are found in the study area. While the larvae of amphibians are totally dependent on aquatic habitats, the adults are typically terrestrial. Great Basin spadefoot and Woodhouses toads, painted turtles, and western terrestrial garter snakes are found at or near the water, while western rattlesnakes, gopher snakes, short-horned lizards, side-blotched lizards, and western skinks can be found in dryer conditions. A complete list of the reptiles and amphibians expected to occur along the Hanford Reach is included in Appendix I.

Endangered, Threatened, and Sensitive Species

The Hanford Reach is unique, as it is perhaps the last stronghold of many of the Pacific Northwest's most endangered, threatened, and sensitive wildlife species. At least 48 of these species are classified as state threatened, endangered, or species of concern, and/or as federal sensitive, candidate, threatened, or endangered species. The variety and close proximity of habitat types in the Hanford Reach promote a diversity of fish, wildlife, and botanic species. Because these habitats have been altered throughout most of the rest of eastern Washington, many of the species associated with shrub-steppe, riverine, riparian, and island areas are currently quite rare. The expanse of shrub-steppe habitat protected in part by the Hanford site along the Columbia River is nationally significant in providing nesting habitat for a large number of birds which utilize other portions of the United States during the non-breeding season, including the ferruginous hawk, long-billed curlew, and loggerhead shrike. The Hanford Reach is also internationally significant for a great many species such as Swainson's hawk, which nests along the Reach, yet winters in Argentina; or the American white pelican, which nests in British Columbia, utilizes the Reach as a migration stopover, and winters in Mexico. Lists of both federal and state species are in Appendix H.

Fish

Species of Special Concern, as determined by the state of Washington (state), found in the Reach include mountain sucker (Catostomus platyrhynchus), sandroller (Percopsis transmontana), paiute sculpin (Cottus beldingi), and reticulate sculpin (Cottus perplexus). Information regarding these species is limited; however, the sandroller is one species for which there is documented in the Hanford Reach.

The sandroller has been classified by the state as a species of special concern due to its limited distribution. It is endemic to the Columbia River system but is currently found in a relatively small portion of the basin. The Willamette River basin in Oregon is the only portion of the Columbia River system where the sandroller is known to have wide-spread distribution. It has been observed to be locally abundant during the spawning season in reservoirs below the Hanford Reach (Dennis Rondorf 1991). The sandroller has been found above Priest Rapids Dam in the Wanapum reservoir near Crescent Bar on the Columbia (Dell et al. 1975), in the Hanford Reach, and is known from only two areas in the Snake River (D. Dauble 1991).

Birds

The Hanford Reach provides important habitat for wintering bald eagles, a federal and state threatened species. Fitzner and Hanson (1979) summarized bald eagle occurrence on the Hanford Reach between 1961 and 1977, and survey work has continued through to the present. Numbers of wintering eagles have ranged from a low of 6 in the 1960s to a high of 55 in December, 1987 (Fitzner 1991). The expanded eagle population is due partly to increases in autumn-spawning chinook salmon carcasses, which provide an

abundant food source. Other aspects which contribute to the attractiveness of the Reach for wintering eagles include the abundance of wintering waterfowl and the presence of groves of trees suitable for perches and night roosts. Bald eagles disperse along the Reach to feed during the day, and often perch along the White Bluffs during sunny days.

Peregrine falcons, which are listed as an endangered species by both federal and state governments, are rare along the Hanford Reach. The abundance of wintering waterfowl would seem to serve as the primary attractant for peregrines, although an immature peregrine was observed in May 1988 chasing a rock dove near Coyote Rapids (W.R. Radke 1991).

The Swainson's hawk is a state species of special concern, recognizing that it could become threatened if its population decline continues. Swainson's hawks spend only the nesting season along the Hanford Reach, and migrate as far south as Argentina during the winter (R. Fitzner 1980). Between 1975 and 1978, an average of 14 pairs nested on the Hanford Site (Fitzner 1980) and currently about 28 pairs nest on the area which includes Saddle Mountain National Wildlife Refuge and the Wahluke State Wildlife Recreation Area (W.R. Radke and R. Fitzner 1991).

Ferruginous hawks are a federal candidate species and a threatened species by the state. They are closely associated with shrub-steppe habitat. Although only about 60 pairs nest in Washington, a record 8 pairs nested on the Hanford Site during 1988, making the shrub-steppe habitat adjacent to the Reach an important area for this raptor (R. Fitzner 1991).

The long-billed curlew, a state monitor species, nests in scattered groups throughout the Hanford Site and Wahluke Slope. They also nest on the Saddle Mountain National Wildlife Refuge. The total for these areas is approximately 300 birds, with about 100 occurring west of the Columbia River (Allen 1980). The preferred habitat for nesting is upland areas dominated by grass cover. Islands in the Hanford Reach also provide adequate nesting habitat, and serve as important feeding and loafing sites as well. One island serves as a major staging area before curlews migrate from the Reach during July. Long-billed curlews were recently downgraded to category C3, and are no longer considered an active candidate species.

The western sage grouse, a federal candidate species and a state species of special concern, was historically abundant on the area. The Reach may at one time have had the highest concentration of sage grouse anywhere in the state, and "large flocks" or "clouds of grouse" were described several miles below Priest Rapids in the early 1800s. Snodgrass (1904) reported sage grouse hens as being especially abundant along the White Bluffs. By 1982, only one lek (mating site) was documented on Saddle Mountain National Wildlife Refuge upstream of Coyote Rapids, and none have been located since that time (Columbia National Wildlife Refuge, unpublished). Although grouse are occasionally reported along this part of the Columbia River, it is possible that sage grouse breeding has ceased along the Hanford Reach. A brood of sage grouse was observed within 15 miles of the Reach in 1989 on the Hanford Site Arid Lands Ecology Reserve (L. Fitzner 1991).

White pelicans, are considered a sensitive species by the USFWS and an endangered species by the state. There are no nesting colonies in Washington, and only 9 colonies throughout the west (USFWS, 1980). While a nesting colony does not currently exist in the Reach, excellent breeding habitat appears to be present and future efforts to establish a colony by state and federal agencies should be considered (W.R. Radke 1991).

Mammals

The pygmy rabbit is considered a federal candidate species and is listed as threatened by the state, with possible future uplisting to endangered. It is the smallest rabbit species in North America and is considered an endemic species in several western states including a small isolated portion in Washington restricted to the Columbia Plateau. Habitat for the pygmy rabbit includes dense undisturbed clumps of sagebrush where the cover of sagebrush approaches 50 percent. Seldom is this species found in sparsely vegetated areas (USFWS 1979). Because of these habitat requirements, it is suspected that the pygmy rabbit is present within the Hanford Reach study area.

Invertebrates

The Columbia pebblesnail (formerly the great Columbia River spire snail) is listed as a federal candidate species. This aquatic mollusk is found in the Hanford Reach and in five other Columbia River tributaries, although distribution within each of the rivers is limited (Frest 1988). The shortface lanx (formerly the giant Columbia River limpet), has been downgraded to category 3C (i.e. more abundant or widespread than previously believed and/or not subject to any identifiable threat) by the USFWS and is no longer considered to be a federal candidate species (Federal Register, Vol. 56, No. 225, Thursday, November 21, 1991). Both of these species occur in sizeable numbers throughout the Reach and reproduction is good. They have both been found in the stomachs of goldeneye ducks and mountain whitefish.

Plants

The Hanford Reach study area has never been thoroughly surveyed for rare plant species. Although rare plant species are documented to occur at specific locations, one cannot assume that any species is limited in the Hanford Reach to only its known locations. The species may or may not occur in suitable habitat at unsurveyed locations along the Hanford Reach. It is also possible that rare species in addition to those listed may occur in the Hanford Reach, but have not been located by survey work conducted to date. Several plant species found in the Reach have special status due to their limited distribution.

The persistantsepal yellowcress (Rorippa columbiae) is a candidate for listing by the federal government and is considered endangered by the state. Persistentsepal yellowcress is found in Washington along unimpounded stretches of the Columbia River from near Vernita Bridge to River Mile 345 and then again below Bonneville Dam near Beacon Rock State Park. The habitat for persistentsepal yellowcress on the Columbia River is gently sloping gravel banks with wet silty soil beneath a layer of gravel (Sauer and Leder 1985). The gravel size is typically less than 7 cm, although some plants occur among stones as large as 40 cm (Sauer and Leder 1985). The species is apparently adapted to substrate disturbance of the type that seasonally occurred with spring floods, before the construction of the Columbia River dams. Historically, the species emerged in the Hanford Reach as spring flood waters receded in early summer and had sufficient time to flower and fruit before fall.

Columbia milkvetch (Astragalus columbianus)is a narrow Washington endemic, restricted in range from an area near Wanapum Dam south to near Vernita Bridge. The species is restricted to the west/south side of the Columbia River. It is a candidate for listing under the Endangered Species Act and is considered threatened in Washington (WNHP 1987). The habitat of the species is primarily deep-sandy loam soils dominated by the big sagebrush - Sandberg's bluegrass type (Mastrogiuseppe and Gill 1987). However within the Hanford Reach study area, Columbia milkvetch occurs among river cobbles embedded in silt and sand, above and below the historical high water mark (Mastrogiuseppe 1988).

Another extremely rare species known from the vicinity of the Hanford Reach is silky northern wormwood (Artemisia campestris ssp. borealis var. wormskioldii). This plant is presently listed as state endangered and is a federal candidate. Only two populations are currently known, one near Sentinel Gap and the other on an island in the Columbia gorge. The rare species has not yet been found on the Hanford Reach, but surveys are far from complete. Large areas of apparently suitable habitat exist along the shores of the river, and would make excellent sites for recovery projects if naturally occurring populations of the rare wormwood are not found on the Reach.

Three other state sensitive species are known from upland areas immediately adjacent to the Hanford Reach. Bristly cryptantha (Cryptantha interrupta) and dwarf desert-primrose (Camissonia {=Oenothera} pygmaea) can be found on the White Bluffs. Populations of gray cryptantha (Cryptantha leucophae) are fairly common on sandy sites in the vicinity of the Reach.

Several rare plant species that occur on or near the Hanford Reach are presently given a monitor designation by the state and include Robinson's onion (Alllum robinsonii), Columbia River mugwort (Artemisia lindleyana), stalked-pod milkvetch (Astragalus sclerocarpus), medick milkvetch (Astragalus speirocarpus), crouching milkvetch (Astragalus succumbens), and fuzzy beardtongue (Penstemon eriantheru). Although some of these species are quite common on the Hanford Site and are not in immediate danger, the loss of any major part of their present habitat would put them at risk. Protecting the Hanford Reach before irreversible damage has been done provides a biologically and economically rational approach to conserving these rare plants. Recovery efforts, although always expensive, may still fail in situations where species have been pushed too close to the edge of extinction.

Four other species have been listed as sensitive by the state and include dense sedge (Carex densa), shining flatsedge (Cyperus rivularis), southern mudwort (Limosella acaulis), and false-pimpernel (Lindernia anagallidea) (WNHP 1987). Sensitive species are defined as taxa with small populations, or localized distributions within the state whose populations and habitats will be jeopardized if current land use practices continue (WNHDS 1989).

Dense sedge is known from two recent sites in Washington, one of which is along the Hanford Reach in Benton County. The habitat for dense sedge is just above the average high water mark created by releases of water from upstream dams and is associated with willows and riverbank wormwood. Shining flatsedge is known from six recent sightings in Washington, one of which is within the Hanford Reach. The habitat is the sandy mud of a seasonally inundated small embayment, just below the high water mark and is associated with other sedges and rushes.

Southern mudwort is known from five recent sightings in Washington, one of which is within the Hanford Reach. Southern mudwort grows in moist sandy mudflats where it is periodically inundated both by season and dam-induced river level fluctuations and is associated with shining flatsedge, common hedge-hyssop,

and spike-rush. False pimpernel is known from five recent sightings in Washington, two of which are within the Hanford Reach. False-pimpernel is found on moist sandy mudflats, just below high water. The habitat is protected from the river current by bars and/or islands. It is probably submerged when the river is high in the spring and also inundated in the summer by dam-induced river level fluctuations and is associated with southern mudwort, common hedge-hyssop and spike-rush.

C. CULTURAL RESOURCES

The cultural resources of the Hanford Reach include many archaeological, historic, and American Indian sites. Throughout most of the region, hydroelectric power development, agricultural activities, land leveling, looting, and residential and commercial development have destroyed or covered over the majority of cultural sites. Archaeological, historical, and American Indian sites within the Hanford Reach have been protected because of the lack of hydroelectric power development and that the Hanford Site has been generally closed to public access since 1943. That this river segment has been strictly controlled for the past 50 years has contributed to the unique quality of preservation and geographic context that cannot be duplicated in the state or region. (Cushing 1990) The Hanford Reach study area includes areas which are the traditional and continuing homeland of the Wanapum people and ceded treaty lands of the Confederated Tribes of the Umatilla Indian Reservation and Yakama Indian Nation. Among the important American Indian cultural resources are ancestral cemeteries or burial grounds, usual and accustomed fishing sites, sites for current practice of traditional Indian religion, anadromous fisheries, subsistence and medicinal plants, and old homesites and place names.

American Indians do not necessarily view cultural resources and/or archaeological sites as places of specific locations. The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) have commented that the entire Hanford Reach appears to qualify as a "Traditional Cultural Property" as discussed by National Register Bulletin No. 38 (Parker and King, 1990). Parker and King defined "place" as one with "traditional cultural significance" and,

> "a location associated with the traditional beliefs of a Native American group about its origins, its cultural history, or the nature of the world: a location where Native American religious practitioners have historically gone, and are known or thought to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice; and a location where a community has traditionally carried out economic, artistic, or other cultural practices important in maintaining its historical identity." (Parker and King 1990:1)

The extent of prehistoric, historic, and American Indian resources within the Hanford Reach contribute to the understanding of the mid-Columbia past.

Prehistoric

Most of the existing archaeological sites date from at least 7000 years ago. There are at least 120 prehistoric archaeological sites inventoried along the Hanford Reach of the Columbia River. Most of these sites are included in National or State Registers of archaeological districts. National Register properties include the: 1) Hanford Island Archaeological Site, 2) Hanford North Archaeological District, 3) Locke Island Archaeological District, 4) Paris Archaeological Site, 5) Tri-Cities Archaeological District, 6) Ryegrass Archaeological District, 7) Wooded Island Archaeological District, and 8) Savage Island Archaeological District. There are also three state register properties within the study area: 1) Coyote Rapids Archaeological District, 2) Hanford South Archaeological District, and 3) Wahluke Archaeological District.

The majority of archaeological sites in the Hanford Reach include housepit villages, open camps, fishing stations, caches, and cemeteries. Housepit villages are man-made depressions in the landscape and generally consist of evidence of domestic activity such as fire-cracked rocks, animal bone, charcoal, and projectile points. Of the twenty-three housepit sites recorded in the Hanford Site area, 19 are located on the river itself and are within the Hanford Reach study area. The identified housepit villages include one of the largest remaining villages in the Columbia Basin.

Open camps are similar to the housepit sites in terms of the artifacts contained within, however, they lack the characteristic pithouse depressions. Fishing stations are found scattered along the banks of the Columbia River, and were generally identified by notched and grooved net sinkers and cobble tools. Caches are located along the banks of the river and were used as places to store materials for a later purpose, such as tool and net weights for fishing. Cemeteries are commonly found on the islands and upper banks of the river and most date back to within the last 2000 years. The quality of preservation of most archaeological sites cannot be matched except for a few isolated areas at the fringes of the Columbia Basin. Ongoing inventories by the DOE have revealed 27 additional archaeological sites increasing the understanding of traditional river use (Chatters 1989; Gard 1991)

Historic

In addition to a wealth of archaeological sites, the Hanford Reach also includes many historic features of the Euroamerican pioneers who established towns, such as Hanford, White Bluffs, and Ringold, along the riverbanks in the early twentieth century. By the late 1800s and early 1900s, the towns of White Bluffs, Hanford, Ringold, Wahluke, Haven, Mitchell, and other small communities, began to emerge along the river (Chatters 1992), and new ferries began operation at Richmond and Wahluke. The Hanford Irrigation and Power Company formed in 1906 to provide water to the local farmers and ranchers. Fruit farming became the most profitable venture for many farmers along the Hanford Reach. Most of these historic sites were removed in the 1940s when the U.S. Government established the Hanford Works (Chatters and Hoover 1986; Rice 1980) on February 9, 1943.

Remaining historic features include the Allard Powerhouse, the Hanford irrigation ditch, remnants of a log structure, the Hanford High School, and the Bruggeman Warehouse. The Bruggeman Warehouse was identified as significant in this study because it is representative of a type of building built along the river. It was constructed in 1922 fixing water cobbles together with morter and is the remaining structure of a dairy which was once located along the Columbia River. A rich body of historical information identifies homesteads and ranches, historic roadways, steamboat navigation and landings, ferry landings and crossings,

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post offices, fruit orchards, and the associated settlements of White Bluffs, Hanford, Wahluke, Arrowsmith, Allard, and Richland. These historic sites are not as well represented in the archaeological record as the prehistoric sites.

An important historic site is the 100-B Reactor which has been included on the Historic American Engineering Record and was added to the National Register of Historic Places. The 100-B Reactor was the first large-scale reactor to attain full power and, hence, represents the beginning of the nuclear age. It was part of the Manhattan Project, which was established to develop nuclear weapons for use in World War II. Plutonium produced by the 100-B Reactor was used in the first man-made nuclear explosion, at Alamagordo, New Mexico, in 1945. Later 100-B Reactor produced plutonium used in the atomic bomb dropped on Nagasaki, Japan. The site has been recognized as an important part of the nation's technological heritage by the Society of Mechanical Engineering, which in 1976 dedicated it as a National Historic Mechanical Engineering Landmark. In 1992, it was added to the National Register of Historic Places for the unique role it played in world history and the history of the United States. The DOE may decide to preserve the reactor and open it as a museum or interpretive center, or it may be removed from its present location. If removed, mitigation including the recordation of the role this building played in world history, would be in accordance with Section 106 of the National Historic Preservation Act.

American Indian

In prehistoric and early historic times, the Hanford Reach was heavily populated by various tribes (Cushing 1990). Regional Indian groups with cultural and historical ties to the Hanford Reach include the Colville, Nez Perce, Umatilla, Wanapum, and Yakama tribes. The closest contemporary ties are with the Wanapum people who never left their homelands along the Columbia River at the upstream extent of the study area. The study area also includes lands ceded to the Government by the Umatilla and Yakama tribes under the Walla Walla Treaty Council in 1855.

American Indians of the region view the cultural resources and the entire environment of the Hanford Reach of the Columbia River as an inseparable whole. The viability of the ecosystem and the tribes ability to continue to use the natural resources of the area is of utmost importance to regional tribes. The resources of the Hanford Reach provide the necessary components for the cultural survival of Indian people of this region.

American Indian resources include former village sites, burials and cemeteries, subsistence resource areas, such as root digging grounds and traditional fishing sites, rock art sites, talus pits, and rock cairns. Many of these types of sites may qualify for listing on the National Register of Historic Places. Others may be protected by the Archaeological Resources Protection Act or as religious sites under the American Indian Religious Freedom Act.

The Hanford Reach is a geographic center for American Indian religious belief and central to the practice of American Indian religion of this region. Many great Indian religious leaders such as Smohalla, began their teachings here. The river is central to Native American belief and many believe the Creator made the first people here. Locations sacred to American Indians occur throughout the Hanford Reach.

D. VISUAL RESOURCES

The visual quality of the Hanford Reach is particularly significant for two reasons: the scale of its landscape features and the lack of disturbance. The Reach is a place of powerful features, including the mighty Columbia River, the spacious basalt plains, the distant mountain ridges and the spectacular White Bluffs. These features are remarkably well preserved. Despite the development of nuclear facilities along the shoreline, much of the Hanford Reach looks the same now as it would have appeared a century ago. It remains one of the last wild landscapes along the Columbia River.

These characteristics are particularly evident in the area from the northern extent of the White Bluffs to the Hanford townsite. In this regionally significant segment, the scenery is dominated by the White Bluffs, numerous large and small islands, the distant views of Rattlesnake and Gable Mountains, and a relatively dense zone of riparian vegetation.

Columbia River

The Columbia River is the dominant visual feature in the landscape. There are no other comparable rivers in the region of this size and scale. It is wide (one-quarter to one-half mile), flat, and flows smoothly with few rapids. The river flows around 18 islands scattered throughout the study reach. The Hanford Reach is the last significant stretch of the Columbia River that maintains the pre-development characteristics of the mid-Columbia River ecosystem.

Landforms

Geologic landforms are the dominant visual features of the Hanford Reach (Map #12). The colors of the major landforms range from various shades of brown (mountains and sand dunes), creamy white (White Bluffs), and dark grey to black (flood basalts).

Two mountain ranges appear as rolling silhouettes in the distant background. The east-west trending Saddle Mountains straddle the north boundary of the Hanford Site, while the northwest-southeast trending Rattlesnake Mountains mark the southwest corner of the Site. Gable Butte and Gable Mountain are both

located south of the river, and dominate the middleground landscape. Gable Butte is approximately 700 feet high and one-third mile wide. It gently slopes from east to west. The saddle-shaped Gable Mountain, located about one mile east of Gable Butte, rises to approximately 1,000 feet. This Mountain is steep sided on its southwest and northeast sides, with more gentle slopes to the northwest and southeast. These light to dark brown landforms are relatively barren except for scattered grasses and shrubs. Drainages are visually discernable on both.

Rising prominently to over 500 feet above the north and shoreline of the northeastern part of the study area are the White Bluffs, the most striking landform of the immediate foreground. Formed from the Ringold Formation, the White Bluffs flank the river for some 25 miles. The multi-colored brown, jagged, stratigraphic layers of rock provide visual relief and good habitat for many bird species. Umtanum Ridge is the other major landform within the foreground environment. It is located on the south shoreline in the northwest part of the study area, one of the first visual features encountered on a river float trip.

The Hanford Dune Field adjoins the west shoreline of the lower part of the Reach. A nationally significant geological resource, some dune formations are visible from the river and are also interesting to look at from an airplane. Visitors flying commercial airlines into and out of the Tri-Cities will commonly fly right over the Hanford Dunes.

Vegetation

Semi-arid, low growing plants dominate the Hanford Site upland landscape. Some common species of this shrub-steppe habitat include: big sagebrush, bitter-brush, common rabbit-brush, spiny hopsage, and cheat grass. Grasses and forbs also comprise the vegetation on the sand dunes. Common species in dune areas include lance-leaf scurf-pea, pale evening primrose, thick-spiked wheatgrass, and winged dock. On the islands, the semi-arid vegetation is represented by thick-spiked wheatgrass, giant wildrye, yarrow, and cheat grass, and is often found near the center of an island on silt-sand loam soils. This vegetation community may be ringed by absinthium, northern buckwheat, lupine, and sand dropseed on the cobble substrate.

The outer edge of the islands and portions of the shoreline are typically occupied by riparian communities, the most common species being reed canarygrass, common witchgrass, large barnyard grass, sandbar willow, poplar, and numerous forbs.

Throughout the Hanford Reach there are scattered clumps of exotic trees planted in the 1930s. These trees mark the location of abandoned farmsteads, and usually consist of single rows of black locust, lombardy poplar, Russian olive, Siberian elm, or white mulberry areas. Most of the exotic trees are located along the shoreline (Map #12). Their green foliage and relatively high profile (when compared with low-lying vegetation) provide visual diversity, habitat for some bird species, and shade for recreationists during the hot summer months.

Cultural Features

A variety of industrial and agricultural activities are visible from the river throughout the study area. The northern boundary of the Reach is bounded by Priest Rapids Dam, bordered by a railroad line, and state highway, and crossed by high voltage powerlines, and the Vernita Bridge.

Nine operating and retired nuclear facilities, including reactors, water intakes, and cooling water return structures, are intermittently located along the south shoreline of the upper portion of the Reach. The only operating reactor, WNP-1 which is owned and operated by the Washington Public Power Supply System, is located on the west shoreline just north of the south study boundary. Most of the plant is set back from the river, but some related structures, such as water intakes, are visible on the shoreline.

The remnants of a log cabin mark the original site of the White Bluffs townsite and ferry landing. Remnants of the Old Hanford Townsite, including wooden power lines crossing the river, are also evident on the west bank.

Development gradually increases from the wooden power lines downstream to the end of the study area. Agricultural fields and orchards are prevalent on the east shoreline, as are irrigation equipment and farm homes and buildings.

E. RECREATIONAL RESOURCES

Summary of Use Patterns

The Hanford Reach and adjacent wildlife refuge areas provide a wide variety of recreational activities year round for local residents and visitors alike. The most popular activities, sport fishing, flatwater motor boating, and waterfowl hunting are considered regionally significant. Other popular activities include waterskiing, swimming, upland hunting, and nature observation. The heaviest use period occurs during September and October, coincident with the fall chinook runs. Hunting occurs from mid-October to the end of January. Nature observation is most popular during the fall and winter months when the greatest number and diversity of migratory and wintering waterfowl species are present.

Despite the lack of comprehensive studies of recreational use of the Hanford Reach, some conclusions can be made about the amount and type of use based on data for the Wahluke State Wildlife Recreation Area, the principal area along the Hanford Reach which is open for public recreation. Based on traffic count data (Table 8), more than 41,000 people in 18,000 vehicles used the recreation area and facilities close to the area between July 1988 and July 1989 (assuming 2.3 people per vehicle, the visitation number used by the Department of Wildlife). More than half of the use is at the Vernita boat launch, an unimproved launch area immediately upstream of Vernita Bridge.

Table 8: Visitation to Wahluke Wildlife Recreation Area, 1988-89 (Kent 1989): Washington Department of Wildlife, Moses Lake, Washington field office.

Area	Vehicles	Estimated Visits
Vernita	9,250	21,275
White Bluffs	4,250	9,775
Ringold	3,600	8,280
Wahluke Slope	1,000	2,300
TOTAL	**18,100**	**41,630**

The WSDFW estimates that 77 percent of the visits to the recreation area are related to fishing, while 14 percent are for recreational hunting (Kent 1989). About 8 percent of the visits are related to non-consumptive recreation (such as sightseeing, photography, and nature observation) (Table 9). Each of these uses is described in greater detail in the following section.

Table 9: Recreational use of Wahluke Wildlife Recreational Area, 1988-89 (Kent 1989): Washington Department of Wildlife, Moses Lake, Washington field office.

Use	Percent Total
Fishing (Columbia)	75
Fishing (wasteway/ponds)	2
Hunting (watefowl)	12
Hunting (upland game)	2
Hunting (deer)	0.5
Trapping	0.5
Non-consumptive	8
TOTAL	100

These estimates represent the majority of recreational use of the Hanford Reach study area. Because of use restrictions on Hanford Site and Saddle Mountain National Wildlife Refuge lands, virtually all of the land-based recreation in the study area is on the Wahluke State Wildlife Recreation Area. Water-based recreation would be supplemented with boating use which originates from areas downstream of the study segment, although the distance from Richland area boat launches to key fishing and sightseeing locations suggest that this use probably accounts for less than 20% of water-based use within the Hanford Reach. This would indicate that total current recreational use of the Hanford Reach comprises approximately 10,000 land-based visits by hunters, trappers, and nonconsumptive users and approximately 40,000 visits by water-based users, predominantly anglers, per year.

Sport Fishing

The Hanford Reach is enjoyed by sport fishermen throughout the Pacific Northwest. Salmon, steelhead, sturgeon, and smallmouth bass are the primary sport fishes. Of these species, the fall chinook salmon and steelhead are regionally significant recreational resources.

As discussed in the evaluation of the fisheries resources, the fall chinook salmon is highly prized by anglers for its large size, strength, and high quality of its flesh. The abundance of fall chinook in the Hanford Reach has attracted an abundance of anglers, with an average of 21,000 angling trips per season between 1985 and 1991 (Table 10). The success of these anglers has made the Hanford Reach first and second among mainstem and tributary areas, respectively, of the Columbia River between the Megler-Astoria bridge and Chief Joseph Dam, in sport salmon catch for the last seven years. In that period, the Hanford Reach catch has averaged 34 percent of the total sport harvest of salmon during the primary fall chinook season (August to mid-October).

Table 10: Fall chinook fishery, Hanford Reach, 1985-91 (Washington Department of Fisheries 1993b).

Year	Catch	Est. Angler Trips
1985	14,563	11,060
1986	20,730	25,651
1987	7,645	29,121
1988	6,718	21,228
1989	4,342	19,277
1990	3,570	12,952
1991 (prelim)	3,045	11,104
AVG	**8,659**	**21,056**

The summer-run steelhead trout is almost as heavily fished as the chinook. During the 1985-89 period, there was an average of 19,000 angler trips per season for steelhead. The success of steelhead anglers along the Hanford Reach was sufficient to place the river segment in the top five rivers in all Washington state in steelhead sport catch in 1988-89 (Table 11).

Table 11: Annual steelhead catch, Hanford Reach and McNary reservoir above U.S. Highway 12, 1982-92 (WDW 1993).

Year	Total Catch
1982-83	2,865
1983-84	2,418
1984-85	4,192
1985-86	4,716
1986-87	5,702
1987-88	2,267
1988-89	3,928
1989-90	3,680
1990-91	3,678
1991-92	3,634
AVG	**3,708**

Most fishing occurs within three areas of the Hanford Reach: between Vernita Bridge and Priest Rapids Dam; downstream of the Ringold Hatchery; and in the vicinity of the old White Bluffs ferry landing (Estes 1991; McIntosh 1991) (Map #8). Bass fishing is also popular in the Hanford Reach, although there are no data available on the level of use. The peak bass fishing periods are from mid-June to mid-July, and the backwater sloughs serve as the primary areas for this activity.

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Hunting

Waterfowl Hunting

Waterfowl hunting is the primary hunting activity in the Hanford Reach. Large populations of migratory ducks and geese and resident waterfowl are the major hunting attraction. The abundance of waterfowl and availability of favorable conditions for hunting make the Reach an excellent location for waterfowl hunting and a regionally significant resource.

Downstream of the historic Hanford townsite, hunting opportunities are excellent along the many sloughs and islands which create fine conditions for establishing blinds and setting out decoys. Waterfowl populations are enhanced by the waterfowl sanctuary upstream of the wooden powerline crossing, low recreational usage, and by the presence of open flowing water during the winter months. Waterfowl hunting is allowed only from the wooden powerlines south to the vicinity of north Richland (Map # - recreation map). The river segment north and west of the wooden powerlines to the Vernita Bridge is reserved as a wintering waterfowl sanctuary. Waterfowl hunting seasons typically occur during the fall and winter months.

Upland Hunting and Trapping

Hunting of upland birds (pheasant, chuckar, and quail) and deer also occurs within the Wahluke State Wildlife Recreation Area during the fall hunting seasons. During the 1988-89 deer hunting season, the Ringold and Wahluke Game Management Units accounted for 453 and 173 hunter days, respectively (Map #8) (Washington Department of Wildlife 1989). Beaver, muskrat, mink, and bobcat trapping is practiced in the Wahluke State Wildlife Recreation Area from about mid-November to mid-March. Trapping occurs in the vicinity of wasteways and ponds, and along the Columbia River and its shoreline.

Nonconsumptive Uses

Flatwater Boating

Although much of the boating along the Hanford Reach is related to fishing or waterfowl hunting use, the segment is notable as a flatwater boating reach in its own right. The scenery, wildlife, and opportunities for solitude make the area increasingly attractive for boating recreation. An analysis of flatwater boating rivers throughout Washington, conducted as part of the Pacific Northwest River Study (National Park Service

1986), identified flow and scenery as important features and concluded that the Hanford Reach is an outstanding area for flatwater boating. It is these characteristics that make this recreational activity a regionally significant resource.

Jet and propeller-driven boats use the entire Hanford Reach while non-motorized boats generally stay in the vicinity of the three, primitive river access areas located within the study boundaries: Vernita Bridge, White Bluffs Ferry Landing (east side only), and Ringold Hatchery. Because public access to the shorelines and islands is limited to the high water mark in some areas and no overnight camping is allowed within the Hanford Site, recreational boating is only a day use activity (Map #8). However, the entire river segment could easily be navigated with a canoe or kayak by breaking the trip into two or more consecutive day trips.

The Vernita Bridge primitive boat access area, administered by the WSDFW, is the most popular access area in the Reach. The WSDFW has proposed developing a formal public boat launch at this site to better accommodate users. The remaining two primitive access sites within the study boundaries are on the Wahluke State Wildlife Recreation Area administered through a cooperative agreement by the WSDFW. South of the study area there are developed river access sites close to the Tri-Cities population centers (Map #8).

Nature Observation

The Hanford Reach and surrounding lands provide some of the best opportunities for wildlife viewing in eastern Washington state. Bald eagles, common loons, pelicans, terns, gulls, great blue herons, mule and white tailed, coyotes, and beavers are some of the larger species that may be observed. Bird watching opportunities are optimal during the winter months when the Hanford Reach is visited by wintering and migratory waterfowl. One of the more popular places to view waterfowl is from the primitive dirt road that runs along the north shore of the lower part of the Reach (Map #8) (Kent 1991). Upland scenic views of the river and shrub steppe landscape can be enjoyed from overlooks on the White Bluffs and on top of the Saddle Mountains.

Swimming

Swimming is a seasonal activity that occurs during the hot summer months from approximately Memorial Day to Labor Day. There are no developed beaches or public designated swimming areas within the boundaries of the study area, so people either swim from boats or from the shoreline.

Waterskiing

Like swimming, waterskiing typically occurs during the hot summer months from mid-May to mid-September. Most waterskiing occurs south of the study area in the vicinity of Richland, however skiers do occasionally travel into the Hanford Reach to ski in the area just north of Wooded Island and in the vicinity of the Hanford Dunes (Map #8).

Other Activities

Other recreational activities occur within or adjacent to the Hanford Reach, but the number of participants is relatively small. Some activities, such as off-road motorcycling, artifact collecting, and camping, are illegal and can be detrimental to the landscape and resources. Off-road motorcycle use in the vicinity of the White Bluffs has inflicted considerable damage in certain locations. Artifact collection is an ongoing problem throughout the Hanford Site. Camping is permitted at the Ringold boat launch, but also occurs at times on the shoreline and on some of the islands. The sand dunes are sometimes used by shoreline swimmers (Kent 1990), although this area is officially a no-access area (Estes 1991). Some recreational gold panning may occur along the shoreline and on islands.

Trends

Although there are no specific data on recreational use trends for the Hanford Reach, statewide studies suggest projected trends in recreational use in the area. The principal statewide recreation plan, Washington Outdoors: Assessment and Policy Plan, 1990-1995, indicates that all recreational uses along the Hanford Reach are likely to increase. In many cases, the increase in use outstrips the projected increase in population growth, indicating an increase in per capita participation for certain recreational activities. This is true of visiting interpretive centers and displays, outdoor photography, picnicking, sightseeing and exploring, and nature study and wildlife observation, all of which have projected growth rates of 35% or greater in the period 1987-2000. Other recreational uses which occur in the Hanford Reach area are expected to have more moderate rates of growth, including boating and freshwater fishing.

Hunting upland birds, waterfowl, and large and small game is anticipated to increase in the state, but the rate of growth is less than the anticipated growth in population, indicating a decrease in per capita participation. This is particularly pronounced for hunting upland birds, small game, and waterfowl.

Growth rates for activities in the Hanford Reach area will probably reflect statewide trends to a large extent. Decreases in local hunting use have been reported by WSDFW field personnel (McIntosh, 1991). There are indications that local fishing use may increase faster than statewide trends. The inherent quality of the salmon and steelhead sport fishery on the reach, as indicated by the consistently high ranking of the area in catch rates, would tend to concentrate regional fishing use in the Hanford Reach. The popularity and potential growth of fishing in the reach is reflected in boat registration data from the Washington Department of Licensing, which indicate that the total number of registered vessels in Benton, Franklin, and Grant Counties increased from 8,692 to 11,057 between 1987 and 1990, with an annual increase of at least 8 percent (Table 12).

Table 12: Boat registrations in Benton, Franklin, and Grant Counties, 1987-90 (Washington Department of Licensing 1990).

County	1987	1988	1989	1990
Benton	5,228	5,627	6,026	6,438
Franklin	1,415	1,536	1,593	1,681
Grant	2,049	2,294	2,595	2,938
TOTAL	**8,692**	**9,457**	**10,214**	**11,057**

Enforcement

Enforcement responsibilities are currently shared between the DOE, WSDFW, USFWS, and county sheriffs. Most of the enforcement efforts are directed at protection of fish and wildlife resources and Hanford security. Some activities are currently unregulated (such as boating and guiding) while others are illegal (off-road vehicles, camping, and artifact collecting) but difficult to enforce because of lack of manpower, overlapping enforcement jurisdictions, uncertainty about land use ownership, and the lack of a unified policy.

The WSDFW patrols the entire river on a weekly basis during the spring, summer, and fall and twice a month during the winter (McIntosh 1991). The Wahluke State Wildlife Recreation Area is patrolled by Region 2 (Ephrata office) and Region 3 (Yakima office). The USFWS patrols the river and islands to the vicinity of RM 351 (just north of Wooded Island) (Linehan 1991). Islands south of this area are part of the McNary National Wildlife Refuge. Staff from the Columbia National Wildlife Refuge patrol the Saddle Mountain National Wildlife Refuge. The Benton and Franklin County sheriff offices patrol to the Hanford Dunes on summer weekends (Linehan 1991).

F. SOCIOECONOMIC CHARACTERISTICS

The Columbia River has a considerable impact on the local economies surrounding the Hanford Reach study area. Agriculture is the predominant land use in the counties in which the study area is located (Grant, Franklin, Benton, and Adams), but the economies of each of the four counties are dominated by non-farm industries. Adams county is not discussed because the study area contains approximately 320 acres of land all of which is publicly owned. The nuclear industry is the largest employment sector and contributes the most in terms of payroll to the local economy. The Hanford Site accounts for one-fifth of the total jobs (16,290 of 91,886 in 1991) and $625 million in payroll in Benton, Franklin, and Grant counties. Agriculture is responsible for about one-sixth of the total employment in Benton, Franklin, and Grant counties (13,285 people) and almost $134 million in payroll. The Washington Public Power Supply System is the third largest contributors to payroll, accounting for 1,710 additional workers and contractors in the nuclear energy industry and $71 million in payroll (Table 13). Other major industrial companies employed over 1,400 people. Tourism accounted for 1,900 employees, making it the third largest employment sector.

Table 13: Annual Average Covered Employment and Wages, Benton, Franklin, & Grant Counties, 1991. Source: Employment Security Department, LMEA. (note: "covered" = workers and wages carried under the Federal Employment Security Act under the Department of Labor).

Employer	Employment	Payroll ($million)
DOE & Contractors (Hanford)	16,290	625
WPPSS	1,710	71
Agriculture	13,285	134
Other Major Employers*	25,503	533
Tourism**	1,857	17
Total Primary	58,645	1384
Total Secondary	33,241	650
TOTAL	**91,886**	**2034**

* **Benton County** = Heavy construction, trade contractors, food & kindred products, general merchandise,m food stores, business services, and health services. **Franklin** = food and kindred products, wholesale trade (all), food stores, business services, and health services. **Grant** = food & kindred products, trucking and warehousing, eating and drinking places, health services, local government and wholesale trade (nondurable goods).

** Tourism is defined as hotels and other lodging places and amusement and recreation services.

The secondary employment sector in Benton, Franklin, and Grant counties includes wholesale and retail, transportation, communication, utilities, finance, real estate, and construction industries accounting for nearly 34,000 workers.

Within the Hanford Reach study area, the Hanford Site, WPPSS facilities, hydropower generation, agriculture, and recreation contribute to the overall economy of the surrounding counties.

Nuclear Industry

The focus of the Hanford Site has shifted from nuclear defense and energy research to environmental restoration. The major industrial firms in the Tri-Cities (Westinghouse Hanford, Battelle Northwest, and Washington Public Power Supply System) are all economically tied to this energy industry and the Hanford Site, employing 16,290 people in 1991. Other local firms are involved in the cleanup of the Hanford Site.

The WPPSS oversees the operation of one nuclear generating facility and performs additional functions related to two mothballed incomplete nuclear plants on the Columbia River. WNP-2 is the only nuclear reactor generating electricity at this time. This plant typically generates approximately 9% of the electricity generated for the BPA. BPA supplies approximately 45% of the region's electricity.

Hydroelectric Generation

The Columbia River System hosts one of the most sophisticated and complex hydroelectric systems in the world. This system consists of the Columbia and Snake rivers, in addition to numerous tributaries. This system produces approximately 60% of the electric power consumed by Washington, Oregon, Idaho, and portions of Montana, Wyoming, Utah, Nevada, and California (Grant Co. PUD 10/29/92). Within the United States, the mainstem of the Columbia River supports 11 hydroelectric projects. The Hanford Reach Study Area encompasses a portion of the Priest Rapids Dam project land. The northern boundary of the

Hanford Reach Study Area is river mile (RM) 396 which is one mile south of Priest Rapids Dam and the southern boundary is RM 345 the upper end of the McNary Pool. Under optimum conditions, Priest Rapids Dam contributes approximately 920 Megawatts (MW) of capacity to the Columbia River hydroelectric system. During the years 1988 through 1991, which were below average streamflow years, Priest Rapids average net annual generation was 4,751,000 megawatt-hours (MWH).

Current river operations on the Columbia River take into account diverse interests and a broad spectrum of agencies and river users. This requirement demands an integrated approach to planning and operations among the various user groups. Unlike the large federal and Canadian dams located further upstream, Priest Rapids Dam is considered a "run-of-the-river" dam. For the most part, flows at the dam are determined by the water releases of the larger upstream dams.

Priest Rapids Dam provides power to a wide area of the Pacific Northwest. In addition to Grant County P.U.D., twelve other public and private utilities serving approximately 3.3 million customers in seven western states receive 63.5 percent of the dam's generation or an average of 3.1 million megawatt hours of power. The remaining 36.5 percent of Priest Rapids Dam's generation goes to customers in Grant County. Grant County's economy is based on diversified agriculture, food processing, manufacturing, hydroelectric projects and a strong service sector. The largest source of employment in Grant County is in the food processing sector which employs approximately 1700 people. Energy intensive manufacturing, silicon and chemical products account for another 500 jobs in the county. The economy of Grant County, which lags the economy of many other counties in the state, is tied directly to operation of Priest Rapids Dam.

Agriculture

In a regional context, the Hanford Reach is located in one of Washington's most significant agricultural areas. In 1987, Grant County ranked second in Washington state in the market value of agricultural crops sold, while Franklin and Benton Counties ranked fifth and sixth, respectively (Clements 1989). Numerous types of vegetables, grains, and fruits are grown in these counties.

Prior to the federal acquisition of the Hanford Site during World War II, the area supported more agriculture along the river corridor (Chatters 1989). Today, chiefly because of the 1943 federal acquisition of the Hanford Site, comparatively little land is devoted to agriculture within the 51-mile long, quarter-mile wide study area. The federal Agricultural Stabilization and Conservation Service estimates that there are 774 acres of croplands within the study area, and that the market value of crops grown is approximately three million dollars (Table 14)(ASCS 1993). The majority of croplands are located in the Ringold area, occupying approximately the last eight miles of the study area in Franklin County. Existing agricultural production would not be affected by any protection designation of the Hanford Reach.

Table 14: Crops grown within one quarter-mile of the Columbia River, Hanford Reach study corridor, 1992 (reported to and reviewed by USDA Agricultural Stabilization and Conservation Service, Pasco, Washington 1992).

Crop	Acreage	Value ($)
Cherries	202	1,396,254
Grapes	160	432,000
Apples	189	946,540
Stone fruits	95	298,205
Alfalfa hay	60	30,876
Wheat	35	11,550
Potatoes	16	39,993
Red Clover Seed	17	8,372
TOTAL	**774**	**3,163,790**

The Ringold area is particularly notable among agricultural areas of the Columbia Basin because of the microclimate created by the Columbia River and the White Bluffs. The microclimate features warmer temperatures in winter and cooler temperatures in summer, as well as greater mixing of air (Watson 1989). The microclimate contributes to a lengthened growing season (210 days for Ringold versus 157 days for Prosser) and earlier ripening of stone fruit. As a result, the Ringold area frequently produces the earliest harvests of cherries in Washington state.

While the agricultural land along the Hanford Reach is not irrigated with Columbia Basin Project water, the Project supports a distribution and marketing structure within the region which is important to Ringold growers and to the local economy. The Washington State University Cooperative Extension Service typically uses a "roll-over" factor of 2.5 times the farm gate receipts to estimate the value of agriculture to a county's economy (Whitelatch 1990). Accordingly, crops produced within the Hanford study area would annually generate over five million dollars to the Franklin County economy.

In 1987, there were 3,951 farms in Franklin, Benton, and Grant Counties, accounting for 2.4 million total acres of which 675 thousand were irrigated (Table 15). The total market value of agricultural products sold in these counties was over 660 million dollars.

Table 15: Selected agriculture statistics, Benton, Franklin, and Grant Counties, 1987 (Clements 1989).

	Benton	Franklin	Grant	State
Total land area	1,097,420	795,347	1,702,259	42,567,238
Land in farms	676,837	632,519	1,113,170	16,469,678
Total cropland	448,294	ND	751,875	8,190,984
Irrigated land	137,511	189,236	397,385	1,638,470
Pasture/rangeland	196,896	180,918	306,888	5,028,706
Number of farms	1,296	856	1,799	36,080
Average farm size	522	739	619	456
Foreign owned	200	ND	4,998	424,055

The Hanford Reach study area is located within one of Washington state's major agricultural areas and the Northwest's largest reclamation project, the Columbia Basin Project (Map #10). The Project is presently irrigating 640,000 acres in the Columbia Basin. An additional 7.2 million acres in the Columbia Basin are being cultivated outside of the Columbia Basin Project.

Prior to the DOE's Hanford Site project, some of the lands on the Wahluke Slope, north of the river, were identified for future irrigation development as part of the BR Columbia Basin Project. Some of these lands, approximately 32,000 acres, were eventually incorporated into the Hanford Site as part of a safety and security buffer zone. Bureau of Reclamation lands are subject to a Memorandum of Agreement signed in 1957 (see Appendix K) which states that when these lands are no longer needed as a buffer zone by the DOE, they will be returned to the Bureau of Reclamation for incorporation into the Columbia Basin Project.

With the change of the primary DOE mission from defense production to environmental restoration, the need for the buffer zone has diminished. Currently, these lands are administered by the USFWS and the WSDFW, as areas to provide recreational opportunities and protect wildlife habitat. While these lands remain under the overall management of the DOE, it is likely that the DOE will declare these lands excess to their needs in the near future. Under this scenario, according to the 1957 Agreement, those lands acquired from the Bureau of Reclamation would be returned for inclusion in the Columbia Basin Project. Remaining public domain lands would revert to the Bureau of Land Management. Lands acquired by the DOE in fee would be transferred to the General Services Administration for release through the government excess property disposal process.

Agricultural development of these lands under the Columbia Basin Project is entirely dependent upon the availability of irrigation water and additional funding from Congress. In a letter to the National Park Service from the BR dated 2/17/93 (see Appendix J), it is stated,

> "Unless there are significant changes in National policies and priorities, it appears unlikely that Reclamation would provide irrigation water for lands on the Hanford site within the foreseeable future. Even though there are some valid arguments supporting such a development, there are serious environmental and economic concerns that would need to be addressed prior to Federal involvement."

In addition, the nondevelopment of the Wahluke Slope has no effect on the assessments of nearby farms. The BR states,

> "Construction repayment obligations for any given tract are based on the land classification of the acreage in that tract. The repayment obligation of other landowners would not be affected by a decision regarding development of the Hanford lands. However, it may be possible that a very slight reduction in the average per acre operation and maintenance (O&M) costs could occur if this land proved to be exceptionally inexpensive to serve (which is not anticipated), or if the irrigation district was able to capitalize on economies of scale."

Livestock Grazing

An estimated 23,234 acres of land (1925 animal unit months\AUM's) within the study area is leased by the WSDFW to three permit holders for livestock grazing (Map #10). The grazing seasons currently extend from November 15 to April 15 (9,280 acres, 750 AUMs), March 15 to May 15 (3034 acres, 300 AUMs), and February 1 to April 30 (10,920 acres, 875 AUMs).

In exchange for grazing rights the permit holders are required to pay an annual fee per AUM based on the Fair Market Value derived from the Agricultural Statistics Board. Additionally, the permit holder must pay a 12.84 percent leasehold excise tax on all grazing fees and services to the WSDFW.

A total of 431,860 acres of rangeland are present in Benton and Franklin Counties. This translates to 117,821 AUMs in Benton County and an average of 217,125 AUMs in Franklin County (Table 16). This rangeland is valued at between $9.00 and $12.00 per AUM, while irrigated pasture is valued at between $12.00 and $15.00 per AUM (Sprague 1991).

Table 16: Rangeland acres and animal unit months\AUM's in Benton and Franklin Counties (Sprague 1991).

	Acres	AUMs/Acre	AUMs
Benton County			
Rattlesnake area (Includes Hanford)	55,000	.71	39,050
N. Horse Heaven Hills	38,000	.29	11,020
S. Horse Heaven Hills	124,000	.46	57,040
Remaining areas	21,860	.49(avg)	10,711
TOTAL	238,860	.49	117,821
Franklin County			
TOTAL	193,000	1.125(avg)	217,125

Sharecropping

Eighty-five acres of land within the study area is leased by the WSDFW for agricultural sharecropping. The three leased parcels of land are all located in the southeast corner of the Wahluke State Wildlife Recreation Area (Map #10). These leases produce food and cover for wildlife and manage the land for continued multi-purpose recreation. The lessees are required to provide the WSDFW with between 7 and 10 percent (percentage varies with lease agreement) of the crops grown on leased land, or an equivalent in cash or grain value. Additionally, the lessees are required to pay a leasehold excise tax of 12.84 percent on the fair market value of the crops grown for wildlife when the fair market value exceeds $250. Services provided to the WSDFW that exceed $250 or $20.84 per month are also subject to the tax.

Mineral Resource Exploration and Development

Within the Hanford Site and surrounding vicinity, there is potential for a variety of geologic resources that could be viable for commercial extraction. The study area has abundant economic sources of aggregate (sand, gravel, and quarry stone). Large quantities of crushed stone and fill material have been used at Hanford since the 1940s. The study area has 21 existing gravel pits, including 7 within the southern river corridor, 5 within the northern and eastern river corridor, and 9 north of the corridor. Clay resources are present along the eastern margin of the study area and one pit was developed at Hanford. Pumicite may be present within the study area and at least five pumicite deposits have been developed in the surrounding vicinity. These resources are within hauling range of the Tri-Cities, a major local market. As the population continues to grow in this area, demand for these materials will increase to support construction activities.

The resource with the greatest future economic development potential at Hanford is natural gas. In 1913, the Rattlesnake Hills gas field was discovered. The small, shallow field was developed in 1929 and produced until it was closed in 1941, yielding a total of about 2.5 billion cubic feet of gas. Elevated levels of dissolved gas also occur in groundwater throughout much of the central part of Hanford. Thin coal and carbonaceous shale interbeds within the basalt which occur from intervals between 2,000 and 4,950 feet deep are probably the source of this shallow gas. The coal subbitumous appear to be marginal quality, discontinuous, and are probably too deep and too thin to be economic under foreseeable market conditions.

In the 1950's, renewed interest in oil and gas exploration in the Columbia Plateau led to drilling of two exploratory wells outside of the study area that were unsuccessful (Cushing 1988). Exploration resumed in the 1980s, and more than 10 million acres of lands in the Columbia Basin were leased to oil and gas development companies. Recent deep exploration wells drilled by Shell Oil Company indicate potential for commercial development within and beneath the Columbia River Basalt Group. Shell drilled four, deep, exploration wells to the north and northwest of the study area, and one to the southeast. Gas was present in several of the wells. The Shell BN 1-9 well on Saddle Mountains seven miles west of Hanford had twelve gas zones, two of which yielded 2, 4, and 3.1 million cubic feet of gas per day. To date, no commercially viable gas supplies have been found, and there is no natural gas production in Washington state.

The study area is within a U.S. Geological Survey designated oil and gas play area, with potential for major deposits of gas. Gas might occur within large anticlinal traps, fault traps or stratigraphic traps. Lingley and Walsh (1986) note that trap areas could range from 3,000 to 25,000 acres, and each trap might contain from 40 billion to 1 trillion cubic feet of gas. This could equate to an in-place value of about $1 to 3 billion per

trap, although deposits might be sub-commercial at the low current prices because of the lack of infrastructure, distance to markets and great depth needed for wells.

Even if no oil and gas exploration activity occurs, mineral leasing of the study area could result in annual rentals of up to $240,000 per year. Expenditures for geophysical exploration would be about $200,000 per line. Exploration wells would cost about $12-20 million each. Gas field development costs could range from about $60 to $468 million. Pipeline construction could cost up to $8 million. Revenues from gas production could be substantial, based on a 12.5% royalty, but would depend on the production rate.

The Othello/Beverly local market might support a small, intermittent commercial gravel operation (e.g., averaging 10-50,000 cubic yards/year) within a 30 mile haul distance of the study area. The primary use of the materials would probably be for road construction and maintenance. Sales royalties might be in the range of $5-50,000/year, depending on the fair market value. Larger gravel operations (100,000 + cubic yards/year) might be feasible as the Tri-Cities market grows, or from deposits within 10-20 miles of the Tri-Cities.

There has been no active mineral exploration within the Hanford Site for over fifty years, and no formal evaluation of potential for mineral resources has been prepared for this study and environmental impact statement. Mineral potential might be evaluated as part of a legislative transfer of jurisdiction, or for continuation of withdrawals. Currently, the Hanford Reach study area contains no known outstanding mineral leases.

Recreation/Tourism

The Hanford Reach provides a wide range of recreational activities. Most of these are dependent on or related to the river in some way. Fishing, waterfowl hunting, and boating are the primary recreational uses which draw recreationists from the region to the area. Although there are no specific data on recreational use trends for the Hanford Reach, statewide studies suggest projected trends in recreational use in the area.

The principal statewide recreation plan, Washington Outdoors: Assessment and Policy Plan, 1990-1995, indicates that all recreational uses along the Hanford Reach are likely to increase. In many cases, the increase in use outstrips the projected increase in population growth, indicating an increase in per capita participation for certain recreational activities. This is true of visiting interpretive centers and displays, outdoor photography, picnicking, sightseeing and exploring, and nature study and wildlife observation, all of which have projected growth rates of 35% or greater in the period 1987-2000. Other recreational uses which occur in the Hanford Reach area are expected to have more moderate rates of growth, including boating and freshwater fishing. Hunting upland birds, waterfowl, and large and small game is anticipated to increase in the state, but the rate of growth is less than the anticipated growth in population, indicating a decrease in per capita participation. This is particularly pronounced for hunting upland birds, small game, and waterfowl.

Growth rates for activities in the Hanford Reach area will probably reflect statewide trends to a large extent. Decreases in local hunting use have been reported by WSDFW field personnel (McIntosh, 1991). There are indications that local fishing use may increase faster than statewide trends. The inherent quality of the salmon and steelhead sport fishery on the reach, as indicated by the consistently high ranking of the area in catch rates, would tend to concentrate regional fishing use in the Hanford Reach. The popularity and

potential growth of fishing in the reach is reflected in boat registration data from the Washington Department of Licensing, which indicate that the total number of registered vessels in Benton, Franklin, and Grant Counties increased from 8,692 to 11,057 between 1987 and 1990, with an annual increase of at least 8 percent.

Land Use and Fisheries Regulation

Land Use Regulation

Private lands bordering the Hanford Reach are subject to Franklin, Grant, and Benton county zoning regulations. The majority of this land is in agricultural use, however, existing zoning regulations allow many uses other than agriculture. The following summarizes each of the counties existing zoning regulations and provides a partial list of possible uses.

Lands under the jurisdiction of Franklin county are zoned "agricultural". Besides agriculture and it's related accessory buildings, other allowable uses include single family dwellings (1 dwelling per 5 acre lot), commercial and private stables, riding academies, veterinary clinics, nurseries and greenhouses (Ritchie, 1991). The majority of lands under the jurisdiction of Grant county are zoned "agricultural" with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Under the agricultural zone, allowable uses include single family dwellings, agricultural processing plants, feedmills, packing plants, and warehouses related to agricultural purposes, granges, churches, and on-site hazardous waste treatment and storage facilities. The heavy industrial zone allows automobile assembly plants, breweries, concrete mixing plants, docks, piers, and associated shipping facilities, glass product manufacturing, junkyards, manufacture of wood products, and slaughter houses (Grant County 1988). Lands in Benton county are zoned "unclassified". Allowable uses include mobile homes, all current and energy related uses on the Hanford Site, and all allowable uses under the "agricultural" and "residential" zones, some of which include general farming and accessory buildings, community clubhouses, golf courses, parks and playgrounds, public utility buildings, multiple family dwellings, schools, professional offices, hospitals, and industrial schools.

Growth Management Act

In an attempt to respond to the increasing need to protect important resource values while planning for growth, Washington state enacted the Growth Management Act (GMA) in 1990. Benton, Franklin, and Grant counties are planning under this Act which requires all cities and counties in Washington state to plan how they are to manage growth, specifically, "A basic objective of the legislation is to give guidance and encouragement to local governments throughout the state as they assess their goals for the future in accord with state goals, evaluate their communities' assets, write their plans and policies, and implement them through regulations and innovative techniques to encompass their vision for the future." State goals emphasize conservation of significant timber, agriculture, and mineral resource lands, protection of critical areas, planning coordination among neighboring jurisdictions, consistency of capital and transportation plans with land use plans, and extensive public participation. (An Overview: The Growth Management Act of 1990, Washington State Department of Community Development).

While the GMA provides guidance in how to manage growth, it does not include substantive standards for protection of critical areas. Degrees of protection, adoption of regulations, and their implementation are all subject to the discretion and modification of local governments. While, counties will continue to complete development of regulations for critical areas protection, the success of the Growth Management Act is unknown.

Shoreline Management Act

In 1971, Washington state passed the Shoreline Management Act (SMA) (Chapter 90.58 RCW) in response to citizen demands for "a planned, rational and concerted effort...to prevent the inherent harm in an uncoordinated and piecemeal development of the state's shorelines." (Shorelines of Statewide Significance, Focus Sheet, Washington Department of Ecology, 10/91)

The SMA provides a framework and a uniform set of rules to guide planning and management for all reasonable and appropriate uses of the shorelines of the state. Cities and counties then plan (via shoreline master programs) and regulate (via permits) shoreline development within their jurisdiction. With a few exceptions, there are essentially no pe rformance standards contained in the SMA itself; the SMA contains mostly guidelines.

The geographical extent of shoreline jurisdiction for each city and county is determined by each city and county, within the limits set by the definition of "wetland" in RCW 90.58.030. The state SMA defines wetlands as "those lands extending landward for two hundred feet in all directions as measured on a horizontal plane from the ordinary high water mark; floodways and contiguous floodplain areas landward two hundred feet from such floodways; and all marshes, bogs, swamps, and river deltas associated with the streams, lakes, tidal waters.....". The state also encourages that the 100 year flood plain be included in the definition of a wetland in order to control development. However, whether or not this is included varies from city to county. While Benton County does include the 100 year flood plain in its definition of wetland, Grant and Franklin Counties specifically do not. Developments proposed in the latter two counties for the 100 year floodplain often are allowed as long as they meet the minimum standards established by the Federal Emergency Management Agency (FEMA).

All shoreline permits have to be reviewed by the WDOE, however, the WDOE has limited authority over what it can approve or deny. The WDOE has no authority to approve or deny substantial development permits (about 90% of all shoreline permits). The term "Substantial development" is defined as "any development of which the total cost or fair market value exceeds two thousand five hundred dollars, or any development which materially interferes with the normal public use of the water or shorelines of the state."(Chapter 90.58 RCW, p.3). Note that a wide variety of projects are exempt from the need to obtain a substantial development permit, including but not limited to: single family residences, single family dock construction, and construction activities normal or necessary for farming, irrigation, and other ranching activities. If local government and/or WDOE determines there has been a violation of the SMA than both have the authority to issue enforcement orders and penalties. The WDOE does have the authority to approve, approve with conditions, or deny, conditional use permits and variances, which constitute approximately 10% of shoreline permits (Bales, WDOE, 1993).

Hydraulic Project Approval

The Hydraulic Project Approval (HPA) is the permit administered by the Washington State Department of Fish and Wildlife designed specifically to protect fish and shellfish and their habitat. The purpose of the HPA is to see that needed construction is done in a manner to prevent damage to the state's fishery resource ("So you Want to Work Near the Water", WSDFW). The law which established the HPA process (Revised Code of Washington (RCW) 75.20.100) states that work, construction, development or other activities that will use, divert, obstruct or change the natural flow or bed of any fresh or salt water of the state will require an HPA. The HPA process applies to all activities within the ordinary high water line of fresh waters. The HPA is limited because it's jurisdiction is restricted to the ordinary high water line. Regulation of shoreline and upland development in a manner that sustains productive fish habitat tends to be the jurisdiction of local communities, through their implementation of the State Shorelines Management Act (Willms, 1993). Refer to the above discussion of the Shorelines Management Act.

Fisheries Regulation

Due to the variety of competing uses on the Columbia River, numerous plans and laws have been put forth to try and protect the fisheries resource, particularly the anadromous fish, on the Columbia River. In December 1980, Congress passed the Pacific Northwest Electric Power Planning and Conservation Act. The Act authorized the states of Idaho, Montana, Oregon, and Washington to enter into an interstate compact to create a policy making and planning body for two important Northwest resources - electrical power and the Columbia River Basin's fish and wildlife. The Act authorized the four states to create the Northwest Electric Power and Conservation Planning Council (Council).

The Council's Fish and Wildlife Program calls for the rebuilding of salmon and steelhead runs to the Columbia River as mitigation for losses accrued from hydropower development. The Council has adopted an interim goal of doubling the salmon and steelhead runs from 1976-81 levels of 2.5 million to 5 million adult fish. This rebuilding plan will rely on upriver bright fall chinook as a major component in these efforts. Additionally, a high priority of the Council's Fish and Wildlife Program is to increase naturally spawning populations of salmon and steelhead. A major component is maintenance of an adequate habitat base. For the upriver bright fall chinook, the vast majority of this habitat is located within the Hanford Reach.

The U.S. - Canada Pacific Salmon Interception Treaty of 1985 sets controls on ocean harvests of Columbia River chinook runs, as well as virtually all salmon runs from southeast Alaska to the Oregon coast. Hanford Reach upriver bright fall chinook have been specifically identified through the U.S. - Canada Treaty as a species of particular importance. They have been classified as an indicator stock, to be used to monitor whether the goals of the Treaty are being met. They contribute substantially to the Alaskan and Canadian troll fisheries as well as in-river gillnet and sport fisheries. Reductions in production of these fish affect the equity and balance that has been established by the Treaty. If inadequate numbers of these fish are available for harvest in Alaskan or Canadian fisheries, the United States may be obligated to substitute other stocks to comply with treaty sharing principles.

The Hanford Reach contains usual and accustomed fishing places of Indian Tribes of the region. Indian Tribes have vigorously pursued enhancement and protection of the fisheries resources. Each spring ceremonial salmon are taken from the Reach and each spring their return is recognized and honored by a religious ceremony. The federal government is responsible for upholding treaties it signed with certain Columbia River Indian tribes in 1855. In the treaties the tribes ceded most of their lands, but reserved rights to fish within their reservations and at "all usual and accustomed fishing places ... in common with citizens." Subsequent court cases have consistently upheld these treaty fishing rights. Negotiations between the states, the federal government, and the tribes in the 1983 United States v. Oregon litigation resulted in an agreement whereby certain fall chinook stocks are harvested predominantly by ocean and river non-tribal commercial and sports fishermen, while fish produced in the Hanford Reach are harvested primarily by treaty Indian commercial fisheries.

The Columbia River Fisheries Management Plan (CRFMP) is the negotiated agreement between the United States, the states of Oregon and Washington, and several Columbia River tribes named in the United States v. Oregon legislation. This plan establishes management guidelines for habitat protection, enhancement efforts, hatchery production techniques, escapement levels, and harvest allocation requirements such as season length and bag limits. The CRFMP also states that annual ocean and in-river fishing regimes shall be established by the respective management entities to meet the provisions of the CRFMP.

The Vernita Bar Agreement provides for minimum flow releases below Priest Rapids dam for the protection of the fall chinook salmon spawning area on the Vernita Bar. The agreement was reached in 1988, in settlement of the Vernita Bar Phase of the Mid-Columbia proceedings, and was approved by the Federal Energy Regulatory Commission (FERC) as a condition of the license for the Priest Rapids Dam. The agreement was signed by the Washington Public Utility Districts in Grant, Chelan, and Douglas Counties, Bonneville Power Administration, National Marine Fisheries Service, Washington State Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, Yakama Indian Nation, Umatilla Confederated Tribes, and the Colville Confederated Tribes.

The intent of the Agreement is to hold flows down during the fall (which will limit the area of fall chinook salmon spawning to the lower elevations on the bar), and then to provide sufficient flows during the winter and spring to assure the survival of the eggs and newly hatched fish. Water flows, and thus depths, influence where fish spawn. If flows are high when the fish are spawning, the fish will build their nests, or redds, higher up on the bar. But if flows then drop during incubation or after hatching when the young fish are still in the gravel, these higher redds will dry out, and the eggs and fish die. The Vernita Bar Agreement limits river flow in the fall to 70,000 cubic feet per second, so fish are forced to spawn at the lower sites. During

the winter and spring, through the incubation, post hatch, and emergence periods, sufficient flows are released to keep the redds covered, and thus improve their survival. The post spawning flows are determined annually, based on field surveys that identify when, where, and to what extent spawning has occurred.

While the Vernita Bar Agreement offers critical protection to spawning chinook salmon, their redds, and their progeny from damage due to flow fluctuations, it is important to note the limits to this protection, and understand why the Agreement does not supplant the need for additional measures to permanently protect the Hanford Reach. The Agreement addresses only instream flows, and does not prevent loss or damage to physical habitat. It is geographically limited to the Vernita Bar area, though flow releases will be of benefit downstream. It pertains only to one species of fish (fall chinook salmon), and benefits to other aquatic resources are coincidental. It is in effect only a portion of the year (winter to spring). Finally, it is not permanent. However, annual extensions to the license may be granted and the terms of the Vernita Bar Agreement may be effected. The Vernita Bar Agreement would be renegotiated with any subsequent hydroelectric power license.

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CHAPTER IV
ENVIRONMENTAL CONSEQUENCES

PROPOSED ACTION:
National Wildlife Refuge with National Wild and Scenic River overlay

This alternative would create designations of a National Wildlife Refuge and a National Wild and Scenic River. The refuge would include federal lands currently administered by the U.S. Fish and Wildlife Service (USFWS) and the Washington Department of Wildlife (WSDFW). The National Wild and Scenic River would include the river and its immediate corridor between river miles 396 and 346.5, including private lands. The USFWS would manage the entire area. The DOE would continue to be responsible for site cleanup where hazardous wastes occur, and retain overall management responsibility until the sites are certified clean. Dams would be prohibited. Water resource development projects would be prohibited where they have an adverse impact on resources. The focus of management would be on the protection of all natural and cultural resources, with a particular emphasis on the enhancement of fish and wildlife habitat. Some recreational access points would be improved but not necessarily expanded. Some additional facilities and programs for visitor interpretation would be provided. Development on federal lands within the immediate river corridor would be curtailed, with the exception of those activities related to cleanup of the Hanford Site. Activities conducted by the DOE affecting the river corridor would be subject to review and approval by USFWS.

The following analysis examines proposed management actions which would impact the eleven issues identified as significant to the Hanford Reach. Effects on the resources of the Hanford Reach from Hanford Site cleanup activities will be considered in the Hanford Remedial Action Environmental Impact Statement currently being completed by the DOE and anticipated for release in December 1994.

1) Effects on Fall Chinook Salmon

Of the species that pass through or reside in the Hanford Reach, none is more significant than the fall chinook salmon. The fall chinook are significant commercially because they have excellent flesh quality throughout most of their upstream migration. They are important to the recreational fishery because of their strength, beauty, and size (fall chinook can reach up to 60 pounds). Additionally, the fall chinook salmon have great cultural significance for American Indian tribes. All of these characteristics make them extremely valuable to the ocean troll and in-river net fisheries, American Indian tribes, and sport fishermen. A great majority of the fall chinook passing McNary Dam in recent years are returning to spawn naturally in the Hanford Reach.

Applicable Management Actions:

The following analysis specifically examines those suggested management actions from Chapter II, Alternatives, which are considered to have an impact on fall chinook salmon. Management actions are considered the most reasonable projections based on current information and are subject to the final management plan.

1a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam, proposed in the 1970s by the Army Corps of Engineers (ACOE) at river mile 348 is used as the basis for analyzing potential impacts if a dam were constructed in the Hanford Reach. The proposed dam would have been over 7700 ft. wide and 82

ft. high and created an impoundment that would have extended the entire length of the reach (RM345-396). Almost 50 miles of spawning and rearing habitat which currently accounts for approximately 85% of the total Hanford Reach fall chinook production, would have been inundated by the impoundment and spawning eliminated. Upstream and downstream migration is critical to fall chinook stocks in the Columbia River: approximately 80% of the total adult fall chinook run entering the mouth of the river will return to the Hanford Reach (Geist 1991). In 1987, 90,000 adult fall chinook returned to spawn in the Reach (Geist 1991). The significance of this salmon stock to the Northwest Indian tribes, commercial, and sport fisheries is discussed in detail in Chapter III, Affected Environment, page 98. While salmon returns would continue to fluctuate due to upstream and downstream factors, this alternative would eliminate the threat of future impediments to migration and from fluctuating water levels which are detrimental to eggs and fry through exposure of nest and stranding of anadromous fish (SAI/PMX/DC 1979). In addition, the prohibition on dams would prevent decreased stream temperature fluctuations, reduction in shallow water habitat, and decreased stream velocities in approximately 44 miles of critical rearing habitat. Consequently, there would be a beneficial impact on fall chinook salmon.

1b. Water Resource Development Project Construction

Water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. The intent of this project was to construct a shallow-draft commercial navigation channel through the Reach in order to allow barges and large vessels to travel from Richland to upstream ports. This project would have required the dredging of a 20 mile long channel to a uniform channel depth of 14 ft within the reach. It would have disturbed a substantial amount of spawning habitat, including areas that have large concentrations of spawning redds, and changed the hydraulics of the river with unknown consequences on spawning habitat and use. Fisheries agencies concluded that barge traffic on the river would disturb spawning activity and resulting wakes would increase shoreline and island erosion which would cause siltation of spawning gravels (Washington Department of Fisheries 1987). Approximately 85% of the total Columbia River fall chinook adults are naturally spawning fish which depend on swift currents, cobble, and shallow water (Roler 1991). Even hatchery production of fall chinook is indirectly dependent on these conditions because naturally produced brood stock provide the eggs for the Priest Rapids hatchery. Dredging in the reach would increase the cross section area of the river and would generally result in reduced water velocities for the same amount of river flow. The resulting channelized flow and slower overall velocities between the shore and the edge of the channel could impact spawning and other processes that require fairly rapid flow in the shallow areas. Limitations on water resource development projects would ensure the maintenance of existing conditions on approximately 50 miles of critical spawning habitat within the Hanford Reach and ensure that conditions are favorable for salmon once they return. Consequently, there would be a beneficial impact on fall chinook salmon.

1c. Water Quality Protection

Under this alternative, the level of water quality would be protected within the Hanford Reach through a prohibition on dam construction, limitations on water resource development projects, and controls on development to reduce siltation and other water pollution (for further information on water quality, please refer to, "Effects on Water Quality", page 155). Excellent water quality is critical to salmon spawning and rearing success.Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. Consequently, protection of present water quality levels would have a beneficial impact on fall chinook salmon.

1d. Instream Flow Protection

Under this alternative, the USFWS would continue to evaluate flow requirements for fall chinook salmon and work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. These determinations may be influenced to some degree, yet would not be dictated by the designation of the Hanford Reach as a National Wildlife Refuge and National Wild and Scenic River. The Wild and Scenic River designation would be yet another expression of Congressional intent to protect fall chinook salmon. Maintaining instream flows would allow fall chinook salmon populations to migrate, spawn, and rear in the Hanford Reach. Consequently, there would be a beneficial impact on the fall chinook salmon.

1e. Nuisance Aquatic Macrophyte Control

Under this alternative, the USFWS would make efforts to control nuisance aquatic macrophytes within the Hanford Reach in conformance with a management plan that is developed in accordance with Service and Department of the Interior (DOI) Pest Management Policies and Responsibilities, contained in 30 AM12 and 517 DM1. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flow. Restricted flows in turn, can adversely affect salmon habitat by increasing water temperature and reducing sedimentation transport and oxygen supply, especially in the shallow water areas which salmon prefer (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes, by either chemical or mechanical means, would limit and potentially reduce populations and help protect spawning and rearing habitat. Consequently, fall chinook salmon would not be impacted.

1f. White Bluffs Protection

Under this alternative, the USFWS would limit activities which would contribute to sloughing of the White Bluffs. The USFWS would review its own activities and seek voluntary participation from agencies and individuals to limit activities which contribute to sloughing of the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs. Several significant spawning areas are located immediately below the White Bluffs and sloughing contributes sediments to the river which eventually siltates spawning gravels, making them less desirable for salmon. The rate of sloughing is expected to continue at existing levels, which would continue to impact those spawning areas located directly below the White Bluffs. However, to the extent that management efforts were successful in reducing impacts to the White Bluffs, there would be a beneficial impact on spawning habitat for the fall chinook salmon.

1g. Controls on Development

Under this alternative, the USFWS would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The USFWS would undertake no development which would have adverse impacts to fall chinook salmon spawning and rearing habitat.

The DOE would be able to construct intakes and outfalls and those required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include, but are not limited to, buildings, roads, and groundwater flow barriers or treatment systems which could result in temporary adverse impacts to fishery values. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize impacts to fall chinook salmon spawning and rearing habitat.

In recent years there have been dramatic increases in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area boundary. These type of developments often result in loss of existing wetlands, riparian vegetation, and stream bank integrity. While it is not known how much impact has already occurred, incremental losses such as these diminish fish productivity as well as ecosystem diversity. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to restrictions through existing zoning and voluntary compliance. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

Private lands are included in the Wild and Scenic River designation. The majority of private ownership within the river corridor is near Priest Rapids Dam and in the Ringold area (Grant and Franklin counties). Both of these areas are near or adjacent to important fall chinook salmon spawning areas. The Wild and Scenic Rivers Act does not give the federal government the authority to zone private lands or regulate the use of private property. The USFWS would encourage state and local officials to protect wild and scenic river values on private lands within the corridor. Scenic easements could be acquired as a last resort if state and local actions prove ineffective in protecting fall chinook salmon spawning and rearing habitat. Consequently, there would be a beneficial impact on fall chinook salmon.

1h. Controls on Mining and Mineral Development

Under this alternative, all mining and mineral development on federal lands would be prohibited, except those activities conducted in conformance with a refuge management plan (a possible example would be use of gravel from existing gravel pits to maintain refuge roads). No activities would be allowed unless they are determined to be compatible with the purposes for which the refuge and wild and scenic river are established. On private lands within the Wild and Scenic River designation, the USFWS would review and evaluate mining and mineral development proposals. If proposed development would threaten salmon resources, and existing regulation would permit the activity, the USFWS would consider purchasing an easement to protect salmon resources. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river adjacent to one of the more popular spawning areas (NPS, 1992). Mining and mineral development activities in or near the river would increase river sedimentation and/or introduce toxic materials into the river, both of which adversely affect water quality and damage salmon spawning areas. Consequently, the limitations on mining and mineral development would have a beneficial impact on fall chinook salmon.

1i. Controls on Agricultural Use

Under this alternative, the USFWS would evaluate the effects of sharecropping on 85 acres of federal land currently managed by the WSDFW. Continuation of sharecropping would depend upon whether existing agriculture benefits wildlife. Existing sharecropping practices have not had an impact on water quality which could potentially impact salmon habitat. On private lands, approximately 800 acres are used for agricultural purposes within the corridor designated as a Wild and Scenic River (ASCS 1993). Existing agricultural practices have not been shown to have an adverse impact on water quality. While chemical runoff and siltation can affect water quality, there is no evidence to date that existing agricultural activities are affecting water quality within the study area. With a lack of projected increase in agricultural use within the study area, impacts on water quality are not anticipated. As a result, limited management actions proposed are not expected to have any impact on fall chinook salmon.

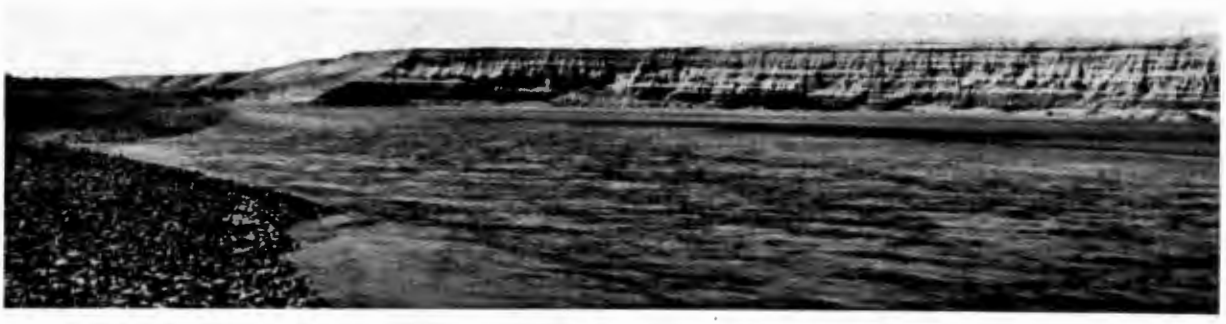
1j. Controls on Grazing

Under this alternative, the USFWS would reevaluate grazing use and determine through its management planning process whether grazing could benefit wildlife. Grazing would be terminated in proximity to the river where it could impact water quality as well as where it does not have wildlife benefits. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity also impact upland habitats by loosening soils and creating tracks which hasten erosion and increase sedimentation to the river. It is anticipated that the amount of land currently grazed would be reduced. Consequently, grazing activity at current or reduced levels is not expected to have an adverse impact on fall chinook salmon.

CUMULATIVE IMPACT

Fall chinook salmon populations along with other anadromous fish have been drastically reduced in the Northwest, particularly in the Columbia River system. A number of factors have contributed to this reduction including the construction of dams, over harvest, siltation of spawning beds and runoff from agricultural practices and developments along the Columbia River. Dams in particular have destroyed or damaged most historic spawning areas. Recognition of these threats has led to state, federal, and international actions to protect spawning and rearing habitat, regulate harvest, and manage instream flows. In the foreseeable future, additional impacts from agriculture uses and water resource development projects are expected to increase and further threaten fall chinook salmon populations as well as remaining spawning areas.

The Proposed Action would help protect the aquatic habitat of the Hanford Reach vital to fall chinook spawning. This action would augment and be consistent with ongoing activities to protect and enhance anadromous fish stocks throughout the Northwest.



2) Effects on Cultural Resources

The cultural resources of the Hanford Reach include archaeological and historic sites. Archaeological and historical sites within the Hanford Reach are generally intact because public access has been restricted to the Hanford Site since 1943. Among the most important American Indian cultural resources are ancestral cemeteries or burial grounds, usual and accustomed fishing sites, sites for current practice of traditional Indian religion, anadromous fisheries, subsistence and medicinal plants, and old homesites and place names. Many of the historical sites along the Hanford Reach are significant and are identified in the historical records.

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on cultural resources. Management actions are considered the most reasonable projections based on current information and are subject to the final management plan.

2a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the Army Corps of Engineers at river mile 348 is the basis for a likely scenario of potential impacts should a dam be constructed in the Hanford Reach. Studies of the Ben Franklin Dam indicated that the project would have inundated two National Register sites, four archaeological districts, and 122 prehistoric archaeological sites (Rice 1980). The prohibition on dams would prevent inundation and disturbance from construction of access roads, utility corridors, and other related facilities. Consequently, there would be a beneficial impact to cultural resources.

2b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. A large number of archaeological sites are located within or along the banks of the river. Channel dredging would have varying impacts on cultural resources depending on the location of the dredging, the placement of dredge spoils, and the potential for erosion of sites from increased stream velocities and barge-generated wakes. Consequently, limitations on water resource development projects would prevent potential impacts and have a beneficial impact on cultural resources.

2c. Controls on Development

Under this alternative, the USFWS would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The USFWS would undertake no development which would have adverse impacts to cultural resources. All development would be subject to Section 106 of the National Historic Preservation Act in an attempt to minimize disturbance of archaeological sites. If cultural sites are discovered during development, efforts would be made to recover or salvage artifacts.

The DOE would be able to construct intakes and outfalls and required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include, but not be limited to, buildings, roads, and groundwater flow barriers or treatment systems which could result in temporary adverse impacts to cultural resources. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize such impacts

(see Effects on DOE Activities, "Controls on Development", page 165). All development would be subject to Section 106 of the National Historic Preservation Act in an attempt to minimize disturbance of archaeological sites. If cultural sites are discovered during development, efforts would be made to recover or salvage artifacts.

In recent years there have been dramatic increases in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area. These type of developments have had an adverse impact on cultural resources through disturbance of sites. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to developmental restrictions through existing zoning and voluntary compliance. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

Private lands are included in the Wild and Scenic River designation. The majority of private ownership within the river corridor is near Priest Rapids Dam and in the Ringold area (Grant and Franklin counties). The Wild and Scenic River designation does not give the federal government the authority to zone private lands or regulate the use of private property. The USFWS would encourage state and local officials to protect wild and scenic river values on private lands within the corridor. Scenic easements could be acquired as a last resort if state and local actions prove ineffective in protecting cultural resources. Consequently, there would be a beneficial impact on cultural resources.

2d. Controls on Mining and Mineral Development

Under this alternative, all mining and mineral development on federal lands would be prohibited, except those activities conducted in conformance with a refuge management plan (a possible example would be use of gravel from existing gravel pits to maintain refuge roads). No activities would be allowed unless they are determined to be compatible with the purposes for which the refuge and wild and scenic river are established. On private lands within the Wild and Scenic River designation, the USFWS would review and evaluate mining and mineral development proposals. If proposed development would threaten cultural resources, and existing regulation would permit the activity, the USFWS would consider purchasing an easement to protect cultural resources. In 1992, a proposal was pursued to placer mine for gold within 1/4 mile of the river (NPS 1992). Mining and mineral development activities could damage or destroy cultural resource sites through direct disturbance of the ground and/or exposure of the sites to erosion or vandalism. Consequently, the limitations on mining and mineral development would have a beneficial impact on cultural resources.

2e. Controls on Agricultural Use

Under this alternative, the USFWS would evaluate the effects of sharecropping on 85 acres of federal land currently managed by the WSDFW. Continuation of sharecropping would depend upon whether existing agriculture benefits wildlife. Existing sharecropping practices have not had an impact on cultural resources. On private lands, approximately 800 acres are used for agricultural purposes within the corridor designated as Wild and Scenic River (ASCS 1993). Although private lands within the study area have not been formally

surveyed for cultural resources, the existence of cultural resources on federal lands in proximity to the river is a strong indicator that cultural resources may exist on private lands. Cultural sites can be impacted by agricultural activities, primarily by the cultivation of new previously undisturbed areas. If a change in existing agricultural practices threatens cultural resources, the USFWS may consider purchasing an easement to protect cultural resources. Consequently, there could be a beneficial impact on cultural resources.

2f. Controls on Grazing

Under this alternative, the USFWS would reevaluate grazing use and determine through its management planning process whether grazing could benefit wildlife. Grazing would be terminated where it could impact cultural resources. An estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity impact upland habitats by loosening soils and creating tracks which hasten erosion which could expose and trample vulnerable cultural resource sites. It is anticipated that the amount of land currently grazed would be reduced. Consequently, grazing activity at current or reduced levels is not expected to have an adverse impact on cultural resources.

2g. Control of Wildfire

Under this alternative, a federally guided, multi-agency wildfire suppression program would be maintained. The USFWS is responsible for suppressing fires on refuges and each refuge has fire fighting capabilities. When needed, the USFWS can call on the U.S. Forest Service to obtain fast response using spotter aircraft and aerial retardant drops to assist with fire control, a resource not available to local county fire districts. When incident command teams work on refuges, the land manager determines which fire fighting methods are acceptable based on the resources affected. In bad fire years, wildfires sometimes exceed 1,000 acres or more within the study area. The last large fire was in 1993 when over 12,000 acres were burned. In other years, wildfires tend to range between 5-20 acres depending on the quickness of the response.

Presently, fire control effectiveness is limited because most wildfire response is provided within the limitations of the local volunteer county fire districts which are not familiar with the cultural resources of the area, because federal agencies do not have management responsibility for that part of the study area managed by the state, and because present management of Saddle Mountain National Wildlife Refuge does not provide staffing specifically for that area. With increased refuge staffing under this proposal and improved refuge direction of the fire suppression program, there would be less likelihood of fire posing a threat to cultural resources because of more sensitive fire suppression techniques, i.e. no clearing of fire lines with bulldozers or tractor/disc equipment in cultural resource significant areas. Consequently, there would be less potential for impact to cultural resources.

2h. Interpretation and Education Activities

The USFWS would provide interpretation of cultural values and public outreach. Efforts would specifically include development of interpretative displays and leaflets, tours and programs with refuge staff, and increased law enforcement to help provide information. This program would increase public understanding of the significance of archaeological sites and sanctions on site disturbance and decrease the incidence of site vandalism and unauthorized collecting. Consequently, there would be a beneficial impact on cultural resources.

2i. Inventory and Survey Activities
Under this alternative, cultural resource inventories and surveys would be conducted by the USFWS in compliance with Sections 110 and 106 of the National Historic Preservation Act. Archaeological surveys would be conducted to augment the inventory of sites along the river pursuant to the refuge management plan. Consequently, better knowledge of resource location would reduce inadvertent damage and have a beneficial impact on cultural resources.

2j. Law Enforcement Actions
Under this alternative, patrols would be increased. Increases in patrols would support enforcement of the laws and regulations which prohibit trespass and unauthorized off-road vehicle use and reduce existing problems. Additional regulations may be proposed following development of the refuge management plan. Vandalism of significant cultural resource sites in the Hanford Reach continues to occur from unauthorized access and off-road vehicle use. Off-road vehicle use not only makes cultural resource sites more accessible, but their use can directly destroy these resources. The majority of damage to cultural resource sites is from those who collect artifacts as a hobby (Chatters 1992). With increases in patrols, it is anticipated that there would be a beneficial impact on cultural resources.

CUMULATIVE IMPACT

Once inhabited by various American Indian tribes and early settlers, the Hanford Site contains important archaeological, cultural, and historic resources. Regionally, these resources continue to be threatened by mining activities, development, vandalism, and agricultural practices. In the foreseeable future these threats are expected to continue, which will result in the loss of additional cultural resources.

The Proposed Action would assure continued federal protection of cultural resource sites within the Reach through 1) increased and improved enforcement of regulations, 2) reduced disturbances from disruptive land management practices, and 3) a more aware, sensitive refuge user. This would help protect the historical record and the resources important to the continuation of American Indian culture.

3) Effects on Biodiversity

The Hanford Reach features several types of habitat which are declining in area and quality along the mainstem Columbia River, such as the aquatic habitat of the free-flowing river, riverine shoreline habitat, riparian habitat along the river banks, bluff habitat of the White Bluffs, upland shrub-steppe communities, and the various lakes and wetlands located primarily on the Wahluke Slope. The aquatic, riverine, and riparian habitats, once abundant on the mainstem river, have been lost to dam construction and inundation of free-flowing segments. The White Bluffs are a unique geological feature comprised of claystones and siltstones which line approximately 31 miles of the river and are inherently rare as a habitat type. The shrub-steppe habitat along the Hanford Reach is a remnant of the plant communities that historically covered vast areas of the Columbia Basin. Also, lake and wetland habitat areas that have developed in the arid shrub-steppe along wasteways, returning irrigation water to the river, have become very important to wildlife. Consequently, the variety and integrity of habitat types along the Hanford Reach is of regional significance.

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on biodiversity. Management actions are considered the most reasonable projections based on current information and are subject to the final management plan.

3a. Dam Construction

Under this alternative, dams would be prohibited. Prohibition on dam construction would prevent impoundment of the last free-flowing non-tidal segment of the Columbia River. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. This project would have inundated approximately 11,500 acres of riparian lands which provides essential habitat for approximately 250 deer, 10,000 upland game birds, and 318,000 waterfowl (U.S. Army Corps of Engineers, 1979). In addition, almost 50 miles of free-flowing river would have been inundated, with a loss in native aquatic habitat and species. Such impacts might include an increase in water temperatures over natural conditions, alteration of the species composition of plant communities that currently exist on the cobble substrates, an increase in sedimentation, inundation of as many as fifteen river islands (1660 acres), inundation of all existing riparian vegetation (1260 acres), and a reduction in shallow water habitat (U.S. Army Corps of Engineers 1980). The prohibition on dams would prevent disturbance of aquatic, riverine, and riparian habitats and minimize habitat-related declines in existing populations of native plants, fish, and wildlife. Consequently, there would be a beneficial impact on biodiversity.

3b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a water resource development project. This project would have increased erosion of riverine and riparian habitats, inundated nesting areas for colony nesters, Canada geese, long-billed curlews, and waterfowl, and increased disturbance by allowing large vessels and barges to travel close to river islands (U.S. Fish and Wildlife Service 1988). Impacts would be particularly acute for wintering waterfowl, which number in the tens of thousands on the Hanford Reach (actual daily waterfowl counts for November through January, 1986-1990, were between 25,000-93,000). Dredging would disturb river sediments which might contain contaminants that could subsequently degrade water quality and affect aquatic and riverine habitats. Limitations on water resource development projects would prevent disturbance of aquatic, riverine, and riparian habitats and minimize habitat-related declines in existing populations of native plants, fish, and wildlife. Consequently, there would be a beneficial impact on biodiversity.

3c. Water Quality Protection

Under this alternative, the level of water quality would be protected within the Hanford Reach through controls on development to reduce siltation and other water pollution, a prohibition on dam construction, and limitations on water resource development projects (for further information on water quality, please refer to, "Effects on Water Quality", page 155). Excellent water quality supports viable riverine and riparian habitats and those species dependent on these habitats. Surface water sampling stations indicate that the

Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. In addition to the river, upland lakes and wetlands provide important habitat for migratory waterfowl and other water dependent species. Consequently, this alternative is expected to have a beneficial impact on biodiversity because the USFWS would not allow activities which are considered detrimental to water quality.

3d. Instream Flow Protection

Under this alternative, the USFWS would continue to evaluate flow requirements to support riverine and riparian habitats and the species dependent on these habitats. The USFWS would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. These determinations may be influenced to some degree, yet would not be dictated by the designation of the Hanford Reach as a National Wildlife Refuge and National Wild and Scenic River. The Wild and Scenic River designation would be yet another expression of Congressional intent to protect species dependent on riverine and aquatic habitats. Consequently, there would be a beneficial impact on biodiversity.

3e. Nuisance Aquatic Macrophyte Control

Under this alternative, the USFWS would make efforts to control nuisance aquatic macrophytes within the Hanford Reach in conformance with a refuge management plan that is developed in accordance with Service and Department of the Interior (DOI) Pest Management Policies and Responsibilities, contained in 30 AM12 and 517 DM1. Eurasian milfoil, an introduced species, is most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows, in turn, can adversely affect aquatic and riverine habitat by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes, by either chemical or mechanical means, would limit and potentially reduce populations and protect aquatic and riverine habitats. Consequently, there would be a beneficial impact on biodiversity.

3f. White Bluffs Protection

Under this alternative, the USFWS would limit activities which would contribute to sloughing of the White Bluffs. The USFWS would review its own activities and seek voluntary participation from agencies and individuals to limit activities which contribute to sloughing of the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs. The bluffs provide important nesting habitat for species including but not limited to cliff swallows, great horned owls, red-tailed hawks, and say's phoebe. The rate of sloughing is expected to continue at existing levels which would continue the gradual erosion of the White Bluffs. However, to the extent that management efforts were successful in reducing impacts to the White Bluffs, there would be a beneficial impact on biodiversity.

3g. Non-Native Vegetation Control

Under this alternative, the USFWS would make efforts to control the spread of non-native vegetation as provided in a refuge management plan. Non-native vegetation is both a cause and effect of disturbance of native habitats. The disturbance of native habitats leads to the establishment of non-native vegetation. Existing non-native vegetation in the study area consists of Russian olive trees (dispersed over approximately 500 acres), salt cedar (dispersed over approximately 100 acres), purple loosestrife (dispersed over approximately 10 acres), and common white mulberry trees, which are scattered along the banks of the river (Goeke 1991, Rickard 1992). Salt cedar, purple loosestrife, and Russian olive have demonstrated their

ability to rapidly invade wetlands, outcompete and displace native species, greatly reduce the value of wetlands as wildlife habitat, and decrease biodiversity. In addition, the presence of these plants create a seed source for movement to other land (Noxious Weed Control Board of Grant County, 1992). Non-native vegetation would be retained where it provides benefits to wildlife (i.e. nesting sites). The selected management of non-native vegetation through either removal or retention, would have a beneficial impact on biodiversity.

3h. Revegetation of Disturbed Areas

Under this alternative, revegetation of disturbed areas using native plant species would occur pursuant to the refuge management plan. Approximately 3200 acres along the Benton County shoreline of the reach are disturbed (L. Fitzner 1991) and could be reseeded with native plant species. Specific native species to be used for revegetation would be identified in the management plan. Reclamation of existing gravel pits and revegetation with native plant species could reduce non-native plants and restore habitat in these areas. Revegetation of disturbed areas with native species in riparian and shrub-steppe habitats would enhance the diversity and abundance of endemic plant and animal species and would have a beneficial effect on biodiversity.

3i. Control of Wildfire

Under this alternative, a federally guided, multi-agency wildfire suppression program would be maintained. The USFWS is responsible for suppressing fires on refuges and each refuge has fire fighting capabilities. When needed, the USFWS can call on the U.S. Forest Service to obtain fast response using spotter aircraft and aerial retardant drops to assist with fire control, a resource not available to local county fire districts. When incident command teams work on refuges, the land manager determines which fire fighting methods are acceptable based on the resources affected. In bad fire years, wildfires sometimes exceed 1,000 acres or more within the study area. The last large fire was in 1993 when over 12,000 acres were burned. In other years, wildfires tend to range between 5-20 acres depending on the quickness of the response.

Presently, fire control effectiveness is limited because most wildfire response is provided within the limitations of the local volunteer county fire districts which are not familiar with the natural resources of the area, because federal agencies do not have management responsibility for that part of the study area managed by the state, and because present management of Saddle Mountain National Wildlife Refuge does not provide staffing specifically for that area. With increased refuge staffing under this proposal and improved refuge direction of the fire suppression program, there would be less likelihood of fire posing a threat to upland habitats. Consequently, there would be less potential for impact to biodiversity.

3j. Controls on Development

Under this alternative, the USFWS would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The USFWS would undertake no development which would have adverse impacts to riverine and aquatic habitats.

The DOE would be able to construct intake and outfalls and required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include, but are not limited to, buildings, roads, and groundwater flow barriers or treatment systems. Construction of these type of facilities may result in impacts to riverine and aquatic habitats, particularly localized and temporary siltation and potential chemical and radiological releases. All cleanup activities would be reviewed on the

basis of potential environmental impacts and every attempt would be made by the DOE to minimize such impacts (see Effects on DOE Activities, "Controls on Development", page 165).

In recent years there have been dramatic increase in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area boundary. These type of developments often result in increased sediments to the river and displaced wildlife populations due to a reduction in habitat and reduced native vegetation. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to restrictions through existing zoning and voluntary compliance. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

Private lands are included in the Wild and Scenic River designation. The majority of private ownership within the river corridor is near Priest Rapids Dam and in the Ringold area (Grant and Franklin counties). The Wild and Scenic Rivers Act does not give the federal government the authority to zone private lands or regulate the use of private property. The USFWS would encourage state and local officials to protect wild and scenic values on private lands within the corridor. Scenic easements could be acquired as a last resort if state and local actions prove ineffective in protecting riverine, aquatic, and riparian habitats. Consequently, there would be a beneficial impact on biodiversity.

3k. Controls on Mining and Mineral Development

Under this alternative, all mining and mineral development on federal lands would be prohibited, except those activities conducted in conformance with a refuge management plan (a possible example would be use of gravel from existing gravel pits to maintain refuge roads). No activities would be allowed unless they are determined to be compatible with the purposes for which the refuge and wild and scenic river are established. On private lands within the Wild and Scenic River designation, the USFWS would review and evaluate mining and mineral development proposals. If proposed development would threaten important habitats, and existing regulation would permit the activity, the USFWS would consider purchasing an easement to protect the native species. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river (NPS, 1992). Mining and mineral development activities within the designation boundaries could damage or destroy sensitive terrestrial or aquatic habitat areas that are declining in both area and quality along the mainstem Columbia River. In the case of sensitive species of plant or animals with severely restricted habitat requirements, this could be particularly damaging, going even so far as to extirpate them from the local area. Consequently, the limitations on mining and mineral development would have a beneficial impact on biodiversity.

3l. Controls on Agricultural Use

Under this alternative, the USFWS would evaluate the effects of sharecropping on 85 acres of federal land currently managed by the WSDFW. Continuation of sharecropping would depend upon whether existing agriculture benefits wildlife. Habitat destruction from existing sharecropping practices has already occurred. On private lands, approximately 800 acres are used for agricultural purposes within the corridor designated Wild and Scenic River (ASCS 1993). Within the Wild and Scenic River designation, a change in

existing agricultural practices that threaten the significant habitats of the Hanford Reach may result in acquisition of an easement to protect biodiversity. Consequently, there would be a beneficial impact on biodiversity.

3m. Controls on Grazing

Under this alternative, the USFWS would reevaluate grazing use and determine through its management planning process whether grazing could benefit wildlife. Grazing would be terminated in proximity to the river where it could potentially impact riverine and aquatic habitats as well as where it does not have wildlife benefit. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing. It is anticipated that the amount of land currently grazed would be reduced. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity impact upland habitats by loosening soils and creating tracks and channels which hasten erosion. In addition, where placed in high densities, cattle trample and consume native plants which are often then replaced with non-native species. Comparative USFWS studies involving grazed and ungrazed portions of the study area have shown that there is greater abundance and diversity of wildlife on ungrazed shrub-steppe lands (Radke, 1987). The limitation on grazing would eliminate any further damage to upland and riparian habitats and consequently have a beneficial effect on biodiversity.

3n. Law Enforcement Actions

Under this alternative, patrols would be increased. Additional regulations may be proposed following development of management plan. Trespass and off-road vehicle use in sensitive habitat areas results in various impacts, specifically, increased incidences of wildfires, littering, disturbance to rare plants and flowers, and harassment of nesting and resting wildlife. Off-road vehicle use has already resulted in damage to upland and riparian habitats, with the majority of damage occurring on the steep slopes near Ringold, and harassment of wildlife. Restrictions on public access in sensitive habitat areas and increased patrols would decrease trespass and disturbance of native species and, consequently, have a beneficial effect on biodiversity. In addition, increased patrols would assist in the detection of wildfires which can destroy sensitive habitats and is expected to have a significant benefit on biodiversity.

CUMULATIVE IMPACT

In the past, the natural array of habitats throughout the Columbia Basin supported a diverse biota. This biodiversity has been altered by habitat destruction due to a variety of activities including construction of dams, grazing, agricultural, residential and commercial developments and introduction of non-native species.

Establishment of the Hanford Site for nuclear defense production removed the Hanford Reach, the last free-flowing stretch of the Columbia River, from private development. It also resulted in the Hanford Site becoming an island of shrub-steppe habitat surrounded by intensely developed modern agricultural areas. In the foreseeable future, pressures for agricultural, residential, and commercial developments are expected to increase and further threaten biodiversity.

The Proposed Action would formally provide permanent protection for the existing biodiversity of the Columbia Basin. This action would be consistent with and augment other local, state, federal, and international activities which protect biodiversity through land acquisition, legislation, and environmental regulation.

4) Effects on Endangered, Threatened, Candidate, and Sensitive Species

The Hanford Reach is unique as it is one of the last stronghold of many of the Pacific Northwest's most endangered, threatened, and sensitive wildlife species. At least 48 of these species are within the proposed National Wildlife Refuge and National Wild and Scenic River boundary and are either classified as federal endangered, threatened, candidate, or sensitive species, and/or state threatened, endangered, or species of concern.

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on endangered, threatened, candidate, and sensitive species. Management actions are considered the most reasonable projections based on current information and are subject to the final management plan.

4a. Dam Construction

Under this alternative, dams would be prohibited. The prohibition on dams would prevent the severe alteration of the aquatic and riverine habitat of the Hanford Reach which threatened and endangered species depend upon. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. This project would have significantly altered the aquatic habitat and flow regime of the Hanford Reach. The Columbia pebblesnail, a federally listed candidate species, relies on clean, well-oxygenated, and swiftly moving water to meet respiration requirements, all of which would be eliminated if a dam were constructed (U.S. Fish and Wildlife Service 1988). The riverine habitat for the persistentsepal yellowcress and Columbia milkvetch plant populations, both federally listed candidate species, would be destroyed. The common loon, a federally listed sensitive species, and the white pelican, considered endangered by the state, depend on riverine habitat for nesting, cover, and feeding, all of which would be impacted if a dam were constructed. The prohibition on dams would help maintain the existing quality of aquatic, riverine, and shallow water habitats of the Hanford Reach. This would have a beneficial impact on the above mentioned threatened and endangered species and result in consequent species stabilization or even potential increases in populations and delisting. In addition, the prohibition on dams would protect habitat for salmon, an important winter food source for bald eagles, a federally listed threatened species (for further information, a detailed discussion is located under this alternative, "Effects on Fall Chinook Salmon", page 134).

4b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on the resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have increased erosion of riverine and riparian habitats and increased disturbance by allowing large vessels and barges to travel close to river islands resulting in the reduction of listed and candidate species which are dependent on these habitats (U.S. Fish and Wildlife Service 1988). The common loon, a federally listed sensitive species, and the white pelican, considered endangered by the state, depend on riverine habitat for nesting, cover, and feeding, all of which could be impacted if water resource development projects were to occur in sensitive habitat areas or were to affect such areas. In addition, limitations on water resource development projects would protect spawning and rearing habitat for salmon, an important winter food source for bald eagles, a federally listed threatened species (for further information, a detailed discussion is located under this alternative, "Effects on Fall Chinook Salmon", page 134).

4c. Water Quality Protection

Under this alternative, the level of water quality would be protected through controls on development to reduce siltation and other water pollution, a prohibition on dam construction, and limitations on water resource development projects (for further information on water quality, please refer to, "Effects on Water Quality", page 155). Excellent water quality supports viable riverine and riparian habitats and those species dependent on these habitats. Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. In addition to the river, upland lakes and wetlands provide important habitat for migratory waterfowl which are also prey for bald eagles and peregrine falcons, federally listed threatened and endangered species, respectively. Consequently, this alternative is expected to have a beneficial impact on threatened and endangered species because the USFWS would not allow activities which are considered detrimental to water quality.

4d. Instream Flow Protection

Under this alternative, the USFWS would continue to evaluate flow requirements to support existing aquatic and riverine habitats for the persistentsepal yellowcress, Columbia milkvetch, and the Columbia pebblesnail, all of which are federally listed candidate species; the sandhill crane, a federally listed sensitive species, and the white pelican, considered endangered by the state. The USFWS would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. These determinations may be influenced to some degree, yet would not be dictated by the designation of the Hanford Reach as a National Wildlife Refuge and National Wild and Scenic River. The Wild and Scenic River designation would be yet another expression of Congressional intent to protect species dependent on riverine and aquatic habitats. Consequently, there would be a beneficial impact on threatened and endangered species.

4e. Nuisance Aquatic Macrophyte Control

Under this alternative, the USFWS would make efforts to control nuisance aquatic macrophytes within the Hanford Reach in conformance with a refuge management plan that is developed in accordance with Service and Department of the Interior (DOI) Pest Management Policies and Responsibilities, contained in 30 AM12 and 517 DM1. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows, in turn, can adversely affect aquatic habitat by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes by either chemical or mechanical means would limit and potentially reduce populations and protect aquatic habitat which supports the Columbia pebblesnail, a federally listed candidate species. Consequently, there would be a beneficial impact to threatened and endangered species.

4f. White Bluffs Protection

Under this alternative, the USFWS would limit activities which would contribute to sloughing of the White Bluffs. The USFWS would review its own activities and seek voluntary participation from agencies and individuals to limit activities which contribute to sloughing of the White Bluffs. The White Bluffs are a unique geological feature comprised of claystones and siltstones which line approximately 31 miles of the Hanford Reach. The White Bluffs provide predator-free roost sites and foraging essential to maintaining large numbers of wintering bald eagles and peregrine falcons, both of which are federally listed as threatened and endangered species, respectively. The Bluffs also provide an important microclimate which

assists large raptors with thermoregulation and allows them to minimize energy loss. It is beneficial to have this geological formation in proximity to food and water. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs and the continuation of sloughing could result in the eventual loss of bluff habitat. The rate of sloughing is expected to continue at existing levels, which may result in the loss of individual bald eagle and peregrine falcon nesting sites. However, to the extent that management efforts were successful in reducing impacts to the White Bluffs, there would be a beneficial impact on threatened and endangered species.

4g. Non-Native Vegetation Control

Under this alternative, the USFWS would make efforts to control the spread of non-native vegetation as provided in a refuge management plan. Non-native vegetation is both a cause and effect of disturbance of native habitats. Existing non-native vegetation in the study area consists of Russian olive trees (dispersed over approximately 500 acres), salt cedar (dispersed over approximately 100 acres), purple loosestrife (dispersed over approximately 10 acres), and common white mulberry trees which are scattered along the banks of the Hanford Reach (Goeke 1991; Rickard 1992). Ferruginous hawks have been noted to nest in Russian olive trees, however, removal of these trees should have little impact because other nest sites are available. Removal of Russian olive trees may benefit ferruginous hawks by removing potential black-billed magpie nest sites. Black-billed magpies are a potential avian predator (Hill 1992). Removal of the common white mulberry trees may benefit the persistentsepal yellowcress because the trees grow along the edge of the river, particularly in the gravel beaches, which support this rare plant species. Non-native vegetation would be retained where it provides benefits to threatened and endangered species (i.e. nesting sites). Consequently, with the exception of the persistentsepal yellowcress, the selected management of non-native vegetation through either removal or retention, would have a beneficial impact on threatened and endangered species.

4h. Revegetation of Disturbed Areas

Under this alternative, revegetation of disturbed areas with native plant species would occur pursuant to the refuge management plan. Approximately 3200 acres along the Benton County shoreline of the reach are disturbed (L. Fitzner 1991) and could be reseeded with native plant species. Shrub-steppe habitat provides hunting areas and prey for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species, respectively. Revegetation of disturbed shrub-steppe areas with native species could enhance the diversity and abundance of endemic plant and animal species. Reclamation of existing gravel pits and revegetation with native plant species could reduce non-native plants and restore habitat in these areas. Shrub-steppe also provides habitat for sage grouse, pygmy rabbit, and loggerhead shrike, all federally listed candidate species. Consequently, revegetation of disturbed areas would have a beneficial impact on threatened and endangered species.

4i. Control of Wildfire

Under this alternative, a federally guided, multi-agency wildfire suppression program would be maintained. The USFWS is responsible for suppressing fires on refuges and each refuge has fire fighting capabilities. When needed, the USFWS can call on the U.S. Forest Service to obtain fast response using spotter aircraft and aerial retardant drops to assist with fire control, a resource not available to local county fire districts. When incident command teams work on refuges, the land manager determines which fire fighting methods are acceptable based on the resources affected. In bad fire years, wildfires sometimes exceed 1,000 acres or more within the study area. The last large fire was in 1993 when over 12,000 acres were burned. In other years, wildfires tend to range between 5-20 acres depending on the quickness of the response.

Presently, fire control effectiveness is limited because most wildfire response is provided within the limitations of the local volunteer county fire districts which are not familiar with the natural resources of the area, because federal agencies do not have management responsibility for that part of the study area managed by the state, and because present management of Saddle Mountain National Wildlife Refuge does not provide staffing specifically for that area. With increased refuge staffing under this proposal and improved refuge direction of the fire suppression program, there would be less likelihood of fire posing a threat to upland habitats. Consequently, there would be less potential for impact to threatened and endangered species.

4j. Controls on Development

Under this alternative, the USFWS would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The USFWS would undertake no development which would have adverse impacts to riverine and aquatic habitats.

The DOE would be able to construct intake and outfalls and required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include, but are not limited to, buildings, roads, and groundwater flow barriers or treatment systems. Construction of these type of facilities may result in localized and temporary siltation and potential chemical and radiological releases to riverine and aquatic habitats for the persistentsepal yellowcress, Columbia milkvetch, and Columbia pebblesnail, all of which are federally listed candidate species, the common loon, a federally listed sensitive species, and the white pelican, considered endangered by the state. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize such impacts (see Effects on DOE Activities, "Controls on Development" page 165).

In recent years there have been dramatic increases in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area boundary. These type of developments often result in increased sediments to the river and displaced species populations due to a reduction in habitat and reduced native vegetation. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to development restrictions through existing zoning and voluntary compliance. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

Private lands are included in Wild and Scenic River designation. The majority of private ownership within the river corridor is near Priest Rapids Dam and in the Ringold area (Grant and Franklin counties). The Wild and Scenic Rivers Act does not give the federal government the authority to zone private lands or regulate the use of private property. The USFWS would encourage state and local officials to protect wild and scenic river values on private lands within the corridor. Scenic easements could be acquired as a last resort if state and local actions prove ineffective in protecting riverine, aquatic, and riparian habitats critical to threatened and endangered species. Consequently, there would be a beneficial impact on threatened and endangered species.

4k. Controls on Mining and Mineral Development

Under this alternative, all mining and mineral development on federal lands would be prohibited, except those activities conducted in conformance with a refuge management plan (a possible example would be use of gravel from existing gravel pits to maintain refuge roads). No activities would be allowed unless they are deemed compatible with the purposes for which the refuge and wild and scenic river are established. On private lands within the Wild and Scenic River designation, the USFWS would review and evaluate mining and mineral development proposals. If proposed development would threaten important habitats, and existing regulation would permit the activity, the USFWS would consider purchasing an easement to protect the native species. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river (NPS, 1992). Mining and mineral development activities within the designation boundaries could damage or destroy sensitive terrestrial or aquatic habitat areas that are important to rare plants and/or animals. In the case of endangered, threatened, candidate, and sensitive species of plants or animals with severely restricted habitat requirements, this could be particularly damaging, going even so far as to extirpate them from the local area. Consequently, the limitations on mining and mineral development would help protect threatened and endangered species.

4l. Controls on Agricultural Use

Under this alternative, the USFWS would evaluate the effects of sharecropping on 85 acres of federal land currently managed by the WSDFW. Continuation of sharecropping would depend upon whether existing agriculture benefits wildlife. Habitat disruption from existing sharecropping practices has already occurred and most species become listed due to loss of habitats. On private lands, approximately 800 acres are used for agricultural purposes with the corridor designated Wild and Scenic River (ASCS 1993). On private lands within the Wild and Scenic River designation, a change in existing agricultural practices that threaten the habitat depended on by threatened and endangered species may result in acquisition of an easement to protect these species. Consequently, there would be a beneficial impact on threatened and endangered species.

4m. Controls on Grazing

The USFWS would reevaluate grazing use and determine through its management planning process whether grazing could benefit wildlife. Grazing would be terminated in proximity to the river where it could impact riverine and aquatic habitats as well as where it does not have wildlife benefit. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing. It is anticipated that the amount of land currently grazed would be reduced. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity impact upland habitats by loosening soils and creating tracks and channels which hasten erosion. In addition, where placed in high densities, cattle trample and consume native plants which are then often replaced with non-native species. Comparative USFWS studies involving grazed and ungrazed portions of the study area have shown that there is greater abundance and diversity of

wildlife on ungrazed shrub-steppe lands (Radke, 1987). Shrub-steppe provides hunting areas and prey for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species respectively. Shrub-steppe also provides habitat for sage grouse, pygmy rabbits, and loggerhead shrike, all federally listed candidate species. Other habitats which could be impacted by cattle include riparian and wetland types. The limitation on grazing would eliminate any further damage to shrub-steppe, riparian, and wetland habitats and consequently would have a beneficial effect on threatened and endangered species.

4n. Law Enforcement Actions

Under this alternative, patrols would be increased. Additional regulations may be proposed following development of the refuge management plan. Shrub-steppe habitat appears to be the most disturbed from unauthorized public access and off-road vehicle use. Reductions in shrub-steppe habitat decrease both the hunting areas and prey for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species, respectively, and decrease habitat for sage grouse, pygmy rabbit, and loggerhead shrike, all federally listed candidate species. Increases in patrols and resource management staff would increase enforcement of laws which prohibit trespass and off-road vehicle use. Maintenance of shrub-steppe habitat through enforcement of off-road vehicle use would have a beneficial impact on the above mentioned species by maintaining habitat, hunting areas, and cover for prey. In addition, increased patrols would assist in the detection of wildfires which can destroy sensitive habitats and is expected to have a significant benefit on threatened and endangered species.

CUMULATIVE IMPACT

Historically, a wide-variety of species thrived on or within shrub-steppe, riverine, and riparian habitats. With development, agricultural use, changes in natural river flows, and the introduction of non-native species, a number of native species have been lost or reduced. Currently, state and federal agencies list 48 species in the Hanford Reach area as endangered, threatened, candidate, or sensitive.

Undammed, undeveloped, and largely uninhabitated, the Hanford Reach provides a final refuge for native species and communities eliminated elsewhere by permanent flooding and land use changes. As a result, the Reach as managed under DOE ownership, is the last refuge for many of the Pacific Northwest's most endangered, threatened, candidate, and sensitive species. Currently, under the Endangered Species Act, federal and state land managing agencies are obligated to protect these species.

In the foreseeable future, pressures to open more lands for development and other uses are anticipated to intensify and subsequently remove habitat which supports threatened and endangered species. As a result, more species are expected to be added to respective state and federal lists.

Under the Proposed Action, the federal obligations to protect endangered, threatened, sensitive, and candidate species would continue. This action would help protect populations of these species in and along the Reach through prohibition of development and improved habitat management practices. This action would also augment and be consistent with other local, state, federal, and international programs which benefit such species.

5) Effects on the White Bluffs

The White Bluffs are a unique geological feature comprised of claystones and siltstones which line approximately 31 miles of the Hanford Reach. In the study area, the White Bluffs rise up to almost 600 feet and represent the single outcrop of the Ringold formation in the Pasco Basin. Besides being the most striking landform on the Hanford Reach, the White Bluffs are also regionally significant as a paleontological resource. An especially significant feature of the White Bluffs is the mammalian fauna preserved in the sediments of the Ringold Bar. Fossil remains from rhinoceros, camel, deer, horse, mastodon, bear, coyote, fossil fishes, turtles, and rodents are also found in the Ringold Formation.

A common geologic hazard associated with the White Bluffs is landslides, commonly referred to as sloughing. Landslides occurred in this area during the Pleistocene epoch, a result of saturation and undercutting by glacial-related floodwater. More recently, suspected human-induced landslide activity has developed and includes significant slides at the southern end of the White Bluffs.

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered the most reasonable projections based on current information and are subject to the final management plan.

5a. White Bluffs Protection

Under this alternative, the USFWS would limit activities which would contribute to sloughing of the White Bluffs. The USFWS would review its own actions and seek voluntary participation from agencies and individuals to limit their activities which would contribute to sloughing of the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs. The rate of sloughing is expected to continue at existing levels which would continue the gradual erosion of the White Bluffs. However, to the extent that management efforts were successful in reducing impacts, there would be a beneficial impact on the White Bluffs.

5b. Interpretation and Education Activities

The USFWS would provide interpretation of the significance of the White Bluffs through an education outreach program as provided in the refuge management plan. This would help decrease the incidence of site vandalism and unauthorized collecting of fossils and disturbance and consequently have a beneficial impact on the White Bluffs.

5c. Law Enforcement Actions

Under this alternative, patrols would be increased. Illegal collecting of fossils continues to reduce the integrity of the White Bluffs.Vandalism of significant fossils in the White Bluffs continues to occur primarily from trespass and off-road vehicle use. While the majority of off-road vehicle use occurs on the steep slopes near Ringold, incidents of their use have occurred on the slopes of the White Bluffs. Off-road vehicle use lessens the stability of the White Bluffs by loosening the siltstones and claystones which make up the formation. Increased enforcement of the laws prohibiting trespass and off-road vehicle use is expected to have a beneficial effect on the White Bluffs by reducing disturbance.

CUMULATIVE IMPACT
Erosion and sloughing are natural occurrences which have been accelerated by increased agricultural development, off-road vehicle use and grazing. Sloughing has become a major problem resulting from irrigation water which has exacerbated the instability of the slopes above the river. Without present controls on land use, development, and water use, increased irrigated agriculture could accelerate sloughing in the foreseeable future.

The Proposed Action, together with the Bureau of Reclamation's "Red Zone" designation, would help protect the White Bluffs by preventing increased potential for sloughing and erosion.

6) Effects on Water Quality

The Columbia River from Grand Coulee Dam to the mouth of the river near Astoria, Oregon has been designated by the Washington Department of Ecology as a Class A (excellent) surface water body. Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. Surface water quality is especially important because approximately 95% of water used in the Pasco Basin is derived from surface water, with the remaining 5% derived from groundwater.

Applicable Mgmt. Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered the most reasonable projections based on current information and are subject to the final management plan.

6a. Dam Construction
Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. A dam would result in increased water temperatures over natural conditions by prolonged exposure to solar radiation, and increased sedimentation resulting from reductions in river flow which will decrease the capacity of the river to carry solids (SAI/PMX/DC 1979). Any change in the equilibrium of the river, such as stream flow, temperature, and substrate, will affect water quality (Thompson 1992). Prohibition on new dam construction would prevent an increase in water temperatures over natural conditions and an increase in sedimentation (U.S. Army Corps of Engineers, 1979). Consequently, there would be a beneficial impact on water quality.

6b. Water Resource Development Project Construction
Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on the resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed river sediments which may contain contaminants and impact water quality. Impacts to water quality would vary depending on the location of the dredging. Dredging in the middle of the river would transport sediments downstream and have less of an impact on water quality than along the shorelines, which could cause localized silt plumes containing concentrated amounts of associated contaminants (Johnson 1992). Limitations on water resource development projects would consequently have a beneficial impact on water quality.

6c. Instream Flow Protection

Under this alternative, the USFWS would continue to evaluate flow requirements to protect fisheries, significant habitats, and threatened and endangered species. The USFWS would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. These determinations may be influenced to some degree, yet would not be dictated by the designation of the Hanford Reach as a National Wildlife Refuge and National Wild and Scenic River. The Wild and Scenic River designation would be yet another expression of Congressional intent to protect fisheries, significant habitats, and threatened and endangered species. Consequently, there would be a beneficial impact on water quality.

6d. Nuisance Aquatic Macrophyte Control

Under this alternative, the USFWS would make efforts to control nuisance aquatic macrophytes in the Hanford Reach in conformance with a management plan that is developed in accordance with Service and Department of the Interior (DOI) Pest Management Policies and Responsibilities, contained in 30 AM12 and 517 DM1. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate and can restrict river flows. Restricted flows, in turn, can adversely affect water quality by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes by either chemical or mechanical means would limit and potentially reduce populations and consequently have a beneficial impact on water quality.

6e. Controls on Development

Under this alternative, the USFWS would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The USFWS would undertake no development which would have adverse impacts to water quality.

The DOE would be able to construct intakes and outfalls and required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include, but are not limited to, buildings, roads, and groundwater flow barriers or treatment systems which could result in temporary adverse impacts to water quality. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize such impacts (see Effects on DOE Activities, "Controls on Development", page 165).

In recent years, there have been dramatic increases in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area boundary. These type of developments often increase sediments to the river which may impact water quality. In addition, upland agricultural development could result in increases in fertilizer and pesticide runoff to the river which could have an impact on water quality. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to restrictions through existing zoning and voluntary compliance. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning

allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

Private lands are included in the Wild and Scenic River designation. The majority of private ownership within the river corridor is near Priest Rapids Dam and in the Ringold area (Grant and Franklin counties). The Wild and Scenic Rivers Act does not give the federal government the authority to zone private lands or regulate the use of private property. The USFWS would encourage state and local officials to protect wild and scenic river values on private lands within the corridor. Scenic easements could be acquired as a last resort if state and local actions prove ineffective in protecting existing water quality. Consequently, with the exception of potential DOE cleanup activities, there would be a beneficial impact on water quality.

6f. Controls on Mining and Mineral Development

Under this alternative, all mining and mineral development on federal lands would be prohibited, except those activities conducted in conformance with a refuge management plan (a possible example would be use of gravel from existing gravel pits to maintain refuge roads). No activities would be allowed unless they are determined to be compatible with the purposes for which the refuge and wild and scenic river are established. On private lands within the Wild and Scenic River designation, the USFWS would review and evaluate mining and mineral development proposals. If proposed development would threaten water quality, and existing regulation would permit the activity, the USFWS would consider purchasing an easement. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river (NPS, 1992). Mining and mineral development activities in or near the river would increase river sedimentation and/or introduce toxic materials into the river, both of which adversely affect water quality. Consequently, the limitations on mining and mineral development would help protect water quality.

6g. Controls on Agricultural Use

Under this alternative, the USFWS would evaluate the effects of sharecropping on 85 acres of federal land currently managed by the WSDFW. Continuation of sharecropping would depend on whether existing agriculture benefits wildlife. Existing sharecropping practices have not had an impact on water quality. On private lands, approximately 800 acres are used for agricultural purposes within the corridor designated as Wild and Scenic River (ASCS 1993). Existing agricultural practices have not been shown to have an adverse impact on water quality. While chemical runoff and siltation can affect water quality, there is no evidence to date that existing agricultural activities are affecting water quality within the study area. With a lack of projected increase in agricultural use within the study area, impacts on water quality are not anticipated. As a result, limited management actions proposed are not expected to have any impact on water quality.

6h. Controls on Grazing

Under this alternative, the USFWS would reevaluate grazing use and determine through its management planning process whether grazing could benefit wildlife. Grazing would be terminated in proximity to the river where it could impact water quality as well as where it does not have wildlife benefits. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water. It is anticipated that the amount of land currently grazed would be reduced. Consequently, grazing activity at current or reduced levels is not expected to have an adverse impact on water quality.

CUMULATIVE IMPACT

The Columbia River from Grand Coulee Dam to the mouth of the river has been designated as a Class A (excellent) surface water body. The water is suitable for essentially all uses, including raw drinking water, recreation, and wildlife habitat.

Direct discharge of radionuclides from Hanford activities was virtually eliminated when the last reactors using the once-through-cooling system were shut down in 1971. Since the shutdown, the primary source of contamination from the Hanford Site is from plumes of contamination.

Water quality in the Hanford Reach may be at risk due to potential projects such as mining, agriculture, dam construction, dredging, and development. Foreseeable impacts from these projects may include increased sedimentation and pollution, farm chemical runoff, increased temperature, and reduced river velocities.

The Proposed Action would limit land use to help ensure that the quality of the water within the Hanford Reach is maintained. It would have little impact on land use outside the designated area, and thus little impact on water quality of the river as a whole.

7) Effects on Instream Flows

Before dams were built on the Columbia River, its great volume and seasonal fluctuations combined with substrate and climate to shape the unique ecosystems along its shore. The river's vast flow is now tightly choreographed by a network of agencies striving to maximize power production, meet irrigation needs of desert farms, and support remnants of the once abundant salmon fisheries. A multitude of agreements exist to regulate flows for a variety of often competing interests (for more information refer to Ch. III, Affected Environment, "Fisheries Regulation", page 129). The Hanford Reach is the last portion of the river which has the appearance of the pre-settlement, mid-Columbia ecosystem. The Reach has a river current, but no naturally occurring seasonal flow fluctuations.

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on instream flows. Management actions are considered the most reasonable projections based on current information and are subject to the final management plan.

7a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. A dam would significantly alter existing stream flows in the Hanford Reach and impound the last free-flowing non-tidal segment of the Columbia River. A prohibition on dams would prevent significant alteration of existing instream flows, ensure that instream flow needs for significant natural and cultural resources were provided, and consequently have a beneficial impact on existing instream flows.

7b. Water Resource Development Project Construction
Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have increased the cross section area of the river and would have generally resulted in reduced water velocities for the same amount of river flow. Limitations on water resource development projects would ensure that instream flow needs for significant natural and cultural resources were provided, and consequently have a beneficial impact on existing instream flows.

7c. Instream Flow Protection
Under this alternative, the USFWS would continue to evaluate flow requirements to allow fall chinook salmon, or any other aquatic wildlife to migrate, spawn, rear, or reside. The USFWS would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. These determinations may be influenced to some degree, yet would not be dictated by the designation of the Hanford Reach as a National Wildlife Refuge and National Wild and Scenic River. The Wild and Scenic River designation would be yet another expression of Congressional intent to protect fisheries, significant habitats, and threatened and endangered species. Consequently, there would be a beneficial impact on water quality.

CUMULATIVE IMPACT

Numerous hydroelectric dams have altered the historic patterns of the river, transforming the Columbia over most of its length into a series of artificial lakes. The river's vast flow is now choreographed by a network of agencies striving to maximize power production; meet irrigation needs; and support remnants of the once abundant salmon fisheries.

Today, agreements have been reached to provide high flows in certain seasons to aid downstream migration of juvenile salmon and steelhead, and maintain higher reservoir level for resident fish and summer recreation. A complex framework of laws, regulations, and contracts governs the operation of federal and non-federal dams in the Columbia River basin. In the foreseeable future, federal, state, and local agencies collectively will ensure that appropriate stream flows are maintained.

The Proposed Action will influence but not dictate instream flows.

8) Effects on Tribal Access and Use

The Hanford Reach area contains lands ceded to the United States by both the YIN and CTUIR in the treaties of 1855. The treaties with the YIN and CTUIR reserved to the tribes certain rights and privileges. These rights include the right to fish at all usual and accustomed places and the privileges of hunting and gathering traditional goods and medicines, and pasturing of livestock, on open and unclaimed land. The Department of Energy has maintained the position that, due to security and safety concerns, the uses of the lands within Hanford are not compatible with the exercise of the privileges of hunting and gathering or pasturing of livestock and are, therefore, not considered open and unclaimed. A transfer of lands from the Department of Energy to another federal agency would result in a reassessment of the status of the transferred lands to determine compatibility with exercise of the various reserved rights and privileges.

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on tribal access and use. Management actions are considered the most reasonable projections based on current information and are subject to the final management plan.

8a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. Presently, the lack of dams permits a variety of uses within the reach. Construction of a dam would effect a variety of American Indian uses on the Hanford Reach such as salmon fishing, gathering foods and medicines, and flooding of traditional cultural properties and sacred sites. Availability of anadromous fish in the Hanford Reach is dependent on unimpeded migration and favorable spawning and rearing conditions, both of which would be impacted through construction of a dam. Fishing would be directly impacted by the reduced salmon populations, particularly the wild fall chinook salmon which would be drastically reduced or eliminated. It is the position of the tribes that the Hanford Reach, in particular, is an inseparable natural and cultural resource upon which the tribes' culture and heritage rests. The federal government is responsible for upholding treaties it signed with the above mentioned tribes in 1855, which has a trust responsibility to the American Indians and guarantee rights to certain resources of which states, "the right to fish at all usual and accustomed fishing places...". The prohibition on new dams would result in the maintenance of unimpeded migration and spawning and rearing habitat. The tribes have also stated that the ecosystems of the Columbia Basin are an integral part of the culture and religion of the tribes and bands of the region. Prohibition on dams would protect the fall chinook fishery and special plant populations and have a beneficial impact on tribal access and use.

8b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed critical spawning and rearing habitat for fall chinook salmon, an important resource for the tribes. In addition, significant cultural resource sites located within or along the banks of the river would be vulnerable to direct impacts from dredging or indirectly by erosion from barge traffic. If fish populations and cultural resource sites are lost then access and use for American Indians would diminish. Consequently, limitations on water resource development projects would have a beneficial impact on tribal access and use.

8c. Controls on Grazing

The USFWS would reevaluate grazing use and determine through its management planning process whether grazing could benefit wildlife. Grazing would be terminated in proximity to the river where it could impact water quality as well as where it does not have wildlife benefit. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing. Impacts to American Indian access and use to grazing would be dependent on whether the USFWS decides to continue grazing. There would be no impact on access and use if grazing is continued, however, if grazing is terminated then there would be an impact.

8d. Allowance for Recreational Activities

Under this alternative, recreational activities would be permitted except in certain areas as determined in the refuge management planning process. Hunting, particularly waterfowl hunting, and fishing are the most popular activities within the Hanford Reach study area. Hunting is currently allowed on the lands administered by the WSDFW and in restricted areas along the river. Hunting would be permitted except in certain areas as determined in the refuge management planning process, i.e. waterfowl sanctuary areas or areas closed to protect sensitive plant or animal populations. If additional areas are open for hunting then there would be a beneficial impact on tribal access and use. Fishing in the Reach is an activity common to both the tribes and sportfishermen alike. The fall chinook salmon is highly prized by anglers for its large size, strength, and flesh quality. The number of fall chinook salmon has attracted an abundance of anglers, with an average of 21,000 angling trips per season between 1985 and 1991. It is possible that conflicts could arise between tribes and sport fishermen with regards to usual and accustomed fishing places, and consequently recreational activities could have a slight impact on tribal access and use. Nonconsumptive uses may also infringe on American Indian access and use of the reach. Consequently, increased recreational activities could have an adverse impact on tribal access and use.

CUMULATIVE IMPACT

The Hanford Reach includes areas which are the traditional and continuing homeland of the Wanapum people and the ceded treaty lands of the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and Yakama Indian Nation. Among the important American Indian cultural resources are ancestral cemeteries, usual and accustomed fishing sites, sites for current practice of traditional Indian religion, fisheries, subsistence and medicinal plants, and old homesites and place names.

Since the signing of Treaties in 1855, areas of traditional use by Northwest Indians have been significantly reduced or eliminated by dams, impoundment of rivers and privatization of federal lands. This has caused a significant reduction of the resource base and limited their ability to practice their religion. Since 1943, the Department of Energy and its predecessors have allowed only limited access and use of the Hanford Site. The DOE has maintained that, due to security and safety concerns, uses of the lands within Hanford are not compatible with the exercise of hunting and gathering or pasturing of livestock. Therefore, these lands are not considered open and unclaimed.

In the foreseeable future, DOE is expected to excess the lands north and east of the river. Based on GSA surplus property procedures, these lands are expected to be transferred to another government agency. The future level of access and use by American Indians would be dependent on who ultimately acquires the property and whether or not the land is considered open and unclaimed. The Proposed Action would be expected to improve opportunities for tribal access and use of lands transferred from the DOE to USFWS, subject to resource management and protection requirements.

9) Effects on Land Ownership and Use

There are approximately 2,600 acres of land within one-quarter mile of the river along the 49.5-mile segment proposed for designation that are not federally-owned. Private lands represent approximately two percent of the total study area and approximately 9.8 miles of the 99-mile shoreline (6.3 miles at the northern end and 3.5 miles at the southern end). All of the private land parcels are located outside of the Hanford Site and are concentrated in two areas: 1) on the north and south sides of the Columbia River between the north study area boundary and the west boundary of the Hanford Site; and 2) on the east side of the River from the south boundary of the Wahluke State Wildlife Recreation Area and the south study area boundary. Primary use of these lands is agricultural, specifically orchards. Private lands are only included in the National Wild and Scenic River designation; they are not included in the National Wildlife Refuge.

In addition, two public entities, the Grant County Public Utility District No. 2 and the Washington Public Power Supply System, either own or have long-term leases on lands located within the study area. Both of these entities are engaged in the production of electricity, and the land parcels within the study area are portions of larger tracts on which are situated the main energy production facilities. While these lands are technically not private, their use is controlled through regulation. Therefore, these lands are not included with the public lands associated with the DOE lands on the Hanford Site.

The National Wild and Scenic Rivers Act has the greatest impact on projects and activities proposed for federal lands within the designated river corridor. The Act was designed to prohibit federal actions which would have an adverse effect on Wild and Scenic River values while at the same time allowing private landowners the greatest range of compatible uses of their land. Under the Act, existing land uses are generally considered compatible and would be allowed to continue. Existing uses are an integral part of the Hanford Reach and its history and are part of the reason the river was found eligible. The term "living landscape" is applied to the private lands within the Hanford Reach because they are inextricably tied to the local communities and ways of life.

New land uses on federally owned lands or lands on which the federal government has acquired an easement, must be evaluated for their compatibility with protection of natural, cultural, scenic and recreational values. New uses that do not adversely affect the values for which the river was found eligible would not be opposed. If the future use is similar in type and intensity to current uses, the action is generally considered to be compatible with National System designation.

Applicable Management Actions

The following analysis examines those management actions from Chapter II, Alternatives, which are considered the most reasonable projections based on current information and are subject to the final management plan.

9a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. Construction for a new dam in this location could require land acquisition and inundate private lands. Consequently, a prohibition on dams would not result in a change in land ownership and use.

9b. Controls on Local Energy Transfer Facilities

In order to understand the impact that Wild and Scenic River designation could have on energy transfer facilities within the Hanford Reach, it is useful to review the relevant portion of the Wild and Scenic Rivers Act. Section 7(a) of the Wild and Scenic Rivers Act (P.L. 90-542, as amended) provides that,

> "The Federal Power Commission (now Federal Energy Regulatory Commission) shall not license the construction of any dam, water conduit, reservoir, powerhouse, transmission line, or other project works under the Federal Power Act (41 Stat. 1063), as amended (16 U.S.C. 791a et seq)., on or directly affecting any river which is designated... as a component of the National Wild and Scenic Rivers system, and no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river was established, as determined by the Secretary charged with its administration."

Under this alternative, no actions would be taken to alter existing power production facilities. Power production at Priest Rapids Dam and WNP-2 would continue, and completion of an energy production facility at WNP-1 would not be precluded. Routine maintenance activities would not be affected. However, new or expanded facilities may be affected or precluded. The USFWS would encourage the use of existing intake and outfall structures and transmission line corridors. New corridors would be evaluated for their compatibility with National Wildlife Refuge and National Wild and Scenic River designations. Proposals would be evaluated particularly for impacts on fish, wildlife, flora, and cultural resources. The Proposed Action includes a recommendation to Congress that FERC be permitted to relicense existing facilities over which it has jurisdiction and that it have discretion to issue licenses for new facilities where it ordinarily would have jurisdiction, subject to a determination by the Secretary of the Interior that the project not adversely impact refuge and river values. Other types of proposals requiring federal permits or licenses, such as National Pollution Discharge Elimination System permits, would be similarly evaluated. Instream flows to maintain existing power production for this portion of the Columbia River would continue to be determined through discussions and negotiations among agencies and parties representing various river uses. These determinations may be influenced to some degree, yet would not be dictated by, designation of the Hanford Reach. Consequently, there may be potential for future impact on power production facilities in the form of additional design and construction related to mitigation of environmental damage.

9c. Controls on Development

Designation of a National Wildlife Refuge would have no effect on land ownership and use because the refuge contains federal lands exclusively. Under the Wild and Scenic River designation, the USFWS would encourage state and local officials to protect wild and scenic values on private lands within the corridor. The Wild and Scenic Rivers Act does not give the federal government authority to zone private lands or regulate the use of private property. Changes in land use would be scrutinized for compatibility with the Wild and Scenic River. Scenic easements could be acquired as a last resort if state and local actions prove ineffective. Consequently, impacts on landowners and existing uses would be slight or none.

9d. Controls on Mining and Mineral Development

Under this alternative, all mining and mineral development on federal lands would be prohibited, except those activities in conformance with the refuge management plan (a possible example would be use of gravel from existing gravel pits to maintain refuge roads). No activities would be allowed unless they are determined to be compatible with the purposes for which the refuge and wild and scenic river are established. On private lands within the Wild and Scenic River designation, the USFWS would review and evaluate mining and mineral development proposals. If proposed development would threaten important habitats, and existing regulation would permit the activity, the USFWS would consider purchasing an

easement to protect the threatened resource(s). In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river (NPS, 1992). The designated area has oil and gas reserves, but whether any of commercial value exist is not known. Some areas are suitable for mineral material disposals (gravel, sand, and clay), and potential for other minerals exists. Consequently, this alternative could result in loss of potential mineral production, thereby having an adverse effect on land ownership and use.

9e. Controls on Agricultural Use

Under this alternative, the USFWS would evaluate the effects of sharecropping on 85 acres of federal land currently managed by the WSDFW. Continuation of sharecropping would depend upon whether existing agriculture benefits wildlife. Sharecropping to provide food and cover for wildlife might continue and consequently have no additional effect on existing land use of these areas, or may not be renewed which would have an adverse effect on the sharecroppers. Agricultural activities which expand upon existing types and intensity would be reviewed by the USFWS for compatibility with Wild and Scenic River values.

While private lands are not included in the proposed refuge, they are included in the proposed Wild and Scenic River designation. A wide range of agricultural uses of private lands is considered compatible with Wild and Scenic River designation when the classification is "recreational", meaning considerable development is already present along the shorelines. This is the case with the Hanford Reach. Existing irrigation withdrawals and systems would be unaffected by designation. Proposals for major new withdrawals would be reviewed by the USFWS to determine if they would result in adverse effects on river values. The USFWS may recommend that state agencies charged with permitting such facilities deny the permit application. However, if the proposed changes or new applications do not have a significant impact on the values for which the river was designated, the action would not be opposed (see Ch. III., Affected Environment, page 66, for a general discussion of water rights). Easements may be acquired by the USFWS to assure continued compatible agricultural uses. Easements may be acquired on up to 1,800 acres of private land to protect river values.

Use of up to 85 acres for agricultural production could be terminated under the Proposed Action, or additional acreage could be farmed if found to protect and enhance wildlife. In any case, there would be slight or no impact on land ownership and use.

9f. Controls on Grazing

Under this alternative, the USFWS would reevaluate and determine through its management planning process whether grazing could benefit wildlife. Use of federal lands by private individuals for grazing may be impacted depending upon the outcome of the management plan. An estimated 24,000 acres of land within the study area are currently leased by private parties for livestock grazing by the WSDFW. It is anticipated that the amount of land currently grazed would be reduced. Grazing on non-federal lands would not be affected by Wild & Scenic River designation. Consequently, it is anticipated that there would be slight impacts to use of federal lands for grazing.

CUMULATIVE IMPACT

Originally populated by several tribes of American Indians which hunted and fished along the Columbia River, the area was subsequently settled and developed for residential and agricultural use beginning in the late 1800s. Most of the affected lands were acquired by the federal government through condemnation and developed during WW II to produce nuclear materials for national defense.

Currently, the lands north and east of the river are used for wildlife and recreational purposes. Lands outside of the Hanford Site are used predominantly for agricultural, commercial, and residential developments.

In the foreseeable future, the lands north and east of the river will no longer be required by the DOE as a buffer zone and will be excessed. Based on the GSA surplus property procedures, these lands are expected to be transferred to another government agency and managed for conservation and recreation purposes. It is possible that the approximately 1800 acres of privately-owned lands within the study area could be converted to uses other than agriculture. The Proposed Action would continue federal ownership and protection of those lands now managed by DOE and would preclude potential private development and use of those lands. Existing utilities (BPA, WPPSS, and Grant County PUD) would not be affected. Private use of federal lands would be prohibited except when beneficial and compatible with management of the protected resources. The Proposed Action would not affect existing land uses on private lands within the area designated into the Wild and Scenic River system. It would preclude those potential changes in use of private lands which might adversely impact those resources for which the area is designated. Overall, there would be little or no change in land ownership and use of the 105,000 acre study area.

10) Effects on Department of Energy Activities on the Hanford Site

In 1989, the DOE, U.S. Environmental Protection Agency (EPA), and Washington Department of Ecology (WDOE) entered into the Hanford Federal Facility Agreement and Consent Order (commonly referred to as the "Tri-Party Agreement") which committed the three agencies to a long term cooperative program for cleaning up the Hanford Site. For at least the next 30 years, the agencies will be actively involved in identifying and cleaning up waste sites that pose a risk to human health, welfare, and the environment. This work is expected to involve both non-intrusive and intrusive investigations. Non-intrusive investigation includes biological and ecological sampling, spring and seep sampling along river beds, geophysical methodologies (i.e. ground penetrating radar), soil gas sampling, and surface soil sampling. Intrusive investigation includes installing ground water monitoring wells, soil borings, and excavations for analysis. Once contamination has been identified and quantified, actions may begin, if necessary, to stabilize or remove contaminants. This may include removal of soil, pumping and treating of ground water, in-situ vitrification, or capping of contaminated areas.

The Bonneville Power Administration (BPA) owns several transmission facilities on the Hanford Site. Three of BPA's major 500-kV substations - Hanford, Ashe, and Midway - are located on the Hanford Site, as well as several other lower voltage substations. These substations support interregional power transmission and form a major hub of the Pacific Northwest's transmission system. Three of the substations are located within the Hanford Reach study area--Hanford, Midway, and Benton. BPA also owns eleven transmission lines that cross the Hanford Site and the study reach of the river. The transmission line crossings are paralleled by roads that provide access to the lines for repair and maintenance purposes. Designation of the Hanford Reach as a National Wildlife Refuge with National Wild and Scenic River overlay would establish land use patterns for wildlife and recreation purposes which is one of the several factors considered in determining clean-up levels under the Tri-Party Agreement. Human use scenarios, based on expected USFWS management plans, would be used to calculate human risk assessments. Environmental risk assessments would also be used to determine clean-up levels. Congressional designation would, therefore, expedite final clean-up of the Hanford Reach by resolving the permanent land use issue in that area.

Land management responsibility would be transferred from DOE to USFWS when areas of land are certified as "clean", based on the risk assessments described above. It is expected that lands north and east of the Columbia River, commonly known as the "north slope", would be transferred in the near term. Lands within the Hanford 100-Areas would be transferred at a much later date. In the interim, the USFWS would work closely with the DOE, EPA, and the Washington Department of Ecology in the clean-up decision process.

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on DOE activities on the Hanford Site. Management actions are considered the most reasonable projections based on current information and are subject to the final management plan.

10a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. In 1979, the DOE conducted a study to determine the impacts of the Ben Franklin Dam project on the Hanford Site. The study concluded that construction of the dam, which would impound approximately 50 miles of the river located adjacent to the Hanford Site, would raise the groundwater level throughout the Hanford Site and also potentially have an impact on existing facilities and future cleanup activities. It was determined that the most significant impact would be the flooding of the reactor area along the river (the "100 Area") which contains a number of waste burial grounds, contaminated soil sites, and buildings (U.S. Army Corps of Engineers 1979). The resulting reservoir would raise the groundwater level throughout the Hanford Site and could potentially have an impact on existing facilities and future cleanup activities. The greatest impact on the Hanford Site would be the flooding of the reactor area along the river, most notably the 100 Area. The prohibition on dams would prevent impacts resulting from inundation to buildings and waste burial grounds and consequently have a beneficial impact on the Hanford Site.

10b. National Wild and Scenic River Designation

Under this alternative, a National Wild and Scenic River would be designated. National Wild and Scenic River overlay would encompass the river and extend inland an average of one quarter mile on both sides of the river. While federal designation may provide the impetus for advocacy groups to seek aquifer reclassification, which could restrict ongoing and future DOE activities at the Hanford Site (i.e disposal to the soil column of treated liquid waste), reclassification would not be sought or supported in the designation and management of the area. In addition, Wild and Scenic River designation would grant limited authority over National Pollution Discharge Elimination System (NPDES) permitting to the USFWS. Under Section 7 of the Wild and Scenic Rivers Act (P.L. 90-542, as amended), permitting would be subject to a review of impacts and mitigation proposals. It is assumed that all existing permits and new permits for cleanup would be reviewed. New permits for discharges into the Hanford Reach for other activities would also be subject to USFWS review and approval. Language would be suggested in proposed legislation to Congress which would provide that designation shall not increase cleanup standards for remedial activities at Hanford.

Enhancement of recreational and natural values, a goal of National Wild and Scenic River designation, would be accomplished by cleanup of the Hanford Site. Therefore, National Wild and Scenic River designation would not impede Hanford Site cleanup.

10c. Controls on Development

Under this alternative, new construction would be prohibited within the designation boundaries except intake and outfall structures and those required facilities related to clean up of the Hanford Site. All of these facilities would be subject to the review and approval by the USFWS. Presently, no facilities are anticipated at this time. Impacts of the Proposed Action on planning, design, and permitting for these facilities is anticipated to be slight.

10d. Controls on Local Energy Transfer Facilities

Under this alternative, no actions would be taken to alter existing power production facilities. However, the USFWS would encourage the use of existing intake and outfall structures and transmission line corridors. Designation would not impact DOE's ability to maintain existing transmission lines or upgrade within existing transmission line corridors. Consequently, there would be no effect on existing lines and facilities, but new corridors and facilities would be subject to USFWS review.

CUMULATIVE IMPACT

The Bonneville Power Administration and Bureau of Reclamation were present prior to the establishment of the Hanford Site. The Hanford Site was established in 1943 during WW II and special nuclear material production activities continued through the Cold War. Only 6% of the land surface of the Hanford Site is impacted by production and waste management activities. With the end of the Cold War, the mission of the Hanford Site has changed to primarily waste management and environmental restoration.

In May 1989, the Tri-Party Agreement was signed among federal and state agencies to provide a legal and procedural framework for cleanup and regulatory compliance at the Hanford Site. Significant cleanup work is underway or planned within the Hanford Reach study area.

The Proposed Action allows for continuation of DOE waste management and environmental restoration activities. The Proposed Action would determine future uses of the area and therefore the level to which cleanup must occur under the Tri-Party Agreement. Congressional designation may, therefore, expedite final clean-up of the Hanford Reach.

11) Effects on Recreational Access and Use

The Hanford Reach and adjacent wildlife recreation/refuge areas provide a wide variety of recreational activities year round for local residents and visitors alike. The most popular activities include fishing, upland hunting, and nature observation. The Hanford Reach is enjoyed by sport fishermen throughout the Pacific Northwest with the primary sport fishes being salmon, steelhead, sturgeon, and smallmouth bass. The abundance of waterfowl and availability of favorable conditions for hunting make the Reach a regionally significant resource for waterfowl hunting. The scenery, wildlife, and opportunities for solitude also make the area increasingly attractive for boating.

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on recreational access and use. Management actions are considered the most reasonable projections based on current information and are subject to the final management plan.

11a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. A dam would impound the last free-flowing non-tidal segment of the Columbia River, with subsequent impacts to the existing nature of recreational activities the Hanford Reach, in particular, fishing, wildlife observation, and boating. The availability of anadromous fish for fishing is dependent on unimpeded migration and spawning and rearing habitat, both of which would be eliminated by the construction of a dam (for further information, a detailed discussion is located in this alternative "Effects on Fall Chinook Salmon", page 134).

Dams would also change existing flow conditions through the Hanford Reach which could alter the type of boating which occurs, specifically navigation by anglers and other recreational users. Boating would shift toward power boats and waterskiing. The type of fish available for recreational purposes would shift from anadromous to resident. Sloughs, islands, and channels which are important for wildlife, hunting and nature observation would be submerged. Prohibitions on dams would protect existing populations of anadromous fish for fishing, maintain appropriate water levels for boaters, and maintain existing sloughs, islands, and channels for recreational purposes. Consequently, there would be a beneficial effect on recreational access and use.

11b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed and destroyed critical spawning and rearing habitat for fall chinook salmon which supports the recreational fishery. Consequently, limitations on water resource development projects would have a beneficial impact on recreational access and use by supporting the anadromous fishery through protecting critical salmon habitat.

11c. Instream Flow Protection

Under this alternative, the USFWS would continue to evaluate flow requirements to protect recreational activities in the Hanford Reach. The USFWS would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. These determinations may be influenced to some degree, yet would not be dictated by the designation of the Hanford Reach as a National Wildlife Refuge and National Wild and Scenic River. The Wild and Scenic River designation would be yet another expression of Congressional intent to protect recreational activities. Consequently, there would be a beneficial impact on recreational access and use.

11d. Nuisance Aquatic Macrophyte Control

Under this alternative, the USFWS would make efforts to control nuisance aquatic macrophytes in the Hanford Reach in conformance with a management plan that is developed in accordance with Service and Department of the Interior (DOI) Pest Management Policies and Responsibilities, contained in 30 AM12 and 517 DM1. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flow. Restricted flows have the greatest impact on salmon habitat by increasing water temperature and reducing sedimentation transport and oxygen supply, especially in the shallow water areas which salmon prefer (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes, by either chemical or mechanical means, would limit and potentially reduce populations and help protect salmon habitat. Consequently, support of the anadromous fishery would have a beneficial impact on recreational access and use.

11e. Wildlife Habitat Protection

Under this alternative, the USFWS would protect various wildlife habitats through controlling the spread of non-native vegetation, revegetating disturbed areas with native species, reducing grazing, and limiting activities which could impact the White Bluffs. The Hanford Reach and surrounding lands provide some of the best opportunities for wildlife viewing in eastern Washington state. Bald eagles, common loons, wintering and migratory waterfowl, pelicans, terns, gulls, great blue herons, mule and white-tailed deer, coyotes, and beavers may be observed. Protection under the refuge designation would help maintain or increase populations of wildlife for observation and game animals available for hunting. The refuge, which could also include development of an interpretive roadway through the Wahluke State Wildlife Recreation Area, would have a beneficial impact by providing additional recreational use and access.

11f. Control of Wildfire

Under this alternative, a federally guided, multi-agency wildfire suppression program would be maintained. The USFWS is responsible for suppressing fires on refuges and each refuge has fire fighting capabilities. When needed, the USFWS can call on the U.S. Forest Service to obtain fast response using spotter aircraft and aerial retardant drops to assist with fire control, a resource not available to local county fire districts. When incident command teams work on refuges, the land manager determines which fire fighting methods are acceptable based on the resources affected. In bad fire years, wildfires sometimes exceed 1,000 acres or more within the study area. The last large fire was in 1993 when over 12,000 acres were burned. In other years, wildfires tend to range between 5-20 acres depending on the quickness of the response.

Presently, fire control effectiveness is limited because most wildfire response is provided within the limitations of the local volunteer county fire districts which are not familiar with the cultural resources of the area, because federal agencies do not have management responsibility for that part of the study area managed by the state, and because present management of Saddle Mountain National Wildlife Refuge does not provide staffing specifically for that area. With increased refuge staffing under this proposal and improved refuge direction of the fire suppression program, there would be less likelihood of fire posing a threat to existing wildlife populations for recreational purposes. Consequently, there would be less potential for impact to recreational access and use.

11g. Controls on Development

Under this alternative, the USFWS would not construct any facilities if found to be incompatible with the values and purposes for which the area was designated. Some DOE cleanup activities as related to the Hanford Site, particularly within the river corridor, may result in impacts to riverine and aquatic habitats. Private lands would not be available for public recreational access and use. Consequently, there would be a beneficial impact on recreational access and use.

11h. Allowance for Recreational Facilities

Under this alternative, an interpretive road and the development of facilities for an array of nonconsumptive uses would increase use at specific sites and may increase overall use of the area. Certain improvements to existing recreational facilities would be completed. Improvement to the Ringold boat access site would provide a safer and more easily maintained facility, reduce disturbance of adjacent areas, and allow some local increase in use. Similar consequences would be anticipated at the Vernita Bridge and White Bluffs Landing boat access if they were improved. Combined, these improvements would have a beneficial impact on recreational access and use.

11i. Allowance for Recreational Activities

Under this alternative, recreational activities would be permitted except in certain areas as determined in the refuge management planning process. Efforts to protect fish and wildlife habitat, including prohibitions on dams, control of non-native vegetation, revegetation of disturbed areas, monitoring development, would help maintain fishing and hunting opportunities which are the more popular recreational activities. The success of anglers in the Reach has made it the first or second among mainstream or tributary areas of the Columbia River in sport salmon catch for the last seven years. The abundance of waterfowl and availability of favorable conditions for hunting make the Reach an excellent location for waterfowl hunting. Consequently, efforts to protect fishing and wildlife habitat would have a beneficial impact on recreational access and use.

11j. Interpretation and Education Activities

Under this alternative, the USFWS would provide interpretation and education about the Hanford Reach. Efforts would specifically include development of interpretative displays and leaflets, self-guided auto tour through the Wahluke Slope, tours and programs with refuge staff, and increased law enforcement to help provide information. These actions would increase public understanding of the significance of the resources of the Hanford Reach and would increase visitor satisfaction when visiting the area. Consequently, there would be a beneficial impact to recreational access and use.

11k. Law Enforcement Actions

Under this alternative, patrols would be increased. Increased patrols and resource management field staff might result in reductions in trespass on key habitat areas, harassment of wildlife, disturbance of archaeological sites, unauthorized vehicle use, and other inappropriate recreational activities. Consequently, increased patrols and resource management staff would result in greater resource protection which would help protect the natural resources, visitor safety, and help assure beneficial recreational opportunities of the Hanford Reach.

CUMULATIVE IMPACT

Before 1943, prior to the Department of Energy closing the area for security purposes, the Hanford Site provided a wide variety of year-round sport and recreational opportunities . The grand landscape and scenery, abundant wildlife, and small population centers created little recreational demand; the supply of recreational opportunities was nearly unlimited. Subsequent to World War II, with significant increases in urbanization and agricultural developments stimulated by the Columbia Basin Project, recreational demands for access and use in support of a wide-range of activities has increased while the recreational supply decreased. Between July 1988 and July 1989, traffic counts for the Wahluke Wildlife Recreation Area totaled over 41,600 visitors; seventy-five percent of them fished for salmon.

The Washington Statewide Comprehensive Outdoor Recreation Plan (1990-1995) indicates that all recreational uses along the Hanford Reach are likely to increase in the foreseeable future. In many cases the increase in use outstrip the projected increase in population growth, indicating an increase in per capital participation for certain activities and certainly reducing existing experiences while influencing quality of life values. With this increased demand and limited supply, overcrowding is certain. With its vast habitat and scenery and easy access by means of the river, non-consumptive recreational uses should also continue to increase throughout the Reach.

The Proposed Action would continue to allow current recreational uses including swimming, hunting, fishing, boating, wildlife observation, and nature study and would improve access and use at existing facilities. The Action would also supplement statewide outdoor recreation plans by providing increased recreational opportunities through additional development on interpretative and educational facilities at sites within the protected area and at nearby off-site locations.

Short-Term Use vs. Long-Term Productivity

Revegetation of disturbed areas may require short-term use of machinery which would disturb adjacent areas and produce noise and dust. Reestablishment of native habitat would result in long term increases in the diversity and abundance of native plant and animal species.

Prohibition of mineral location, leasing, sales, exploration, and development would result in a loss of short-term economic benefits from these activities.

Prohibition on dams and limitations on water resource development projects would assure long-term protection of anadromous fishery.

Control of non-native aquatic and terrestrial vegetation may require the use of machinery which would cause localized short-term increases in air or water pollution. Removal of non-native vegetation, except those trees used as roosts, would contribute to reestablishment of native habitat and long-term increase in the diversity and abundance of native plant and animal species.

Unavoidable Adverse Impacts

Prohibitions on dams and limitations on water resource development projects would foreclose future navigation and water resource development projects and prospects for power generation from new dams within the Reach.

Establishment of a National Wildlife Refuge and implementation of a management plan would require increased federal funding. Restrictions on development within the corridor would foreclose DOE options to site permanent facilities near the river. Private development would be restricted as well to the extent that zoning, availability of water, and local market conditions would permit development.

Prohibition of mineral location, leasing, and sales would foreclose these options.

Grazing would be precluded on federal lands unless it can be shown to benefit wildlife.

Irreversible and Irretrievable Resource Commitments

The public lands, which comprise 97% of the study area, are owned by the federal government and managed for recreation, wildlife, or both. The transfer of these lands to the USFWS as a refuge would not be a change in land use, but a change in management policy. Changes in sharecropping and grazing leases are not irreversible. No irreversible commitments are proposed since Congressional action could change the proposed National Wildlife Refuge designation, and the designation does not propose any irreversible actions. Designation of the River as Recreational under the National Wild and Scenic Rivers Act does not represent any change in use, nor is the designation irreversible.

Many of the perceived irretrievable commitments are speculative and reflect projected loss of gain from possible activities rather than loss of tangibles. Examples include loss of electricity from a dam which is not being proposed, loss of navigation which is not now possible, and loss of private development on federal land which is managed for recreation and wildlife habitat and has no water rights. Federal funds which would be used to operate the proposed Refuge and Recreational River would be irretrievable.

On private lands, no irreversible commitments are proposed since the designation of the river and corridor as Recreational would be an act of Congress and could be reversed. No irreversible actions are proposed. Irretrievable commitments would consist of possible loss of potential gain from new activities not prohibited by zoning. These could include multiple family residences, heavy industry, or commercial establishments. Since acquisition of easements and willing fee title are possible, these potential losses could be mitigated at fair market value where a threat to river resources occurs. Present land uses would be unaffected. The Proposed Action does not propose any irretrievable commitments of resources on private land.

Socioeconomic Impacts

The socioeconomic impacts of implementing the Proposed Action would be minimal. There would be no change in land use. Management of the publicly owned lands within the Reach and the Wahluke Slope to insure habitat protection for wildlife purposes would continue. In addition, the Proposed Action would have no affect on existing water rights or power generation operations. There are no provisions to control instream flow or alter operations in support of power production.

Recreational activities (boating, fishing, hunting, nonconsumptive) would most likely continue at existing levels, although they would be subject to management agency discretion. Grazing activities on public lands would also be at the discretion of the management agency.

Private lands would be included within the Wild and Scenic River designation (recreational classification). Restrictions for the most part would not be placed on current agricultural production. Local zoning ordinances may limit non-agricultural uses of these lands to those that are compatible with the Wild and Scenic River designation.

Research throughout the country has documented the economic growth potential in response to protected environments. Political scientists are demonstrating that environmental protection and economic prosperity are compatible. Studies show that states with higher environmental ranks consistently outperformed their lower counterparts. With the Hanford Reach protected, long term economic growth is very possible.

Cumulative Impact Of Proposed Action

The cumulative impacts of the Proposed Action would be positive. These impacts would continue and in some cases increase the protection of those resources for which protection of the Hanford Reach is being considered. These positive impacts include:

- protection of aquatic habitat vital to fall chinook salmon;
- protection of cultural resources, including the historical record and resources important to the practice of American Indian culture;
- assurance of biodiversity in the Columbia Basin;
- protection of endangered, threatened, candidate, and sensitive species populations;
- minimization of the potential for increased sloughing and erosion of the White Bluffs;
- improvement of tribal access and use opportunities;
- determination of land use within the designated area which establishes cleanup levels under the Tri-Party Agreement (resulting in a less expensive more achievable cleanup); and
- assurance of addressing future needs for recreational access and use.

In selecting the Proposed Action no impacts would occur on:

- existing uses on private lands;
- water quality of the Columbia River as a whole;
- instream flows;
- cleanup mission at the Hanford Site on the south side of the river;

- future DOE missions at the Hanford Site; and
- power transmission lines.

Continued federal ownership of the federal lands in the Reach would preclude potential private development.

Negative impacts resulting from the Proposed Action would include:

- restrictions on grazing; and
- restrictions/controls on potential future uses of private lands within the designated area that would be incompatible with resource protection.

These negative impacts would not be irreversible. They may of necessity be long-term in order to protect the resource.

ALTERNATIVE A:
National Wildlife Refuge with National Wild and Scenic River overlay, excluding private lands

This alternative, like the Proposed Action, would combine the designation of a National Wildlife Refuge and a Wild and Scenic River. Designation boundaries would remain the same except the National Wild and Scenic River would include the river and its immediate corridor and only federally-owned lands within the upstream and downstream boundary. No private lands are included in the Wild and Scenic River designation.

The following analyzes differences in management actions which would impact the eleven issues identified by the study task force as significant to the Hanford Reach.

1) Effects on Fall Chinook Salmon

1a. Controls on Development

Under this alternative, impacts to fall chinook salmon would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control development on those private lands excluded from the designated area even if an adverse impact on fall chinook salmon were to occur. Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129). On private lands, residential, recreational, industrial, or agricultural developments could occur. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Developments often result in increased erosion and siltation of spawning beds, additional water diversions, reduction in riparian vegetation, and disturbance of the bed and banks of the river. Consequently, there could be an adverse impact on fall chinook salmon from development.

1b. Controls on Mining and Mineral Development

Under this alternative, impacts to fall chinook salmon would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control activities on those private lands even if an adverse impact to fall chinook salmon were to occur. Activities could include gravel operations or gold dredging which increase sedimentation and adversely affects water quality and disturbs spawning areas. For example, in 1992 a proposal was made to placer mine for gold within a 1/4 mile of the river adjacent to one of the most popular spawning areas. Consequently, mining and mineral development on private lands could threatened fishing resources and have an adverse impact on fall chinook salmon.

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1c. Controls on Agricultural Use

Under this alternative, impacts to fall chinook salmon would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control agricultural uses on the private lands excluded from the designated area even if an adverse impact on fall chinook salmon were to occur. Approximately 800 acres are currently used for agricultural purposes within the river corridor. While the extent of existing agricultural practices have not been shown to have an adverse impact on water quality, a significant expansion of agricultural practices may have an impact on water quality and subsequent spawning habitat by increased volumes of pesticide runoff and sedimentation. Consequently, fall chinook salmon may be impacted.

1d. Controls on Grazing

Under this alternative, impacts to fall chinook salmon would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control grazing on private lands excluded from the designated area even if an adverse impact on fall chinook salmon were to occur. Grazing could be expanded on private lands. Depending on the extent of this expansion, water quality and subsequent spawning habitat could be adversely impacted from increased sedimentation. Consequently, an increase in grazing on private lands could have an adverse impact on water quality which could affect fall chinook salmon.

2) Effects on Cultural Resources

2a. Controls on Development

Under this alternative, impacts to cultural resources would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control development on private lands excluded from the designated area even if the development had an adverse impact on cultural resources. With the exclusion of private lands from the designation, conversion of these lands to nonagricultural uses may occur. Residential, recreational, and industrial developments could result in disturbances and loss of historic and archaeologic sites. Such development could cause adverse impact to cultural resources. Consequently, development on private lands may have an adverse impact on cultural resources.

2b. Controls on Mining and Mineral Development

Under this alternative, impacts to cultural resources would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control development on private lands excluded from the designated area even if the development had an adverse impact on cultural resources. Activities could include gravel operations or gold dredging which could disturb the surface of the land which often exposes cultural resources. For example, in 1992 a proposal was made to placer mine for gold within a 1/4 mile of the river where significant cultural resource sites were located. Consequently, mining and mineral development on those lands excluded from the designated area could impact cultural resources.

2c. Controls on Agricultural Use
Under this alternative, impacts to cultural resources would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control agricultural uses on private lands excluded from the designated area even if an adverse impact on cultural resources were to occur. An increase or a change in existing agricultural practices could result in disturbance and loss of cultural sites. Consequently, greater threats to cultural resources may result on the private lands excluded from the designated area.

2d. Controls on Grazing
Under this alternative, impacts to cultural resources would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control grazing on private lands excluded from the designated area even if an adverse impact on cultural resources were to occur. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity also impact upland habitats by loosening soils and creating tracks which hasten erosion which could expose vulnerable cultural resource sites. With the exclusion of private lands from the designated area, grazing could be expanded. Consequently, cultural resources could be adversely impacted.

3) Effects on Biodiversity

3a. Controls on Development
Under this alternative, impacts to biodiversity would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control development on private lands excluded from the designated area even if an adverse impact on biodiversity were to occur. Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129). Development or the conversion to more intensive land uses on those private lands may have an adverse impact on riverine, aquatic, and riparian habitats. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Development would potentially increase sediments to the river, displace wildlife populations due to a reduction in habitat and reduce native vegetation located within the river corridor, and consequently have an adverse impact on biodiversity.

3b. Controls on Mining and Mineral Development
Under this alternative, impacts to biodiversity would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control mining and mineral development on private lands excluded from the designated area even if an impact on biodiversity were to occur. Mining and mineral development could disturb or threaten important riverine, riparian, and upland habitats. For example, in 1992, a proposal was made to placer mine gold within a 1/4 mile of the river. This proposal would have disturbed shrub-steppe habitat by digging test holes and related mining operations. Consequently, mining and mineral development on private lands excluded from the designated area would adversely impact biodiversity.

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3c. Controls on Agricultural Use

Under this alternative, impacts to biodiversity would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control agricultural uses on private lands excluded from the designated area even if an impact on biodiversity were to occur. Agricultural practices could increase and potentially alter existing habitats. Native habitat types and respective species could be lost and/or replaced with agricultural crops and non-native species. Consequently, such conversion would have an adverse effect on biodiversity.

3d. Controls on Grazing

Under this alternative, impacts to biodiversity would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control grazing uses on private lands excluded from the designated area even if an adverse impact on biodiversity were to occur. Dependent on the extent of grazing activities, alteration of riparian and upland habitats is possible. Comparative USFWS studies involving grazed and ungrazed portions of the study area have shown that there is greater abundance and diversity of wildlife on ungrazed shrub-steppe lands (Radke, 1987). In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity impact upland habitats by loosening soils and creating tracks and channels which hasten erosion. In addition, where placed in high densities, cattle trample and consume native plants which are then often replaced with exotic species. Consequently, grazing could have an adverse impact on biodiversity.

4) Effects on Endangered, Threatened, Candidate, and Sensitive Species

4a. Controls on Development

Under this alternative, impacts to endangered, threatened, candidate, and sensitive species would be similar to those described under the Proposed Action. However, the USFWS would have no authority, other than that provided for listed species under Section 9 of the Endangered Species Act (refer to Legal Requirements Common to All Alternatives, page 26), to control development on private lands excluded from the designated area. Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129). Such developments along the river corridor would increase siltation and other waste pollution from projects which can impact riverine and aquatic habitat for the persistentsepal yellowcress, Columbia milkvetch, and Columbia pebblesnail, all of which are federally listed candidate species, the sandhill crane, a federally listed sensitive species, and the white pelican, considered endangered by the state. Developments could also impact roosting and nesting areas for bald eagles, a federally listed threatened species, which are located in riparian habitat. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). With the exclusion of private lands from the designation, the conversion to nonagricultural uses is possible which could reduce native habitats and wildlife. Consequently, there could be an adverse impact on threatened and endangered species.

4b. Controls on Mining and Mineral Development

Under this alternative, impacts to endangered, threatened, candidate, and sensitive species would be similar to those described under the Proposed Action. However, the USFWS would have no authority, other than that provided for listed species under section 9 of the Endangered Species Act (refer to Legal Requirements Common to All Alternatives, page 26), to control mining and mineral development even if an adverse impact on species were to occur. Mining and mineral development would be possible in or near the river on private lands excluded from the designation. Mining and mineral development could disturb riverine, riparian, and upland habitats. Such disturbances could threaten important habitats relied upon by threatened and endangered species. For example, in 1992, a proposal was made to placer mine gold within a 1/4 mile of the river. This proposal would have disturbed shrub-steppe habitat by digging test holes and related mining operations. Consequently, mining and mineral development on private lands excluded from the designated area would adversely impact threatened and endangered species.

4c. Controls on Agricultural Use

Under this alternative, impacts to endangered, threatened, candidate, and sensitive species would be similar to those described under the Proposed Action. However, the USFWS would have no authority, other than that provided for listed species under section 9 of the Endangered Species Act (refer to Legal Requirements Common to All Alternatives, page 26), to control agricultural uses on private lands even if an adverse impact on species were to occur. Many species become listed due to loss of habitats. Agricultural practices could increase and potentially alter habitats depended upon by threatened and endangered species. Consequently, there could be an adverse effect on threatened and endangered species.

4d. Controls on Grazing

Under this alternative, impacts to endangered, threatened, candidate, and sensitive species would be similar to those described under the Proposed Action. However, the USFWS would have no authority, other than that provided for listed species under section 9 of the Endangered Species Act (refer to Legal Requirements Common to All Alternatives, page 26), to control grazing on private lands even if an adverse impact on species were to occur. Dependent on the extent of grazing activities, alteration of riparian and upland habitats as well as the reduction of the quality of shrub-steppe habitat is possible. Comparative USFWS studies involving grazed and ungrazed portions of the study area have shown that there is greater abundance and diversity of wildlife on ungrazed shrub-steppe lands (Radke, 1987). In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity impact upland habitats by loosening soils and creating tracks and channels which hasten erosion. In addition, where placed in high densities, cattle trample and consume native plants which are then often replaced with exotic species. Shrub-steppe provides hunting areas and prey for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species respectively. Shrub-steppe also provides habitat for sage grouse, pygmy rabbits, and loggerhead shrike, all federally listed candidate species. Other habitats which could be impacted by cattle include riparian and wetland types. Consequently grazing on private lands, could have an adverse impact on threatened and endangered species.

5) Effects on the White Bluffs

Under this alternative, like the Proposed Action, the USFWS would monitor and not permit or initiate any actions which would contribute to sloughing of the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs. The USFWS would seek voluntary participation from agencies and individuals to identify possible remedial actions to reduce sloughing. The rate of sloughing is expected to continue at existing levels which would continue the gradual erosion of the White Bluffs. The exclusion of private lands from the designated area has no impact on the White Bluffs.

6) Effects on Water Quality

6a. Controls on Development

Under this alternative, impacts to water quality would be similar to those described under the Proposed Action. However, the USFWS would have no authority, to control development on private lands even if an adverse impact on water quality were to occur. Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129). Developments or the conversion to nonagricultural uses on private lands could increase sediments to the river which may impact water quality. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). In addition, upland agricultural development could result in increases in fertilizer and pesticide runoff to the river which could have an impact on water quality.

6b. Controls on Mining and Mineral Development

Under this alternative, impacts to water quality would be similar to those described under the Proposed Action. However, the USFWS would have no authority, to control mining and mineral development on private lands even if an adverse impact on water quality were to occur. Activities could include gravel operations or gold dredging which increase sedimentation and adversely affects water quality. For example, in 1992 a proposal was made to placer mine for gold within a 1/4 mile of the river. Consequently, mining and mineral development on private lands could have an adverse impact on water quality.

6c. Controls on Agricultural Use

Under this alternative, impacts to water quality would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control agricultural uses on the private lands even if an adverse impact on water quality were to occur. Approximately 800 acres are currently used for agricultural purposes within the river corridor. While the extent of existing agricultural practices have not been shown to have an adverse impact on water quality, an expansion of agricultural practices could impact water quality from increased chemical runoff and siltation. A significant expansion of agricultural practices may have an impact on water quality by increased volumes of pesticide runoff and sedimentation. Consequently, water quality may be impacted.

6d. Controls on Grazing

Under this alternative, impacts to water quality would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control grazing on private lands even if an adverse impact on water quality were to occur. Grazing could be expanded on private lands and depending on the extent of this expansion, water quality could be adversely impacted from increased sedimentation. Consequently, an increase in grazing on private lands could have an adverse impact on water quality.

7) Effects on Instream Flows

Like the Proposed Action, the USFWS would continue to work with all appropriate federal, state, and local agencies to ensure that appropriate stream flows are maintained to allow fall chinook salmon, or any other aquatic wildlife to migrate, spawn, rear, or reside. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. These determinations may be influenced to some degree, yet would not be dictated, by the designation of the Hanford Reach as a National Wildlife Refuge and National Wild and Scenic River. The exclusion of private lands from the designated study area has no impact on instream flows.

8) Effects on Tribal Access and Use

Like the Proposed Action, a transfer of lands from the DOE to another federal agency would result in a reassessment of the status of the transferred lands to determine compatibility with exercise of the various reserved tribal rights and privileges. The exclusion of private lands from the designated area has no impact on tribal access and use.

9) Effects on Land Ownership and Use

9a. Controls on Development

Under this alternative, private lands are excluded from the designated area. The USFWS would have no authority to zone private lands or regulate the use of private property. Zoning remains a power of local and state governments. Under the Wild and Scenic Rivers Act. The USFWS would encourage state and local officials to protect wild and scenic river values on private lands within the corridor, but state and local action is purely voluntary and subject to change. Existing zoning for the river corridor is primarily agricultural. Permitted uses range from single and multiple family dwellings, greenhouses, general farm buildings, and golf courses to more intensive uses such as hospitals, automobile assembly plants, packing plants, commercial stables, and breweries. Private lands may be converted to nonagricultural uses such as recreational, industrial, or residential which could potentially increase erosion and siltation to the river. However, there would be no impact on existing land ownership and use.

9b. Controls on Mining and Mineral Development

Under this alternative, private lands are excluded from the designated area and all mineral exploration and development on private lands would be possible. Consequently, there would be no impact on land ownership and use.

9c. Controls on Agricultural Use

Under this alternative, private lands are excluded from the designated area. Consequently, there would be no impact on existing land ownership and use.

9d. Controls on Grazing

Under this alternative, private lands are excluded from the designated area. Consequently, there would be no impact on existing land ownership and use.

10) Effects on Department of Energy Activities on the Hanford Site

Under this alternative, impacts to DOE activities would be similar to those described under the Proposed Action. Designation of the Hanford Reach as a National Wildlife Refuge with National Wild and Scenic River overlay, would determine land use, which is one of several factors considered in determining clean-up levels under the Tri-Party Agreement. The exclusion of private lands from the designated study area would have no impact on DOE activities.

11) Effects on Recreational Access and Use

11a. Controls on Development

Under this alternative, impacts to recreational access and use would be similar to those described under the Proposed Action. However, the USFWS would have no authority to control development on private lands even if an adverse impact on recreational access and use were to occur. The conversion to non-agricultural uses is possible which could reduce native habitats and wildlife. Additional corridor development may foreclose opportunities for fishing, hunting, and a variety of non-consumptive uses. Over the last three years, approximately 7-10 houses have been constructed within a quarter mile of the river. Consequently, there could be an adverse impact on recreational access and use from development.

ALTERNATIVE B:
No Action

The No Action alternative is required by the National Environmental Policy Act (NEPA). It has been modified from the draft to reflect the DOE's changing mission at Hanford from defense production to environmental restoration and waste management.

This alternative illustrates a scenario for the study area most likely to occur assuming no future legislation results from this study. As a result of the change in mission, it is expected that the lands north and east of the river will be excessed by the Department of Energy because they are no longer needed as a security and safety buffer. Disposition of these lands would vary. Lands which were withdrawn from the public domain for the Columbia Basin Project and property originally acquired by the Bureau of Reclamation (BR) would return to BR jurisdiction. Administration of the remaining public domain lands would revert to the Bureau of Land Management. Lands acquired in fee by the DOE (approximately 50% of the north slope or 45,000 acres) would be disposed within the next 5 to 10 years according to procedures established by the General Services Administration (GSA); the federal agency responsible for the disposal of excess federal real property. Lands on the south side of the river would remain under DOE management responsibility for the foreseeable future.

Given the national significance of the resources values on the North Slope, it is assumed that for purpose of this analysis, the lands currently administered by the DOE would remain in public ownership (federal, state, or local) and be managed for conservation and recreation purposes.

Effects on the resources of the Hanford Reach from Hanford Site cleanup activities will be considered in the Hanford Remedial Action Environmental Impact Statement currently being completed by the DOE and anticipated for release in December 1994. In the short term, DOE programs to monitor and protect significant natural and cultural resources would continue and the USFWS and WSDFW would retain resource management responsibilities over the refuges north and east of the river as long as permits with DOE were maintained. Prohibitions on dams and water resource development projects would expire in 1996 with the termination of the moratorium provided by Public Law 100-605.

1) Effects on Fall Chinook Salmon

Of the species that pass through or reside in the Hanford Reach, none is more significant than the fall chinook salmon. The fall chinook are significant commercially because they have excellent flesh quality throughout most of their upstream migration, and are important to the recreational fishery because of their strength, beauty, and size. Additionally, the fall chinook salmon especially have great cultural significance for American Indians. A great majority of the fall chinook passing McNary Dam in recent years are returning to spawn naturally in the Hanford Reach.

The following analysis examines the existing management situation and how fall chinook salmon would be impacted in the foreseeable future.

1a. Dam Construction

Under this alternative, it is assumed that there would be no prohibition on dams after the existing moratorium expires in 1996. Construction of a new dam in the Hanford Reach is possible, however, there are no current proposals. The Ben Franklin Dam, proposed in the 1970s by the Army Corps of Engineers

(ACOE) at river mile 348 is used as the basis for analyzing potential impacts should a dam be constructed in the Hanford Reach. The proposed dam would have been over 7700 ft. wide and 82 ft. high and created an impoundment that would have extended the entire length of the reach (RM345-396). Almost 50 miles of spawning and rearing habitat which currently accounts for approximately 85% of the total Hanford Reach fall chinook production, would be inundated by the impoundment and spawning would be eliminated. Upstream and downstream migration is critical to fall chinook stocks in the Columbia River: approximately 80% of the total adult fall chinook run entering the mouth of the river will return to the Hanford Reach (Geist 1991). In 1987, 90,000 adult fall chinook returned to spawn in the reach. Existing conditions would be maintained until November 1996, however, subsequent construction of a dam would drastically reduce or eliminate fall chinook salmon. This could ultimately result in their listing as a threatened or endangered species.

1b. Water Resource Development Project Construction

Under this alternative, it is assumed that there would be no prohibition on water resource development projects after the existing moratorium expires in 1996. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. The intent of this project was to construct a shallow-draft commercial navigation channel through the Reach in order to allow barges and large vessels to travel from Richland to upstream ports. This project would have required the dredging of a 20 mile long channel to a uniform channel depth of 14 ft within the reach. It would have disturbed a substantial amount of spawning habitat, including areas that have large concentrations of spawning redds, and changed the hydraulics of the river with unknown consequences on spawning habitat and use. Fisheries agencies concluded that barge traffic on the river would disturb spawning activity and resulting wakes would increase shoreline and island erosion which would cause siltation of spawning gravels (Washington Department of Fisheries 1987). Approximately 85% of the total Columbia River fall chinook adults are naturally spawning fish which depend on swift currents, cobble, and shallow water (Roler 1991). Existing conditions would be maintained until November 1996, however, subsequent water resource development projects could result in a major loss of salmon populations. This could ultimately result in their listing as a threatened or endangered species.

1c. Water Quality Protection

Under this alternative, dams, water resource development projects, mining, and residential development could occur and have an impact on water quality (for further information, a detailed discussion is located in this alternative, "Effects on Water Quality", page 198). Excellent water quality is critical to salmon spawning and rearing success. Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. Potential impacts may include increased sedimentation and pollution from development, increased temperatures, and reduced river velocities. Consequently, due to the potential impacts development has on water quality, there could be adverse impacts to fall chinook salmon.

1d. Instream Flow Protection

Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Barring major changes in the operation of upstream and downstream dams, the existing flow regime would be maintained. Future alteration of the flow regime may not insure optimum flow requirements for fall chinook salmon. Consequently, there could be an adverse effect on fall chinook salmon.

1e. Nuisance Aquatic Macrophyte Control

At present and in the foreseeable future, there will be no control of nuisance aquatic macrophytes in the Hanford Reach. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows from increased vegetation, in turn, can adversely affect salmon habitat by increasing water temperature and reducing sedimentation transport and oxygen supply, especially in the shallow water areas which salmon prefer (U.S. Army Corps of Engineers 1979b). Consequently, continued increases in milfoil populations may have an adverse impact on fall chinook salmon spawning and rearing habitat.

1f. White Bluffs Protection

No actions would be taken to limit and reduce activities which could impact the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs and continues to reduce stability. Several significant spawning areas are located immediately below the White Bluffs. Sloughing contributes sediments to the river which eventually siltates spawning gravels, making them less desirable for salmon. The rate of sloughing is expected to continue at existing levels, which would continue to impact those spawning areas located directly below the White Bluffs. Consequently, it is likely that deterioration of the White Bluffs would continue and possibly accelerate impacting fall chinook salmon.

1g. Controls on Development

In the short term, assuming the continuation of the existing DOE mission for the Hanford Site which entails cleanup and environmental restoration, development within the corridor would be limited to support of cleanup activities, i.e. the "100 Areas". Cleanup activities would result in localized and temporary adverse impact to fishery values. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize impacts to fall chinook salmon spawning and rearing habitat.

In the long term, development on public lands in the study area would be dependent upon the discretion and needs of the administering agency. Lands would be transferred to a resource management agency and managed for conservation and recreation purposes. No large-scale development would occur on federal lands. Consequently, impacts are not expected to affect fall chinook salmon.

On private lands, existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129). On private lands, residential, recreational, industrial, or agricultural developments could occur resulting in increased erosion and siltation of spawning beds, additional water diversions, reduction in riparian vegetation, and disturbance of the bed

and banks of the river. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Consequently, there could be an adverse impact on fall chinook salmon from development.

1h. Controls on Mining and Mineral Development

Under this alternative, the current withdrawals which prohibit mining and mineral development would remain in effect in the short term while DOE maintains management responsibility. When the DOE excesses the lands, long term consequences would depend on the agency obtaining the property. With continued public ownership, disturbance to fall chinook salmon spawning and rearing habitat would be minimized. On private lands within the study area, mining and mineral development could occur and potentially increase sedimentation which adversely effects water quality and disturbs spawning gravels. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river adjacent to one of the more popular spawning areas (NPS, 1992). Consequently, impacts to fall chinook salmon are anticipated to be minimal on public lands but difficult to determine on private lands.

1i. Controls on Agricultural Use

With continued public ownership, existing sharecropping leases would most likely be maintained. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. Existing sharecropping practices have not had an impact on water quality, which could potentially impact salmon habitat. In the long term (post DOE management), consequences would depend on the agency obtaining the property and their plans for future use. On private lands, no additional controls would exist and it is possible that additional lands could be developed for agricultural purposes. Agricultural practices of the type currently along the river are not impacting water quality and subsequent spawning habitat. Consequently, only if the type and intensity of agriculture changes in a manner to adversely affect water quality would there be an impact on fall chinook salmon.

1j. Controls on Grazing

Under this alternative, whether or not to continue grazing on public lands would be subject to the discretion of the managing agency. Currently, an estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity also impact upland habitats by loosening soils and creating tracks which hasten erosion and increase sedimentation to the river. Unless the amount of grazing is increased substantially, water quality would not be affected. Consequently, there would be little or no impact on fall chinook salmon.

2) Effects on Cultural Resources

The cultural resources of the Hanford Reach include archaeological and historic sites. Archaeological and historical sites within the Hanford Reach are generally intact because public access to the Hanford Site has been limited since 1943. Among the most important American Indian cultural resources are ancestral cemeteries or burial grounds, usual and accustomed fishing sites, sites for current practice of traditional American Indian religion, anadromous fisheries, food and medicinal plants, and old homesites and place names. Many sites along the Hanford Reach are significant and are identified in historical records. The following analysis examines the existing management situation and how cultural resources would be impacted in the foreseeable future.

2a. Dam Construction

Under this alternative, it is assumed that there would be no prohibition on dams after the existing moratorium expires in 1996. Construction of a new dam in the Hanford Reach is possible, however, there are no current proposals. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts should a dam be constructed in the Hanford Reach. This project would have inundated two National Register sites, four archaeological districts, and 122 prehistoric archaeological sites (Rice 1980). Consequently, development of a dam could have long term significant adverse impacts on cultural resources located along the river.

2b. Water Resource Development Project Construction

Under this alternative, it is assumed that there would be no prohibition on water resource development projects after the existing moratorium expires in 1996. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a water resource development project. This project would have had varying impacts on cultural resources located along the bank of the river depending on the location of the dredging, the placement of dredge spoils, and the potential for erosion of sites from increased stream velocities and barge-generated wakes. Consequently, not only are there direct impacts, but use by barges could result in subsequent waves which could erode significant cultural resource sites contained within the banks of the river.

2c. Controls on Development

In the short term, assuming the continuation of the existing DOE mission for the Hanford Site which entails environmental cleanup and site restoration, development within the corridor would be limited to support of clean up activities, i.e. the "100 Areas". Cleanup activities could result in temporary adverse impacts to cultural resources. The DOE is required by law to conduct cultural resource inventories and evaluate sites proposed for development. In the long term, development would be dependent upon the discretion and needs of the administering agency. Lands would be transferred to a resource management agency and managed for conservation and recreation purposes. No large-scale development would occur on federal lands. Other development would be subject to existing federal regulations, and disturbance to archaeological sites and artifacts would be minimized or properly documented. Consequently, in the long term, impacts to cultural resources would depend on management along the Hanford Reach, with few impacts anticipated.

On private lands, existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129). On private lands, residential, recreational, industrial, or agricultural developments could occur and result in disturbances and loss of historic and archaeologic sites. Such development could cause unacceptable adverse impact to cultural resources. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Consequently, those cultural resource sites on private lands may be vulnerable to development which may have an adverse impact on cultural resources.

2d. Controls on Mining and Mineral Development

Under this alternative, the current withdrawals which prohibit mining and mineral development would remain in effect in the short term while DOE maintains management responsibility. When the DOE excesses the lands, long term consequences would depend on the agency obtaining the property. With continued public ownership, and management for conservation and recreation purposes, the withdrawals may well be retained. Disturbance to archaeological sites and artifacts would be minimized or properly documented. On private lands within the study area, mining and mineral development could occur and potentially have an adverse effect on cultural resources. In 1992, a proposal was pursued to placer mine gold within 1/4 mile of the river where significant cultural resource sites were located. Consequently, impacts to cultural resources are anticipated to be minimal on public lands but difficult to determine on private lands.

2e. Controls on Agricultural Use

With continued public ownership, existing sharecropping leases would most likely be maintained. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. When DOE excesses the lands, long term consequences would vary depending on the agency obtaining the property and their plans for future use. Existing sharecropping practices have not had an impact on cultural resources. On private lands, it is possible that agricultural development could be expanded and result in disturbance and loss of additional significant sites. Consequently, impacts to cultural resources are anticipated to be minimal on public lands but difficult to determine on private lands.

2f. Controls on Grazing

Under this alternative, whether or not to permit grazing would be subject to the discretion of the managing agency. An estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing by the WSDFW. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity also impact upland habitats by loosening soils and creating tracks which hasten erosion which could expose vulnerable cultural resource sites. It is likely that grazing could continue and be expanded with continued public ownership. On private lands, grazing could be expanded. Consequently, depending on the extent of grazing activities, cultural resources could be adversely impacted.

2g. Control of Wildfire

On public lands, wildfire control would continue to consist of agency/county cooperative efforts. On private lands, the respective county would be responsible for wildfires. Counties have limited resources to fight wildfires, i.e. no access to federal aerial support, and they also utilize techniques less sensitive to the protection of cultural resources. Controls on wildfires would continue as is; consequently, there is greater potential for impacts to cultural resources on private lands than with an action alternative.

2h. Interpretation and Education Activities

Under this alternative and in the short term, the DOE would continue to provide additional information regarding cultural resources of the Hanford Reach. In the long term, the degree to which interpretation and education programs were pursued by a public agency is unknown. Cultural resources could be slightly impacted if interpretation and education activities are reduced with a consequent decreased understanding of their significance.

2i. Inventory and Survey Activities

Under this alternative and in the short term, the DOE would continue to conduct inventories and surveys on cultural resources until such time as lands are excessed and the disposal process complete. The DOE has an established cultural resources program which includes staff with a high level of expertise and familiarity with the cultural resources in the Hanford Reach. Ongoing DOE inventories would continue to document archaeological sites which could result in nominations of sites to the National Register of Historic Places and/or the establishment of National Historic Landmarks. Maintenance of existing historic and archaeological sites would continue. In the long term, other public agencies would be responsible for cultural resource management under applicable regulations and authorities (i.e. National Historic Preservation Act, sections 106 & 110, and respective state laws). Consequently, no impact to cultural resources is anticipated.

2j. Law Enforcement Actions

In the long term (post DOE management), enforcement of the laws which prohibit unauthorized off-road vehicle use and unauthorized access and use would be subject to the discretion and managing capability of the administering agency. With respect to cultural resources, off-road vehicle use is of particular concern. Off-road vehicle use not only makes cultural resource sites more accessible, but their use can also directly destroy these resources. Unauthorized access often results in damage to significant cultural resources. Assuming continued public ownership, minor impacts to cultural resources are expected.

3) Effects on Biodiversity

The Hanford Reach features several types of habitat which are declining in area and quality along the mainstem Columbia River. These habitats include the aquatic habitat of the free-flowing river, the riverine shorelines habitat, the riparian habitat along the river banks, the bluff habitat of the White Bluffs, the upland shrub-steppe communities, and lakes and wetlands. The aquatic, riverine, and riparian habitats, once abundant on the mainstem river, have been lost to dam construction and inundation of free-flowing segments. The White Bluffs are a unique geological feature comprised of claystones and siltstones which line approximately 31 miles of the Hanford Reach and are inherently rare as a habitat type. The shrub-steppe habitat along the Hanford Reach is a remnant of the plant communities that historically covered vast areas of the Columbia Basin. The variety and integrity of habitat types along the Hanford Reach is truly exceptional. The following analysis examines the existing management situation and how biodiversity would be impacted in the foreseeable future.

3a. Dam Construction

Under this alternative, there would be no prohibition on dams after the existing moratorium expires in 1996. Construction of a new dam in the Hanford Reach is possible, however, there are no current proposals. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts should a dam be constructed in the Hanford Reach. This project would have inundated approximately 11,500 acres of riparian lands which provides essential habitat for approximately 250 deer, 10,000 upland game birds, and 318,000 waterfowl (U.S. Army Corps of Engineers, 1979). In addition, almost 50 miles of free-flowing river would have been inundated, with a loss in native aquatic habitat and species. Existing conditions would be maintained until November 1996, however, subsequent construction of a dam would damage native habitat and consequently have an adverse impact on biodiversity.

3b. Water Resource Development Project Construction

Under this alternative, there would be no prohibition on water resource development projects after the existing moratorium expires in 1996. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a water resource development project. This project would have increased erosion of riverine and riparian habitats, inundated nesting areas for colony nesters, Canada geese, long-billed curlews, and waterfowl, and increased disturbance by allowing large vessels and barges to travel close to river islands (U.S. Fish and Wildlife Service 1988). Impacts would be particularly acute for wintering waterfowl, which number in the tens of thousands on the Hanford Reach (actual daily waterfowl counts for November through January, 1986-1990, were between 25,000-93,000). The Reach is especially important to wintering waterfowl because it provides one of the only few large areas along the Columbia River which is protected against major disturbance (U.S. Fish and Wildlife Service 1988; Annear 1991). Existing conditions would be maintained until November 1996, however, subsequent water resource development projects could have a significant adverse impact to biodiversity.

3c. Water Quality Protection

Under this alternative, dams, water resource development projects, mining and mineral development, and residential development could occur and have an impact on water quality (for further information, a detailed discussion is located in this alternative, "Effects on Water Quality", page 198). Excellent water quality supports viable riverine and riparian habitats and those species dependent on these habitats. Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. In addition to the river, upland lakes and wetlands provide important habitat for migratory waterfowl and other water dependent species. Potential impacts may include increased sedimentation and pollution from development, increased temperatures, and reduced river velocities. Due to the potential impacts development has on water quality, there could be adverse impacts to riverine and riparian habitat and consequently adverse impacts on biodiversity.

3d. Instream Flow Protection

Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Barring major changes in the operation of upstream and downstream dams, the existing flow regime would be maintained. Future alteration of the flow regime may not insure optimum flow requirements for maintenance of aquatic habitats. Consequently, there could be an adverse impact on biodiversity.

3e. Nuisance Aquatic Macrophyte Control

At present and in the foreseeable future, there will be no control of nuisance aquatic macrophytes. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows from increased vegetation, in turn, can adversely affect riverine and riparian habitat by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Continued increases in milfoil populations may have an adverse impact on riverine and riparian habitats and respective species, and, consequently, biodiversity.

3f. White Bluffs Protection

No action would be taken to limit and reduce activities which could impact the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs and continues to reduce stability. The White Bluffs provide important nesting habitat for species including but not limited to cliff swallows, great-horned owls, red-tailed hawks, and say's phoebe. The rate of sloughing is expected to continue at existing levels which would continue the gradual erosion of the White Bluffs. Consequently, additional sloughing would have a possible but unquantified effect on biodiversity by reducing bluff habitat and its respective species.

3g. Non-Native Vegetation Control

Under this alternative, management of non-native vegetation would be subject to the discretion and capability of the managing agency. Non-native vegetation is both a cause and effect of disturbance of native habitats. Currently, non-native vegetation consists of Russian olive trees (dispersed over approximately 500 acres), salt cedar (dispersed over approximately 10 acres), purple loosestrife (dispersed over approximately 10 acres), and common white mulberry trees which are scattered along the banks of the river (Goeke 1991; Rickard 1992). The spread of non-native vegetation would depend on the efforts of the public agency. Consequently, the impact on biodiversity is unknown.

3h. Revegetation of Disturbed Areas

Under this alternative, the revegetation of disturbed areas would be subject to the discretion and capability of the managing agency. Replacement of native vegetation with non-native vegetation has a detrimental impact on biodiversity. Approximately 3200 acres along the Benton County shoreline of the reach are disturbed (L. Fitzner 1991) and should be reseeded with native plant species. Increases in non-native vegetation would have an impact on the diversity and abundance of endemic plant and animal species and subsequently have an adverse effect on biodiversity.

3i. Control of Wildfire

On public lands, wildfire control would continue to consist of agency/county cooperative efforts. On private lands, the respective county would be responsible for wildfires. Counties have limited resources to fight wildfires, i.e. no access to federal aerial support. Controls on wildfires would continue as is; consequently, there is greater potential for impacts to biodiversity on private lands than with an action alternative.

3j. Controls on Development

In the short term, assuming the continuation of the existing DOE mission for the Hanford Site which entails cleanup and environmental restoration, development within the corridor would be limited to support of cleanup activities, i.e. the "100 Areas". Cleanup activities would result in localized and temporary disturbance, but this impact might be mitigated by the DOE replanting sites with native plant species following cleanup. Continuation of existing DOE management would result in the maintenance of the diversity and populations of native plants, fish, and wildlife.

In the long term, development on public lands in the study area would be dependent upon the discretion and needs of the administering agency. Lands would be transferred to a resource management agency and managed for conservation and recreation purposes. No large-scale development would occur on federal lands. Consequently, actions are not expected to affect biodiversity.

On private lands, residential, recreational, industrial, or agricultural developments could occur resulting in increased erosion and siltation of spawning beds, additional water diversions, reduction in riparian vegetation, and disturbance of the bed and banks of the river. Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129). During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Consequently, there could be an adverse impact on biodiversity from development.

3k. Controls on Mining and Mineral Development

Under this alternative, the current withdrawals which prohibit mining and mineral development would remain in effect in the short term while DOE maintains management responsibility. When the DOE excesses the lands, long term consequences would depend on the agency obtaining the property. With continued public ownership, disturbance to riverine, riparian, and upland habitats would be minimized. On private lands within the study area, mining and mineral development could occur and potentially have an adverse effect on habitats. In 1992, a proposal was pursued to placer mine gold within a 1/4 mile of the river. This proposal would have disturbed shrub-steppe habitat, in particular the sagebrush-cheatgrass community, by digging of test holes and related mining activities (NPS 1992). Consequently, impacts to biodiversity are anticipated to be minimal on public lands but difficult to determine on private lands.

3l. Controls on Agricultural Use

With continued public ownership existing sharecropping leases would most likely be maintained. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. When the DOE excesses the lands, long term consequences would depend on the agency obtaining the property and their plans for future use. Habitat alteration from existing sharecropping practices has already occurred. On private lands within the study area, it is possible that agricultural use could be expanded and reduce native habitat types and respective species. Consequently, impacts to biodiversity are anticipated to be minimal on public lands but difficult to determine on private lands.

3m. Controls on Grazing

Under this alternative, whether or not to continue and/or expand grazing on public lands would be subject to the discretion of the managing agency. An estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity also impact upland habitats by loosening soils and creating tracks which hasten erosion which could result in increased sedimentation to the river. Comparative USFWS studies involving grazed and ungrazed portions of the study area have shown that there is greater abundance and diversity of wildlife on ungrazed shrub-steppe lands (Radke, 1987). In addition, where placed in high densities, cattle trample and consume native plants which are then often replaced with exotic species. On private lands, grazing could be expanded. Depending on the extent of grazing activities, impacts to riparian and upland habitats will continue. Consequently, impacts to biodiversity are anticipated to be minimal on public lands but difficult to determine on private lands.

3n. Law Enforcement Actions

In the long term (post DOE management), enforcement of the laws which prohibit unauthorized off-road vehicle use and unauthorized access would be subject to the discretion and capability of the managing agency. Off-road vehicle use has resulted in damage to upland and riparian habitats, with the majority of damage occurring on the steep slopes near Ringold, and harassment of wildlife populations. Unauthorized access and use in sensitive habitat areas also results in impacts to riparian and upland habitats, specifically by increased incidences of wildfires, littering, disturbance to rare plants and flowers, and distraction and disturbance of nesting and resting wildlife. While sensitive areas are posted to reduce trespass, trespass still accounts for numerous disturbances to habitats. Both off-road vehicle use and unauthorized access are expected to continue absent increases in law enforcement. Consequently, assuming continued public ownership, minor impacts to biodiversity are expected.

4) Effects on Threatened, Endangered, Sensitive, and Candidate Species

The Hanford Reach is unique as it is perhaps the last stronghold of many of the Pacific Northwest's most endangered, threatened, and sensitive wildlife species. At least 48 of these species are classified as federal sensitive, candidate, threatened, or endangered species, and/or state threatened, endangered, or species of concern. The following analysis examines the existing managmenet situation and how threatened and endangered species would be impacted in the foreseeable future.

4a. Dam Construction

Under this alternative, there would be no prohibition on dams after the existing moratorium expires in 1996. Construction of a new dam in the Hanford Reach is possible, however, there are no current proposals. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts should a dam be constructed in the Hanford Reach. This project would have significantly altered the aquatic habitat and flow regime of the Hanford Reach. The Columbia pebblesnail, a federally listed candidate species, relies on clean, well-oxygenated, and swiftly moving water to meet respiration requirements, all of which would be eliminated (U.S. Fish and Wildlife Service 1988). The riverine habitat for the persistentsepal yellowcress and Columbia milkvetch, federally listed candidate species, would be destroyed. In addition, riverine habitat which provides nesting, cover, and feeding essential to the sandhill crane, a federally listed sensitive species, and the white pelican, considered endangered by the state, would be lost with consequent declines in species populations. A dam would also greatly reduce salmon populations which bald eagles rely on as a winter food source resulting in reduced or eliminated eagle populations (U.S. Army Corps of Engineers 1979a). Finally, dam construction could result in the listing of the Fall chinook salmon as an threatened or endangered species. Existing conditions would be maintained until November 1996, however, subsequent construction of a dam would damage habitats and consequently have an adverse impact to threatened and endangered species.

4b. Water Resource Development Project Construction

Under this alternative, it is assumed that there would be no prohibition on water resource development projects after the existing moratorium expires in 1996. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have increased erosion of riverine and riparian habitats and increased disturbance by allowing large vessels and barges to travel close to river islands (U.S. Fish and Wildlife Service 1988), resulting in the reduction of listed and candidate species which are dependent on these habitats. The moratorium would maintain existing conditions until November 1996, however, subsequent

water resource development projects could significantly change the aquatic habitat and flow regime and adversely impact several threatened and endangered species.

4c. Water Quality Protection

Under this alternative, dams, water resource development projects, mining and mineral development, and residential development could occur and have an impact on water quality (for further information, a detailed discussion is located in this alternative, "Effects on Water Quality", page 198). Excellent water quality supports viable riverine and riparian habitats and those species dependent on these habitats. Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. In addition to the river, upland lakes and wetlands provide important habitat for migratory waterfowl which are also prey for bald eagles and peregrine falcons, federally listed and endangered species. Potential impacts may include increased sedimentation and pollution from development, increased temperatures, and reduced river velocities. Due to the potential impacts development has on water quality, there could be adverse impacts to habitats which threatened and endangered species depend upon.

4d. Instream Flow Protection

Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Barring major changes in the operation of upstream and downstream dams, the existing flow regime would be maintained. Future alteration of the flow regime may not insure optimum flow requirements for maintenance of aquatic habitats. Consequently, there could be an adverse impact on threatened and endangered species.

4e. Nuisance Aquatic Macrophyte Control

At present and in the foreseeable future, there will be no control of nuisance aquatic macrophytes. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows from increased vegetation, in turn, can adversely affect salmon habitat by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Continued increases in milfoil populations may have an adverse impact on aquatic habitat which supports threatened and endangered species, specifically the Columbia pebblesnail, a federally listed candidate species.

4f. White Bluffs Protection

No action would be taken to limit and reduce activities which could impact the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs and continues to reduce stability. Bluffs provide roost and foraging for bald eagles and peregrine falcons, both of which are federally listed as threatened and endangered species, respectively. The rate of sloughing is expected to continue at existing levels which would continue the gradual erosion of the White Bluffs. Consequently, additional sloughing would have a possible but unquantified effect on threatened and endangered species through the loss of bluff habitat for roosting and foraging for bald eagles and peregrine falcons.

4g. Non-Native Vegetation Control

Under this alternative, management of non-native vegetation would be subject to the discretion and capability of the managing agency. Non-native vegetation is both a cause and effect of disturbance of native habitats. Currently, non-native vegetation consists of Russian olive trees (dispersed over approximately 500 acres), salt cedar (dispersed over approximately 10 acres), purple loosestrife (dispersed over approximately 10 acres), and common white mulberry trees which are scattered along the banks of the river (Goeke 1991; Rickard 1992). The spread of non-native vegetation would depend on the efforts of the public agency. Consequently, the impact on threatened and endangered species is unknown.

4h. Revegetation of Disturbed Areas

Under this alternative, the revegetation of disturbed areas would be subject to the discretion and capability of the managing agency. Replacement of native vegetation with non-native vegetation reduces shrub-steppe habitat for threatened and endangered species. Shrub-steppe habitat provides hunting areas and prey for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species, respectively. Shrub-steppe also provides habitat for sage grouse, pygmy rabbit, and loggerhead shrike, all federally listed candidate species. Approximately 3200 acres along the Benton County shoreline of the reach are disturbed (L. Fitzner 1991) and should be reseeded with native plant species. Increases in non-native vegetation would have an impact on native habitats and subsequently have an adverse affect on threatened and endangered species.

4i. Control of Wildfire

On public lands, wildfire control would continue to consist of agency/county cooperative efforts. On private lands, the respective county would be responsible for wildfires. Counties have limited resources to fight wildfires, i.e. no access to federal aerial support. Controls on wildfires would continue as is; consequently, there is greater potential for impacts to biodiversity on private lands than with an action alternative.

4j. Controls on Development

In the short term, assuming the continuation of the existing DOE mission for the Hanford Site which entails cleanup and environmental restoration, development within the corridor would be limited to support of cleanup activities, i.e. the "100 Areas". Cleanup activities would result in localized and temporary disturbance, but this impact might be mitigated by the DOE replanting sites with native plant species following cleanup. Continuation of existing DOE management would result in the maintenance of habitats depended upon by threatened and endangered species.

In the long term, development on public lands in the study area would be dependent upon the discretion and needs of the administering agency. Lands would be transferred to a resource management agency and managed for conservation and recreation purposes. No large-scale development would occur on federal lands. Consequently, actions are not expected to affect threatened and endangered species.

On private lands, residential, recreational, industrial, or agricultural developments could occur resulting in increased erosion and siltation of spawning beds, additional water diversions, reduction in riparian vegetation, and disturbance of the bed and banks of the river. Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected

Environment, page 129). During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Consequently, there could be an adverse impact on threatened and endangered species from development.

4k. Controls on Mining and Mineral Development

Under this alternative, the current withdrawals which prohibit mining and mineral development would remain in effect in the short-term while DOE maintains management responsibility. When the DOE excesses the lands, long term consequences would depend on the agency obtaining the property. With continued public ownership, disturbance to riverine, riparian, and upland habitats and the threatened and endangered species dependent on these habitats would be minimized. On private lands within the study area, mining and mineral development could occur and potentially have an adverse impact on threatened and endangered species. In 1992, a proposal was pursued to placer mine gold within 1/4 mile of the river. This proposal would have disturbed shrub-steppe habitat, in particular the sagebrush-cheatgrass community, by digging of test holes and related mining activities (NPS 1992). Consequently, impacts to threatened and endangered species are anticipated to be minimal on public lands but difficult to determine on private lands.

4l. Controls on Agricultural Use

With continued public ownership, existing sharecropping leases would most likely be maintained. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. When DOE excesses the land, long term consequences would depend on the agency obtaining the property and their plans for future use. Many species become listed due to loss of habitats. Habitat alteration from existing sharecropping practices has already occurred. On private lands within the study area, it is possible that agricultural use could be expanded and reduce native habitat types and respective species. Consequently, impacts to threatened and endangered species are anticipated to be minimal on public lands but difficult to determine on private lands.

4m. Controls on Grazing

Under this alternative, whether or not to continue and/or expand grazing on public lands would be subject to the discretion of the managing agency. An estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity also impact upland habitats by loosening soils and creating tracks which hasten erosion. Grazing has particularly had an impact on shrub-steppe and riparian areas. Shrub-steppe provides hunting areas and prey for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species respectively. Shrub-steppe also provides habitat for sage grouse, pygmy rabbits, and loggerhead shrike, all federally listed candidate species. Other habitats which could be impacted by cattle include riparian and wetland types. On private lands, grazing could be expanded. Depending on the extent of grazing activities, impacts to riparian and upland habitats will continue. Consequently, impacts to threatened and endangered species are anticipated to be minimal on public lands but difficult to determine on private lands.

4n. Law Enforcement Actions

In the long term (post DOE management), enforcement of the laws which prohibit unauthorized off-road vehicle use and unauthorized access would be subject to the discretion and capability of the managing agency. Access in sensitive habitat areas results in impacts to riparian and upland habitats, specifically by increased incidences of wildfires and distraction and disturbance of various nesting and resting areas for

listed and candidate species. Off-road vehicle use primarily impacts shrub-steppe habitat by eliminating vegetation. Loss of shrub-steppe habitat results in reduced populations of pygmy rabbits, sage grouse, and loggerhead shrikes, all federal candidate species, as well as reductions of prey and adequate hunting areas for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species, respectively. With existing limitations in patrolling, unauthorized access and off-road vehicle use are expected to continue to impact riparian and shrub-steppe habitats which adversely impact threatened and endangered species. Consequently, assuming continued public ownership, minor impacts to threatened and endangered species are expected.

5) Effects on the White Bluffs

The White Bluffs are a unique geological feature comprised of claystones and siltstones which line approximately 31 miles of the Hanford Reach. The White Bluffs rise up to almost 600 feet in the study area, and represent the single outcrop of the Ringold formation in the Pasco Basin. Besides being the most striking landform on the Hanford Reach, the White Bluffs are also regionally significant as a paleontological resource. The upper Ringold consists of tremendous deposits of fish and turtle deposits that are indigenous east of the Rocky Mountains, in addition to occasional concentrations of mammal fossils such as camel, deer, horse, mastodon, members of the pig family, various kinds of rodents, and rabbits (Gustafson, E.P. 1978). An especially significant feature of the White Bluffs is the mammalian fauna preserved in the sediments of the Ringold Bar. A common geologic hazard associated with the White Bluffs is landslides, commonly referred to as sloughing. Landslides occurred in this area during the Pleistocene epoch, a result of saturation and undercutting by glacial-related floodwater. More recently, suspected human-induced landslide activity has developed and includes one slide at the southern end of the White Bluffs. The following analysis examines the existing management situation and how the White Bluffs would be impacted in the foreseeable future.

5a. White Bluffs Protection

No action would be taken to limit and reduce activities which could impact the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs and continues to reduce stability. It is likely that deterioration of the White Bluffs would continue and possibly accelerate. Consequently, there would be an adverse impact on the White Bluffs.

5b. Interpretation and Education Activities

In the short term, the DOE would continue to provide additional information regarding the White Bluffs, particularly the paleontological fossils, while DOE maintains management responsibility. When DOE excesses the lands, long term consequences would vary on the agency acquiring the property and their plans for use. The degree to which interpretation and education programs were pursued by a public agency is unknown. Consequently, there could be a slight impact on the White Bluffs resulting from decreased understanding of their significance.

5c. Law Enforcement Actions

In the long term (post DOE management), enforcement of the laws which prohibit unauthorized off-road vehicle use, unauthorized access, and illegal fossil collecting would be subject to the discretion and capability of the managing agency. While the majority of off-road vehicle use occurs on the steep slopes near Ringold, incidents of their use have occurred on the slopes of the White Bluffs. Off-road vehicle use lessens the stability of the White Bluffs by loosening the siltstones and claystones which make up the formation. The White Bluffs contain an extensive series of exposed Miocene and Pliocene vertebrate and

invertebrate fossil deposits. Assuming continued public ownership, minor impacts to the White Bluffs are expected.

6) Effects on Water Quality

The Columbia River from Grand Coulee Dam to the mouth of the river near Astoria, Oregon has been designated by the Washington Department of Ecology as a Class A (excellent) surface water body. Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. Surface water quality is especially important because approximately 95% of water used in the Pasco Basin is derived from surface water, with the remaining 5% derived from groundwater. The following analysis examines the existing management situation and how water quality would be impacted in the foreseeable future.

6a. Dam Construction

Under this alternative, it is assumed that there would be no prohibition on dams after the existing moratorium expires in 1996. Any change in the equilibrium of the river, such as stream flow, temperature, and substrate, will affect water quality (Thompson 1992). Construction of a new dam in the Hanford Reach is possible, however, there are no current proposals. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts should a dam be constructed in the Hanford Reach. This project would have resulted in increased water temperatures over natural conditions by prolonged exposure to solar radiation, and increased sedimentation resulting from reductions in river flow which would have decreased the capacity of the river to carry solids (SAI/PMX/DC 1979). Existing conditions would be maintained until November 1996, however, subsequent construction of a dam would have a short term adverse impact on water quality.

6b. Water Resource Development Project Construction

Under this alternative, it is assumed that there would be no prohibition on water resource development projects after the existing moratorium expires in 1996. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed river sediments which may contain contaminants and impact water quality. Impacts to water quality would vary depending on the location of the dredging. Dredging in the middle of the river would transport sediments downstream and have less of an impact on water quality than along the shorelines, which could cause localized silt plumes containing concentrated amounts of associated contaminants (Johnson 1992). Existing conditions would be maintained until November 1996, however, subsequent water resource development projects could have an adverse impact on water quality.

6c. Instream Flow Protection

Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Barring major changes in the operation of upstream and downstream dams, the existing flow regime would be maintained. Future alteration of the flow regime may not insure optimum flow requirements to ensure water quality. Consequently, there could be a slight adverse effect on water quality.

6d. Nuisance Aquatic Macrophyte Control

At present and in the foreseeable future, there will be no control of nuisance aquatic macrophytes in the Hanford Reach. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows from increased vegetation, in turn, can adversely affect water quality by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Continued increases in milfoil populations may have an adverse impact on water quality over time.

6e. Controls on Development

In the short term, assuming the continuation of the existing DOE mission for the Hanford Site which entails cleanup and environmental restoration, development within the corridor would be limited to support of cleanup activities, i.e. the "100 Areas". Cleanup activities could result in localized and temporary siltations in addition to potential chemical and radiological contamination.

In the long term, development on public lands in the study area would be dependent upon the discretion and needs of the administering agency. Lands would be transferred to a resource management agency and managed for conservation and recreation purposes. No large-scale development would occur on federal lands. Consequently, actions are not expected to affect water quality.

On private lands, residential, recreational, industrial, or agricultural developments could occur resulting in increased erosion and siltation, additional water diversions, reduction in riparian vegetation, disturbance of the bed and banks of the river, and increased pollution from point and non-point sources. Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129). During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Consequently, there could be an adverse impact on water quality from development.

6f. Controls on Mining and Mineral Development

Under this alternative, the current withdrawals which prohibit mining and mineral development would remain in effect in the short term while DOE maintains management responsibility. When the DOE excesses the lands, long term consequences would depend on the agency obtaining the property. With continued public ownership, disturbance to water quality would be minimal. On private lands within the study area, mining and mineral activities such as gravel operations or gold dredging could occur and potentially increase sedimentation which adversely effects water quality. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river (NPS, 1992). Consequently, impacts to water quality are anticipated to be minimal on public lands but difficult to determine on private lands.

6g. Controls on Agricultural Use

With continued public ownership, existing sharecropping leases would most likely be maintained. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. Existing sharecropping practices have not had an impact on water quality. In the long term, subsequent to DOE excessing the lands, consequences would depend on the agency obtaining the property

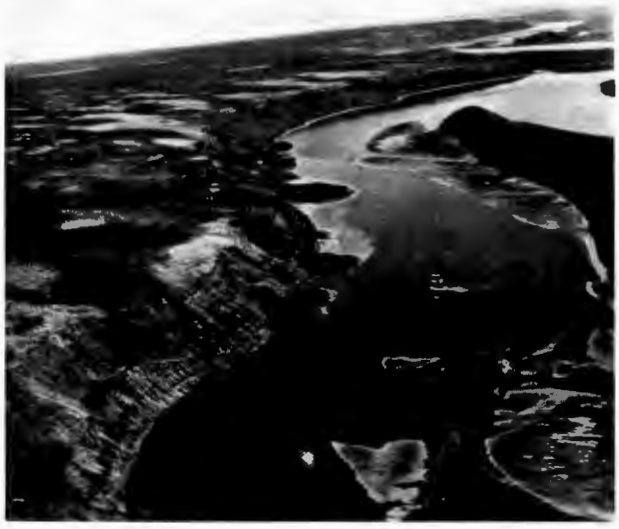
and their plans for future use. On private lands, no additional controls would exist and it is possible that additional lands could be developed for agricultural purposes. Agricultural practices of the type currently along the river are not impacting water quality. Consequently, only if the type and intensity of agriculture changes in such a manner to adversely affect water quality would an impact be expected.

6h. Controls on Grazing

Under this alternative, whether or not to continue grazing on public lands would be subject to the discretion of the managing agency. Currently, an estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity also impact upland habitats by loosening soils and creating tracks which hasten erosion which could result in increased sedimentation to the river. Consequently, unless the amount of grazing is increased substantially, water quality would not be affected.

7) Effects on Instream Flows

Before dams were built on the Columbia River, its great volume and seasonal patterns combined with substrate and climate to shape the ecosystems along its shore. The river's vast flow is now tightly choreographed by a network of agencies striving to maximize power production, meet irrigation needs of desert farms, and support remnants of the once abundant salmon fisheries. Except for the fact that the seasonal patterns no longer occur due to hydroelectric development, the Hanford Reach is all that remains to suggest the appearance of the pre-settlement, mid-Columbia ecosystem. The following analysis examines the existing management situation and how instream flows would be impacted in the foreseeable future.



7a. Dam Construction

Under this alternative, it is assumed that there would be no prohibition on dams after the existing moratorium expires in 1996. Construction of a new dam in the Hanford Reach is possible, however, there are no current proposals. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts should a dam be constructed in the Hanford Reach. This project would have significantly altered existing stream flows in the Hanford Reach and impounded the last free-flowing non-tidal segment of the Columbia River. Existing conditions would be maintained until November 1996, however, subsequent construction of a dam would have an adverse impact on instream flows.

7b. Water Resource Development Project Construction

Under this alternative, it is assumed that there would be no prohibition on water resource development projects after the existing moratorium expires in 1996. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have increased the cross-section area of the river and would generally have

resulted in reduced water velocities for the same amount of river flow. Existing conditions would be maintained until November 1996, however, subsequent water resource development projects would have an adverse impact on instream flows.

7c. Instream Flow Protection

Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Barring major changes in the operation of upstream and downstream dams, the existing flow regime would be maintained. Consequently, there would be no impact on instream flows.

8) Effects on Tribal Access and Use

The Hanford Reach area contains lands ceded to the United States by both YIN and CTUIR in the treaties of 1855. However, it is possible that this status could change under USFWS management. The Yakama Indian Nation (YIN), the Confederated Tribes and Bands of the Umatilla Indian Reservation (CTUIR) and the Nez Perce Tribe, under treaties have retained the right to fish at traditional fishing sites, which are termed "usual and accustomed places". Additionally, they have retained the privilege of hunting, gathering roots and berries, and pasturing of horses on open and unclaimed land. It is the position of the tribes that the Hanford Reach is an inseparable natural and cultural resource upon which the tribal culture and heritage rests. The following analysis examines the existing management situation and how tribal access and use would be impacted in the foreseeable future.

8a. Dam Construction

Under this alternative, there would be no prohibition on dams after the existing moratorium expires in 1996. Construction of a dam is possible, however, there are no current proposals. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. Construction of a dam would effect a variety of American Indian uses on the Hanford Reach such as salmon fishing, gathering foods and medicines, and flooding of traditional cultural properties and sacred sites. Availability of anadromous fish in the Hanford Reach is dependent on unimpeded migration and favorable spawning and rearing conditions, both of which would be impacted through construction of a dam. Fishing would be directly impacted by the reduced salmon populations, particularly the wild fall chinook salmon which would be drastically reduced or eliminated (for further information, refer to "Effects on Fall Chinook Salmon", page 183). In addition, the resulting reservoir would inundate shoreline plant communities used for medicinal purposes, as well as inundate the White Bluffs Landing, which is considered a usual and accustomed fishing site for the Yakama and Wanapum people (Rice, 1991; Swindell,1942). The tribes have stated that the ecosystems of the Columbia Basin are an integral part of the culture and religion of the tribes and bands of Indians of this region. The federal government is responsible for upholding treaties it signed with the above mentioned tribes in 1855, which guarantees rights to certain resources, of which states, "the right to fish at all usual and accustomed fishing places...". Existing conditions would be maintained until November 1996, however, subsequent construction of a dam would impact resources significant to American Indians and consequently have an adverse affect on tribal access and use.

8b. Water Resource Development Project Construction

Under this alternative, it is assumed that there would be no prohibition on water resource development projects after the existing moratorium expires in 1996. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed critical spawning and rearing habitat for fall chinook salmon, an

important resource for the tribes. In addition, significant cultural resource sites located within or along the banks of the river would be vulnerable to direct impacts from dredging or indirectly by erosion from barge traffic. Existing conditions would be maintained until November 1996, however, subsequent water resource development projects could adversely impact tribal access and use.

8c. Controls on Grazing

Under this alternative, grazing would be subject to the discretion of the managing entity. An estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing by the WSDFW. Consequently, adverse impacts to tribal access and use may result if grazing is prohibited by a future managing agency.

8d. Allowance for Recreational Activities

Under this alternative, recreational activities would be permitted at the discretion of the managing agency. Hunting, particularly waterfowl hunting, and fishing are the most popular recreational activities in the Hanford Reach study area. Hunting is currently allowed on the lands administered by the WSDFW and in restricted areas along the river. If additional areas are open for hunting then there would be a beneficial impact on tribal access and use. Fishing in the Reach is an activity common to both tribes and sportfishermen alike. The fall chinook salmon is highly prized by anglers for its large size, strength, and flesh quality. The number of fall chinook salmon has attracted an abundance of anglers, with an average of 21,000 angling trips per season between 1985 and 1991. It is possible that conflicts could arise between American Indians and sport fishermen with regards to usual and accustomed fishing places, and consequently recreational activities could have a slight impact on tribal access and use. Nonconsumptive uses may also infringe on tribal access and use of the reach. With continued public ownership, there would be no impact on tribal access and use.

9) Effects on Land Ownership and Use

Currently, there are approximately 2,600 acres of land within one-quarter mile of the river along the 51-mile study segment that is not federally-owned. Private lands represent approximately two percent of the total study area and approximately 9.8 miles of the shoreline (6.3 miles at the north end and 3.5 miles at the southern end). All of the private land parcels are located outside of the Hanford Site and are concentrated in two areas: 1) on the north and south sides of the Columbia River between the north study area boundary and the west boundary of the Hanford Site; and 2) on the east side of the River between the south boundary of the Wahluke State Wildlife Recreation Area and the south study area boundary. This alternative would not affect existing land ownership and use. The following analysis examines the existing management situation and how land ownership and use would be impacted in the foreseeable future.

9a. Dam Construction

Under this alternative, it is assumed that there would be no prohibition on dams after the existing moratorium expires in 1996. Construction of a new dam in the Hanford Reach is possible, however, there are no current proposals. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. Construction of a dam could require land acquisition and inundate private lands along the Columbia River. Existing conditions would be maintained until November 1996, however, subsequent construction of a dam would adversely impact private ownership and use.

9b. Controls on Local Energy Transfer Facilities
Under this alternative, no actions would be taken to alter existing power production facilities. Consequently, existing power production in or near the study area would not be impacted.

9c. Controls on Development
Under this alternative, no actions would be taken to limit development on private lands. Consequently, existing land ownership and use would not be impacted.

9d. Controls on Mining and Mineral Development
The current withdrawals which prohibit mining and mineral development would remain in effect in the short term while DOE maintains management responsibility. In the long term, the future managing agency could open the area to mining and mineral development. This could result in a wider range of uses and consequently have a beneficial impact on land ownership and use.

9e. Controls on Agricultural Use
When the DOE excesses the lands, consequences would depend on the agency obtaining the property and their use of the area. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. It is not known what the impact would be on the extent of use for agriculture and consequently, land ownership and use.

9f. Controls on Grazing
Under this alternative, whether or not to permit grazing would be subject to the discretion of the managing agency. An estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing by the WSDFW. It is not known what the impact would be on the extent of use for grazing and consequently, land ownership and use.

10) Effects on Department of Energy Activities on the Hanford Site

In 1989, the DOE, EPA, and WDOE entered into the Hanford Federal Facility Agreement and Consent Order (commonly referred to as the "Tri-Party Agreement") which committed the three agencies to a long term cooperative program for cleaning up the Hanford Site. For at least the next 30 years, the agencies will be actively involved in identifying and cleaning up waste sites that pose a risk to human health, welfare, and the environment. This work is expected to involve both non-intrusive and intrusive investigations. Non-intrusive investigation includes biological and ecological sampling, spring and seep sampling along river beds, geophysical methodologies (e.g. ground penetrating radar), soil gas sampling, and surface soil sampling. Intrusive investigation includes installing ground water monitoring wells, soil borings, and excavations for analysis. Once contamination has been identified and quantified, actions may begin, if necessary, to stabilize or remove contaminants. This may include removal of soil, pumping and treating of ground water, in-situ vitrification, or capping of contaminated areas.

Under this alternative, land use will not be determined for the Hanford Reach and will be debated for some time. Final clean-up under the Tri-Party Agreement cannot occur until land use is determined and subsequently used in the risk assessments, unless the most conservative land use is assumed. This would probably increase the time and cost of Hanford clean-up. The following analysis examines the existing management situation and how DOE activities on the Hanford Site would be impacted in the foreseeable future.

10a. Dam Construction

Under this alternative, it is assumed that there would be no prohibition on dams after the existing moratorium expires in 1996. Construction of a new dam in the Hanford Reach is possible, however, there are no current proposals. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. In 1979, the DOE conducted a study to determine the impacts of the Ben Franklin Dam project on the Hanford Site. The study concluded that construction of the dam, which would impound approximately 50 miles of the river located adjacent to the Hanford Site, would raise the groundwater level throughout the Hanford Site and also potentially have an impact on existing facilities and future cleanup activities. It was determined that the most significant impact would be the flooding of the reactor area along the river (the "100 Area") which contains a number of waste burial grounds, contaminated soil sites, and buildings (U.S. Army Corps of Engineers 1979). Existing conditions would be maintained until November 1996, however, subsequent construction of a dam would have a significant impact on DOE activities on the Hanford Site.

10b. Protective Designation

Under this alternative, there would be no protective designation and therefore no effect on DOE activities.

10c. Controls on Development

Under this alternative, there would be no control on development and therefore no effect on DOE activities.

10d. Controls on Local Energy Transfer Facilities

Under this alternative, no actions would be taken to alter existing power production facilities. Consequently, existing power production in or near the study area would not be impacted.

11) Effects on Recreational Access and Use

The Hanford Reach and adjacent wildlife recreation/refuge areas provide a wide variety of recreational activities year round for local residents and visitors alike. The most popular activities include fishing, boating, hunting, and nature observation. The Hanford Reach is enjoyed by sport fishermen throughout the Pacific Northwest with the primary sport fishes being salmon, steelhead, sturgeon, and smallmouth bass. The abundance of waterfowl and availability of favorable conditions for hunting make the Reach an excellent location for waterfowl hunting and a regionally significant resource. The scenery, wildlife, and opportunities for solitude also make the area increasingly attractive for boating recreation. The following analysis examines the existing management situation and how recreational access and use would be impacted in the foreseeable future.

11a. Dam Construction

Under this alternative, it is assumed that there would be no prohibition on dams after the existing moratorium expires in 1996. Construction of a new dam in the Hanford Reach is possible, however, there are no current proposals. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. This project would have impounded the last free-flowing segment of the Columbia River and changed recreation from river-related to lake-related and subsequently, result in various impacts to the recreational use of the Hanford Reach, in particular, fishing, wildlife observation, and boating. The availability of anadromous fish for fishing is dependent on unimpeded migration and spawning and rearing habitat, both of which would be impacted through the construction of a dam (for further information, a detailed discussion is located in this alternative "Effects on Fall Chinook Salmon", page 183).

Dams would also change existing flow conditions through the Hanford Reach which could alter the type of boating which occurs, specifically navigation by anglers and other recreational users. Boating would shift toward power boats and waterskiing. The type of fish available for recreational purposes would shift from anadromous to resident. Sloughs, islands, and channels which are important for wildlife, hunting and nature observation would be submerged. Existing conditions would be maintained until November 1996, however, subsequent construction of a dam would have an adverse affect on recreational access and use in the Hanford Reach.

11b. Water Resource Development Project Construction

Under this alternative, it is assumed that there would be no prohibition on water resource development projects after the existing moratorium expires in 1996. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s, provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed and destroyed critical spawning and rearing habitat for fall chinook salmon which supports the recreational fishery. Existing conditions would be maintained until November 1996, however, subsequent water resource development projects could have an adverse impact on recreational access and use.

11c. Instream Flow Protection

Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Barring major changes in the operation of upstream and downstream dams, the existing flow regime would be maintained. Future alteration of the flow regime may not insure optimum flow requirements for maintenance of a variety of recreational activities. Consequently, there could be an adverse impact on recreational access and use.

11d. Nuisance Aquatic Macrophyte Control

At present and in the foreseeable future, there will be no control of nuisance aquatic macrophytes in the Hanford Reach. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows from increased vegetation, in turn, can adversely affect salmon habitat by increasing water temperature and reducing sedimentation transport and oxygen supply, especially in the shallow water areas which salmon prefer (U.S. Army Corps of Engineers 1979b). Continued increases in milfoil populations may have an adverse impact on fall chinook salmon and consequently recreational access and use.

11e. Wildlife Habitat Protection

Under this alternative, wildlife habitat protection and restoration programs would be subject to the discretion of the managing agency. The Hanford Reach and surrounding lands provide some of the best opportunities for wildlife viewing in eastern Washington state. Bald eagles, common loons, wintering and migratory waterfowl, pelicans, terns, gulls, great blue herons, mule and white-tailed deer, coyotes, and beavers are some of the species that may be observed. Existing habitat protection consists of restricting public access and controlling wildfires, both of which are dependent upon levels of patrols. Consequently, populations of wildlife will be determined to some extent by the efforts of the future land manager.

11f. Control of Wildfire

On public lands, wildfire control would continue to consist of agency/county cooperative efforts. On private lands, the respective county would be responsible for wildfires. Counties have limited resources to fight wildfires i.e. no access to federal aerial support. Controls on wildfires would continue as is; consequently,

there is greater potential for impacts to wildlife habitats which would benefit wildlife for recreational purposes on private lands than with an action alternative.

11g. Controls on Development

In the short term, assuming the continuation of the existing DOE mission for the Hanford Site which entails cleanup and environmental restoration, development within the corridor would be limited to support of cleanup activities, i.e. the "100 Areas". Cleanup activities would result in localized and temporary disturbance, but this impact is not anticipated to impact recreational access and use. Continuation of existing DOE management would result in the maintenance of wildlife habitats depended upon for various types of recreation.

In the long term, development on public lands in the study area would be dependent upon the discretion and needs of the administering agency. Lands would be transferred to a resource management agency and managed for conservation and recreation purposes. No large-scale development would occur on federal lands. Consequently, there would be no impact on recreational access and use.

11h. Allowance for Recreational Facilities

Under this alternative, it is assumed that no improvements to existing recreational facilities would be completed. This may result in degrading of existing boat launch areas and eventual loss of access areas to the river. Consequently, there would be no impact on recreational access and use.

11i. Allowance for Recreational Activities

When the DOE excesses the lands, continued public ownership and existing recreational activities are anticipated. Consequently, there would be no impact on recreational access and use.

11j. Interpretation and Education Activities

Under this alternative and in the short term, the DOE would continue to provide additional information regarding cultural resources of the Hanford Reach. In the long term, the degree to which interpretation and education programs were pursued by a public agency is unknown. The experience of the recreational user could be slightly impacted if interpretation and education activities are reduced with a consequent decreased understanding of the significance of the Hanford Reach.

11k. Law Enforcement Actions

In the long term (post DOE management), enforcement of the laws which prohibit unauthorized off-road vehicle use and unauthorized access and use would be subject to the discretion and managing capability of the administering agency. Trespass on key habitat areas, disturbance of archaeological sites, unauthorized vehicle use, and other inappropriate recreational activities can impact the overall recreational experience. Assuming continued public ownership, minor impacts to recreational access and use are expected.

ALTERNATIVE C:
Dams Prohibited and Limitations on Water Resource Development Projects, No Additional Designations

This alternative would legislatively prohibit dams. Water resource development projects which have an adverse impact on the resources of the Hanford Reach would also be prohibited. As a result of the change in the DOE mission from defense production to environmental restoration, it is expected that the lands north and east of the river will be excessed by the Department of Energy because they are no longer needed as a security and safety buffer. Disposition of these lands would vary. Lands which were withdrawn from the public domain for the Columbia Basin Project and property originally acquired by the Bureau of Reclamation (BR) would return to BR jurisdiction. Administration of the remaining public domain lands would revert to the Bureau of Land Management. Lands acquired in fee by the DOE (approximately 50% of the north slope or 45,000 acres) would be disposed within the next 5 to 10 years according to procedures established by the General Services Administration (GSA); the federal agency responsible for the disposal of excess federal real property. Lands on the south side of the river would remain under DOE management responsibility for the foreseeable future.

Given the national significance of the resources values on the North Slope, it is assumed that for purpose of this analysis, the lands currently administered by the DOE would remain in public ownership (federal, state, or local) and be managed for conservation and recreation purposes.

Effects on the resources of the Hanford Reach from Hanford Site cleanup activities will be considered in the Hanford Remedial Action Environmental Impact Statement currently being completed by the DOE and anticipated for release in December 1994. In the short term, DOE programs to monitor and protect significant natural and cultural resources would continue and the USFWS and WSDFW would retain resource management responsibilities over the refuges north and east of the river as long as permits with DOE were maintained.

Please refer to the Proposed Action, beginning on page 124, for a brief background summary of each of the enumerated issues discussed below.

1) Effects on Fall Chinook Salmon

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on fall chinook salmon.

1a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam, proposed in the 1970s by the Army Corps of Engineers (ACOE) at river mile 348 is used as the basis for analyzing potential impacts if a dam were constructed in the Hanford Reach. The proposed dam would have been over 7700 ft. wide and 82 ft. high and created an impoundment that would have extended the entire length of the reach (RM345-396). Almost 50 miles of spawning and rearing habitat which currently accounts for approximately 85% of the total Hanford Reach fall chinook production, would have been inundated by the impoundment and spawning eliminated. Upstream and downstream migration is critical to fall chinook stocks in the Columbia River: approximately 80% of the total adult fall chinook run entering the mouth of the river will return to the Hanford Reach (Geist 1991). In 1987, 90,000 adult fall chinook returned to spawn in the Reach (Geist

1991). The significance of this salmon stock to the Northwest Indian tribes, commercial, and sport fisheries is discussed in detail in Chapter III, Affected Environment, page 98. While salmon returns would continue to fluctuate due to upstream and downstream factors, this alternative would eliminate the threat of future impediments to migration and from fluctuating water levels which are detrimental to eggs and fry through exposure of nest and stranding of anadromous fish (SAI/PMX/DC 1979). In addition, the prohibition on dams would prevent decreased stream temperature fluctuations, reduction in shallow water habitat, and decreased stream velocities in approximately 44 miles of critical rearing habitat. The prohibition on dams would eliminate impediments to migration and the threat of habitat destruction. Consequently, there would be a beneficial impact on fall chinook salmon.

1b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. The intent of this project was to construct a shallow-draft commercial navigation channel through the Reach in order to allow barges and large vessels to travel from Richland to upstream ports. This project would have required the dredging of a 20 mile long channel to a uniform channel depth of 14 ft within the reach. It would have disturbed a substantial amount of spawning habitat, including areas that have large concentrations of spawning redds, and changed the hydraulics of the river with unknown consequences on spawning habitat and use. Fisheries agencies concluded that barge traffic on the river would disturb spawning activity and resulting wakes would increase shoreline and island erosion which would cause siltation of spawning gravels (Washington Department of Fisheries 1987). Approximately 85% of the total Columbia River fall chinook adults are naturally spawning fish which depend on swift currents, cobble, and shallow water for spawning (Roler 1991). Even hatchery production of fall chinook is indirectly dependent on these conditions because naturally produced brood stock provide the eggs for the Priest Rapids hatchery. Dredging in the reach would increase the cross section area of the river and would generally result in reduced water velocities for the same amount of river flow. The resulting channelized flow and slower overall velocities between the shore and the edge of the channel could impact spawning and other processes that require fairly rapid flow in the shallow areas. Limitations on water resource development projects would ensure the maintenance of existing conditions on approximately 50 miles of critical spawning habitat within the Hanford Reach and ensure that conditions are favorable for salmon once they return. Consequently, there would be a beneficial impact on fall chinook salmon.

1c. Water Quality Protection

Under this alternative, mining and mineral development and residential and commercial development could occur and have an impact on water quality (for further information, a detailed discussion is located in this alternative, "Effects on Water Quality", page 222). Excellent water quality is critical to salmon spawning and rearing success. Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. Potential impacts may include increased sedimentation and pollution from development. Consequently, due to the potential impacts development has on water quality, there could be adverse impacts to fall chinook salmon.

1d. Instream Flow Protection

Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Barring major changes in the operation of upstream and downstream dams, the existing flow regime would be maintained. Future alteration of the flow regime may not insure optimum flow requirements for fall chinook salmon. Consequently, there could be an adverse effect on fall chinook salmon.

1e. Nuisance Aquatic Macrophyte Control

At present and in the foreseeable future, there will be no control of nuisance aquatic macrophytes in the Hanford Reach. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows from increased vegetation, in turn, can adversely affect salmon habitat by increasing water temperature and reducing sedimentation transport and oxygen supply, especially in the shallow water areas which salmon prefer (U.S. Army Corps of Engineers 1979b). Consequently, continued increases in milfoil populations may have an adverse impact on fall chinook salmon spawning and rearing habitat.

1f. White Bluffs Protection

No actions would be taken to limit and reduce activities which could impact the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs and continues to reduce stability. Several significant spawning areas are located immediately below the White Bluffs. Sloughing contributes sediments to the river which eventually siltates spawning gravels, making them less desirable for salmon. The rate of sloughing is expected to continue at existing levels, which would continue to impact those spawning areas located directly below the White Bluffs. Consequently, it is likely that deterioration of the White Bluffs would continue and possibly accelerate impacting fall chinook salmon.

1g. Controls on Development

In the short term, assuming the continuation of the existing DOE mission for the Hanford Site which entails cleanup and environmental restoration, development within the corridor would be limited to support of cleanup activities, i.e. the "100 Areas". Cleanup activities would result in localized and temporary adverse impact to fishery values. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize impacts to fall chinook salmon spawning and rearing habitat.

In the long term, development on public lands in the study area would be dependent upon the discretion and needs of the administering agency. Lands would be transferred to a resource management agency and managed for conservation and recreation purposes. No large-scale development would occur on federal lands. Consequently, impacts are not expected to affect fall chinook salmon.

On private lands, existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129). On private lands, residential, recreational, industrial, or agricultural developments could occur resulting in increased erosion and siltation of spawning beds, additional water diversions, reduction in riparian vegetation, and disturbance of the bed and banks of the river. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Consequently, there could be an adverse impact on fall chinook salmon from development.

1h. Controls on Mining and Mineral Development

Under this alternative, the current withdrawals which prohibit mining and mineral development would remain in effect in the short term while DOE maintains management responsibility. When the DOE excesses the lands, long term consequences would depend on the agency obtaining the property. With continued public ownership, disturbance to fall chinook salmon spawning and rearing habitat would be minimized. On private lands within the study area, mining and mineral development could occur and potentially increase sedimentation which adversely effects water quality and disturbs spawning gravels. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river adjacent to one of the more popular spawning areas (NPS, 1992). Consequently, impacts to fall chinook salmon are anticipated to be minimal on public lands but difficult to determine on private lands.

1i. Controls on Agricultural Use

With continued public ownership, existing sharecropping leases would most likely be maintained. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. Existing sharecropping practices have not had an impact on water quality, which could potentially impact salmon habitat. In the long term (post DOE management), consequences would depend on the agency obtaining the property and their plans for future use. On private lands, no additional controls would exist and it is possible that additional lands could be developed for agricultural purposes. Agricultural practices of the type currently along the river are not impacting water quality and subsequent spawning habitat. Consequently, only if the type and intensity of agriculture changes in a manner to adversely affect water quality would there be an impact on fall chinook salmon.

1j. Controls on Grazing

Under this alternative, whether or not to continue grazing on public lands would be subject to the discretion of the managing agency. Currently, an estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity also impact upland habitats by loosening soils and creating tracks which hasten erosion and increase sedimentation to the river. Unless the amount of grazing is increased substantially, water quality would not be affected. Consequently, there would be little or no impact on fall chinook salmon.

2) Effects on Cultural Resources

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on cultural resources.

2a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the Army Corps of Engineers at river mile 348 is the basis for a likely scenario of potential impacts should a dam be constructed in the Hanford Reach. Studies of the Ben Franklin dam indicated that the project would have inundated two National Register sites, four archaeological districts, and 122 prehistoric archaeological sites (Rice 1980). The prohibition on dams would prevent inundation and disturbance from construction of access roads, utility corridors, and other related facilities. Consequently, there would be a beneficial impact to cultural resources.

2b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. A large number of archaeological sites are located within or along the banks of the river. Channel dredging would have varying impacts on cultural resources depending on the location of the dredging, the placement of dredge spoils, and the potential for erosion of sites from increased stream velocities and barge-generated wakes. Consequently, limitations on water resource development projects would prevent potential impacts and be beneficial to the protection of cultural resources.

2c. Controls on Development

In the short term, assuming the continuation of the existing DOE mission for the Hanford Site which entails environmental cleanup and site restoration, development within the corridor would be limited to support of clean up activities, i.e. the "100 Areas". Cleanup activities could result in temporary adverse impacts to cultural resources. The DOE is required by law to conduct cultural resource inventories and evaluate sites proposed for development.

In the long term, development would be dependent upon the discretion and needs of the administering agency. Lands would be transferred to a resource management agency and managed for conservation and recreation purposes. No large-scale development would occur on federal lands. Other development would be subject to existing federal regulations, and disturbance to archaeological sites and artifacts would be minimized or properly documented. Consequently, in the long term, impacts to cultural resources would depend on management along the Hanford Reach, with few impacts anticipated.

On private lands, existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129). On private lands, residential, recreational, industrial, or agricultural developments could occur and result in disturbances and loss of historic and archaeologic sites. Such development could cause unacceptable adverse impact to cultural resources. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Consequently, those

cultural resource sites on private lands may be vulnerable to development which may have an adverse impact on cultural resources.

2d. Controls on Mining and Mineral Development

Under this alternative, the current withdrawals which prohibit mining and mineral development would remain in effect in the short term while DOE maintains management responsibility. When the DOE excesses the lands, long term consequences would depend on the agency obtaining the property. With continued public ownership, and management for conservation and recreation purposes, the withdrawals may well be retained. Disturbance to archaeological sites and artifacts would be minimized or properly documented. On private lands within the study area, mining and mineral development could occur and potentially have an adverse effect on cultural resources. In 1992, a proposal was pursued to placer mine gold within 1/4 mile of the river where significant cultural resource sites were located. Consequently, impacts to cultural resources are anticipated to be minimal on public lands but difficult to determine on private lands.

2e. Controls on Agricultural Use

With continued public ownership, existing sharecropping leases would most likely be maintained. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. When DOE excesses the lands, long term consequences would vary depending on the agency obtaining the property and their plans for future use. Existing sharecropping practices have not had an impact on cultural resources. On private lands, it is possible that agricultural development could be expanded and result in disturbance and loss of additional significant sites. Consequently, impacts to cultural resources are anticipated to be minimal on public lands but difficult to determine on private lands.

2f. Controls on Grazing

Under this alternative, whether or not to permit grazing would be subject to the discretion of the managing agency. An estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing by the WSDFW. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity also impact upland habitats by loosening soils and creating tracks which hasten erosion which could expose vulnerable cultural resource sites. It is likely that grazing could continue and be expanded with continued public ownership. On private lands, grazing could be expanded. Consequently, depending on the extent of grazing activities, cultural resources could be adversely impacted.

2g. Control of Wildfire

On public lands, wildfire control would continue to consist of agency/county cooperative efforts. On private lands, the respective county would be responsible for wildfires. Counties have limited resources to fight wildfires, i.e. no access to federal aerial support, and they also utilize techniques less sensitive to the protection of cultural resources. Controls on wildfires would continue as is; consequently, there is greater potential for impacts to cultural resources on private lands than with an action alternative.

2h. Interpretation and Education Activities

Under this alternative and in the short term, the DOE would continue to provide additional information regarding cultural resources of the Hanford Reach. In the long term, the degree to which interpretation and education programs were pursued by a public agency is unknown. Cultural resources could be slightly impacted if interpretation and education activities are reduced with a consequent decreased understanding of their significance.

2i. Inventory and Survey Activities

Under this alternative and in the short term, the DOE would continue to conduct inventories and surveys on cultural resources until such time as lands are excessed and the disposal process complete. The DOE has an established cultural resources program which includes staff with a high level of expertise and familiarity with the cultural resources in the Hanford Reach. Ongoing DOE inventories would continue to document archaeological sites which could result in nominations of sites to the National Register of Historic Places and/or the establishment of National Historic Landmarks. Maintenance of existing historic and archaeological sites would continue. In the long term, other public agencies would be responsible for cultural resource management under applicable regulations and authorities (i.e. National Historic Preservation Act, sections 106 & 110, and respective state laws). Consequently, no impact to cultural resources is anticipated.

2j. Law Enforcement Actions

In the long term (post DOE management), enforcement of the laws which prohibit unauthorized off-road vehicle use and unauthorized access and use would be subject to the discretion and managing capability of the administering agency. With respect to cultural resources, off-road vehicle use is of particular concern. Off-road vehicle use not only makes cultural resource sites more accessible, but their use can also directly destroy these resources. Unauthorized access often results in damage to significant cultural resources. Assuming continued public ownership, minor impacts to cultural resources are expected.

3) Effects on Biodiversity

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on biodiversity.

3a. Dam Construction

Under this alternative, dams would be prohibited. Prohibition on dam construction would prevent impoundment of the last free-flowing non-tidal segment of the Columbia River. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. This project would have inundated approximately 11,500 acres of riparian lands which provides essential habitat for approximately 250 deer, 10,000 upland game birds, and 318,000 waterfowl (U.S. Army Corps of Engineers, 1979). In addition, almost 50 miles of free-flowing river would have been inundated, with a loss in native aquatic habitat and species. Such impacts might include an increase in water temperatures over natural conditions, alteration of the species composition of plant communities that currently exist on the cobble substrates, an increase in sedimentation, inundation of as many as fifteen river islands (1660 acres), inundation of all existing riparian vegetation (1260 acres), and a reduction in shallow water habitat (U.S. Army Corps of Engineers 1980). The prohibition on dams would prevent disturbance of aquatic, riverine, and riparian habitats and minimize habitat-related declines in existing populations of native plants, fish, and wildlife. Consequently, there would be a beneficial impact on biodiversity.

3b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a water resource development project. This project would have increased erosion of riverine and riparian habitats, inundated nesting areas for colony nesters, Canada geese, long-billed curlews, and waterfowl, and increased disturbance by allowing large vessels and barges to travel close to river islands (U.S. Fish and Wildlife Service 1988). Impacts would be particularly acute for wintering waterfowl, which number in the tens of thousands on the Hanford Reach (actual daily waterfowl counts for November through January, 1986-1990, were between 25,000-93,000). Dredging would disturb river sediments which might contain contaminants that could subsequently degrade water quality which directly affects aquatic and riverine habitats. Limitations on water resource development projects would prevent disturbance of aquatic, riverine, and riparian habitats and minimize habitat-related declines in existing populations of native plants, fish, and wildlife. Consequently, there would be a beneficial impact on biodiversity.

3c. Water Quality Protection

Under this alternative, mining and mineral development and commercial and residential development could occur and have an impact on water quality (for further information, a detailed discussion is located in this alternative, "Effects on Water Quality", page 222). Excellent water quality supports viable riverine and riparian habitats and those species dependent on these habitats. Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. In addition to the river, upland lakes and wetlands provide important habitat for migratory waterfowl and other water dependent species. Potential impacts may include increased sedimentation and pollution from development, increased temperatures, and reduced river velocities. Due to the potential impacts development has on water quality, there could be adverse impacts to riverine and riparian habitat and consequently adverse impacts on biodiversity.

3d. Instream Flow Protection

Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Barring major changes in the operation of upstream and downstream dams, the existing flow regime would be maintained. Future alteration of the flow regime may not insure optimum flow requirements for maintenance of aquatic habitats. Consequently, there could be an adverse impact on biodiversity.

3e. Nuisance Aquatic Macrophyte Control

At present and in the foreseeable future, there will be no control of nuisance aquatic macrophytes. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows from increased vegetation, in turn, can adversely affect riverine and riparian habitat by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Continued increases in milfoil populations may have an adverse impact on riverine and riparian habitats and respective species, and, consequently, biodiversity.

3f. White Bluffs Protection

No actions would be taken to limit and reduce activities which could impact the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs and continues to reduce stability. The White Bluffs provide important nesting habitat for species including but not limited to cliff swallows, great-horned owls, red-tailed hawks, and say's phoebe. The rate of sloughing is expected to continue at existing levels which would continue the gradual erosion of the White Bluffs. Consequently, additional sloughing would have a possible but unquantified effect on biodiversity by reducing bluff habitat and its respective species.

3g. Non-Native Vegetation Control

Under this alternative, management of non-native vegetation would be subject to the discretion and capability of the managing agency. Non-native vegetation is both a cause and effect of disturbance of native habitats. Currently, non-native vegetation consists of Russian olive trees (dispersed over approximately 500 acres), salt cedar (dispersed over approximately 10 acres), purple loosestrife (dispersed over approximately 10 acres), and common white mulberry trees which are scattered along the banks of the river (Goeke 1991; Rickard 1992). The spread of non-native vegetation would depend on the efforts of the public agency. Consequently, the impact on biodiversity is unknown.

3h. Revegetation of Disturbed Areas

Under this alternative, the revegetation of disturbed areas would be subject to the discretion and capability of the managing agency. Replacement of native vegetation with non-native vegetation has a detrimental impact on biodiversity. Approximately 3200 acres along the Benton County shoreline of the reach are disturbed (L. Fitzner 1991) and should be reseeded with native plant species. Increases in non-native vegetation would have an impact on the diversity and abundance of endemic plant and animal species and subsequently have an adverse effect on biodiversity.

3i. Control of Wildfire

On public lands, wildfire control would continue to consist of agency/county cooperative efforts. On private lands, the respective county would be responsible for wildfires. Counties have limited resources to fight wildfires, i.e. no access to federal aerial support. Controls on wildfires would continue as is; consequently, there is greater potential for impacts to biodiversity on private lands than with an action alternative.

3j. Controls on Development

In the short term, assuming the continuation of the existing DOE mission for the Hanford Site which entails cleanup and environmental restoration, development within the corridor would be limited to support of cleanup activities, i.e. the "100 Areas". Cleanup activities would result in localized and temporary disturbance, but this impact might be mitigated by the DOE replanting sites with native plant species following cleanup. Continuation of existing DOE management would result in the maintenance of the diversity and populations of native plants, fish, and wildlife.

In the long term, development on public lands in the study area would be dependent upon the discretion and needs of the administering agency. Lands would be transferred to a resource management agency and managed for conservation and recreation purposes. No large-scale development would occur on federal lands. Consequently, actions are not expected to affect biodiversity.

On private lands, residential, recreational, industrial, or agricultural developments could occur resulting in increased erosion and siltation of spawning beds, additional water diversions, reduction in riparian vegetation, and disturbance of the bed and banks of the river. Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129). During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Consequently, there could be an adverse impact on biodiversity from development.

3k. Controls on Mining and Mineral Development

Under this alternative, the current withdrawals which prohibit mining and mineral development would remain in effect in the short term while DOE maintains management responsibility. When the DOE excesses the lands, long term consequences would depend on the agency obtaining the property. With continued public ownership, disturbance to riverine, riparian, and upland habitats would be minimized. On private lands within the study area, mining and mineral development could occur and potentially have an adverse effect on habitats. In 1992, a proposal was pursued to placer mine gold within a 1/4 mile of the river. This proposal would have disturbed shrub-steppe habitat, in particular the sagebrush-cheatgrass community, by digging of test holes and related mining activities (NPS 1992). Consequently, impacts to biodiversity are anticipated to be minimal on public lands but difficult to determine on private lands.

3l. Controls on Agricultural Use

With continued public ownership existing sharecropping leases would most likely be maintained. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. When the DOE excesses the lands, long term consequences would depend on the agency obtaining the property and their plans for future use. Habitat alteration from existing sharecropping practices has already occurred. On private lands within the study area, it is possible that agricultural use could be expanded and reduce native habitat types and respective species. Consequently, impacts to biodiversity are anticipated to be minimal on public land, but difficult to determine on private lands.

3m. Controls on Grazing

Under this alternative, whether or not to continue and/or expand grazing on public lands would be subject to the discretion of the managing agency. An estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity also impact upland habitats by loosening soils and creating tracks which hasten erosion which could result in increased sedimentation to the river. Comparative USFWS studies involving grazed and ungrazed portions of the study area have shown that there is greater abundance and diversity of wildlife on ungrazed shrub-steppe lands (Radke, 1987). In addition, where placed in high densities, cattle trample and consume native plants which are then often replaced with exotic species. On private lands, grazing could be expanded. Depending on the extent of grazing activities, impacts to riparian and upland habitats will continue. Consequently, impacts to biodiversity are anticipated to be minimal on public lands but difficult to determine on private lands.

3n. Law Enforcement Actions

In the long term (post DOE management), enforcement of the laws which prohibit unauthorized off-road vehicle use and unauthorized access would be subject to the discretion and capability of the managing agency. Off-road vehicle use has resulted in damage to upland and riparian habitats, with the majority of damage occurring on the steep slopes near Ringold, and harassment of wildlife populations. Unauthorized access and use in sensitive habitat areas also results in impacts to riparian and upland habitats, specifically by increased incidences of wildfires, littering, disturbance to rare plants and flowers, and distraction and disturbance of nesting and resting wildlife. While sensitive areas are posted to reduce trespass, trespass still accounts for numerous disturbances to habitats. Both off-road vehicle use and unauthorized access are expected to continue absent increases in law enforcement. Consequently, assuming continued public ownership, minor impacts to biodiversity are expected.

4) Effects on Threatened, Endangered, Sensitive, and Candidate Species

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on threatened and endangered species.

4a. Dam Construction

Under this alternative, dams would be prohibited. The prohibition on dams would prevent the severe alteration of the aquatic and riverine habitat of the Hanford Reach which threatened and endangered species depend upon. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. This project would have significantly altered the aquatic habitat and flow regime of the Hanford Reach. The Columbia pebblesnail, a federally listed candidate species, relies on clean, well-oxygenated, and swiftly moving water to meet respiration requirements, all of which would be eliminated if a dam were constructed (U.S. Fish and Wildlife Service 1988). The riverine habitat for the persistentsepal yellowcress and Columbia milkvetch plant populations, both federally listed candidate species, would be destroyed. The common loon, a federally listed sensitive species, and the white pelican, considered endangered by the state, depend on riverine habitat for nesting, cover, and feeding, all of which would be impacted if a dam were constructed. The prohibition on dams would help maintain the existing quality of aquatic, riverine, and shallow water habitats of the Hanford Reach. This would have a beneficial impact on the above mentioned threatened and endangered species and result in consequent species stabilization or even potential increases in populations and delisting. In addition, the prohibition on dams would protect habitat for salmon, an important winter food source for bald eagles, a federally listed threatened species (for further information, a detailed discussion is located under this alternative, "Effects on Fall Chinook Salmon", page 207).

4b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on the resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have increased erosion of riverine and riparian habitats and increased disturbance by allowing large vessels and barges to travel close to river islands resulting in the reduction of listed and candidate species which are dependent on these habitats (U.S. Fish and Wildlife Service 1988). The common loon, a federally listed sensitive species, and the white pelican, considered endangered by the state, depend on riverine habitat for nesting, cover, and feeding, all of which could be impacted if water resource development projects were to occur in sensitive habitat areas or were to affect such areas. In addition, limitations on water resource development projects would protect spawning and rearing habitat

for salmon, an important winter food source for bald eagles, a federally listed threatened species (for further information, a detailed discussion is located under this alternative, "Effects on Fall Chinook Salmon", page 207).

4c. Water Quality Protection

Under this alternative, mining and mineral development, and commercial and residential development could occur and have an impact on water quality (for further information, a detailed discussion is located in this alternative, "Effects on Water Quality", page 222). Excellent water quality supports viable riverine and riparian habitats and those species dependent on these habitats. Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. In addition to the river, upland lakes and wetlands provide important habitat for migratory waterfowl which are also prey for bald eagles and peregrine falcons, federally listed and endangered species. Potential impacts may include increased sedimentation and pollution from development, increased temperatures, and reduced river velocities. Due to the potential impacts development has on water quality, there could be adverse impacts to habitats which threatened and endangered species depend upon.

4d. Instream Flow Protection

Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Barring major changes in the operation of upstream and downstream dams, the existing flow regime would be maintained. Future alteration of the flow regime may not insure optimum flow requirements for maintenance of aquatic habitats. Consequently, there could be an adverse impact on threatened and endangered species.

4e. Nuisance Aquatic Macrophyte Control

At present and in the foreseeable future, there will be no control of nuisance aquatic macrophytes. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows from increased vegetation, in turn, can adversely affect salmon habitat by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Continued increases in milfoil populations may have an adverse impact on aquatic habitat which supports threatened and endangered species, specifically the Columbia pebblesnail, a federally listed candidate species.

4f. White Bluffs Protection

No actions would be taken to limit and reduce activities which could impact the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs and continues to reduce stability. Bluffs provide roost and foraging for bald eagles and peregrine falcons, both of which are federally listed as threatened and endangered species, respectively. The rate of sloughing is expected to continue at existing levels which would continue the gradual erosion of the White Bluffs. Consequently, additional sloughing would have a possible but unquantified effect on threatened and endangered species through the loss of bluff habitat for roosting and foraging for bald eagles and peregrine falcons.

4g. Non-Native Vegetation Control

Under this alternative, management of non-native vegetation would be subject to the discretion and capability of the managing agency. Non-native vegetation is both a cause and effect of disturbance of native habitats. Currently, non-native vegetation consists of Russian olive trees (dispersed over approximately 500 acres), salt cedar (dispersed over approximately 10 acres), purple loosestrife (dispersed over approximately 10 acres), and common white mulberry trees which are scattered along the banks of the river (Goeke 1991; Rickard 1992). The spread of non-native vegetation would depend on the efforts of the public agency. Consequently, the impact on threatened and endangered species is unknown.

4h. Revegetation of Disturbed Areas

Under this alternative, the revegetation of disturbed areas would be subject to the discretion and capability of the managing agency. Replacement of native vegetation with non-native vegetation reduces shrub-steppe habitat for threatened and endangered species. Shrub-steppe habitat provides hunting areas and prey for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species, respectively. Shrub-steppe also provides habitat for sage grouse, pygmy rabbit, and loggerhead shrike, all federally listed candidate species. Approximately 3200 acres along the Benton County shoreline of the reach are disturbed (L. Fitzner 1991) and should be reseeded with native plant species. Increases in non-native vegetation would have an impact on native habitats and subsequently have an adverse affect on threatened and endangered species.

4i. Control of Wildfire

On public lands, wildfire control would continue to consist of agency/county cooperative efforts. On private lands, the respective county would be responsible for wildfires. Counties have limited resources to fight wildfires, i.e. no access to federal aerial support. Controls on wildfires would continue as is; consequently, there is greater potential for impacts to biodiversity on private lands than with an action alternative.

4j. Controls on Development

In the short term, assuming the continuation of the existing DOE mission for the Hanford Site which entails cleanup and environmental restoration, development within the corridor would be limited to support of cleanup activities, i.e. the "100 Areas". Cleanup activities would result in localized and temporary disturbance, but this impact might be mitigated by the DOE replanting sites with native plant species following cleanup. Continuation of existing DOE management would result in the maintenance of habitats depended upon by threatened and endangered species.

In the long term, development on public lands in the study area would be dependent upon the discretion and needs of the administering agency. Lands would be transferred to a resource management agency and managed for conservation and recreation purposes. No large-scale development would occur on federal lands. Consequently, actions are not expected to affect threatened and endangered species.

On private lands, residential, recreational, industrial, or agricultural developments could occur resulting in increased erosion and siltation of spawning beds, additional water diversions, reduction in riparian vegetation, and disturbance of the bed and banks of the river. Existing zoning for the river corridor is

primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129). During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Consequently, there could be an adverse impact on threatened and endangered species from development.

4k. Controls on Mining and Mineral Development

Under this alternative, the current withdrawals which prohibit mining and mineral development would remain in effect in the short-term while DOE maintains management responsibility. When the DOE excesses the lands, long term consequences would depend on the agency obtaining the property. With continued public ownership, disturbance to riverine, riparian, and upland habitats and the threatened and endangered species dependent on these habitats would be minimized. On private lands within the study area, mining and mineral development could occur and potentially have an adverse impact on threatened and endangered species. In 1992, a proposal was pursued to placer mine gold within 1/4 mile of the river. This proposal would have disturbed shrub-steppe habitat, in particular the sagebrush-cheatgrass community, by digging of test holes and related mining activities (NPS 1992). Consequently, impacts to threatened and endangered species are anticipated to be minimal on public lands but difficult to determine on private lands.

4l. Controls on Agricultural Use

With continued public ownership, existing sharecropping leases would most likely be maintained. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. When DOE excesses the land, long term consequences would depend on the agency obtaining the property and their plans for future use. Many species become listed due to loss of habitats. Habitat alteration from existing sharecropping practices has already occurred. On private lands within the study area, it is possible that agricultural use could be expanded and reduce native habitat types and respective species. Consequently, impacts to threatened and endangered species are anticipated to be minimal on public lands but difficult to determine on private lands.

4m. Controls on Grazing

Under this alternative, whether or not to continue and/or expand grazing on public lands would be subject to the discretion of the managing agency. An estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity also impact upland habitats by loosening soils and creating tracks which hasten erosion. Grazing has particularly had an impact on shrub-steppe and riparian areas. Shrub-steppe provides hunting areas and prey for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species respectively. Shrub-steppe also provides habitat for sage grouse, pygmy rabbits, and loggerhead shrike, all federally listed candidate species. Other habitats which could be impacted by cattle include riparian and wetland types. On private lands, grazing could be expanded. Depending on the extent of grazing activities, impacts to riparian and upland habitats will continue. Consequently, impacts to threatened and endangered species are anticipated to be minimal on public lands but difficult to determine on private lands.

4n. Law Enforcement Actions

In the long term (post DOE management), enforcement of the laws which prohibit unauthorized off-road vehicle use and unauthorized access would be subject to the discretion and capability of the managing agency. Access in sensitive habitat areas results in impacts to riparian and upland habitats, specifically by increased incidences of wildfires and distraction and disturbance of various nesting and resting areas for listed and candidate species. Off-road vehicle use primarily impacts shrub-steppe habitat by eliminating vegetation. Loss of shrub-steppe habitat results in reduced populations of pygmy rabbits, sage grouse, and loggerhead shrikes, all federal candidate species, as well as reductions of prey and adequate hunting areas for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species, respectively. With existing limitations in patrolling, unauthorized access and off-road vehicle use are expected to continue to impact riparian and shrub-steppe habitats which adversely impact threatened and endangered species. Consequently, assuming continued public ownership, minor impacts to threatened and endangered species are expected.

5) Effects on the White Bluffs

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on the White Bluffs.

5a. White Bluffs Protection

No actions would be taken to limit and reduce activities which could impact the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs and continues to reduce stability. It is likely that deterioration of the White Bluffs would continue and possibly accelerate. Consequently, there would be an adverse impact on the White Bluffs.

5b. Interpretation and Education Activities

In the short term, the DOE would continue to provide additional information regarding the White Bluffs, particularly the paleontological fossils. When DOE excesses the lands, long term consequences would vary on the agency acquiring the property and their plans for use. The degree to which interpretation and education programs were pursued by a public agency is unknown. Consequently, there could be a slight impact on the White Bluffs resulting from decreased understanding of their significance.

5c. Law Enforcement Actions

In the long term (post DOE management), enforcement of the laws which prohibit unauthorized off-road vehicle use, unauthorized access, and illegal fossil collecting would be subject to the discretion and capability of the managing agency. While the majority of off-road vehicle use occurs on the steep slopes near Ringold, incidents of their use have occurred on the slopes of the White Bluffs. Off-road vehicle use lessens the stability of the White Bluffs by loosening the siltstones and claystones which make up the formation. The White Bluffs contain an extensive series of exposed Miocene and Pliocene vertebrate and invertebrate fossil deposits. Assuming continued public ownership, minor impacts to the White Bluffs are expected.

6) Effects on Water Quality

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on water quality.

6a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. A dam would result in increased water temperatures over natural conditions by prolonged exposure to solar radiation, and increased sedimentation resulting from reductions in river flow which will decrease the capacity of the river to carry solids (SAI/PMX/DC 1979). Any change in the equilibrium of the river, such as stream flow, temperature, and substrate, will affect water quality (Thompson 1992). Prohibition on new dam construction would prevent an increase in water temperatures over natural conditions and an increase in sedimentation (U.S. Army Corps of Engineers, 1979). Consequently, there would be a beneficial impact on water quality.

6b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on the resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed river sediments which may contain contaminants and impact water quality. Impacts to water quality would vary depending on the location of the dredging. Dredging in the middle of the river would transport sediments downstream and have less of an impact on water quality than along the shorelines, which could cause localized silt plumes containing concentrated amounts of associated contaminants (Johnson 1992). Limitations on water resource development projects would consequently have a beneficial impact on water quality.

6c. Instream Flow Protection

Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Barring major changes in the operation of upstream and downstream dams, the existing flow regime would be maintained. Future alteration of the flow regime may not insure optimum flow requirements to ensure water quality. Consequently, there could be a slight adverse effect on water quality.

6d. Nuisance Aquatic Macrophyte Control

At present and in the foreseeable future, there will be no control of nuisance aquatic macrophytes in the Hanford Reach. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows from increased vegetation, in turn, can adversely affect water quality by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Continued increases in milfoil populations may have an adverse impact on water quality over time.

6e. Controls on Development

In the short term, assuming the continuation of the existing DOE mission for the Hanford Site which entails cleanup and environmental restoration, development within the corridor would be limited to support of cleanup activities, i.e. the "100 Areas". Cleanup activities could result in localized and temporary siltations in addition to potential chemical and radiological contamination.

In the long term, development on public lands in the study area would be dependent upon the discretion and needs of the administering agency. Lands would be transferred to a resource management agency and managed for conservation and recreation purposes. No large-scale development would occur on federal lands. Consequently, actions are not expected to affect water quality.

On private lands, residential, recreational, industrial, or agricultural developments could occur resulting in increased erosion and siltation, additional water diversions, reduction in riparian vegetation, disturbance of the bed and banks of the river, and increased pollution from point and non-point sources. Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129). During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Consequently, there could be an adverse impact on water quality from development.

6f. Controls on Mining and Mineral Development

Under this alternative, the current withdrawals which prohibit mining and mineral development would remain in effect in the short term while DOE maintains management responsibility. When the DOE excesses the lands, long term consequences would depend on the agency obtaining the property. With continued public ownership, disturbance to water quality would be minimal. On private lands within the study area, mining and mineral activities such as gravel operations or gold dredging could occur and potentially increase sedimentation which adversely effects water quality. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river (NPS, 1992). Consequently, impacts to water quality are anticipated to be minimal on public lands but difficult to determine on private lands.

6g. Controls on Agricultural Use

With continued public ownership, existing sharecropping leases would most likely be maintained. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. Existing sharecropping practices have not had an impact on water quality. In the long term, subsequent to DOE excessing the lands, consequences would depend on the agency obtaining the property and their plans for future use. On private lands, no additional controls would exist and it is possible that additional lands could be developed for agricultural purposes. Agricultural practices of the type currently along the river are not impacting water quality. Consequently, only if the type and intensity of agriculture changes in such a manner to adversely affect water quality would an impact be expected.

6h. Controls on Grazing

Under this alternative, whether or not to continue grazing on public lands would be subject to the discretion of the managing agency. Currently, an estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity also impact upland habitats by loosening soils and creating tracks which hasten erosion which could result in increased sedimentation to the river. Consequently, unless the amount of grazing is increased substantially, water quality would not be affected.

7) Effects on Instream Flows

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on instream flows.

7a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. A dam would significantly alter existing stream flows in the Hanford Reach and impound the last free-flowing non-tidal segment of the Columbia River. A prohibition on dams would prevent significant alteration of existing instream flows, ensure that instream flow needs for significant natural and cultural resources were provided, and consequently have a beneficial impact on existing instream flows.

7b. Water Resource Development Project Construction

Under this alternative, water resource development projects would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have increased the cross section area of the river and would have generally resulted in reduced water velocities for the same amount of river flow. Limitations on water resource development projects would ensure that instream flow needs for significant natural and cultural resources were provided, and consequently have a beneficial impact on existing instream flows.

7c. Instream Flow Protection

Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Barring major changes in the operation of upstream and downstream dams, the existing flow regime would be maintained. Consequently, there would be no impact on instream flows.

8) Effects on Tribal Access and Use

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on tribal access and use.

8a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. Presently, the lack of dams permits a variety of uses within the reach. Construction of a dam would effect a variety of American Indian uses on the Hanford Reach such as salmon fishing, gathering foods and medicines, and flooding of traditional cultural properties and sacred sites. Availability of anadromous fish in the Hanford Reach is dependent on unimpeded migration and favorable spawning and rearing conditions, both of which would be impacted through construction of a dam. Fishing would be directly impacted by the reduced salmon populations, particularly the wild fall chinook salmon which would

be drastically reduced or eliminated. It is the position of the tribes that the Hanford Reach, in particular, is an inseparable natural and cultural resource upon which the tribes' culture and heritage rests. The federal government is responsible for upholding treaties it signed with the above mentioned tribes in 1855, which has a trust responsibility to the American Indians and guarantee rights to certain resources of which states, "the right to fish at all usual and accustomed fishing places...". The prohibition on new dams would result in the maintenance of unimpeded migration and spawning and rearing habitat. The tribes have also stated that the ecosystems of the Columbia Basin are an integral part of the culture and religion of the tribes and bands of the region. Prohibition on dams would protect the fall chinook fishery and special plant populations and have a beneficial impact on tribal access and use.

8b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed critical spawning and rearing habitat for fall chinook salmon, an important resource for the tribes. In addition, significant cultural resource sites located within or along the banks of the river would be vulnerable to direct impacts from dredging or indirectly by erosion from barge traffic. If fish populations and cultural resource sites are lost then access and use for American Indians would diminish. Consequently, limitations on water resource development projects would have a beneficial impact on tribal access and use.

8c. Controls on Grazing

Under this alternative, whether or not to permit grazing would be subject to the discretion of the managing entity. An estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing by the WSDFW. Currently, tribes are not exercising their right to graze livestock in the study area. It is likely that grazing could continue and be expanded whether the lands continue in public or private ownership. If lands become privately owned, access to grazing by the tribes may be precluded. Consequently, adverse impacts to tribal access and use may result if grazing is prohibited by a future managing entity.

8d. Allowance for Recreational Activities

Hunting and fishing are the most popular recreational activities in the Hanford Reach study area. Hunting is currently allowed on the lands administered by the WSDFW and in restricted areas along the river. If additional areas are open for hunting then there would be a beneficial impact on tribal access and use. However, if no additional areas are open for these purposes, then there would be no impact on access and use. Fishing in the Reach is a popular activity to both tribes and sportfishermen alike. The fall chinook salmon is highly prized by anglers for its large size, strength, and flesh quality. The number of fall chinook salmon has attracted an abundance of anglers, with an average of 21,000 angling trips per season between 1985 and 1991. It is possible that conflicts could arise between American Indians and sport fishermen with regards to usual and accustomed fishing places, and consequently recreational activities could have a slight impact on tribal access and use. Nonconsumptive uses may also infringe on tribal access and use of the reach. When the DOE excesses the lands, consequences would depend on the managing entity and their plans for future use. With continued public ownership, it is anticipated there would be minimal if any impact on tribal access and use.

9) Effects on Land Ownership and Use

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on land ownership and use.

9a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. Construction for a new dam in this location could require land acquisition and inundate private lands. Consequently, a prohibition on dams would not result in a change in land ownership and use.

9b. Controls on Existing Power Production In or Near the Study Area

Under this alternative, no actions would be taken to alter existing power production facilities. Consequently, existing power production in or near the study area would not be impacted.

9c. Controls on Development

Under this alternative, no actions would be taken to limit development on private lands. Consequently, existing land ownership and use would not be impacted.

9d. Controls on Mining and Mineral Development

The current withdrawals which prohibit mining and mineral development would remain in effect in the short term while DOE maintains management responsibility. In the long term, the future managing agency could open the area to mining and mineral development. This could result in a wider range of uses and consequently have a beneficial impact on land ownership and use.

9e. Controls on Agricultural Use

When the DOE excesses the lands, consequences would depend on the agency obtaining the property and their use of the area. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. It is not known what the impact would be on the extent of use for agriculture and consequently, land ownership and use.

9f. Controls on Grazing

Under this alternative, whether or not to permit grazing would be subject to the discretion of the managing agency. An estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing by the WSDFW. It is not known what the impact would be on the extent of use for grazing and consequently, land ownership and use.

10) Effects on Department of Energy Activities on the Hanford Site

Under this alternative, land use would not be determined for the Hanford Reach and will be debated for some time. Final clean-up under the Tri-Party Agreement cannot occur until land use is determined and subsequently used in the risk assessments, unless the most conservative land use is assumed. This would probably increase the time and cost of Hanford clean-up.

The following analysis examines the existing management situation and how DOE industrial activities on the Hanford Site would be impacted in the foreseeable future.

10a. Dam Construction
Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. In 1979, the DOE conducted a study to determine the impacts of the Ben Franklin Dam project on the Hanford Site. The study concluded that construction of the dam, which would impound approximately 50 miles of the river located adjacent to the Hanford Site, would raise the groundwater level throughout the Hanford Site and also potentially have an impact on existing facilities and future cleanup activities. It was determined that the most significant impact would be the flooding of the reactor area along the river (the "100 Area") which contains a number of waste burial grounds, contaminated soil sites, and buildings (U.S. Army Corps of Engineers 1979). The resulting reservoir would raise the groundwater level throughout the Hanford Site and could potentially have an impact on existing facilities and future cleanup activities. The greatest impact on the Hanford Site would be the flooding of the reactor area along the river, most notably the 100 Area. The prohibition on dams would prevent impacts resulting from inundation to buildings and waste burial grounds and consequently have a beneficial impact on the Hanford Site.

10b. Protective Designation
Under this alternative, there would be no protective designation and therefore no effect on DOE activities.

10c. Controls on Development
Under this alternative, there would be no control on development and therefore no effect on DOE activities.

10d. Controls on Local Energy Transfer Facilities
Under this alternative, no actions would be taken to alter existing power production facilities. Consequently, existing power production in or near the study area would not be impacted.

11) Effects on Recreational Access and Use
The following analysis examines the existing management situation and how recreational access and use would be impacted in the foreseeable future.

11a. Dam Construction
Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. A dam would impound the last free-flowing non-tidal segment of the Columbia River, with subsequent impacts to the existing nature of recreational activities the Hanford Reach, in particular, fishing, wildlife observation, and boating. The availability of anadromous fish for fishing is dependent on unimpeded migration and spawning and rearing habitat, both of which would be eliminated by the construction of a dam (for further information, a detailed discussion is located in this alternative "Effects on Fall Chinook Salmon", page 207).

Dams would also change existing flow conditions through the Hanford Reach which could alter the type of boating which occurs, specifically navigation by anglers and other recreational users. Boating would shift toward power boats and waterskiing. The type of fish available for recreational purposes would shift from anadromous to resident. Sloughs, islands, and channels which are important for wildlife, hunting and nature observation would be submerged. Prohibitions on dams would protect existing populations of anadromous fish for fishing, maintain appropriate water levels for boaters, and maintain existing sloughs, islands, and channels for recreational purposes. Consequently, there would be a beneficial effect on recreational access and use.

11b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed and destroyed critical spawning and rearing habitat for fall chinook salmon which supports the recreational fishery. Consequently, limitations on water resource development projects would have a beneficial impact on recreational access and use by supporting the anadromous fishery through protecting critical salmon habitat.

11c. Instream Flow Protection

Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Barring major changes in the operation of upstream and downstream dams, the existing flow regime would be maintained. Future alteration of the flow regime may not insure optimum flow requirements for maintenance of a variety of recreational activities. Consequently, there could be an adverse impact on recreational access and use.

11d. Nuisance Aquatic Macrophyte Control

At present and in the foreseeable future, there will be no control of nuisance aquatic macrophytes in the Hanford Reach. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows from increased vegetation, in turn, can adversely affect salmon habitat by increasing water temperature and reducing sedimentation transport and oxygen supply, especially in the shallow water areas which salmon prefer (U.S. Army Corps of Engineers 1979b). Continued increases in milfoil populations may have an adverse impact on fall chinook salmon and consequently recreational access and use.

11e. Wildlife Habitat Protection

Under this alternative, wildlife habitat protection and restoration programs would be subject to the discretion of the managing agency. The Hanford Reach and surrounding lands provide some of the best opportunities for wildlife viewing in eastern Washington state. Bald eagles, common loons, wintering and migratory waterfowl, pelicans, terns, gulls, great blue herons, mule and white-tailed deer, coyotes, and beavers are some of the species that may be observed. Existing habitat protection consists of restricting public access and controlling wildfires, both of which are dependent upon levels of patrols. Consequently, populations of wildlife will be determined to some extent by the efforts of the future land manager.

11f. Control of Wildfire

On public lands, wildfire control would continue to consist of agency/county cooperative efforts. On private lands, the respective county would be responsible for wildfires. Counties have limited resources to fight wildfires i.e. no access to federal aerial support. Controls on wildfires would continue as is; consequently, there is greater potential for impacts to wildlife habitats which would benefit wildlife for recreational purposes on private lands than with an action alternative.

11g. Controls on Development

In the short term, assuming the continuation of the existing DOE mission for the Hanford Site which entails cleanup and environmental restoration, development within the corridor would be limited to support of cleanup activities, i.e. the "100 Areas". Cleanup activities would result in localized and temporary disturbance, but this impact is not anticipated to impact recreational access and use. Continuation of existing DOE management would result in the maintenance of wildlife habitats depended upon for various types of recreation.

In the long term, development on public lands in the study area would be dependent upon the discretion and needs of the administering agency. Lands would be transferred to a resource management agency and managed for conservation and recreation purposes. No large-scale development would occur on federal lands. Consequently, there would be no impact on recreational access and use.

11h. Allowance for Recreational Facilities

Under this alternative, it is assumed that no improvements to existing recreational facilities would be completed. This may result in degrading of existing boat launch areas and eventual loss of access areas to the river. Consequently, there would be no impact on recreational access and use.

11i. Allowance for Recreational Activities

When the DOE excesses the lands, continued public ownership and existing recreational activities are anticipated. Consequently, there would be no impact on recreational access and use.

11j. Interpretation and Education Activities

Under this alternative and in the short term, the DOE would continue to provide additional information regarding cultural resources of the Hanford Reach. In the long term, the degree to which interpretation and education programs were pursued by a public agency is unknown. The experience of the recreational user could be slightly impacted if interpretation and education activities are reduced with a consequent decreased understanding of the significance of the Hanford Reach.

11k. Law Enforcement Actions

In the long term (post DOE management), enforcement of the laws which prohibit unauthorized off-road vehicle use and unauthorized access and use would be subject to the discretion and managing capability of the administering agency. Trespass on key habitat areas, disturbance of archaeological sites, unauthorized vehicle use, and other inappropriate recreational activities can impact the overall recreational experience. Assuming continued public ownership, minor impacts to recreational access and use are expected.

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ALTERNATIVE D:
National Conservation Area

This alternative would create designation of a National Conservation Area (NCA) designation. The NCA would include the river, it's immediate environment, and incorporate two administrative wildlife refuges which are currently under the administration of the USFWS and the WSDFW. Private lands would be excluded from the designated boundaries. Use and development of private lands would remain the jurisdiction of state and local governments. Dams would be prohibited. Dredging which has a direct and adverse affect on natural and cultural resources would also be prohibited. Development of most new facilities on the Hanford Site within the immediate river corridor would be curtailed, with the exception of those activities related to cleanup of the Hanford Site. Other activities by the DOE would be specifically allowed or subject to review and approval. The BLM would manage the area. The DOE continue to be responsible for site cleanup and retain ownership and management until the sites are certified clean. The focus of management would be on protection of cultural resources and fish and wildlife habitat. A range of uses, including grazing and mineral leasing, would be allowable if approved by BLM. Recreational sites would be retained in their existing number.

The following analysis examines the management actions which would impact the significant issues identified by the study task force. Please refer to the Proposed Action for a brief background summary of each of the enumerated issues discussed below.

Effects on the resources of the Hanford Reach from Hanford Site cleanup activities will be considered in the Hanford Remedial Action Environmental Impact Statement currently being completed by the DOE and anticipated for release in December, 1994.

1) Effects on Fall Chinook Salmon

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on fall chinook salmon. Please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

1a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam, proposed in the 1970s by the Army Corps of Engineers (ACOE) at river mile 348 is used as the basis for analyzing potential impacts if a dam were constructed in the Hanford Reach. The proposed dam would have been over 7700 ft. wide and 82 ft. high and created an impoundment that would have extended the entire length of the reach (RM345-396). Almost 50 miles of spawning and rearing habitat which currently accounts for approximately 85% of the total Hanford Reach fall chinook production, would have been inundated by the impoundment and spawning eliminated. Upstream and downstream migration is critical to fall chinook stocks in the Columbia River: approximately 80% of the total adult fall chinook run entering the mouth of the river will return to the Hanford Reach (Geist 1991). In 1987, 90,000 adult fall chinook returned to spawn in the Reach (Geist 1991). The significance of this salmon stock to the Northwest Indian tribes, commercial, and sport fisheries is discussed in detail in Chapter III, Affected Environment, page 98. While salmon returns would continue to fluctuate due to upstream and downstream factors, this alternative would eliminate the threat of future impediments to migration and from fluctuating water levels which are detrimental to eggs and fry through exposure of nest and stranding of anadromous fish (SAI/PMX/DC 1979). In addition, the prohibition on dams would prevent decreased stream temperature fluctuations, reduction in shallow water habitat, and decreased stream velocities in approximately 44 miles of critical rearing habitat. Consequently, there would be a beneficial impact on fall chinook salmon.

1b. Water Resource Development Project Construction

Water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. The intent of this project was to construct a shallow-draft commercial navigation channel through the Reach in order to allow barges and large vessels to travel from Richland to upstream ports. This project would have required the dredging of a 20 mile long channel to a uniform channel depth of 14 ft within the reach. It would have disturbed a substantial amount of spawning habitat, including areas that have large concentrations of spawning redds, and changed the hydraulics of the river with unknown consequences on spawning habitat and use. Fisheries agencies concluded that barge traffic on the river would disturb spawning activity and resulting wakes would increase shoreline and island erosion which would cause siltation of spawning gravels (Washington Department of Fisheries 1987). Approximately 85% of the total Columbia River fall chinook adults are naturally spawning fish which depend on swift currents, cobble, and shallow water (Roler 1991). Even hatchery production of fall chinook is indirectly dependent on these conditions because naturally produced brood stock provide the eggs for the Priest Rapids hatchery. Dredging in the reach would increase the cross section area of the river and would generally result in reduced water velocities for the same amount of river flow. The resulting channelized flow and slower overall velocities between the shore and the edge of the channel could impact spawning and other processes that require fairly rapid flow in the shallow areas. Limitations on water resource development projects would ensure the maintenance of existing conditions on approximately 50 miles of critical spawning habitat within the Hanford Reach and ensure that conditions are favorable for salmon once they return. Consequently, there would be a beneficial impact on fall chinook salmon.

1c. Water Quality Protection

Under this alternative, the level of water quality would be protected within the Hanford Reach through a prohibition on dam construction, limitations on water resource development projects, and controls on development to reduce siltation and other water pollution (for further information on water quality, please refer to, "Effects on Water Quality", page 248). Excellent water quality is critical to salmon spawning and

rearing success. Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. Consequently, protection of present water quality levels would have a beneficial impact on fall chinook salmon.

1d. Instream Flow Protection

Under this alternative, the BLM would evaluate flow requirements for fall chinook salmon and work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Maintaining instream flows would allow fall chinook salmon populations to migrate, spawn, and rear in the Hanford Reach. Consequently, there would be a beneficial impact on the fall chinook salmon.

1e. Nuisance Aquatic Macrophyte Control

Under this alternative, the BLM would make efforts to control nuisance aquatic macrophytes within the Hanford Reach in conformance with a management plan. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flow. Restricted flows in turn, can adversely affect salmon habitat by increasing water temperature and reducing sedimentation transport and oxygen supply, especially in the shallow water areas which salmon prefer (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes, by either chemical or mechanical means, would limit and potentially reduce populations and help protect spawning and rearing habitat. Consequently, fall chinook salmon would not be impacted.

1f. White Bluffs Protection

Under this alternative, the BLM would limit activities which would contribute to sloughing of the White Bluffs. The BLM would review its own activities and seek voluntary participation from agencies and individuals to limit activities which contribute to sloughing of the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs. Several significant spawning areas are located immediately below the White Bluffs and sloughing contributes sediments to the river which eventually siltates spawning gravels, making them less desirable for salmon. The rate of sloughing is expected to continue at existing levels, which would continue to impact those spawning areas located directly below the White Bluffs. However, to the extent that management efforts were successful in reducing impacts to the White Bluffs, there would be a beneficial impact on spawning habitat for the fall chinook salmon.

1g. Controls on Development

Under this alternative, the BLM would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The BLM would undertake no development which would have adverse impacts to fall chinook salmon spawning and rearing habitat.

The DOE would be able to construct intakes and outfalls and required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include but not be limited to, buildings, roads, and groundwater flow barriers or treatment systems which could result in temporary adverse impacts to fishery values. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize impacts to fall chinook salmon spawning and rearing habitat.

In recent years there have been dramatic increases in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area boundary. These type of developments often result in loss of existing wetlands, riparian vegetation, and stream bank integrity. While it is not known how much impact has already occurred, incremental losses such as these diminish fish productivity as well as ecosystem diversity. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to restrictions through existing zoning and voluntary compliance.

The BLM would have no authority to control development on those private lands excluded from the designated area even if an adverse impact on fall chinook salmon were to occur. Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

On private lands, residential, recreational, industrial, or agricultural developments could occur resulting in increased erosion and siltation of spawning beds, additional water diversions, reduction in riparian vegetation, and disturbance of the bed and banks of the river. The majority of private ownership within the river corridor is near Priest Rapids Dam and in the Ringold area (Grant and Franklin counties). Both of these areas are near or adjacent to important fall chinook salmon spawning areas. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Consequently, impacts to fall chinook salmon are anticipated to be minimal on public lands but difficult to determine on private lands.

1h. Controls on Mining and Mineral Development

Under this alternative, mining and mineral development on federal lands would be allowed as long as it did not impact significant resources of the Hanford Reach. Disturbance to fall chinook salmon spawning and rearing habitat would be minimized. On private lands within the study area, mining and mineral development could occur and potentially increase sedimentation and/or introduce toxic materials into the river, both of which adversely affect water quality and damage salmon spawning areas. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river adjacent to one of the more popular spawning areas (NPS, 1992). Consequently, impacts to fall chinook salmon are anticipated to be minimal on public lands but difficult to determine on private lands.

1i. Controls on Agricultural Use

Under this alternative, agricultural activities would occur on federal lands. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. Sharecropping leases on federal lands would be maintained. Existing sharecropping practices have not had an impact on water quality which could potentially impact salmon habitat. With a lack of projected increase in agricultural use within the study area, impacts on water quality are not anticipated. On private lands, approximately 800 acres are used for agricultural purposes within the study area (ASCS 1993). While the extent of existing agricultural practices have not been shown to have an adverse impact on water quality, a significant expansion of agricultural practices may have an impact on water quality and subsequent spawning habitat by increased volumes of pesticide runoff and sedimentation. Consequently, only if the type and

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intensity of agriculture changes in a manner to adversely affect water quality would there be an impact on fall chinook salmon.

1j. Controls on Grazing

Under this alternative, grazing on federally owned land would be allowed subject to a review and determination of no impact to significant resources. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and White Bluffs vicinity also impact upland habitats by loosening soils and creating tracks which hasten erosion and increase sedimentation to the river. There has been no indication that trespassing cattle nor existing grazing practices significantly degrade water quality due to the large amount of water flowing past in relation to the level of grazing pressure. Continued grazing is not expected to impact water quality and salmon habitat. Consequently there would be no impact on fall chinook salmon.

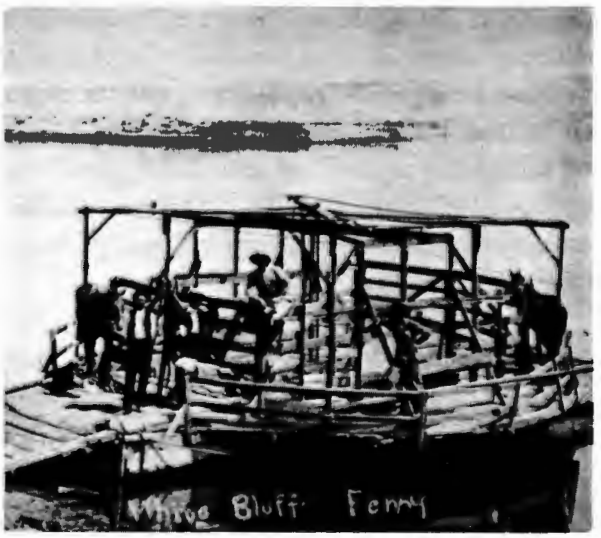
2) Effects on Cultural Resources

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on cultural resources. Please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

2a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the Army Corps of Engineers at river mile 348 is the basis for a likely scenario of potential impacts should a dam be constructed in the Hanford Reach. Studies of the Ben Franklin Dam indicated that the project would have inundated two National Register sites, four archaeological districts, and 122 prehistoric archaeological sites (Rice 1980). The prohibition on dams would prevent inundation and disturbance from construction of access roads, utility corridors, and other related facilities. Consequently, there would be a beneficial impact on cultural resources.



2b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. A large number of archaeological sites are located within or along the banks of the river. Channel dredging would have varying impacts on cultural resources depending on the location of the dredging, the placement of dredge spoils, and the potential for erosion of sites from increased stream velocities and barge-generated wakes. Consequently, limitations on water resource development projects would prevent potential impacts and have a beneficial impact on cultural resources.

2c. Controls on Development

Under this alternative, the BLM would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The BLM would undertake no development which would have adverse impacts to cultural resources. All development would be subject to Section 106 of the National Historic Preservation Act in an attempt to minimize disturbance of archaeological sites. If cultural sites are discovered during development, efforts would be made to recover or salvage artifacts.

The DOE would be able to construct intakes and outfalls and required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include, but not be limited to, buildings, roads, and groundwater flow barriers or treatment systems which could result in temporary adverse impacts to cultural resources. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize such impacts (see Effects on DOE Activities, "Controls on Development", page 253). All development would be subject to Section 106 of the National Historic Preservation Act in an attempt to minimize disturbance of archaeological sites. If cultural sites are discovered during development, efforts would be made to recover or salvage artifacts.

In recent years there have been dramatic increases in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area. These type of developments have had an adverse impact on cultural resources through disturbance of sites. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to developmental restrictions through existing zoning and voluntary compliance. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

On private lands residential, recreational, and industrial developments could occur resulting in disturbances and loss of historic and archaeologic sites. Such development could cause adverse impact to cultural resources. The majority of private ownership within the river corridor is near Priest Rapids Dam and in the Ringold area (Grant and Franklin counties). Consequently, impacts to cultural resources are anticipated to be minimal on public lands but difficult to determine on private lands.

2d. Controls on Mining and Mineral Development

Under this alternative, mining and mineral development on federal lands would be allowed as long as it did not impact significant resources of the Hanford Reach. Disturbance to cultural resources would be minimal. On private lands within the study area, mining and mineral development could occur and potentially disturb the surface of the land which often exposes cultural resources. In 1992, a proposal was pursued to placer mine for gold within 1/4 mile of the river (NPS 1992). Mining and mineral development activities could damage or destroy cultural resource sites through direct disturbance of the ground and/or exposure of the sites to erosion or vandalism. Consequently, impacts to cultural resources are anticipated to be minimal on public lands but difficult to determine on private lands.

2e. Controls on Agricultural Use

Under this alternative, agricultural activities would occur on federal lands. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. Sharecropping leases on federal lands would be maintained. Existing sharecropping practices have not had an impact on cultural resources. With a lack of projected increase in agricultural use within the study area, impacts on cultural resources are not anticipated. On private lands, approximately 800 acres are used for agricultural purposes within the study area (ASCS 1993). Although private lands within the study area have not been formally surveyed for cultural resources, the existence of cultural resources on federal lands in proximity to the river is a strong indicator that cultural resources may exist on private lands. Cultural sites can be impacted by agricultural activities, primarily by the cultivation of new previously undisturbed areas. An increase or a change in existing agricultural practices could result in disturbance and loss of cultural sites. Consequently, impacts to cultural resources are anticipated to be minimal on public lands but difficult to determine on private lands.

2f. Controls on Grazing

Under this alternative, grazing on federally owned land would be allowed, subject to a review and determination of no impact to significant resources. An estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity impact upland habitats by loosening soils and creating tracks which hasten erosion which could expose and trample vulnerable cultural resource sites. Consequently, with grazing practices subject to a determination of no impact, impacts to cultural resources would be minimal.

2g. Control of Wildfire

Under this alternative, a federally guided, multi-agency wildfire suppression program would be maintained. The BLM is responsible for suppressing fires and each NCA has fire fighting capabilities. When needed, the BLM can call on the U.S. Forest Service to obtain fast response using spotter aircraft and aerial retardant drops to assist with fire control, a resource not available to local county fire districts. When incident command teams work on NCA's, the land manager determines which fire fighting methods are acceptable based on the resources affected. In bad fire years, wildfires sometimes exceed 1,000 acres or more within the study area. The last large fire was in 1993 when over 12,000 acres were burned. In other years, wildfires tend to range between 5-20 acres depending on the quickness of the response.

Presently, fire control effectiveness is limited because most wildfire response is provided within the limitations of the local volunteer county fire districts which are not familiar with the cultural resources of the area and because federal agencies do not have management responsibility for that part of the study area managed by the state. With increased staffing under this proposal and improved direction of the fire suppression program, there would be less likelihood of fire posing a threat to cultural resources because of more sensitive fire suppression techniques, i.e. no clearing of fire lines with bulldozers or tractor/disc equipment in cultural resource significant areas. Consequently, there would be less potential for impact to cultural resources.

2h. Interpretation and Education Activities

The BLM would provide interpretation of cultural values and public outreach. Efforts would specifically include development of interpretative displays and leaflets, tours and programs with NCA staff, and increased law enforcement to help provide information. This program would increase public understanding of the significance of archaeological sites and sanctions on site disturbance and decrease the incidence of

site vandalism and unauthorized collecting. Consequently, there would be a beneficial impact on cultural resources.

2i. Inventory and Survey Actions

Under this alternative, the BLM would conduct cultural inventories and surveys as staffing and budget allow. Archaeological surveys would be conducted to augment the inventory of sites along the river pursuant to the management plan. The level of inventories and surveys will be directly related to the amount of staffing and financing devoted to the protection of cultural resources. Consequently, better knowledge of resource location would reduce inadvertent damage and have a beneficial impact on cultural resources.

2j. Law Enforcement Actions

Under this alternative, patrols would be increased. Increases in patrols would support enforcement of the laws and regulations which prohibit trespass and unauthorized off-road vehicle use and reduce existing problems. Additional regulations may be proposed following development of the management plan. Vandalism of significant cultural resource sites in the Hanford Reach continues to occur from unauthorized access and off-road vehicle use. Off-road vehicle use not only makes cultural resource sites more accessible, but their use can directly destroy these resources. The majority of damage to cultural resource sites is from those who collect artifacts as a hobby (Chatters 1992). With increases in patrols, it is anticipated that there would be a beneficial impact on cultural resources.

3) Effects on Biodiversity

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on biodiversity. Due to similarities, with the exception of the "Revegetation of Disturbed Areas", and "Controls on Grazing", please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

3a. Dam Construction

Under this alternative, dams would be prohibited. Prohibition on dam construction would prevent impoundment of the last free-flowing non-tidal segment of the Columbia River. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. This project would have inundated approximately 11,500 acres of riparian lands which provides essential habitat for approximately 250 deer, 10,000 upland game birds, and 318,000 waterfowl (U.S. Army Corps of Engineers, 1979). In addition, almost 50 miles of free-flowing river would have been inundated, with a loss in native aquatic habitat and species. Such impacts might include an increase in water temperatures over natural conditions, alteration of the species composition of plant communities that currently exist on the cobble substrates, an increase in sedimentation, inundation of as many as fifteen river islands (1660 acres), inundation of all existing riparian vegetation (1260 acres), and a reduction in shallow water habitat (U.S. Army Corps of Engineers 1980). The prohibition on dams would prevent disturbance of aquatic, riverine, and riparian habitats and minimize habitat-related declines in existing populations of native plants, fish, and wildlife. Consequently, there would be a beneficial impact on biodiversity.

3b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a water resource development project. This project would have increased erosion of riverine and riparian habitats, inundated nesting areas for colony nesters, Canada geese, long-billed curlews, and waterfowl, and increased disturbance by allowing large vessels and barges to travel close to river islands (U.S. Fish and Wildlife Service 1988). Impacts would be particularly acute for wintering waterfowl, which number in the tens of thousands on the Hanford Reach (actual daily waterfowl counts for November through January, 1986-1990, were between 25,000-93,000). Dredging would disturb river sediments which might contain contaminants that could subsequently degrade water quality and affect aquatic and riverine habitats. Limitations on water resource development projects would prevent disturbance of aquatic, riverine, and riparian habitats and minimize habitat-related declines in existing populations of native plants, fish, and wildlife. Consequently, there would be a beneficial impact on biodiversity.

3c. Water Quality Protection

Under this alternative, the level of water quality would be protected within the Hanford Reach through controls on development to reduce siltation and other water pollution, a prohibition on dam construction, and limitations on water resource development projects (for further information on water quality, please refer to, "Effects on Water Quality", page 248). Excellent water quality supports viable riverine and riparian habitats and those species dependent on these habitats. Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. In addition to the river, upland lakes and wetlands provide important habitat for migratory waterfowl and other water dependent species. Consequently, this alternative is expected to have a beneficial impact on biodiversity because the BLM would not allow activities which are considered detrimental to water quality.

3d. Instream Flow Protection

Under this alternative, the BLM would evaluate flow requirements to support riverine and riparian habitats and the species dependent on these habitats. The BLM would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Consequently, there would be a beneficial impact on biodiversity.

3e. Nuisance Aquatic Macrophyte Control

Under this alternative, the BLM would make efforts to control nuisance aquatic macrophytes within the Hanford Reach in conformance with a management plan. Eurasian milfoil, an introduced species, is most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows, in turn, can adversely affect aquatic and riverine habitat by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes, by either chemical or mechanical means, would limit and potentially reduce populations and protect aquatic and riverine habitats. Consequently, there would be a beneficial impact on biodiversity.

3f. White Bluffs Protection

Under this alternative, the BLM would limit activities which would contribute to sloughing of the White Bluffs. The BLM would review its own activities and seek voluntary participation from agencies and individuals to limit activities which contribute to sloughing of the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs. The bluffs provide important nesting habitat for species including but not limited to cliff swallows, great horned owls, red-tailed hawks, and say's phoebe. The rate of sloughing is expected to continue at existing levels which would continue the gradual erosion of the White Bluffs. However, to the extent that management efforts were successful in reducing impacts to the White Bluffs, there would be a beneficial impact on biodiversity.

3g. Non-Native Vegetation Control

Under this alternative, the BLM would make efforts to control the spread of non-native vegetation as provided in a refuge management plan. Non-native vegetation is both a cause and effect of disturbance of native habitats. The disturbance of native habitats leads to the establishment of non-native vegetation. Existing non-native vegetation in the study area consists of Russian olive trees (dispersed over approximately 500 acres), salt cedar (dispersed over approximately 100 acres), purple loosestrife (dispersed over approximately 10 acres), and common white mulberry trees, which are scattered along the banks of the river (Goeke 1991, Rickard 1992). Salt cedar, purple loosestrife, and Russian olive have demonstrated their ability to rapidly invade wetlands, outcompete and displace native species, greatly reduce the value of wetlands as wildlife habitat, and decrease biodiversity. In addition, the presence of these plants create a seed source for movement to other land (Noxious Weed Control Board of Grant County, 1992). Non-native vegetation would be retained where it provides benefits to wildlife (i.e. nesting sites). The selected management of non-native vegetation through either removal or retention, would have a beneficial impact on biodiversity.

3h. Revegetation of Disturbed Areas

Under this alternative, limited revegetation of native species would occur as necessary. Approximately 3200 acres along the Benton County shoreline of the reach are disturbed (L. Fitzner 1991) and could be reseeded with native plant species. It is estimated that approximately 500 acres would be revegetated under this alternative. Specific native species to be used for revegetation would be identified in the management plan. Reclamation of existing gravel pits and revegetation with native plant species could reduce non-native plants and restore habitat in these areas. Revegetation of disturbed areas with native species in riparian and shrub-steppe habitats would slightly enhance the diversity and abundance of endemic plant and animal species and have a beneficial effect on biodiversity.

3i. Control of Wildfire

Under this alternative, a federally guided, multi-agency wildfire suppression program would be maintained. The BLM is responsible for suppressing fires and each NCA has fire fighting capabilities. When needed, the BLM can call on the U.S. Forest Service to obtain fast response using spotter aircraft and aerial retardant drops to assist with fire control, a resource not available to local county fire districts. When incident command teams work on NCA's, the land manager determines which fire fighting methods are acceptable based on the resources affected. In bad fire years, wildfires sometimes exceed 1,000 acres or more within the study area. The last large fire was in 1993 when over 12,000 acres were burned. In other years, wildfires tend to range between 5-20 acres depending on the quickness of the response.

Presently, fire control effectiveness is limited because most wildfire response is provided within the limitations of the local volunteer county fire districts which are not familiar with the natural resources of the area and because federal agencies do not have management responsibility for that part of the study area managed by the state. With increased staffing under this proposal and improved direction of the fire suppression program, there would be less likelihood of fire posing a threat to upland habitats. Consequently, there would be less potential for impact to biodiversity.

3j. Controls on Development

Under this alternative, the BLM would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The BLM would undertake no development which would have adverse impacts to riverine and aquatic habitats.

The DOE would be able to construct intake and outfalls and required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include, but are not limited to, buildings, roads, and groundwater flow barriers or treatment systems. Construction of these type of facilities may result in impacts to riverine and aquatic habitats, particularly localized and temporary siltation and potential chemical and radiological releases. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize such impacts (see Effects on DOE Activities, "Controls on Development", page 253).

In recent years there have been dramatic increase in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area boundary. These type of developments often result in increased sediments to the river and displaced wildlife populations due to a reduction in habitat and reduced native vegetation. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to restrictions through existing zoning and voluntary compliance. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

On private lands residential, recreational, and industrial developments could occur resulting in disturbances and loss of riverine, aquatic, and riparian habitats. The majority of private ownership within the river corridor is near Priest Rapids Dam and in the Ringold area (Grant and Franklin counties). Development would potentially increase sediments to the river, displace wildlife populations due to a reduction in habitat and reduce native vegetation located within the river corridor. Consequently, impacts to biodiversity are anticipated to be minimal on public lands but difficult to determine on private lands.

3k. Controls on Mining and Mineral Development

Under this alternative, mining and mineral development on federal lands would be allowed as long as it did not impact significant resources of the Hanford Reach. On private lands within the study area, mining and mineral development could damage or destroy sensitive terrestrial or aquatic habitat areas that are declining in both area and quality along the mainstem Columbia River. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river (NPS, 1992). Mining and mineral development could be particularly damaging to those sensitive species of plant or animals with severely restricted habitat requirements going even so far as to extirpate them from the local area. Consequently, impacts to biodiversity are anticipated to be minimal on public lands but difficult to determine on private lands.

3l. Controls on Agricultural Use

Under this alternative, agricultural activities would occur on federal lands. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. Sharecropping leases on federal lands would be maintained. Habitat destruction from existing sharecropping practices has already occurred. On private lands, approximately 800 acres are used for agricultural purposes within the study area (ASCS 1993). Agricultural practices could increase and potentially alter habitats. Native habitat types and respective species could be lost and/or replaced with agricultural crops and non-native species. Consequently, impacts to biodiversity are anticipated to be minimal on public lands but difficult to determine on private lands.

3m. Controls on Grazing

Under this alternative, grazing on federally owned land would be allowed, subject to a review and determination of no impact to significant resources. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity impact upland habitats by loosening soils and creating tracks and channels which hasten erosion. In addition, where placed in high densities, cattle trample and consume native plants which are often then replaced with non-native species. Comparative USFWS studies involving grazed and ungrazed portions of the study area have shown that there is greater abundance and diversity of wildlife on ungrazed shrub-steppe lands (Radke, 1987). Consequently, continued grazing may result in site specific impacts to upland and riparian habitats, however, monitoring of grazing leases would ensure minimal impact to significant resources and consequently minimize impacts to the biodiversity of the area.

3n. Law Enforcement Actions

Under this alternative, patrols would be increased. Additional regulations may be proposed following development of management plan. Trespass and off-road vehicle use in sensitive habitat areas results in various impacts, specifically, increased incidences of wildfires, littering, disturbance to rare plants and flowers, and harassment of nesting and resting wildlife. Off-road vehicle use has already resulted in damage to upland and riparian habitats, with the majority of damage occurring on the steep slopes near Ringold, and harassment of wildlife. Restrictions on public access in sensitive habitat areas and increased patrols would decrease trespass and disturbance of native species and, consequently, have a beneficial effect on biodiversity. In addition, increased patrols would assist in the detection of wildfires which can destroy sensitive habitats and is expected to have a significant benefit on biodiversity.

4) Effects on Endangered, Threatened, Candidate, and Sensitive Species

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on endangered, threatened, candidate, and sensitive species. With the exception of "Revegetation of Disturbed Areas", please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

4a. Dam Construction

Under this alternative, dams would be prohibited. The prohibition on dams would prevent the severe alteration of the aquatic and riverine habitat of the Hanford Reach which threatened and endangered species depend upon. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. This project would have significantly altered the aquatic habitat and flow regime of the Hanford Reach. The Columbia pebblesnail, a federally listed candidate species, relies on clean, well-oxygenated, and swiftly moving water to meet respiration requirements, all of which would be eliminated if a dam were constructed (U.S. Fish and Wildlife Service 1988). The riverine habitat for the persistentsepal yellowcress and Columbia milkvetch plant populations, both federally listed candidate species, would be destroyed. The common loon, a federally listed sensitive species, and the white pelican, considered endangered by the state, depend on riverine habitat for nesting, cover, and feeding, all of which would be impacted if a dam were constructed. The prohibition on dams would help maintain the existing quality of aquatic, riverine, and shallow water habitats of the Hanford Reach. This would have a beneficial impact on the above mentioned threatened and endangered species and result in consequent species stabilization or even potential increases in populations and delisting. In addition, the prohibition on dams would protect habitat for salmon, an important winter food source for bald eagles, a federally listed threatened species (for further information, a detailed discussion is located under this alternative, "Effects on Fall Chinook Salmon", page 230).

4b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on the resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have increased erosion of riverine and riparian habitats and increased disturbance by allowing large vessels and barges to travel close to river islands resulting in the reduction of listed and candidate species which are dependent on these habitats (U.S. Fish and Wildlife Service 1988).

The common loon, a federally listed sensitive species, and the white pelican, considered endangered by the state, depend on riverine habitat for nesting, cover, and feeding, all of which could be impacted if water resource development projects were to occur in sensitive habitat areas or were to affect such areas. In addition, limitations on water resource development projects would protect spawning and rearing habitat for salmon, an important winter food source for bald eagles, a federally listed threatened species (for further information, a detailed discussion is located under this alternative, "Effects on Fall Chinook Salmon", page 230).

4c. Water Quality Protection

Under this alternative, the level of water quality would be protected through controls on development to reduce siltation and other water pollution, a prohibition on dam construction, and limitations on water resource development projects (for further information on water quality, please refer to, "Effects on Water Quality", page 248). Excellent water quality supports viable riverine and riparian habitats and those species dependent on these habitats. Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. In addition to the river, upland lakes and wetlands provide important habitat for migratory waterfowl which are also prey for bald eagles and peregrine falcons, federally listed threatened and endangered species, respectively. Consequently, this alternative is expected to have a beneficial impact on threatened and endangered species because the BLM would not allow activities which are considered detrimental to water quality.

4d. Instream Flow Protection

Under this alternative, the BLM would evaluate flow requirements to support existing aquatic and riverine habitats for the persistentsepal yellowcress, Columbia milkvetch, and the Columbia pebblesnail, all of which are federally listed candidate species; the sandhill crane, a federally listed sensitive species, and the white pelican, considered endangered by the state. The BLM would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Consequently, there would be a beneficial impact on threatened and endangered species.

4e. Nuisance Aquatic Macrophyte Control

Under this alternative, the BLM would make efforts to control nuisance aquatic macrophytes within the Hanford Reach in conformance with a refuge management plan. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows, in turn, can adversely affect aquatic habitat by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes by either chemical or mechanical means would limit and potentially reduce populations and protect aquatic habitat which supports the Columbia pebblesnail, a federally listed candidate species. Consequently, there would be a beneficial impact to threatened and endangered species.

4f. White Bluffs Protection

Under this alternative, the BLM would limit activities which would contribute to sloughing of the White Bluffs. The BLM would review its own activities and seek voluntary participation from agencies and individuals to limit activities which contribute to sloughing of the White Bluffs. The White Bluffs are a unique geological feature comprised of claystones and siltstones which line approximately 31 miles of the Hanford Reach. The White Bluffs provide predator-free roost sites and foraging essential to maintaining

large numbers of wintering bald eagles and peregrine falcons, both of which are federally listed as threatened and endangered species, respectively. The Bluffs also provide an important microclimate which assists large raptors with thermoregulation and allows them to minimize energy loss. It is beneficial to have this geological formation in proximity to food and water. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs and the continuation of sloughing could result in the eventual loss of bluff habitat. The rate of sloughing is expected to continue at existing levels, which may result in the loss of individual bald eagle and peregrine falcon nesting sites. However, to the extent that management efforts were successful in reducing impacts to the White Bluffs, there would be a beneficial impact on threatened and endangered species.

4g. Non-Native Vegetation Control

Under this alternative, the BLM would make efforts to control the spread of non-native vegetation as provided in a refuge management plan. Non-native vegetation is both a cause and effect of disturbance of native habitats. Existing non-native vegetation in the study area consists of Russian olive trees (dispersed over approximately 500 acres), salt cedar (dispersed over approximately 100 acres), purple loosestrife (dispersed over approximately 10 acres), and common white mulberry trees which are scattered along the banks of the Hanford Reach (Goeke 1991; Rickard 1992). Ferruginous hawks have been noted to nest in Russian olive trees, however, removal of these trees should have little impact because other nest sites are available. Removal of Russian olive trees may benefit ferruginous hawks by removing potential black-billed magpie nest sites. Black-billed magpies are a potential avian predator (Hill 1992). Removal of the common white mulberry trees may benefit the persistentsepal yellowcress because the trees grow along the edge of the river, particularly in the gravel beaches, which support this rare plant species. Non-native vegetation would be retained where it provides benefits to threatened and endangered species (i.e. nesting sites). Consequently, with the exception of the persistentsepal yellowcress, the selected management of non-native vegetation through either removal or retention, would have a beneficial impact on threatened and endangered species.

4h. Revegetation of Disturbed Areas

Under this alternative, limited revegetation of native species would occur as necessary.revegetation of disturbed areas with native plant species would occur pursuant to the refuge management plan. Approximately 3200 acres along the Benton County shoreline of the reach are disturbed (L. Fitzner 1991) and could be reseeded with native plant species. It is estimated that approximately 500 acres would be revegetated under this alternative.Shrub-steppe habitat provides hunting areas and prey for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species, respectively. Revegetation of disturbed shrub-steppe areas with native species could enhance the diversity and abundance of endemic plant and animal species. Reclamation of existing gravel pits and revegetation with native plant species could reduce non-native plants and restore habitat in these areas. Shrub-steppe also provides habitat for sage grouse, pygmy rabbit, and loggerhead shrike, all federally listed candidate species. Consequently, revegetation of disturbed areas would have a slight impact on threatened and endangered species.

4i. Control of Wildfire

Under this alternative, a federally guided, multi-agency wildfire suppression program would be maintained. The BLM is responsible for suppressing fires and each NCA has fire fighting capabilities. When needed, the BLM can call on the U.S. Forest Service to obtain fast response using spotter aircraft and aerial retardant drops to assist with fire control, a resource not available to local county fire districts. When incident command teams work on NCA's, the land manager determines which fire fighting methods are

acceptable based on the resources affected. In bad fire years, wildfires sometimes exceed 1,000 acres or more within the study area. The last large fire was in 1993 when over 12,000 acres were burned. In other years, wildfires tend to range between 5-20 acres depending on the quickness of the response.

Presently, fire control effectiveness is limited because most wildfire response is provided within the limitations of the local volunteer county fire districts which are not familiar with the natural resources of the area and because federal agencies do not have management responsibility for that part of the study area managed by the state. With increased staffing under this proposal and improved direction of the fire suppression program, there would be less likelihood of fire posing a threat to upland habitats. Consequently, there would be less potential for impact to threatened and endangered species.

4j. Controls on Development

Under this alternative, the BLM would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The USFWS would undertake no development which would have adverse impacts to riverine and aquatic habitats.

The DOE would be able to construct intake and outfalls and those required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include, but are not limited to, buildings, roads, and groundwater flow barriers or treatment systems. Construction of these type of facilities may result in localized and temporary siltation and potential chemical and radiological releases to riverine and aquatic habitats for the persistentsepal yellowcress, Columbia milkvetch, and Columbia pebblesnail, all of which are federally listed candidate species, the common loon, a federally listed sensitive species, and the white pelican, considered endangered by the state. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize such impacts (see Effects on DOE Activities, "Controls on Development" page 253).

In recent years there have been dramatic increases in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area boundary. These type of developments often result in increased sediments to the river and displaced species populations due to a reduction in habitat and reduced native vegetation. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to development restrictions through existing zoning and voluntary compliance. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

On private lands residential, recreational, and industrial developments could occur resulting in disturbances and loss of riverine, aquatic, and riparian habitats critical to threatened and endangered species. The majority of private ownership within the river corridor is near Priest Rapids Dam and in the Ringold area (Grant and Franklin counties). Development would potentially increase sediments to the river, displace wildlife populations due to a reduction in habitat and reduce native vegetation located within the river corridor, and consequently have an adverse impact on threatened and endangered species.

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4k. Controls on Mining and Mineral Development

Under this alternative, mining and mineral development on federal lands would be allowed as long as it did not impact significant resources of the Hanford Reach. On private lands within the study area, mining and mineral development could occur and potentially damage or destroy sensitive terrestrial or aquatic habitat areas that are important to rare plants and/or animals. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river (NPS, 1992). In the case of endangered, threatened, candidate, and sensitive species of plants or animals with severely restricted habitat requirements, this could be particularly damaging, going even so far as to extirpate them from the local area. Consequently, impacts to threatened and endangered species are anticipated to be minimal on public lands but difficult to determine on private lands.

4l. Controls on Agricultural Use

Under this alternative, agricultural activities would occur on federal lands. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. Habitat disruption from existing sharecropping practices has already occurred and most species become listed due to loss of habitats. On private lands, approximately 800 acres are used for agricultural purposes with the study area (ASCS 1993). Agricultural practices could increase and potentially alter habitats depended upon by threatened and endangered species. Consequently, impacts to threatened and endangered species are anticipated to be minimal on public lands but difficult to determine on private lands.

4m. Controls on Grazing

Under this alternative, grazing on federally owned land would be allowed, subject to a review and determination of no impact to significant resources. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity impact upland habitats by loosening soils and creating tracks and channels which hasten erosion. In addition, where placed in high densities, cattle trample and consume native plants which are then often replaced with non-native species. Comparative USFWS studies involving grazed and ungrazed portions of the study area have shown that there is greater abundance and diversity of wildlife on ungrazed shrub-steppe lands (Radke, 1987). Shrub-steppe provides hunting areas and prey for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species respectively. Shrub-steppe also provides habitat for sage grouse, pygmy rabbits, and loggerhead shrike, all federally listed candidate species. Other habitats which could be impacted by cattle include riparian and wetland types. Consequently, continued grazing may result in site specific impacts to upland and riparian habitats, however, monitoring of grazing leases would ensure minimal impact to significant resources and consequently minimize impacts to threatened and endangered species.

4n. Law Enforcement Actions
Under this alternative, patrols would be increased. Additional regulations may be proposed following development of the refuge management plan. Shrub-steppe habitat appears to be the most disturbed from unauthorized public access and off-road vehicle use. Reductions in shrub-steppe habitat decrease both the hunting areas and prey for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species, respectively, and decrease habitat for sage grouse, pygmy rabbit, and loggerhead shrike, all federally listed candidate species. Increases in patrols and resource management staff would increase enforcement of laws which prohibit trespass and off-road vehicle use. Maintenance of shrub-steppe habitat through enforcement of off-road vehicle use would have a beneficial impact on the above mentioned species by maintaining habitat, hunting areas, and cover for prey. In addition, increased patrols would assist in the detection of wildfires which can destroy sensitive habitats and is expected to have a significant benefit on threatened and endangered species.

5) Effects on the White Bluffs

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on the White Bluffs. Please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

5a. White Bluffs Protection
Under this alternative, the BLM would limit activities which would contribute to sloughing of the White Bluffs. The BLM would review its own actions and seek voluntary participation from agencies and individuals to limit their activities which would contribute to sloughing of the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs. The rate of sloughing is expected to continue at existing levels which would continue the gradual erosion of the White Bluffs. However, to the extent that management efforts were successful in reducing impacts, there would be a beneficial impact on the White Bluffs.

5b. Interpretation and Education Activities
The BLM would provide interpretation of the significance of the White Bluffs through an education outreach program, with particular emphasis on the fossils contained within the White Bluffs. This would help decrease the incidence of site vandalism and unauthorized collecting of fossils and disturbance and consequently have a beneficial impact on the White Bluffs.

5c. Law Enforcement Actions
Under this alternative, patrols would be increased. Illegal collecting of fossils continues to reduce the integrity of the White Bluffs.Vandalism of significant fossils in the White Bluffs continues to occur primarily from trespass and off-road vehicle use. While the majority of off-road vehicle use occurs on the steep slopes near Ringold, incidents of their use have occurred on the slopes of the White Bluffs. Off-road vehicle use lessens the stability of the White Bluffs by loosening the siltstones and claystones which make up the formation. Increased enforcement of the laws prohibiting trespass and off-road vehicle use is expected to have a beneficial effect on the White Bluffs by reducing disturbance.

6) Effects on Water Quality

Applicable Mgmt. Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on water quality. Please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

6a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. A dam would result in increased water temperatures over natural conditions by prolonged exposure to solar radiation, and increased sedimentation resulting from reductions in river flow which will decrease the capacity of the river to carry solids (SAI/PMX/DC 1979). Any change in the equilibrium of the river, such as stream flow, temperature, and substrate, will affect water quality (Thompson 1992). Prohibition on new dam construction would prevent an increase in water temperatures over natural conditions and an increase in sedimentation (U.S. Army Corps of Engineers, 1979). Consequently, there would be a beneficial impact on water quality.

6b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on the resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed river sediments which may contain contaminants and impact water quality. Impacts to water quality would vary depending on the location of the dredging. Dredging in the middle of the river would transport sediments downstream and have less of an impact on water quality than along the shorelines, which could cause localized silt plumes containing concentrated amounts of associated contaminants (Johnson 1992). Limitations on water resource development projects would consequently have a beneficial impact on water quality.

6c. Instream Flow Protection

Under this alternative, the BLM would continue to evaluate flow requirements to protect fisheries, significant habitats, and threatened and endangered species. The BLM would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Consequently, there would be a beneficial impact on water quality.

6d. Nuisance Aquatic Macrophyte Control

Under this alternative, the BLM would make efforts to control nuisance aquatic macrophytes in the Hanford Reach in conformance with a management plan. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate and can restrict river flows. Restricted flows, in turn, can adversely affect water quality by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes by either chemical or mechanical means would limit and potentially reduce populations and consequently have a beneficial impact on water quality.

6e. Controls on Development

Under this alternative, the BLM would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The BLM would undertake no development which would have adverse impacts to water quality.

The DOE would be able to construct intakes and outfalls and required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include, but are not limited to, buildings, roads, and groundwater flow barriers or treatment systems which could result in temporary adverse impacts to water quality. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize such impacts (see Effects on DOE Activities, "Controls on Development", page 253).

In recent years, there have been dramatic increases in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area boundary. These type of developments often increase sediments to the river which may impact water quality. In addition, upland agricultural development could result in increases in fertilizer and pesticide runoff to the river which could have an impact on water quality. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to restrictions through existing zoning and voluntary compliance. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

On private lands, developments or the conversion to nonagricultural uses on private lands could increase sediments to the river which may impact water quality. In addition, upland agricultural development could result in increases in fertilizer and pesticide runoff to the river which could have an impact on water quality. Consequently, impacts to water quality are anticipated to be minimal on public lands but difficult to determine on private lands.

6f. Controls on Mining and Mineral Development

Under this alternative, mining and mineral development on federal lands would be allowed as long as it did not impact significant resources of the Hanford Reach. On private lands within the study area, mining and mineral development could increase river sedimentation and/or introduce toxic materials into the river, both of which adversely affect water quality. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river (NPS 1992). Consequently, impacts to water quality are anticipated to be minimal on public lands but difficult to determine on private lands.

6g. Controls on Agricultural Use

Under this alternative, agricultural activities would occur on federal lands. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. Sharecropping leases on federal lands would be maintained. Existing sharecropping practices have not had an impact on water quality. On private lands, approximately 800 acres are used for agricultural purposes within the study area (ASCS 1993). While the extent of existing agricultural practices have not been shown to have an

adverse impact on water quality, a significant expansion of agricultural practices may have an impact on water quality by increased volumes of pesticide runoff and sedimentation. Consequently, an adverse impact is anticipated only if the type and intensity of agriculture changes in a manner to impact water quality.

6h. Controls on Grazing

Under this alternative, grazing on federally owned lands would be allowed subject to a review and determination of no impact to significant resources. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water. There has been no indication that trespassing cattle nor existing grazing practices significantly degrade water quality due to the large amount of water flowing past in relation to the level of grazing pressure. Consequently, continued grazing is not expected to have an adverse impact on water quality.

7) Effects on Instream Flows

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on instream flows. Please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

7a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. A dam would significantly alter existing stream flows in the Hanford Reach and impound the last free-flowing non-tidal segment of the Columbia River. A prohibition on dams would prevent significant alteration of existing instream flows, ensure that instream flow needs for significant natural and cultural resources were provided, and consequently have a beneficial impact on existing instream flows.

7b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have increased the cross section area of the river and would have generally resulted in reduced water velocities for the same amount of river flow. Limitations on water resource development projects would ensure that instream flow needs for significant natural and cultural resources were provided, and consequently have a beneficial impact on existing instream flows.

7c. Instream Flow Protection

Under this alternative, the BLM would evaluate flow requirements to allow fall chinook salmon, or any other aquatic wildlife to migrate, spawn, rear, or reside. The BLM would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Consequently, there would be a beneficial impact on water quality.

8) Effects on Tribal Access and Use

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on tribal access and use. Please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

8a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. Presently, the lack of dams permits a variety of uses within the reach. Construction of a dam would effect a variety of American Indian uses on the Hanford Reach such as salmon fishing, gathering foods and medicines, and flooding of traditional cultural properties and sacred sites. Availability of anadromous fish in the Hanford Reach is dependent on unimpeded migration and favorable spawning and rearing conditions, both of which would be impacted through construction of a dam. Fishing would be directly impacted by the reduced salmon populations, particularly the wild fall chinook salmon which would be drastically reduced or eliminated. It is the position of the tribes that the Hanford Reach, in particular, is an inseparable natural and cultural resource upon which the tribes' culture and heritage rests. The federal government is responsible for upholding treaties it signed with the above mentioned tribes in 1855, which has a trust responsibility to the American Indians and guarantee rights to certain resources of which states, "the right to fish at all usual and accustomed fishing places...". The prohibition on new dams would result in the maintenance of unimpeded migration and spawning and rearing habitat. The tribes have also stated that the ecosystems of the Columbia Basin are an integral part of the culture and religion of the tribes and bands of the region. Prohibition on dams would protect the fall chinook fishery and special plant populations and have a beneficial impact on tribal access and use.

8b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed critical spawning and rearing habitat for fall chinook salmon, an important resource for the tribes. In addition, significant cultural resource sites located within or along the banks of the river would be vulnerable to direct impacts from dredging or indirectly by erosion from barge traffic. If fish populations and cultural resource sites are lost then access and use for American Indians would diminish. Consequently, limitations on water resource development projects would have a beneficial impact on tribal access and use.

8c. Controls on Grazing

Under this alternative, grazing on federally owned land would be allowed subject to a review and determination of no impact to significant resources. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing.Grazing on the NCA could be allowed in certain areas and restricted in others depending on whether there would be impacts to significant resources. Depending on where grazing is allowed, impacts to tribal access and use could occur.

8d. Allowance for Recreational Activities

Under this alternative, recreational activities would be permitted except in certain areas as determined in the refuge management planning process. Hunting, particularly waterfowl hunting, and fishing are the most popular activities within the Hanford Reach study area. Hunting is currently allowed on the lands administered by the WSDFW and in restricted areas along the river. Hunting would be permitted except in certain areas as determined in the management planning process, i.e. waterfowl sanctuary areas or areas closed to protect sensitive plant or animal populations. If additional areas are open for hunting then there would be a beneficial impact on tribal access and use. Fishing in the Reach is an activity common to both the tribes and sportfishermen alike. The fall chinook salmon is highly prized by anglers for its large size, strength, and flesh quality. The number of fall chinook salmon has attracted an abundance of anglers, with an average of 21,000 angling trips per season between 1985 and 1991. It is possible that conflicts could arise between tribes and sport fishermen with regards to usual and accustomed fishing places, and consequently recreational activities could have a slight impact on tribal access and use. Nonconsumptive uses may also infringe on American Indian access and use of the reach. Consequently, increased recreational activities could have an adverse impact on tribal access and use.

9) Effects on Land Ownership and Use

Applicable Management Actions

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on land ownership and use. Due to similarities, with the exception of "Controls on Grazing", please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

9a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. Construction for a new dam in this location could require land acquisition and inundate private lands. Consequently, a prohibition on dams would not result in a change in land ownership and use.

9b. Controls on Local Energy Transfer Facilities

Under this alternative, no actions would be taken to alter existing power production facilities. Power production at Priest Rapids Dam and WNP 2 would continue, and completion of an energy production facility at WNP 1 would not be precluded. Routine maintenance activities would not be affected. However, under existing review processes for issuance and renewal of hydropower permits, the BLM would review and comment on the applications for new permits and renewals being sought by the energy production facilities. The BLM is allowed to request, and the permitting agency might impose, operating conditions, mitigation actions and/or prohibitions that will further enhance or protect those resources not impacted by the operators. Instream flows to maintain existing power production for this portion of the Columbia River would continue to be determined through discussions and negotiations among agencies and parties representing various river uses. Consequently, there may be potential for future impact on power production facilities in the form of additional design and construction related to mitigation of environmental damage.

9c. Controls on Development
Designation of a National Conservation Area would have no effect on existing land ownership and use because the designated area contains federal lands exclusively.

9d. Controls on Mining and Mineral Development
Under this alternative, mining and mineral development on federal lands would be allowed as long as it did not impact significant resources of the Hanford Reach. On private lands within the study area, mining and mineral development could occur. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river (NPS, 1992). The designated area has oil and gas reserves, but whether any of commercial value exist is not known. Some areas are suitable for mineral material disposals (gravel, sand, and clay), and potential for other minerals exists. Consequently, this alternative could result in loss of potential mineral production, thereby having an adverse effect on land ownership and use.

9e. Controls on Agricultural Use
Under this alternative, agricultural activities would occur on federal lands. Approximately 85 acres of federal land within the study area are leased by the WSDFW for agricultural sharecropping. Sharecropping leases on federal lands would be maintained. Sharecropping to provide food and cover for wildlife would continue and consequently have no effect on existing land use of these areas.

9f. Controls on Grazing
Under this alternative, grazing on federally owned lands would be allowed subject to review and determination of no impact to significant resources. An estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing by the WSDFW. This alternative would allow the continuation and expansion of grazing and other agricultural uses with BLM approval. Therefore, continued grazing is expected to have a beneficial impact on land ownership and use.

10) Effects on Department of Energy Activities on the Hanford Site

Applicable Management Actions:

Designation of the Hanford Reach as a National Conservation Area, would determine land use, which is one of several factors considered in determining clean-up levels under the Tri-Party Agreement. Human use scenarios, based on expected BLM management plans, would be used to calculate human risk assessments. Environmental risk assessments would also be used to determine clean-up levels. Congressional designation would, therefore, expedite final clean-up of the Hanford Reach by resolving the permanent land use issue in that area.

Land ownership would be transferred from DOE to BLM when areas of land are certified as "clean", based on the risk assessments described above. It is expected that lands north and east of the Columbia River, commonly known as the "north slope", would be transferred in the near term. Lands within the Hanford 100-Areas would be transferred at a much later date. In the interim, the BLM would work closely with the DOE, EPA, and the Washington Department of Ecology in the clean-up decision process.

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on DOE industrial activities on the Hanford Site. With the exception of "Protective Designation", please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

10a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. In 1979, the DOE conducted a study to determine the impacts of the Ben Franklin Dam project on the Hanford Site. The study concluded that construction of the dam, which would impound approximately 50 miles of the river located adjacent to the Hanford Site, would raise the groundwater level throughout the Hanford Site and also potentially have an impact on existing facilities and future cleanup activities. It was determined that the most significant impact would be the flooding of the reactor area along the river (the "100 Area") which contains a number of waste burial grounds, contaminated soil sites, and buildings (U.S. Army Corps of Engineers 1979). The resulting reservoir would raise the groundwater level throughout the Hanford Site and could potentially have an impact on existing facilities and future cleanup activities. The greatest impact on the Hanford Site would be the flooding of the reactor area along the river, most notably the 100 Area. The prohibition on dams would prevent impacts resulting from inundation to buildings and waste burial grounds and consequently have a beneficial impact on the Hanford Site.

10b. Protective Designation

Under this alternative, a National Conservation Area would be designated. While federal designation may provide the impetus for advocacy groups to seek aquifer reclassification, which could restrict ongoing and future DOE activities at the Hanford Site (i.e disposal to the soil column of treated liquid waste), reclassification would not be sought or supported in the designation and management of the area. In addition, NCA designation would grant limited authority over National Pollution Discharge Elimination System (NPDES) permitting to the BLM. It is assumed that all existing permits and new permits for cleanup would be reviewed. New permits for discharges into the Hanford Reach for other activities would also be subject to BLM review and approval. Language would be suggested in proposed legislation to Congress which would provide that designation shall not increase cleanup standards for remedial activities at Hanford. Consequently, standards, procedures, and milestones established through the Tri-Party Agreement would not be affected by NCA designation.

10c. Controls on Development

Under this alternative, new construction would be prohibited within the designation boundaries except intake and outfall structures and those required facilities related to clean up of the Hanford Site. All of these facilities would be subject to the review and approval by the BLM. Presently, no facilities are anticipated at this time. Impacts of the designation on planning, design, and permitting for these facilities is anticipated to be slight.

10d. Controls on Local Energy Transfer Facilities

Under this alternative, no actions would be taken to alter existing power production facilities. However, the BLM would encourage the use of existing intake and outfall structures and transmission line corridors. Designation would not impact DOE's ability to maintain existing transmission lines or upgrade within existing transmission line corridors. Consequently, there would be no effect on existing lines and facilities, but new corridors and facilities would be subject to BLM review.

11) Effects on Recreational Access and Use

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on recreational access and use. With the exception of "Allowance for Recreational Facilities", please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

11a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. A dam would impound the last free-flowing non-tidal segment of the Columbia River, with subsequent impacts to the existing nature of recreational activities the Hanford Reach, in particular, fishing, wildlife observation, and boating. The availability of anadromous fish for fishing is dependent on unimpeded migration and spawning and rearing habitat, both of which would be eliminated by the construction of a dam (for further information, a detailed discussion is located in this alternative "Effects on Fall Chinook Salmon", page 230).

Dams would also change existing flow conditions through the Hanford Reach which could alter the type of boating which occurs, specifically navigation by anglers and other recreational users. Boating would shift toward power boats and waterskiing. The type of fish available for recreational purposes would shift from anadromous to resident. Sloughs, islands, and channels which are important for wildlife, hunting and nature observation would be submerged. Prohibitions on dams would protect existing populations of anadromous fish for fishing, maintain appropriate water levels for boaters, and maintain existing sloughs, islands, and channels for recreational purposes. Consequently, there would be a beneficial effect on recreational access and use.

11b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed and destroyed critical spawning and rearing habitat for fall chinook salmon which supports the recreational fishery. Consequently, limitations on water resource development projects would have a beneficial impact on recreational access and use by supporting the anadromous fishery through protecting critical salmon habitat.

11c. Instream Flow Protection

Under this alternative, the BLM would continue to evaluate flow requirements to protect recreational activities in the Hanford Reach. The BLM would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Consequently, there would be a beneficial impact on recreational access and use.

11d. Nuisance Aquatic Macrophyte Control

Under this alternative, the BLM would make efforts to control nuisance aquatic macrophytes in the Hanford Reach in conformance with a management plan. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flow. Restricted flows have the greatest impact on salmon habitat by increasing water temperature and reducing sedimentation transport and oxygen supply, especially in the shallow water areas which salmon prefer (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes, by either chemical or mechanical means, would limit and potentially reduce populations and help protect salmon habitat. Consequently, support of the anadromous fishery would have a beneficial impact on recreational access and use.

11e. Wildlife Habitat Protection

Under this alternative, the BLM would protect various wildlife habitats through controlling the spread of non-native vegetation, revegetating disturbed areas with native species, reducing grazing, and limiting activities which could impact the White Bluffs. The Hanford Reach and surrounding lands provide some of the best opportunities for wildlife viewing in eastern Washington state. Bald eagles, common loons, wintering and migratory waterfowl, pelicans, terns, gulls, great blue herons, mule and white-tailed deer, coyotes, and beavers may be observed. Protection under the refuge designation would help maintain or increase populations of wildlife for observation and game animals available for hunting. The refuge, which could also include development of an interpretive roadway through the Wahluke State Wildlife Recreation Area, would have a beneficial impact by providing additional recreational use and access.

11f. Control of Wildfire

Under this alternative, a federally guided, multi-agency wildfire suppression program would be maintained. The BLM is responsible for suppressing fires and each NCA has fire fighting capabilities. When needed, the BLM can call on the U.S. Forest Service to obtain fast response using spotter aircraft and aerial retardant drops to assist with fire control, a resource not available to local county fire districts. When incident command teams work on NCA's, the land manager determines which fire fighting methods are acceptable based on the resources affected. In bad fire years, wildfires sometimes exceed 1,000 acres or more within the study area. The last large fire was in 1993 when over 12,000 acres were burned. In other years, wildfires tend to range between 5-20 acres depending on the quickness of the response.

Presently, fire control effectiveness is limited because most wildfire response is provided within the limitations of the local volunteer county fire districts which are not familiar with the natural resources of the area and because federal agencies do not have management responsibility for that part of the study area managed by the state. With increased staffing under this proposal and improved direction of the fire suppression program, there would be less likelihood of fire posing a threat to existing wildlife populations for recreational purposes. Consequently, there would be less potential for impact to recreational access and use.

11g. Controls on Development

Under this alternative, the BLM would not construct any facilities if found to be incompatible with the values and purposes for which the area was designated. Some DOE cleanup activities as related to the Hanford Site, particularly within the river corridor, may result in impacts to riverine and aquatic habitats. Private lands would not be available for public recreational access and use. Consequently, there would be a beneficial impact on recreational access and use.

On private lands, the conversion to non-agricultural uses is possible which could reduce native habitats and wildlife. Additional corridor development may foreclose opportunities for fishing, hunting, and a variety of non-consumptive uses and consequently, have an adverse impact on recreational access and use.

11h. Allowance for Recreational Facilities

Under this alternative, an interpretive road and the development of facilities for an array of nonconsumptive uses would increase use at specific sites and may increase overall use of the area. Certain improvements to existing recreational facilities would be completed. If funding levels allow, improvements to the Ringold, White Bluffs Landing, and Vernita Bridge boat access sites would provide a safer and more easily maintained facilities, reduce disturbance of adjacent areas, and allow some local increase in use. Combined, these improvements would have a beneficial impact on recreational access and use.

11i. Allowance for Recreational Activities

Under this alternative, recreational activities would be permitted except in certain areas as determined in the refuge management planning process. Efforts to protect fish and wildlife habitat, including prohibitions on dams, control of non-native vegetation, revegetation of disturbed areas, monitoring development, would help maintain fishing and hunting opportunities which are the more popular recreational activities. The success of anglers in the Reach has made it the first or second among mainstream or tributary areas of the Columbia River in sport salmon catch for the last seven years. The abundance of waterfowl and availability of favorable conditions for hunting make the Reach an excellent location for waterfowl hunting. Consequently, efforts to protect fishing and wildlife habitat would have a beneficial impact on recreational access and use.

11j. Interpretation and Education Activities

Under this alternative, the BLM would provide interpretation and education about the Hanford Reach. Efforts would specifically include development of interpretative displays and leaflets, self-guided auto tour through the Wahluke Slope, tours and programs with staff, and increased law enforcement to help provide information. These actions would increase public understanding of the significance of the resources of the Hanford Reach and would increase visitor satisfaction when visiting the area. Consequently, there would be a beneficial impact to recreational access and use.

11k. Law Enforcement Actions

Under this alternative, patrols would be increased. Increased patrols and resource management field staff might result in reductions in trespass on key habitat areas, harassment of wildlife, disturbance of archaeological sites, unauthorized vehicle use, and other inappropriate recreational activities. Consequently, increased patrols and resource management staff would result in greater resource protection which would help protect the natural resources, visitor safety, and help assure beneficial recreational opportunities of the Hanford Reach.

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ALTERNATIVE E:
National River

This alternative would create designation of a National River (NR) designation. The NR would include the river, it's immediate environment, and incorporate two administrative wildlife refuges which are currently under the administration of the USFWS and the WSDFW. Private lands would be excluded from the designated boundaries. Use and development of private lands would remain the jurisdiction of state and local governments. Dams and dredging which adversely impacts resources would be prohibited. Development within the immediate river corridor would be curtailed, with the exception of those activities related to cleanup of the Hanford Site. Other activities by the DOE would be specifically allowed or subject to review and approval. The National Park Service (NPS) would manage the area. The DOE would continue to be responsible for site cleanup and retain ownership and management until the sites are certified clean. Resource management would be consistent with policies for the National Park system, and would focus on protection of nationally significant natural and cultural resources and on visitor recreation and interpretation. Some recreational sites would be improved and expanded to accommodate future use. Additional facilities and programs for visitor interpretation would be provided.

The following analysis examines the management actions which would impact the significant issues identified by the study task force. Please refer to the Proposed Action for a brief background summary of each of the enumerated issues discussed below.

Effects on the resources of the Hanford Reach from Hanford Site cleanup activities will be considered in the Hanford Remedial Action Environmental Impact Statement currently being completed by the DOE and is anticipated for release in December, 1994.

1) Effects on Fall Chinook Salmon

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on fall chinook salmon. Please refer to the same management action under the Proposed Action for a more detailed discussion.

1a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam, proposed in the 1970s by the Army Corps of Engineers (ACOE) at river mile 348 is used as the basis for analyzing potential impacts if a dam were constructed in the Hanford Reach. The proposed dam would have been over 7700 ft. wide and 82 ft. high and created an impoundment that would have extended the entire length of the reach (RM345-396). Almost 50 miles of spawning and rearing habitat which currently accounts for approximately 85% of the total Hanford Reach fall chinook production, would have been inundated by the impoundment and spawning eliminated. Upstream and downstream migration is critical to fall chinook stocks in the Columbia River: approximately 80% of the total adult fall chinook run entering the mouth of the river will return to the Hanford Reach (Geist 1991). In 1987, 90,000 adult fall chinook returned to spawn in the Reach (Geist 1991). The significance of this salmon stock to the Northwest Indian tribes, commercial, and sport fisheries is discussed in detail in Chapter III, Affected Environment, page 98. While salmon returns would continue to fluctuate due to upstream and downstream factors, this alternative would eliminate the threat of future

impediments to migration and from fluctuating water levels which are detrimental to eggs and fry through exposure of nest and stranding of anadromous fish (SAI/PMX/DC 1979). In addition, the prohibition on dams would prevent decreased stream temperature fluctuations, reduction in shallow water habitat, and decreased stream velocities in approximately 44 miles of critical rearing habitat. Consequently, there would be a beneficial impact on fall chinook salmon.

1b. Water Resource Development Project Construction

Water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. The intent of this project was to construct a shallow-draft commercial navigation channel through the Reach in order to allow barges and large vessels to travel from Richland to upstream ports. This project would have required the dredging of a 20 mile long channel to a uniform channel depth of 14 ft within the reach. It would have disturbed a substantial amount of spawning habitat, including areas that have large concentrations of spawning redds, and changed the hydraulics of the river with unknown consequences on spawning habitat and use. Fisheries agencies concluded that barge traffic on the river would disturb spawning activity and resulting wakes would increase shoreline and island erosion which would cause siltation of spawning gravels (Washington Department of Fisheries 1987). Approximately 85% of the total Columbia River fall chinook adults are naturally spawning fish which depend on swift currents, cobble, and shallow water for spawning (Roler 1991). Even hatchery production of fall chinook is indirectly dependent on these conditions because naturally produced brood stock provide the eggs for the Priest Rapids hatchery. Dredging in the reach would increase the cross section area of the river and would generally result in reduced water velocities for the same amount of river flow. The resulting channelized flow and slower overall velocities between the shore and the edge of the channel could impact spawning and other processes that require fairly rapid flow in the shallow areas. Limitations on water resource development projects would ensure the maintenance of existing conditions on approximately 50 miles of critical spawning habitat within the Hanford Reach and ensure that conditions are favorable for salmon once they return. Consequently, there would be a beneficial impact on fall chinook salmon.

1c. Water Quality Protection

Under this alternative, the level of water quality would be protected within the Hanford Reach through a prohibition on dam construction, limitations on water resource development projects, and controls on development to reduce siltation and other water pollution (for further information on water quality, please refer to, "Effects on Water Quality", page 275). Excellent water quality is critical to salmon spawning and rearing success.Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. Consequently, protection of present water quality levels would have a beneficial impact on fall chinook salmon.

1d. Instream Flow Protection

Under this alternative, the NPS would continue to evaluate flow requirements for fall chinook salmon and work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Maintaining instream flows would allow fall chinook salmon populations to migrate, spawn, and rear in the Hanford Reach. Consequently, there would be a beneficial impact on the fall chinook salmon.

1e. Nuisance Aquatic Macrophyte Control

Under this alternative, the NPS would make efforts to control nuisance aquatic macrophytes within the Hanford Reach in conformance with a management plan. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flow. Restricted flows in turn, can adversely affect salmon habitat by increasing water temperature and reducing sedimentation transport and oxygen supply, especially in the shallow water areas which salmon prefer (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes, by either chemical or mechanical means, would limit and potentially reduce populations and help protect spawning and rearing habitat. Consequently, fall chinook salmon would not be impacted.

1f. White Bluffs Protection

Under this alternative, the NPS would limit activities which would contribute to sloughing of the White Bluffs. The NPS would review its own activities and seek voluntary participation from agencies and individuals to limit activities which contribute to sloughing of the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs. Several significant spawning areas are located immediately below the White Bluffs and sloughing contributes sediments to the river which eventually siltates spawning gravels, making them less desirable for salmon. The rate of sloughing is expected to continue at existing levels, which would continue to impact those spawning areas located directly below the White Bluffs. However, to the extent that management efforts were successful in reducing impacts to the White Bluffs, there would be a beneficial impact on spawning habitat for the fall chinook salmon.

1g. Controls on Development

Under this alternative, the NPS would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The NPS would undertake no development which would have adverse impacts to fall chinook salmon spawning and rearing habitat.

The DOE would be able to construct intakes and outfalls and those required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include, but not be limited to, buildings, roads, and groundwater flow barriers or treatment systems which could result in temporary adverse impacts to fishery values. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize impacts to fall chinook salmon spawning and rearing habitat.

In recent years there have been dramatic increases in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area boundary. These type of developments often result in loss of existing wetlands, riparian vegetation, and stream bank integrity. While it is not known how much impact has already occurred, incremental losses such as these diminish fish productivity as well as ecosystem diversity. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to restrictions through existing zoning and voluntary compliance. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial".

Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

On private lands, residential, recreational, industrial, or agricultural developments could occur resulting in increased erosion and siltation of spawning beds, additional water diversions, reduction in riparian vegetation, and disturbance of the bed and banks of the river. The majority of private ownership within the river corridor is near Priest Rapids Dam and in the Ringold area (Grant and Franklin counties). Both of these areas are near or adjacent to important fall chinook salmon spawning areas. Consequently, impacts to fall chinook salmon are anticipated to be minimal on public lands but difficult to determine on private lands.

1h. Controls on Mining and Mineral Development

Under this alternative, all mining and mineral development on federal lands would be prohibited, except those activities conducted in conformance with a management plan (a possible example would be use of gravel from existing gravel pits to maintain roads). No activities would be allowed unless they are determined to be compatible with the purposes for which the National River was established. On private lands within the study area, mining and mineral development could occur and potentially increase sedimentation and/or introduce toxic materials into the river, both of which adversely affect water quality and damage salmon spawning areas. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river adjacent to one of the more popular spawning areas (NPS 1992). Consequently, impacts to fall chinook salmon are anticipated to be minimal on public lands but difficult to determine on private lands.

1i. Controls on Agricultural Use

Under this alternative, agricultural activities would occur on federal lands. the NPS would evaluate the effects of sharecropping on 85 acres of federal land currently managed by the WSDFW. Sharecropping leases on federal lands would be maintained. Existing sharecropping practices have not had an impact on water quality which could potentially impact salmon habitat. On private lands, approximately 800 acres are used for agricultural purposes within the study area (ASCS 1993). Existing agricultural practices have not been shown to have an adverse impact on water quality. While chemical runoff and siltation can affect water quality, there is no evidence to date that existing agricultural activities are affecting water quality within the study area. With a lack of projected increase in agricultural use within the study area, impacts on water quality are not anticipated. Consequently, impacts to fall chinook salmon are anticipated to be minimal on public lands but difficult to determine on private lands.

1j. Controls on Grazing

Under this alternative, grazing on federally-owned lands would be prohibited. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity also impact upland habitats by loosening soils and creating tracks which hasten erosion and increase sedimentation to the river. Consequently, the prohibition on grazing is not expected to have an impact on water quality.

2) Effects on Cultural Resources

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on cultural resources. Due to similarities, with the exception of, "Interpretation and Education Activities", please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

2a. Dam Construction
Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the Army Corps of Engineers at river mile 348 is the basis for a likely scenario of potential impacts should a dam be constructed in the Hanford Reach. Studies of the Ben Franklin Dam indicated that the project would have inundated two National Register sites, four archaeological districts, and 122 prehistoric archaeological sites (Rice 1980). The prohibition on dams would prevent inundation and disturbance from construction of access roads, utility corridors, and other related facilities. Consequently, there would be a beneficial impact on cultural resources.

2b. Water Resource Development Project Construction
Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. A large number of archaeological sites are located within or along the banks of the river. Channel dredging would have varying impacts on cultural resources depending on the location of the dredging, the placement of dredge spoils, and the potential for erosion of sites from increased stream velocities and barge-generated wakes. Consequently, limitations on water resource development projects would prevent potential impacts and have a beneficial impact on cultural resources.

2c. Controls on Development
Under this alternative, the NPS would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The NPS would undertake no development which would have adverse impacts to cultural resources. All development would be subject to Section 106 of the National Historic Preservation Act in an attempt to minimize disturbance of archaeological sites. If cultural sites are discovered during development, efforts would be made to recover or salvage artifacts.

The DOE would be able to construct intakes and outfalls and required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include, but not be limited to, buildings, roads, and groundwater flow barriers or treatment systems which could result in temporary adverse impacts to cultural resources. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize such impacts (see Effects on DOE Activities, "Controls on Development", page 282). All development would be subject to Section 106 of the National Historic Preservation Act in an attempt to minimize disturbance of archaeological sites. If cultural sites are discovered during development, efforts would be made to recover or salvage artifacts.

In recent years there have been dramatic increases in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area. These type of developments have had an adverse impact on cultural resources through disturbance of sites. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to developmental restrictions through existing zoning and voluntary compliance. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

On private lands residential, recreational, and industrial developments could occur resulting in disturbances and loss of historic and archaeologic sites. Such development could cause adverse impact to cultural resources. The majority of private ownership within the river corridor is near Priest Rapids Dam and in the Ringold area (Grant and Franklin counties). Consequently, impacts to cultural resources are anticipated to be minimal on public lands but difficult to determine on private lands.

2d. Controls on Mining and Mineral Development

Under this alternative, all mining and mineral development on federal lands would be prohibited, except those activities conducted in conformance with a management plan (a possible example would be use of gravel from existing gravel pits to maintain refuge roads). No activities would be allowed unless they are determined to be compatible with the purposes for which the National River was established. On private lands within the study area, mining and mineral development activities could damage or destroy cultural resource sites through direct disturbance of the ground and/or exposure of the sites to erosion or vandalism. In 1992, a proposal was pursued to placer mine for gold within 1/4 mile of the river (NPS 1992). Consequently, impacts to cultural resources are anticipated to be minimal on public lands but difficult to determine on private lands.

2e. Controls on Agricultural Use

Under this alternative, agricultural activities would occur on federal lands. Approximately 85 acres of federal land within the study area is leased by the WSDFW for agricultural sharecropping. Sharecropping leases on federal lands would be maintained. Existing sharecropping practices have not had an impact on cultural resources. On private lands, approximately 800 acres are used for agricultural purposes within the study area (ASCS 1993). Although private lands within the study area have not been formally surveyed for cultural resources, the existence of cultural resources on federal lands in proximity to the river is a strong indicator that cultural resources may exist on private lands. Cultural sites can be impacted by agricultural activities, primarily by the cultivation of new previously undisturbed areas. Consequently, impacts to cultural resources are anticipated to be minimal on public lands but difficult to determine on private lands.

2f. Controls on Grazing

Under this alternative, grazing on federally owned land would be prohibited. An estimated 24,000 acres of land within the study area are leased to private parties for livestock grazing. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity impact upland habitats by loosening soils and creating tracks which

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hasten erosion which could expose and trample vulnerable cultural resource sites. Consequently, the prohibition on grazing is expected to have a beneficial impact on cultural resources.

2g. Control of Wildfire

Under this alternative, a federally guided, multi-agency wildfire suppression program would be maintained. The NPS is responsible for suppressing fires and each NR has fire fighting capabilities. When needed, the NPS can call on the U.S. Forest Service to obtain fast response using spotter aircraft and aerial retardant drops to assist with fire control, a resource not available to local county fire districts. When incident command teams work on NR's, the land manager determines which fire fighting methods are acceptable based on the resources affected. In bad fire years, wildfires sometimes exceed 1,000 acres or more within the study area. The last large fire was in 1993 when over 12,000 acres were burned. In other years, wildfires tend to range between 5-20 acres depending on the quickness of the response.

Presently, fire control effectiveness is limited because most wildfire response is provided within the limitations of the local volunteer county fire districts which are not familiar with the cultural resources of the area and because federal agencies do not have management responsibility for that part of the study area managed by the state. With increased staffing under this proposal and improved direction of the fire suppression program, there would be less likelihood of fire posing a threat to cultural resources because of more sensitive fire suppression techniques, i.e. no clearing of fire lines with bulldozers or tractor/disc equipment in cultural resource significant areas. Consequently, there would be less potential for impact to cultural resources.

2h. Interpretation and Education Activities

Under this alternative, interpretation and education programs would be substantially expanded. The NPS would establish a visitor center, provide tours and interpretative programs, develop interpretative displays, establish an interpretative auto tour of the Wahluke Slope, and provide additional interpretative staff. These activities would greatly increase public understanding of the significance of archaeological sites and sanctions on site disturbance and decrease the incidence of site vandalism and unauthorized collecting. Consequently, there would be a beneficial impact on cultural resources.

2i. Inventory and Survey Activities

Under this alternative, cultural resource inventories and surveys would be conducted by the NPS in compliance with Sections 110 and 106 of the National Historic Preservation Act. Archaeological surveys would be conducted to augment the inventory of sites along the river pursuant to the management plan. Consequently, better knowledge of resource location would reduce inadvertent damage and have a beneficial impact on cultural resources.

2j. Law Enforcement Actions
Under this alternative, patrols would be increased. Increases in patrols would support enforcement of the laws and regulations which prohibit trespass and unauthorized off-road vehicle use and reduce existing problems. Additional regulations may be proposed following development of the management plan. Vandalism of significant cultural resource sites in the Hanford Reach continues to occur from unauthorized access and off-road vehicle use. Off-road vehicle use not only makes cultural resource sites more accessible, but also their use can directly destroy these resources. The majority of damage to cultural resource sites is from those who collect artifacts as a hobby (Chatters 1992). With increases in patrols, it is anticipated that there would be a beneficial impact on cultural resources.

3) Effects on Biodiversity

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on biodiversity. Due to similarities, please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

3a. Dam Construction
Under this alternative, dams would be prohibited. Prohibition on dam construction would prevent impoundment of the last free-flowing non-tidal segment of the Columbia River. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. This project would have inundated approximately 11,500 acres of riparian lands which provides essential habitat for approximately 250 deer, 10,000 upland game birds, and 318,000 waterfowl (U.S. Army Corps of Engineers, 1979). In addition, almost 50 miles of free-flowing river would have been inundated, with a loss in native aquatic habitat and species. Such impacts might include an increase in water temperatures over natural conditions, alteration of the species composition of plant communities that currently exist on the cobble substrates, an increase in sedimentation, inundation of as many as fifteen river islands (1660 acres), inundation of all existing riparian vegetation (1260 acres), and a reduction in shallow water habitat (U.S. Army Corps of Engineers 1980). The prohibition on dams would prevent disturbance of aquatic, riverine, and riparian habitats and minimize habitat-related declines in existing populations of native plants, fish, and wildlife. Consequently, there would be a beneficial impact on biodiversity.

3b. Water Resource Development Project Construction
Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a water resource development project. This project would have increased erosion of riverine and riparian habitats, inundated nesting areas for colony nesters, Canada geese, long-billed curlews, and waterfowl, and increased disturbance by allowing large vessels and barges to travel close to river islands (U.S. Fish and Wildlife Service 1988). Impacts would be particularly acute for wintering waterfowl, which number in the tens of thousands on the Hanford Reach (actual daily waterfowl counts for November through January, 1986-1990, were between 25,000-93,000). Dredging would disturb river sediments which might contain contaminants that could subsequently degrade water quality and affect aquatic and riverine habitats. Limitations on water resource development projects would prevent disturbance of aquatic, riverine, and riparian habitats and

minimize habitat-related declines in existing populations of native plants, fish, and wildlife. Consequently, there would be a beneficial impact on biodiversity.

3c. Water Quality Protection

Under this alternative, the level of water quality would be protected within the Hanford Reach through controls on development to reduce siltation and other water pollution, a prohibition on dam construction, and limitations on water resource development projects (for further information on water quality, please refer to, "Effects on Water Quality", page 275). Excellent water quality supports viable riverine and riparian habitats and those species dependent on these habitats. Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. In addition to the river, upland lakes and wetlands provide important habitat for migratory waterfowl and other water dependent species. Consequently, this alternative is expected to have a beneficial impact on biodiversity because the NPS would not allow activities which are considered detrimental to water quality.

3d. Instream Flows Protection

Under this alternative, the NPS would continue to evaluate flow requirements to support riverine and riparian habitats and the species dependent on these habitats. The USFWS would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. These determinations may be influenced to some degree, yet would not be dictated by the designation of the Hanford Reach as a National Wildlife Refuge and National Wild and Scenic River. The Wild and Scenic River designation would be yet another expression of Congressional intent to protect species dependent on riverine and aquatic habitats. Consequently, there would be a beneficial impact on biodiversity.

3e. Nuisance Aquatic Macrophyte Control

Under this alternative, the NPS would make efforts to control nuisance aquatic macrophytes within the Hanford Reach in conformance with a management plan. Eurasian milfoil, an introduced species, is most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows, in turn, can adversely affect aquatic and riverine habitat by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes, by either chemical or mechanical means, would limit and potentially reduce populations and protect aquatic and riverine habitats. Consequently, there would be a beneficial impact on biodiversity.

3f. White Bluffs Protection

Under this alternative, the NPS would limit activities which would contribute to sloughing of the White Bluffs. The NPS would review its own activities and seek voluntary participation from agencies and individuals to limit activities which contribute to sloughing of the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs. The bluffs provide important nesting habitat for species including but not limited to cliff swallows, great horned owls, red-tailed hawks, and say's phoebe. The rate of sloughing is expected to continue at existing levels which would continue the gradual erosion of the White Bluffs. However, to the extent that management efforts were successful in reducing impacts to the White Bluffs, there would be a beneficial impact on biodiversity.

3g. Non-Native Vegetation Control

Under this alternative, the NPS would make efforts to control the spread of non-native vegetation as provided in a management plan. Non-native vegetation is both a cause and effect of disturbance of native habitats. The disturbance of native habitats leads to the establishment of non-native vegetation. Existing non-native vegetation in the study area consists of Russian olive trees (dispersed over approximately 500 acres), salt cedar (dispersed over approximately 100 acres), purple loosestrife (dispersed over approximately 10 acres), and common white mulberry trees, which are scattered along the banks of the river (Goeke 1991, Rickard 1992). Salt cedar, purple loosestrife, and Russian olive have demonstrated their ability to rapidly invade wetlands, outcompete and displace native species, greatly reduce the value of wetlands as wildlife habitat, and decrease biodiversity. In addition, the presence of these plants create a seed source for movement to other land (Noxious Weed Control Board of Grant County, 1992). Non-native vegetation would be retained where it provides benefits to wildlife (i.e. nesting sites). The selected management of non-native vegetation through either removal or retention, would have a beneficial impact on biodiversity.

3h. Revegetation of Disturbed Areas

Under this alternative, revegetation of disturbed areas would occur as necessary. Approximately 3200 acres along the Benton County shoreline of the reach are disturbed (L. Fitzner 1991) and could be reseeded with native plant species. Specific native species to be used for revegetation would be identified in the management plan. Reclamation of existing gravel pits and revegetation with native plant species could reduce non-native plants and restore habitat in these areas. Revegetation of disturbed areas with native species in riparian and shrub-steppe habitats would enhance the diversity and abundance of endemic plant and animal species and would have a beneficial effect on biodiversity.

3i. Control of Wildfire

Under this alternative, a federally guided, multi-agency wildfire suppression program would be maintained. The NPS is responsible for suppressing fires and each NR has fire fighting capabilities. When needed, the NPS can call on the U.S. Forest Service to obtain fast response using spotter aircraft and aerial retardant drops to assist with fire control, a resource not available to local county fire districts. When incident command teams work on NR's, the land manager determines which fire fighting methods are acceptable based on the resources affected. In bad fire years, wildfires sometimes exceed 1,000 acres or more within the study area. The last large fire was in 1993 when over 12,000 acres were burned. In other years, wildfires tend to range between 5-20 acres depending on the quickness of the response.

Presently, fire control effectiveness is limited because most wildfire response is provided within the limitations of the local volunteer county fire districts which are not familiar with the natural resources of the area and because federal agencies do not have management responsibility for that part of the study area managed by the state. With increased staffing under this proposal and improved direction of the fire suppression program, there would be less likelihood of fire posing a threat to upland habitats. Consequently, there would be less potential for impact to biodiversity.

3j. Controls on Development

Under this alternative, the NPS would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The NPS would undertake no development which would have adverse impacts to riverine and aquatic habitats.

The DOE would be able to construct intake and outfalls and required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include, but are not limited to, buildings, roads, and groundwater flow barriers or treatment systems. Construction of these type of facilities may result in impacts to riverine and aquatic habitats, particularly localized and temporary siltation and potential chemical and radiological releases. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize such impacts (see Effects on DOE Activities, "Controls on Development", page 282).

In recent years there have been dramatic increase in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area boundary. These type of developments often result in increased sediments to the river and displaced wildlife populations due to a reduction in habitat and reduced native vegetation. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to restrictions through existing zoning and voluntary compliance. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

On private lands residential, recreational, and industrial developments could occur resulting in disturbances and loss of riverine, aquatic, and riparian habitats. The majority of private ownership within the river corridor is near Priest Rapids Dam and in the Ringold area (Grant and Franklin counties). Development would potentially increase sediments to the river, displace wildlife populations due to a reduction in habitat and reduce native vegetation located within the river corridor. Consequently, impacts to biodiversity are anticipated to be minimal on public lands but difficult to determine on private lands.

3k. Controls on Mining and Mineral Development

Under this alternative, all mining and mineral development on federal lands would be prohibited, except those activities conducted in conformance with a management plan (a possible example would be use of gravel from existing gravel pits to maintain refuge roads). No activities would be allowed unless they are determined to be compatible with the purposes for which the National River was established. On private lands within the study area, mining and mineral development could damage or destroy sensitive terrestrial or aquatic habitat areas that are declining in both area and quality along the mainstem Columbia River. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river (NPS 1992). In the case of sensitive species of plant or animals with severely restricted habitat requirements, this could be particularly damaging, going even so far as to extirpate them from the local area. Consequently, impacts to biodiversity are anticipated to be minimal on public lands but difficult to determine on private lands.

3l. Controls on Agricultural Use
Under this alternative, agricultural activities would occur on federal lands. Approximately 85 acres of federal land within the study area is managed by the WSDFW for agricultural sharecropping. Sharecropping leases on federal lands would be maintained. Habitat destruction from existing sharecropping practices has already occurred. On private lands, approximately 800 acres are used for agricultural purposes within the study area (ASCS 1993). Consequently, impacts to biodiversity are anticipated to be minimal on public lands but difficult to determine on private lands.

3m. Controls on Grazing
Under this alternative, grazing on federally owned lands is prohibited. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity impact upland habitats by loosening soils and creating tracks and channels which hasten erosion. In addition, where placed in high densities, cattle trample and consume native plants which are often then replaced with non-native species. Comparative USFWS studies involving grazed and ungrazed portions of the study area have shown that there is greater abundance and diversity of wildlife on ungrazed shrub-steppe lands (Radke 1987). The prohibition on grazing would eliminate any further damage to upland and riparian habitats and consequently would have a beneficial effect on biodiversity.

3n. Law Enforcement Actions
Under this alternative, patrols would be increased. Additional regulations may be proposed following development of management plan. Trespass and off-road vehicle use in sensitive habitat areas results in various impacts, specifically, increased incidences of wildfires, littering, disturbance to rare plants and flowers, and harassment of nesting and resting wildlife. Off-road vehicle use has already resulted in damage to upland and riparian habitats, with the majority of damage occurring on the steep slopes near Ringold, and harassment of wildlife. Restrictions on public access in sensitive habitat areas and increased patrols would decrease trespass and disturbance of native species and, consequently, have a beneficial effect on biodiversity. In addition, increased patrols would assist in the detection of wildfires which can destroy sensitive habitats and is expected to have a significant benefit on biodiversity.

4) Effects on Endangered, Threatened, Candidate, and Sensitive Species

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on endangered, threatened, candidate, and sensitive species. Please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

4a. Dam Construction
Under this alternative, dams would be prohibited. The prohibition on dams would prevent the severe alteration of the aquatic and riverine habitat of the Hanford Reach which threatened and endangered species depend upon. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. This project would have significantly altered the aquatic habitat and flow regime of the Hanford Reach. The Columbia

pebblesnail, a federally listed candidate species, relies on clean, well-oxygenated, and swiftly moving water to meet respiration requirements, all of which would be eliminated if a dam were constructed (U.S. Fish and Wildlife Service 1988). The riverine habitat for the persistentsepal yellowcress and Columbia milkvetch plant populations, both federally listed candidate species, would be destroyed. The common loon, a federally listed sensitive species, and the white pelican, considered endangered by the state, depend on riverine habitat for nesting, cover, and feeding, all of which would be impacted if a dam were constructed. The prohibition on dams would help maintain the existing quality of aquatic, riverine, and shallow water habitats of the Hanford Reach. This would have a beneficial impact on the above mentioned threatened and endangered species and result in consequent species stabilization or even potential increases in populations and delisting. In addition, the prohibition on dams would protect habitat for salmon, an important winter food source for bald eagles, a federally listed threatened species (for further information, a detailed discussion is located under this alternative, "Effects on Fall Chinook Salmon", page 258).

4b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on the resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have increased erosion of riverine and riparian habitats and increased disturbance by allowing large vessels and barges to travel close to river islands resulting in the reduction of listed and candidate species which are dependent on these habitats (U.S. Fish and Wildlife Service 1988). The common loon, a federally listed sensitive species, and the white pelican, considered endangered by the state, depend on riverine habitat for nesting, cover, and feeding, all of which could be impacted if water resource development projects were to occur in sensitive habitat areas or were to affect such areas. In addition, limitations on water resource development projects would protect spawning and rearing habitat for salmon, an important winter food source for bald eagles, a federally listed threatened species (for further information, a detailed discussion is located under this alternative, "Effects on Fall Chinook Salmon", page 258).

4c. Water Quality Protection

Under this alternative, the level of water quality would be protected through controls on development to reduce siltation and other water pollution, a prohibition on dam construction, and limitations on water resource development projects (for further information on water quality, please refer to, "Effects on Water Quality", page 275). Excellent water quality supports viable riverine and riparian habitats and those species dependent on these habitats. Surface water sampling stations indicate that the Hanford Reach is of especially high quality and can be characterized as having cool temperatures, very low suspended load, low nutrient content, and an absence of microbial contaminants. In addition to the river, upland lakes and wetlands provide important habitat for migratory waterfowl which are also prey for bald eagles and peregrine falcons, federally listed threatened and endangered species, respectively. Consequently, this alternative is expected to have a beneficial impact on threatened and endangered species because the NPS would not allow activities which are considered detrimental to water quality.

4d. Instream Flows Protection

Under this alternative, the NPS would continue to evaluate flow requirements to support existing aquatic and riverine habitats for the persistentsepal yellowcress, Columbia milkvetch, and the Columbia pebblesnail, all of which are federally listed candidate species; the sandhill crane, a federally listed sensitive species, and the white pelican, considered endangered by the state. The NPS would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue

to be determined through discussions and negotiations among parties representing various river uses. Consequently, there would be a beneficial impact on threatened and endangered species.

4e. Nuisance Aquatic Macrophyte Control

Under this alternative, the NPS would make efforts to control nuisance aquatic macrophytes within the Hanford Reach in conformance with a refuge management plan. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flows. Restricted flows, in turn, can adversely affect aquatic habitat by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes by either chemical or mechanical means would limit and potentially reduce populations and protect aquatic habitat which supports the Columbia pebblesnail, a federally listed candidate species. Consequently, there would be a beneficial impact to threatened and endangered species.

4f. White Bluffs Protection

Under this alternative, the NPS would limit activities which would contribute to sloughing of the White Bluffs. The NPS would review its own activities and seek voluntary participation from agencies and individuals to limit activities which contribute to sloughing of the White Bluffs. The White Bluffs are a unique geological feature comprised of claystones and siltstones which line approximately 31 miles of the Hanford Reach. The White Bluffs provide predator-free roost sites and foraging essential to maintaining large numbers of wintering bald eagles and peregrine falcons, both of which are federally listed as threatened and endangered species, respectively. The Bluffs also provide an important microclimate which assists large raptors with thermoregulation and allows them to minimize energy loss. It is beneficial to have this geological formation in proximity to food and water. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs and the continuation of sloughing could result in the eventual loss of bluff habitat. The rate of sloughing is expected to continue at existing levels, which may result in the loss of individual bald eagle and peregrine falcon nesting sites. However, to the extent that management efforts were successful in reducing impacts to the White Bluffs, there would be a beneficial impact on threatened and endangered species.

4g. Non-Native Vegetation Control

Under this alternative, the NPS would make an effort to control the spread of non-native vegetation as provided in a refuge management plan. Non-native vegetation is both a cause and effect of disturbance of native habitats. Existing non-native vegetation in the study area consists of Russian olive trees (dispersed over approximately 500 acres), salt cedar (dispersed over approximately 100 acres), purple loosestrife (dispersed over approximately 10 acres), and common white mulberry trees which are scattered along the banks of the Hanford Reach (Goeke 1991; Rickard 1992). Ferruginous hawks have been noted to nest in Russian olive trees, however, removal of these trees should have little impact because other nest sites are available. Removal of Russian olive trees may benefit ferruginous hawks by removing potential black-billed magpie nest sites. Black-billed magpies are a potential avian predator (Hill 1992). Removal of the common white mulberry trees may benefit the persistentsepal yellowcress because the trees grow along the edge of the river, particularly in the gravel beaches, which support this rare plant species. Non-native vegetation would be retained where it provides benefits to threatened and endangered species (i.e. nesting sites). Consequently, with the exception of the persistentsepal yellowcress, the selected management of non-native vegetation through either removal or retention, would have a beneficial impact on threatened and endangered species.

4h. Revegetation of Disturbed Areas

Under this alternative, revegetation of disturbed areas would occur as necessary. Approximately 3200 acres along the Benton County shoreline of the reach are disturbed (L. Fitzner 1991) and could be reseeded with native plant species. Shrub-steppe habitat provides hunting areas and prey for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species, respectively. Revegetation of disturbed shrub-steppe areas with native species could enhance the diversity and abundance of endemic plant and animal species. Reclamation of existing gravel pits and revegetation with native plant species could reduce non-native plants and restore habitat in these areas. Shrub-steppe also provides habitat for sage grouse, pygmy rabbit, and loggerhead shrike, all federally listed candidate species. Consequently, revegetation of disturbed areas would have a beneficial impact on threatened and endangered species.

4i. Control of Wildfire

Under this alternative, a federally guided, multi-agency wildfire suppression program would be maintained. The NPS is responsible for suppressing fires and each NR has fire fighting capabilities. When needed, the NPS can call on the U.S. Forest Service to obtain fast response using spotter aircraft and aerial retardant drops to assist with fire control, a resource not available to local county fire districts. When incident command teams work on NR's, the land manager determines which fire fighting methods are acceptable based on the resources affected. In bad fire years, wildfires sometimes exceed 1,000 acres or more within the study area. The last large fire was in 1993 when over 12,000 acres were burned. In other years, wildfires tend to range between 5-20 acres depending on the quickness of the response.

Presently, fire control effectiveness is limited because most wildfire response is provided within the limitations of the local volunteer county fire districts which are not familiar with the natural resources of the area and because federal agencies do not have management responsibility for that part of the study area managed by the state. With increased staffing under this proposal and improved direction of the fire suppression program, there would be less likelihood of fire posing a threat to upland habitats. Consequently, there would be less potential for impact to threatened and endangered species.

4j. Controls on Development

Under this alternative, the NPS would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The NPS would undertake no development which would have adverse impacts to riverine and aquatic habitats. The DOE would be able to construct intake and outfalls and required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include, but are not limited to, buildings, roads, and groundwater flow barriers or treatment systems. Construction of these type of facilities may result in localized and temporary siltation and potential chemical and radiological releases to riverine and aquatic habitats for the persistentsepal yellowcress, Columbia milkvetch, and Columbia pebblesnail, all of which are federally listed candidate species, the common loon, a federally listed sensitive species, and the white pelican, considered endangered by the state. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize such impacts (see Effects on DOE Activities, "Controls on Development" page 282).

In recent years there have been dramatic increases in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area boundary. These type of developments often result in increased sediments to the river and displaced species populations due to a reduction in habitat and reduced native

vegetation. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to development restrictions through existing zoning and voluntary compliance. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

On private lands residential, recreational, and industrial developments could occur resulting in disturbances and loss of riverine, aquatic, and riparian habitats critical to threatened and endangered species. The majority of private ownership within the river corridor is near Priest Rapids Dam and in the Ringold area (Grant and Franklin counties). Development would potentially increase sediments to the river, displace wildlife populations due to a reduction in habitat and reduce native vegetation located within the river corridor, and consequently have an adverse impact on threatened and endangered species.

4k. Controls on Mining and Mineral Development

Under this alternative, all mining and mineral development on federal lands would be prohibited, except those activities conducted in conformance with a management plan (a possible example would be use of gravel from existing gravel pits to maintain refuge roads). No activities would be allowed unless they are deemed compatible with the purposes for which the National River was established. On private lands within the study area, mining and mineral development could damage or destroy sensitive terrestrial or aquatic habitat areas that are important to rare plants and/or animals. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river (NPS, 1992). In the case of endangered, threatened, candidate, and sensitive species of plants or animals with severely restricted habitat requirements, this could be particularly damaging, going even so far as to extirpate them from the local area. Consequently, impacts to threatened and endangered species are anticipated to be minimal on public lands, but difficult to determine on private lands.

4l. Controls on Agricultural Use

Under this alternative, agricultural activities would occur on federal lands. Approximately 85 acres of federal land within the study area is leased by the WSDFW for agricultural sharecropping. Sharecropping leases on federal lands would be maintained. Habitat disruption from existing sharecropping practices has already occurred and most species become listed due to loss of habitats. On private lands, approximately 800 acres are used for agricultural purposes with the study area (ASCS 1993). Consequently, impacts to threatened and endangered species are anticipated to be minimal on public lands but difficult to determine on private lands.

4m. Controls on Grazing

Under this alternative, grazing on federally owned lands is prohibited. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water and ultimately disturb riparian habitats. Cattle traffic on steep slopes in the Ringold and the White Bluffs vicinity impact upland habitats by loosening soils and creating tracks and channels which hasten erosion. In addition, where placed in high densities, cattle trample and consume native plants which are then often replaced with non-native species. Comparative USFWS studies involving grazed and ungrazed portions of the study area have shown that there is greater

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abundance and diversity of wildlife on ungrazed shrub-steppe lands (Radke, 1987). Shrub-steppe provides hunting areas and prey for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species respectively. Shrub-steppe also provides habitat for sage grouse, pygmy rabbits, and loggerhead shrike, all federally listed candidate species. Other habitats which could be impacted by cattle include riparian and wetland types. The prohibition on grazing would eliminate any further damage to shrub-steppe, riparian, and wetland habitats and consequently would have a beneficial effect on threatened and endangered species.

4n. Law Enforcement Actions

Under this alternative, patrols would be increased. Additional regulations may be proposed following development of the refuge management plan. Shrub-steppe habitat appears to be the most disturbed from unauthorized public access and off-road vehicle use. Reductions in shrub-steppe habitat decrease both the hunting areas and prey for peregrine falcons and ferruginous hawks, both of which are federally listed as endangered and candidate species, respectively, and decrease habitat for sage grouse, pygmy rabbit, and loggerhead shrike, all federally listed candidate species. Increases in patrols and resource management staff would increase enforcement of laws which prohibit trespass and off-road vehicle use. Maintenance of shrub-steppe habitat through enforcement of off-road vehicle use would have a beneficial impact on the above mentioned species by maintaining habitat, hunting areas, and cover for prey. In addition, increased patrols would assist in the detection of wildfires which can destroy sensitive habitats and is expected to have a significant benefit on threatened and endangered species.

5) Effects on the White Bluffs

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on the White Bluffs. Please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

5a. White Bluffs Protection

Under this alternative, the NPS would limit activities which would contribute to sloughing of the White Bluffs. The NPS would review its own actions and seek voluntary participation from agencies and individuals to limit their activities which would contribute to sloughing of the White Bluffs. Sloughing has occurred most significantly on approximately 6600 feet of the southern end of the White Bluffs. The rate of sloughing is expected to continue at existing levels which would continue the gradual erosion of the White Bluffs. However, to the extent that management efforts were successful in reducing impacts, there would be a beneficial impact on the White Bluffs.

5b. Interpretation and Education Activities

The NPS would provide interpretation of the significance of the White Bluffs through an education outreach program, with particular emphasis on the fossils contained within the White Bluffs. This would help decrease the incidence of site vandalism and unauthorized collecting of fossils and disturbance and consequently have a beneficial impact on the White Bluffs.

5c. Law Enforcement Actions

Under this alternative, patrols would be increased. Illegal collecting of fossils continues to reduce the integrity of the White Bluffs. Vandalism of significant fossils in the White Bluffs continues to occur primarily from trespass and off-road vehicle use. While the majority of off-road vehicle use occurs on the steep slopes near Ringold, incidents of their use have occurred on the slopes of the White Bluffs. Off-road vehicle use lessens the stability of the White Bluffs by loosening the siltstones and claystones which make up the formation. Increased enforcement of the laws prohibiting trespass and off-road vehicle use is expected to have a beneficial effect on the White Bluffs by reducing disturbance.

6) Effects on Water Quality

Applicable Mgmt. Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on water quality. Please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

6a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. A dam would result in increased water temperatures over natural conditions by prolonged exposure to solar radiation, and increased sedimentation resulting from reductions in river flow which will decrease the capacity of the river to carry solids (SAI/PMX/DC 1979). Any change in the equilibrium of the river, such as stream flow, temperature, and substrate, will affect water quality (Thompson 1992). Prohibition on new dam construction would prevent an increase in water temperatures over natural conditions and an increase in sedimentation (U.S. Army Corps of Engineers, 1979). Consequently, there would be a beneficial impact on water quality.

6b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on the resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed river sediments which may contain contaminants and impact water quality. Impacts to water quality would vary depending on the location of the dredging. Dredging in the middle of the river would transport sediments downstream and have less of an impact on water quality than along the shorelines, which could cause localized silt plumes containing concentrated amounts of associated contaminants (Johnson 1992). Limitations on water resource development projects would consequently have a beneficial impact on water quality.

6c. Instream Flow Protection

Under this alternative, the NPS would continue to evaluate flow requirements to protect fisheries, significant habitats, and threatened and endangered species. The NPS would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Consequently, there would be a beneficial impact on water quality.

6d. Nuisance Aquatic Macrophyte Control

Under this alternative, the NPS would make efforts to control nuisance aquatic macrophytes in the Hanford Reach in conformance with a management plan. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate and can restrict river flows. Restricted flows, in turn, can adversely affect water quality by increasing water temperature and reducing sedimentation transport and oxygen supply (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes by either chemical or mechanical means would limit and potentially reduce populations and consequently have a beneficial impact on water quality.

6e. Controls on Development

Under this alternative, the NPS would not construct any facilities if found to be incompatible with the values and purposes for which the area was established. No new facilities are proposed at this time. The NPS would undertake no development which would have adverse impacts to water quality.

The DOE would be able to construct intakes and outfalls and required facilities related to the cleanup of the Hanford Site. Some of these facilities may be located within the river corridor and include, but are not limited to, buildings, roads, and groundwater flow barriers or treatment systems which could result in temporary adverse impacts to water quality. All cleanup activities would be reviewed on the basis of potential environmental impacts and every attempt would be made by the DOE to minimize such impacts (see Effects on DOE Activities, "Controls on Development", page 282).

In recent years, there have been dramatic increases in recreational use and shoreline development of the mid-Columbia River resulting in construction of new marinas, boat launches, parks, recreational facilities, and single homes outside of the study area boundary. These type of developments often increase sediments to the river which may impact water quality. In addition, upland agricultural development could result in increases in fertilizer and pesticide runoff to the river which could have an impact on water quality. Within the study area, private lands are in Benton, Franklin, and Grant counties and are subject to restrictions through existing zoning and voluntary compliance. During the past 3 years in Franklin County, approximately 7-10 houses have been constructed within a quarter mile of the river (either in the study area or near it) (Brown 1994). Existing zoning for the river corridor is primarily agricultural, with the exception of a small parcel of land just south of Priest Rapids Dam which is largely zoned "heavy industrial". Agricultural zoning allows for such things as single and multiple family dwellings, greenhouses, packing plants, feedmills, general farm buildings, commercial stables, and golf courses. Heavy industrial zoning allows more intensive uses such as concrete mixing plants, automobile assembly plants, junkyards, and breweries (for a more detailed discussion, refer to Chapter III, Affected Environment, page 129).

On private lands, developments or the conversion to nonagricultural uses on private lands could increase sediments to the river which may impact water quality. In addition, upland agricultural development could result in increases in fertilizer and pesticide runoff to the river which could have an impact on water quality. Consequently, impacts to water quality are anticipated to be minimal on public lands but difficult to determine on private lands.

6f. Controls on Mining and Mineral Development

Under this alternative, all mining and mineral development on federal lands would be prohibited, except those activities conducted in conformance with a management plan (a possible example would be use of gravel from existing gravel pits to maintain refuge roads). No activities would be allowed unless they are determined to be compatible with the purposes for which the National River was established. On private lands within the study area, mining and mineral development could increase river sedimentation and/or introduce toxic materials into the river, both of which adversely affect water quality. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river (NPS, 1992). Consequently, impacts to water quality are anticipated to be minimal on public lands but difficult to determine on private lands.

6g. Controls on Agricultural Use

Under this alternative, agricultural activities would occur on federal lands. Approximately 85 acres of federal land within the study area is managed by the WSDFW for agricultural sharecropping. Sharecropping leases on federal lands would be maintained. Existing sharecropping practices have not had an impact on water quality. On private lands, approximately 800 acres are used for agricultural purposes within the study area (ASCS 1993). Existing agricultural practices have not been shown to have an adverse impact on water quality. While chemical runoff and siltation can affect water quality, there is no evidence to date that existing agricultural activities are affecting water quality within the study area. With a lack of projected increase in agricultural use within the study area, impacts on water quality are not anticipated. Consequently, impacts to biodiversity are anticipated to be minimal on public lands but difficult to determine on private lands.

6h. Controls on Grazing

Under this alternative, grazing on federally owned lands would be prohibited. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing. In annual dry seasons, trespassing cattle are often attracted to the river for water. There has been no indication that trespassing cattle nor existing grazing practices significantly degrade water quality due to the large amount of water flowing past in relation to the level of grazing pressure. Consequently, the prohibition on grazing activity is not expected to have an adverse impact on water quality.

7) Effects on Instream Flows

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on instream flows. Please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

7a. Dam Construction
Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. A dam would significantly alter existing stream flows in the Hanford Reach and impound the last free-flowing non-tidal segment of the Columbia River. A prohibition on dams would prevent significant alteration of existing instream flows, ensure that instream flow needs for significant natural and cultural resources were provided, and consequently have a beneficial impact on existing instream flows.

7b. Water Resource Development Project Construction
Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have increased the cross section area of the river and would have generally resulted in reduced water velocities for the same amount of river flow. Limitations on water resource development projects would ensure that instream flow needs for significant natural and cultural resources were provided, and consequently have a beneficial impact on existing instream flows.

7c. Instream Flow Protection
Under this alternative, the NPS would continue to evaluate flow requirements to allow fall chinook salmon, or any other aquatic wildlife to migrate, spawn, rear, or reside. The NPS would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Consequently, there would be a beneficial impact on water quality.

8) Effects on Tribal Access and Use

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on tribal access and use. Please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

8a. Dam Construction
Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. Presently, the lack of dams permits a variety of uses within the reach. Construction of a dam would effect a variety of American Indian uses on the Hanford Reach such as salmon fishing, gathering foods and medicines, and flooding of traditional cultural properties and sacred sites. Availability of anadromous fish in the Hanford Reach is dependent on unimpeded migration and favorable spawning and rearing conditions, both of which would be impacted through construction of a dam. Fishing would be directly impacted by the reduced salmon populations, particularly the wild fall chinook salmon which would be drastically reduced or eliminated. It is the position of the tribes that the Hanford Reach, in particular, is an inseparable natural and cultural resource upon which the tribes' culture and heritage rests. The federal government is responsible for upholding treaties it signed with the above mentioned tribes in 1855, which has a trust responsibility to the American Indians and guarantee rights to certain resources of which states, "the right to fish at all usual and accustomed fishing places...". The prohibition on new dams would result in

the maintenance of unimpeded migration and spawning and rearing habitat. The tribes have also stated that the ecosystems of the Columbia Basin are an integral part of the culture and religion of the tribes and bands of the region. Prohibition on dams would protect the fall chinook fishery and special plant populations and have a beneficial impact on tribal access and use.

8b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed critical spawning and rearing habitat for fall chinook salmon, an important resource for the tribes. In addition, significant cultural resource sites located within or along the banks of the river would be vulnerable to direct impacts from dredging or indirectly by erosion from barge traffic. If fish populations and cultural resource sites are lost then access and use for American Indians would diminish. Consequently, limitations on water resource development projects would have a beneficial impact on tribal access and use.

8c. Controls on Grazing

Under this alternative, grazing on federally owned lands would be prohibited. An estimated 24,000 acres of land within the study area are currently leased to private parties for livestock grazing. Consequently, there would be an adverse impact on American Indian access and use.

8d. Allowance for Recreational Activities

Under this alternative, recreational activities would be permitted except in certain areas as determined in the management plan. Hunting and trapping would be prohibited unless specifically allowed in the designating legislation. Hunting is currently allowed on the lands administered by the WSDFW and in restricted areas along the river. Fishing in the Reach is an activity common to both the tribes and sportfishermen alike. The fall chinook salmon is highly prized by anglers for its large size, strength, and flesh quality. The number of fall chinook salmon has attracted an abundance of anglers, with an average of 21,000 angling trips per season between 1985 and 1991. It is possible that conflicts could arise between tribes and sport fishermen with regards to usual and accustomed fishing places, and consequently recreational activities could have a slight impact on tribal access and use. Nonconsumptive uses may also infringe on American Indian access and use of the reach. Consequently, increased recreational activities could have an adverse impact on tribal access and use.

9) Effects on Land Ownership and Use

Applicable Management Actions

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on land ownership and use. Due to similarities, with the exception of "Controls on Grazing", please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

9a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the

Hanford Reach. Construction for a new dam in this location could require land acquisition and inundate private lands. Consequently, a prohibition on dams would not result in a change in land ownership and use.

9b. Controls on Local Energy Transfer Facilities

Under this alternative, no actions would be taken to alter existing power production facilities. Power production at Priest Rapids Dam and WNP 2 would continue, and completion of an energy production facility at WNP 1 would not be precluded. Routine maintenance activities would not be affected. However, under existing review processes for issuance and renewal of hydropower permits, the NPS would review and comment on the applications for new permits and renewals being sought by the energy production facilities. The NPS is allowed to request, and the permitting agency might impose, operating conditions, mitigation actions and/or prohibitions that will further enhance or protect those resources not impacted by the operators. Instream flows to maintain existing power production for this portion of the Columbia River would continue to be determined through discussions and negotiations among agencies and parties representing various river uses. Consequently, there may be potential for future impact on power production facilities in the form of additional design and construction related to mitigation of environmental damage.

9c. Controls on Development

Designation of a National River would have no impact on existing private land ownership and use because the designated area contains federal lands exclusively.

9d. Controls on Mining and Mineral Development

Under this alternative, all mining and mineral development on federal lands would be prohibited, except those activities in conformance with the management plan (a possible example would be use of gravel from existing gravel pits to maintain refuge roads). No activities would be allowed unless they are determined to be compatible with the purposes for which the National River was established. In 1992, a proposal was pursued to placer mine for gold within a 1/4 mile of the river (NPS 1992). The designated area has oil and gas reserves, but whether any of commercial value exist is not known. Some areas are suitable for mineral material disposals (gravel, sand, and clay), and potential for other minerals exists. Consequently, this alternative could result in loss of potential mineral production, thereby having an adverse effect on land ownership and use.

9e. Controls on Agricultural Use

Under this alternative, agricultural activities would occur on federal lands. Approximately 85 acres of federal land within the study area is leased by the WSDFW for agricultural sharecropping. Sharecropping leases on federal lands would be maintained. Sharecropping to provide food and cover for wildlife might continue and consequently have no additional effect on existing land use of these areas.

9f. Controls on Grazing

Under this alternative, grazing on federally owned lands is prohibited. An estimated 24,000 acres of land within the study area are currently leased by private parties for livestock grazing by the WSDFW. This alternative would prohibit grazing on public lands and consequently have an adverse impact on existing grazing practices on federal lands.

10) Effects on Department of Energy Activities on the Hanford Site

Applicable Management Actions:

Designation of the Hanford Reach as a National River, would determine land use, which is one of several factors considered in determining clean-up levels under the Tri-Party Agreement. Human use scenarios, based on expected NPS management plans, would be used to calculate human risk assessments. Environmental risk assessments would also be used to determine clean-up levels. Congressional designation would, therefore, expedite final clean-up of the Hanford Reach by resolving the permanent land use issue in that area.

Land ownership would be transferred from DOE to NPS when areas of land are certified as "clean", based on the risk assessments described above. It is expected that lands north and east of the Columbia River, commonly known as the "north slope", would be transferred in the near term. Lands within the Hanford 100-Areas would be transferred at a much later date. In the interim, the NPS would work closely with the DOE, EPA, and the Washington Department of Ecology in the clean-up decision process.

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on DOE industrial activities on the Hanford Site. With the exception of the "Protective Designation", please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

10a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. In 1979, the DOE conducted a study to determine the impacts of the Ben Franklin Dam project on the Hanford Site. The study concluded that construction of the dam, which would impound approximately 50 miles of the river located adjacent to the Hanford Site, would raise the groundwater level throughout the Hanford Site and also potentially have an impact on existing facilities and future cleanup activities. It was determined that the most significant impact would be the flooding of the reactor area along the river (the "100 Area") which contains a number of waste burial grounds, contaminated soil sites, and buildings (U.S. Army Corps of Engineers 1979). The resulting reservoir would raise the groundwater level throughout the Hanford Site and could potentially have an impact on existing facilities and future cleanup activities. The greatest impact on the Hanford Site would be the flooding of the reactor area along the river, most notably the 100 Area. The prohibition on dams would prevent impacts resulting from inundation to buildings and waste burial grounds and consequently have a beneficial impact on the Hanford Site.

10b. Protective Designation

Under this alternative, a National River would be designated. While federal designation may provide the impetus for advocacy groups to seek aquifer reclassification, which could restrict ongoing and future DOE activities at the Hanford Site (i.e disposal to the soil column of treated liquid waste), reclassification would not be sought or supported in the designation and management of the area. In addition, NR designation would grant limited authority over National Pollution Discharge Elimination System (NPDES) permitting to the NPS. It is assumed that all existing permits and new permits for cleanup would be reviewed. New permits for discharges into the Hanford Reach for other activities would also be subject to NPS review and approval. Language would be suggested in proposed legislation to Congress which would provide that designation shall not increase cleanup standards for remedial activities at Hanford. Consequently, standards, procedures, and milestones established through the Tri-Party Agreement would not be affected by NR designation.

10c. Controls on Development

Under this alternative, new construction would be prohibited within the designation boundaries except intake and outfall structures and those required facilities related to clean up of the Hanford Site. All of these facilities would be subject to the review and approval by the NPS. Presently, no facilities are anticipated at this time. Impacts of the Proposed Action on planning, design, and permitting for these facilities is anticipated to be slight.

10d. Controls on Local Energy Transfer Facilities

Under this alternative, no actions would be taken to alter existing power production facilities. However, the NPS would encourage the use of existing intake and outfall structures and transmission line corridors. Designation would not impact DOE's ability to maintain existing transmission lines or upgrade within existing transmission line corridors. Consequently, there would be no effect on existing lines and facilities, but new corridors and facilities would be subject to NPS review.

11) Effects on Recreational Access and Use

Applicable Management Actions:

The following analysis examines those management actions from Chapter II, Alternatives, which are considered to have an impact on recreational access and use. With the exception of, "Allowance for Recreational Facilities", please refer to the same management action under the Proposed Action for a more detailed discussion of the following analysis.

11a. Dam Construction

Under this alternative, dams would be prohibited. The Ben Franklin Dam proposed in the 1970s by the ACOE at river mile 348 is the basis for a likely scenario of potential impacts if a dam were constructed in the Hanford Reach. A dam would impound the last free-flowing non-tidal segment of the Columbia River, with subsequent impacts to the existing nature of recreational activities the Hanford Reach, in particular, fishing, wildlife observation, and boating. The availability of anadromous fish for fishing is dependent on unimpeded migration and spawning and rearing habitat, both of which would be eliminated by the construction of a dam (for further information, a detailed discussion is located in this alternative "Effects on Fall Chinook Salmon", page 258).

Dams would also change existing flow conditions through the Hanford Reach which could alter the type of boating which occurs, specifically navigation by anglers and other recreational users. Boating would shift toward power boats and waterskiing. The type of fish available for recreational purposes would shift from anadromous to resident. Sloughs, islands, and channels which are important for wildlife, hunting and nature observation would be submerged. Prohibitions on dams would protect existing populations of anadromous fish for fishing, maintain appropriate water levels for boaters, and maintain existing sloughs, islands, and channels for recreational purposes. Consequently, there would be a beneficial effect on recreational access and use.

11b. Water Resource Development Project Construction

Under this alternative, water resource development projects, such as dredging and channelization, would be prohibited where they have an adverse impact on resources. The Mid-Columbia Navigation Project, proposed by the ACOE in the 1980s provides the basis for analyzing potential impacts from a substantial dredging project. This project would have disturbed and destroyed critical spawning and rearing habitat for fall chinook salmon which supports the recreational fishery. Consequently, limitations on water resource development projects would have a beneficial impact on recreational access and use by supporting the anadromous fishery through protecting critical salmon habitat.

11c. Instream Flow Protection

Under this alternative, the NPS would continue to evaluate flow requirements to protect recreational activities in the Hanford Reach. The NPS would also work with all appropriate federal, state, and local agencies to ensure that sufficient flows are provided. Instream flows would continue to be determined through discussions and negotiations among parties representing various river uses. Consequently, there would be a beneficial impact on recreational access and use.

11d. Nuisance Aquatic Macrophyte Control

Under this alternative, the NPS would make efforts to control nuisance aquatic macrophytes in the Hanford Reach in conformance with a management plan. Eurasian milfoil, an introduced species, is the most prominent and is an increasing threat. While estimates as to the extent of this plant population are not quantified, Eurasian milfoil characteristically spreads at a rapid rate which can restrict river flow. Restricted flows have the greatest impact on salmon habitat by increasing water temperature and reducing sedimentation transport and oxygen supply, especially in the shallow water areas which salmon prefer (U.S. Army Corps of Engineers 1979b). Management of nuisance aquatic macrophytes, by either chemical or mechanical means, would limit and potentially reduce populations and help protect salmon habitat. Consequently, support of the anadromous fishery would have a beneficial impact on recreational access and use.

11e. Wildlife Habitat Protection

Under this alternative, the NPS would protect various wildlife habitats through controlling the spread of non-native vegetation, revegetating disturbed areas with native species, reducing grazing, and limiting activities which could impact the White Bluffs. The Hanford Reach and surrounding lands provide some of the best opportunities for wildlife viewing in eastern Washington state. Bald eagles, common loons, wintering and migratory waterfowl, pelicans, terns, gulls, great blue herons, mule and white-tailed deer, coyotes, and beavers may be observed. Protection under the NR designation would help maintain or increase populations of wildlife for observation and game animals available for hunting. The NR, which could also include development of an interpretive roadway through the Wahluke State Wildlife Recreation Area, would have a beneficial impact by providing additional recreational use and access.

11f. Control of Wildfire

Under this alternative, a federally guided, multi-agency wildfire suppression program would be maintained. The NPS is responsible for suppressing fires and each NR has fire fighting capabilities. When needed, the NPS can call on the U.S. Forest Service to obtain fast response using spotter aircraft and aerial retardant drops to assist with fire control, a resource not available to local county fire districts. When incident command teams work on NR's, the land manager determines which fire fighting methods are acceptable based on the resources affected. In bad fire years, wildfires sometimes exceed 1,000 acres or more within the study area. The last large fire was in 1993 when over 12,000 acres were burned. In other years, wildfires tend to range between 5-20 acres depending on the quickness of the response.

Presently, fire control effectiveness is limited because most wildfire response is provided within the limitations of the local volunteer county fire districts which are not familiar with the cultural resources of the area and because federal agencies do not have management responsibility for that part of the study area managed by the state. With increased staffing under this proposal and improved direction of the fire suppression program, there would be less likelihood of fire posing a threat to existing wildlife populations for recreational purposes. Consequently, there would be less potential for impact to recreational access and use.

11g. Controls on Development

Under this alternative, the NPS would not construct any facilities if found to be incompatible with the values and purposes for which the area was designated. Some DOE cleanup activities as related to the Hanford Site, particularly within the river corridor, may result in impacts to riverine and aquatic habitats. Private lands would not be available for public recreational access and use. Consequently, there would be a beneficial impact on recreational access and use.

11h. Allowance for Recreational Facilities

Under this alternative, substantial improvements to recreational facilities would be accomplished. Improvements in the Vernita Bridge, White Bluffs, and Ringold boat accesses would improve safety, reduce disturbance of adjacent areas, and improve aesthetics. While the improvements may result in increased use at the sites and on the river, all modifications would be planned and designed to avoid sensitive areas. Additional development of facilities for nonconsumptive uses would disperse recreational users on the site, and would improve the safety and enjoyment of visitors. Facility development would also reduce unauthorized camping, hiking, and other uses. Consequently, assuming these improvements are accomplished they would have a beneficial impact on resource protection while enhancing recreational access and use.

11i. Allowance Recreational Activities

Under this alternative, recreational activities, with the exception of hunting, would be permitted except in certain areas as determined in the management plan. Hunting and trapping would be prohibited unless specifically allowed for in the designating legislation. Efforts to protect fish and wildlife habitat, including prohibitions on dams, control of non-native vegetation, revegetation of disturbed areas, monitoring development, would help maintain fishing and wildlife viewing opportunities. The success of anglers in the Reach has made it the first or second among mainstream or tributary areas of the Columbia River in sport salmon catch for the last seven years. The prohibition on hunting would displace existing hunting users. Consequently, there would be an adverse impact on recreational access and use.

11j. Interpretation and Education Activities

Under this alternative, the NPS would provide interpretation and education about the Hanford Reach. Efforts would specifically include development of a fully staffed visitor center, interpretive tours and programs, increased contact between the field staff and visitors, and increased law enforcement. These actions would increase public understanding of the significance of the resources of the Hanford Reach and would increase visitor satisfaction when visiting the area. Consequently, there would be a beneficial impact to recreational access and use.

11k. Law Enforcement Actions

Under this alternative, patrols would be increased. Increased patrols and resource management field staff might result in reductions in trespass on key habitat areas, harassment of wildlife, disturbance of archaeological sites, unauthorized vehicle use, and other inappropriate recreational activities. Consequently, increased patrols and resource management staff would result in greater resource protection which would help protect the natural resources, visitor safety, and help assure beneficial recreational opportunities of the Hanford Reach.

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CHAPTER V
LIST OF PREPARERS

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Name	Responsibility	Qualifications
National Park Service (agency responsible for all phases of the study, including Task Force development and coordination, public involvement, development of study alternatives, and Draft Report/EIS production)		
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Frank Sannino	Cartographer	B.A. Geography, special emphasis on cartography. 10 years experience in cadastral and production cartography
U.S. Fish and Wildlife Service		
Lynn Childers	Writer/Editor	B.S. Zoology 22 years experience in fish and wildlife management and environmental analysis.
David Goeke	Writer/Editor	B.S. Zoology 27 years experience managing national wildlife refuges.
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U.S. Department of Energy		
Kevin Clarke	Writer/Editor (Cultural Resources)	B.A. Anthropology Graduate work in Recreation and Park Administration 17 years experience in river management, federal realty work, and cultural resource management

Name	Responsibility	Qualifications
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Patrick Willison	Writer/Editor (Legal)	LL.M, J.D., B.A. 14 years experience in judiciary and federal law.

The Hanford Reach Resource Assessment Report, developed during the study process by the Task Force, was utilized as a reference and incorporated into this final Report/Environmental Impact Statement. The following people assisted in development of that report:

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Cultural: Jerry Galm (Archaeological and Historical Services, Eastern Washington University), Kenneth Reid (Department of Anthropology, Washington State University)

Visual: Julie McQuary (Ebasco Environmental Inc.), Christine Carlson (National Park Service), Gerry Meyer (Bureau of Land Management)

The Study Team would like to thank the Seattle District of the U.S. Corps of Engineers for contributing documents which provided information on the Mid-Columbia Navigation Project and the Ben Franklin Dam project. These documents were utilized as a invaluable resource when analyzing impacts from dam construction and a significant dredging project. In addition, the study team would especially like to thank the following individuals and agencies for contributing photographs to this document: Richard Steele, Carl van Hoff, Kristen Sycamore, Grant County Public Utility District, Battelle, Washington Department of Fish and Wildlife, Soil Conservation Service, USDA Agricultural Stabilization and Conservation Service, and the U.S. Department of Energy.

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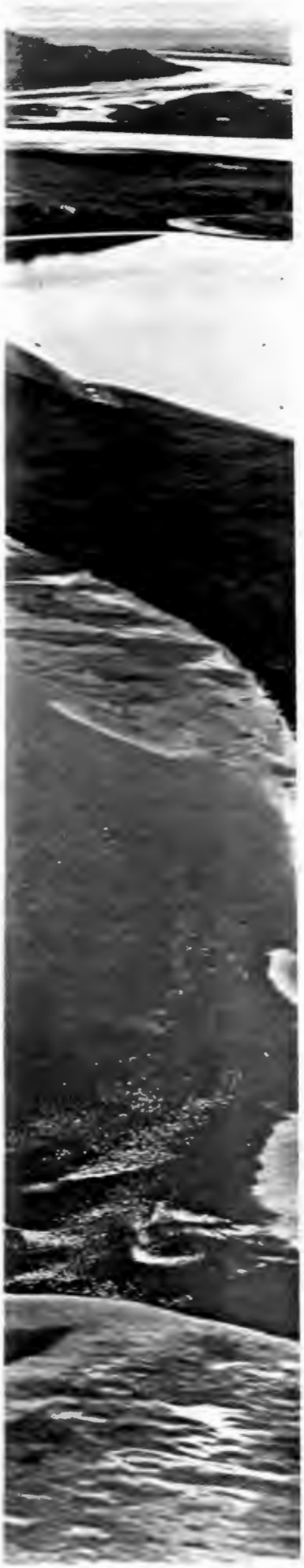

CHAPTER VI
CONSULTATION AND COORDINATION

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Development of the Proposal and the Environmental Impact Statement

1. Agencies, Organizations, and Individuals Directly Involved in the Study

The study authorization in Public Law 100-605 (see Appendix B) includes several references to the entities who must be involved in the study process. It specifies that the overall responsibility belongs to the Secretary of the Interior, and requires that the study be conducted "in consultation with the Secretary of Energy" and that "the Secretary shall cooperate and consult with the State and political subdivisions thereof, local, and tribal governments, and other interested entities" and "provide for public comment" in the study process.

These directions dictated the structure of the study process. The Secretary of the Interior delegated responsibility for the study to the Pacific Northwest Regional Office of the National Park Service. In order to expedite consultation with the Secretary of Energy, a designee of the Department of Energy was invited to sit on a **study team**. A designee of the U.S. Fish and Wildlife Service, another Interior bureau, was also invited onto the study team in order to provide necessary expertise on fish and wildlife issues. The responsibilities of the three-agency study team were to manage day-to-day study activities, oversee technical analyses, and make recommendations to agency decision-makers regarding policy issues encountered in the study.

The need to consult a variety of state and local governments, tribes, and "other interested entities" stimulated the creation of a **study task force** in April, 1989. The task force included representatives of relevant federal, state and local agencies; local organizations representing a variety of interests; and private landowners living along the reach. The current task force membership list is enclosed in Appendix C. The functions of the task force were to review documents, advise the study team on policy decisions, and to air and attempt to resolve issues regarding future management of the Hanford Reach.

The direction to "provide for public comment" has been accommodated through **public meetings** at the scoping and resource assessment phases of the study process and again following the release of the draft Report/EIS. The public was also informed of study progress through publication of a newsletter and other information materials, media articles, and presentations to a variety of local organizations. Additional opportunities for public input will be provided directly following the release of this Report/EIS.

A full list of the agencies, organizations, and experts consulted in the study process can be found in Appendix C.

2. The Study Process

The study process was divided into four major phases: scoping, resource assessment, development of alternatives, and documentation. Each of the phases incorporated procedures to encourage the participation of interested agencies, organizations, and individuals.

SCOPING

The scoping process was discussed in detail in Chapter I, Purpose of and Need for Action, page 9. The formal scoping process included public meetings and a meeting of the task force to identify important issues for the study analysis. Study team members produced the scoping documents, convened the meetings, and reviewed the findings of the scoping process.

RESOURCE ASSESSMENT

The focus of the resource assessment phase was to identify and evaluate the significant natural, cultural, scenic, and recreational characteristics of the study area. The assessment was conducted between August 1989 and March 1990.

The task force was divided into eight working groups for the assessment, each of which analyzed one category of resources. Study team members were assigned to each working group to assist with the analysis. The resource categories were:

Fisheries Resources
Wildlife Resources
Botanic Resources
Geologic and Hydrologic Resources
Recreational Resources
Agricultural Resources
Cultural Resources
Visual Resources

Each working group was responsible for three products: a **description** of the resources in the category, an **evaluation** of their significance, and a **discussion of trends** affecting the significant resources. The working groups met at least once a month through this process.

The basis for the evaluation was the **rarity** or **quality** of the resources in comparison with those on other rivers in Washington State, in the Pacific Northwest, or in the United States. Whenever possible, the evaluations were based on the findings in previously published studies and inventories. Where such information did not exist, the working groups interviewed subject experts about the significance of resources. The results of the evaluation were reviewed by an independent group of resource experts.

The evaluations indicated that seven resources along the Hanford Reach are nationally significant and nine are regionally significant:

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Nationally Significant Resources
Fall Chinook Salmon
Intact Ecosystem
American Indian Cultural Resources
Archeological Sites
Hydrology and Geology (for Energy Facility Siting)
Federally Recognized Rare Plant Species
Federally Recognized Rare Animal Species

Regionally Significant Resources
White Bluffs Fossils
Ringold Agriculture
Waterfowl Hunting
Salmon and Steelhead Fishing
Flatwater Boating
Historic Sites
Scenery in the White Bluffs Segment
State Recognized Rare Plant Species
State Recognized Rare Animal Species

The results of the assessment were documented in the Summary of the Resource Assessment and a Draft Resource Assessment Report. Public meetings to discuss the resource assessment were held in Richland and Basin City, Washington in April 1990.

For more information on the resource assessment process, refer to the above referenced reports which are available from the National Park Service, Pacific Northwest Regional Office, Seattle, Washington.

DEVELOPMENT OF ALTERNATIVES

The alternatives phase of the study process began in May 1990 and concluded in December 1990. The focus of this phase was to define a set of alternatives which would provide some measure of long term protection to the significant resources identified in the resource assessment. A secondary goal of this process was to achieve consensus among study team and task force members on a preferred alternative.

The alternatives phase began with an additional analysis of the significant resources identified in the resource assessment. Working with the task force, the study team identified the physical conditions necessary to maintain the resources and the adequacy of existing controls to provide these conditions. The controls included the laws, regulations, and administrative rules which govern the resources. These tasks resulted in a better understanding of the needs for protection and management for each of the significant resources.

The study team then developed five categories of alternatives representing a range of options for future management of the reach. The categories varied by the types of resources protected and the intensity of management commitment. The five categories, in order of management intensity, are: no action, improved existing management, moderately intensive management focussed on multiple resources, intensive administration focussed on one resource, and intensive administration focussed on multiple resources.

Examples of specific designations, such as National Wildlife Refuge and National Conservation Area, were included for each category. The analysis of categories was reviewed by the task force at two meetings. The next step in the study of alternatives was to evaluate the consequences of each category of management options on the significant resources and on human uses of the reach. The study team analysis was evaluated by the task force in meetings in August and September 1990.

The task force was again divided into working groups to develop proposals for the preferred protection alternative. At meetings in October and November, the working groups developed proposals and presented them to the other task force members. Based on task force comments, the working groups revised their proposals.

Three task force meetings were held in December 1990 to try to achieve consensus on a preferred alternative. Working group proposals were again reviewed and modified to achieve greater agreement among task force members. At the conclusion of this process, several points were agreed to by the majority of task force members present:

1. The designation boundaries should include the river itself for the entire study segment, a 1/4 mile corridor on both sides of the river on public lands, and the existing areas within the Wahluke State Wildlife Recreation Area and Saddle Mountain National Wildlife Refuge.

2. The management of the area should focus on all of the nationally significant resources and the principal administering agency should make a substantial commitment of staff and money to management.

3. Land uses within the area should be limited to those which are consistent with the protection of nationally significant resources.

4. Dams and major dredging within the reach should be prohibited.

5. The reach should receive a formal legislative designation.

6. The Department of Energy should retain certain management responsibilities as comanager of the designated area.

The task force was unable to reach agreement on the following points:

1. The specific legislative designation for the reach (National Wildlife Refuge, National Conservation Area, and National River)

2. The principal administering agency and roles for other agencies.

3. Specific management actions and consequences on significant resources and human uses of the reach.

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This concluded the alternatives phase of the study process. Public review of the alternatives took place during the review of the draft Report/EIS.

DOCUMENTATION

The final phase of the study process, the development of the Report/EIS, was begun in January 1991 and the draft Report/EIS was released to the public July 1992. The study team was responsible for development of the Report/EIS, with occasional consultations with task force members and resource experts. A task force meeting and four public meetings were held in Basin City, Richland, Mattawa, and Seattle, Washington. The public comment period was extended three times in order to better accommodate public review and comment and officially closed November 9, 1992. This final Report/EIS will be transmitted to Congress by the Secretary of the Interior.

3. Mailing List for the Final Report/EIS

Federal Agencies and Officials

Honorable Slade Gorton, U.S. Senator, Washington, D.C.
Honorable Patty Murray, U.S. Senator, Washington, D.C.
Honorable Mark Hatfield, U.S. Senator, Oregon, Washington, D.C.
Honorable Maria Cantwell, U.S. Representative, Washington, D.C.
Honorable Norman Dicks, U.S. Representative, Washington, D.C.
Honorable Jennifer Dunn, U.S. Representative, Washington, D.C.
Honorable Thomas Foley, U.S. Representative, Washington, D.C.
Honorable Jay Inslee, U.S. Representative, Washington, D.C.
Honorable Mike Kreidler, U.S. Representative, Washington, D.C.
Honorable Jim McDermott, U.S. Representative, Washington, D.C.
Honorable Al Swift, U.S. Representative, Washington, D.C.
Honorable Jolene Unsoeld, U.S. Representative, Washington, D.C.
Advisory Council on Historic Preservation, Washington, D.C.
Bureau of Land Management, Portland, Oregon
Bureau of Reclamation, Ephrata, Washington
Bureau of Indian Affairs, Seattle, Washington
Bureau of Mines, Spokane, Washington
U.S. Fish and Wildlife Service, Portland, Oregon and Olympia, Washington
Environmental Protection Agency, Office of Federal Activities, Washington D.C.
Environmental Protection Agency, Seattle and Richland, Washington
National Marine Fisheries Service, Portland, Oregon
National Oceanic and Atmospheric Administration, Washington, D.C.
U.S. Army Corps of Engineers, Seattle and Walla Walla, Washington and Washington, D.C.
U.S. Department of the Interior, Office of Environmental Affairs, Washington D.C.
U.S. Department of Energy, Richland, Washington
U.S. Department of Energy, Washington, D.C.
U.S. Forest Service, Portland, Oregon
Water Resources Council, Washington D.C.
Bonneville Power Administration, Portland, Oregon
Pacific Fishery Management Council, Portland, Oregon
McNary National Wildlife Refuge, Burbank, Washington

Columbia National Wildlife Refuge Complex, Othello, Washington

Advisory Boards
Advisory Council on Historic Preservation, Washington, D.C.

State and Local Agencies and Officials
Governor Mike Lowry
State Representative Gary Chandler
State Representative Dick Nelson
Washington State Department of Ecology
Washington State Department of Fish and Wildlife
Washington State Department of Natural Resources
Washington State Department of Parks and Recreation
Washington State Office of Archaeology and Historic Preservation
Washington State Department of Transportation
Washington State Office of Financial Management
Puget Sound Water Quality Authority
Board of Commissioners, Benton County, Richland, Washington
Board of Commissioners, Port of Benton, Richland, Washington
Board of Commissioners, Franklin County, Pasco, Washington
Board of Commissioners, Grant County, Ephrata, Washington
Board of Commissioners, Adams County, Ritzville, Washington
Department of Community Development, Richland, Washington
Mayor of Pasco
Mayor of Richland
Mayor of Kennewick
Mayor of Othello
Port of Benton

Tribes
Yakama Indian Nation
Wanapum Tribe
Columbia River Inter-Tribal Fish Commission, Portland, Oregon
Confederated Tribes of the Umatilla Indian Reservation
Colville Confederated Tribes
Point No Point Treaty Council

Organizations
American Fisheries Society
American Rivers
Association of Northwest Steelheaders
Association of Washington Archaeology
B Reactor Museum Association
Central Basin Audubon Society
Columbia Basin Bass Club
Columbia River Coalition
Columbia River Conservation League

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Columbia River Gorge Commission
Columbia River United
Federation of Fly Fishers
Federation of Western Outdoor Clubs
Friends of the Columbia
Friends of the Earth
Greater Ecosystem Alliance
Greenpeace
Hanford Education Action League
Hawk Migration Association of North America
Heart of America
Kittitas Audubon Society
Long Live the Kings
Lower Columbia Basin Audubon Society
Lower Columbia Fish Enhancement Group
Mid-Columbia Archaeology Society
Mid-Columbia Steelheaders
National Audubon Society
National Parks and Conservation Association
National Wildlife Federation
National Wildlife Refuge Association
Nature Conservancy
North Cascades Institute
Northwest Conservation Act Coalition
Northwest Gillnetters Association
Northwest Rivers Council
Northwest Steelhead/Salmon Council
Oregon Trout
Pacific Rivers Council
Pilchuck Audubon Society
Rails to Trails Conservancy
Richland Rod & Gun Club
Rivers Network
Seattle Audubon Society
Sierra Club
Sierra Club Legal Defense Fund
Student Conservation Association
The Mountaineers
Tri-State Steelheaders
Trout Unlimited
Trust for Public Land
Volunteers for Outdoor Washington
Wahluke 2000
Washington Environmental Council
Washington Fly Fishing Club
Washington Native Plant Society
Washington Rivers Coalition

Washington State Sportsmens Council
Washington Wilderness Coalition
Washington Wild & Scenic Rivers Campaign
Washington Wool Growers Association
Yakima Valley Audubon Society

Business/Industry
Benton-Franklin Regional Council
Benton and Franklin League of Women Voters
Columbia Basin Development League
Franklin County Farm Bureau
Grand Coulee Project Hydroelectric Authority
Grant County Public Utility District
Northwest Power Planning Council
Richland Chamber of Commerce
Tri-City Industrial Development Council (TRIDEC)
Washington Environmental Industry Association
Washington State Farm Bureau
Washington Public Power Supply System, Richland, Washington

Schools/Libraries/Institutions
Colorado State University, Fort Collins, Colorado
Loyola University, New Orleans, Louisiana
Northwestern University, Evanston, Illinois
University of Washington, Seattle, Washington
Washington State University, Pullman, Washington
Western Washington University, Bellingham, Washington
Wahluke School District, Mattawa, Washington
Hanford Technical Library, Richland, Washington
Kennewick City Library, Kennewick, Washington
Mid-Columbia Regional Library, Kennewick, Washington
Othello City Library, Othello, Washington
Pasco Public Library, Pasco, Washington
Portland City Library, Portland, Oregon
Prosser City Library, Prosser, Washington
Richland City Library, Richland, Washington
Seattle City Library, Seattle, Washington

Media
Capital Press, Kennewick, Washington
Othello Outlook, Othello, Washington
Oregonian, Portland, Oregon
Seattle Times, Seattle, Washington
Seattle Post-Intelligencer, Seattle, Washington
Spokesman Review, Spokane, Washington
Tri-City Herald, Kennewick, Washington
Yakima Herald, Yakima, Washington

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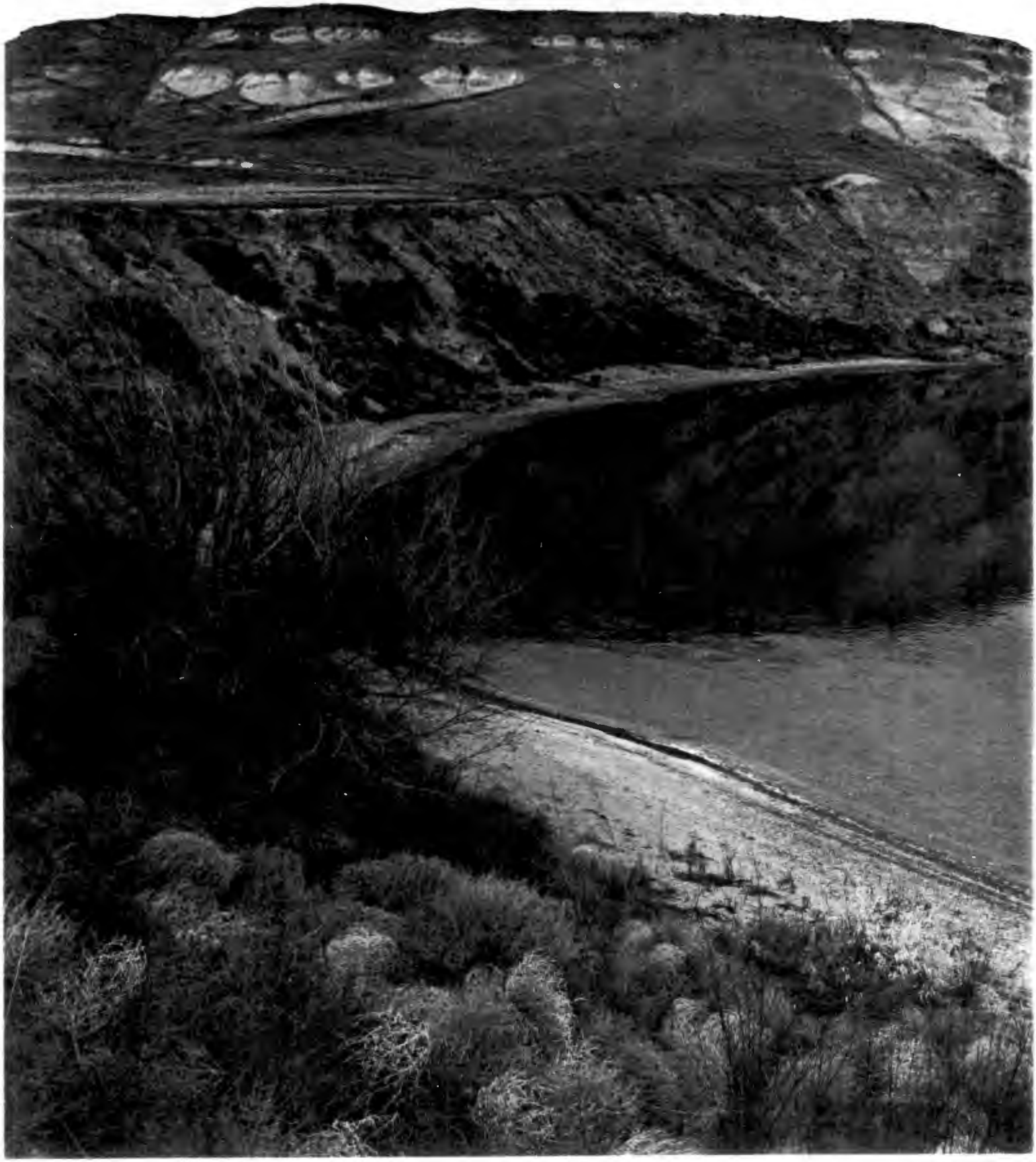
Individuals

Copies of the final Report/EIS will be made available to the individuals who have requested to be on the Study's public mailing list (approximately 800 individuals).



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APPENDIX

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A. References and Bibliography

Aldrich, Ann. 1991. Border Resource Area Manager, Bureau of Land Management, Spokane District Office, Spokane, Washington. Personal communication.

Allen, J.W. 1980. *The ecology and behavior of long-billed curlew in Southeastern Washington*. Washington Monograph No. 73. The Wildlife Society.

Annear, John. 1991. Wildlife Biologist, Umatilla National Wildlife Refuge, Umatilla, Oregon. Personal communication.

Antonio, E. A., T. M. Poston and W. H. Rickard, Jr. In Press. Radiological Survey of Shoreline Vegetation from the Hanford Reach of the Columbia River, 1990 - 1992, PNL-XXYY, Pacific Northwest Laboratory, Richland, Washington.

Bales, Don. 1993. Shorelines Specialist, Shorelands and Coastal Zone Management Program, Washington State Department of Ecology, Olympia, WA. Personal communication.

Ball, I.J., E.L. Bowhay, and C.F. Yocom. 1981. *Ecology and management of the western Canada goose in Washington*. Washington State Department of Game, Biological Bulletin No. 17.

Becker, C.D. 1985. Anadromous salmonids of the Hanford Reach, Columbia River: 1984 status. Prepared for the U.S. Department of Energy, Richland, Washington by Battelle Pacific Northwest Laboratories, Richland, Washington.

Benton County 1981. Benton County Code, 9/21/81. Chapters: 11.08, 11.12, 11.16, 11.48. Benton County Commissioners.

Berschaurers. 1991. Jr. Accountant, Grant County Public Utility District, Ephrata, Washington. Personal communication.

Bisping, L. E., and R. K. Woodruff. 1992. Hanford Site Environmental Data for Calendar Year 1991---Surface and Columbia River. PNL-8149, Pacific Northwest Laboratory, Richland, Washington.

Books, G.G. 1985. Avian interactions with mid-columbia river water level fluctuations. Northwest Science 59:304-312.

Books, G.G. 1984. Avian community interactions with mid-columbia river water level fluctuations: patterns of resource use and species inventory. Masters Thesis, Washington State University, Pullman, Washington.

Brown, C.J.D. 1952. *Spawning habits and early development of the mountain whitefish, Prosopium williamsoni, in Montana*. Copeia (2)

Brown, Daryl. 1994. Franklin County Building Department, Pasco, WA. Personal communication.

Brown, George. 1993. Geologist, Border Resource Area, Bureau of Land Management, Spokane District Office, Spokane, WA. Personal communication.

Buske, N, and L. Josephson. 1988. Water and Sediment Reconnaissance of the Hanford Shoreline, Hanford Reach Project-Data Report 4-Fall 1988, SEARCH Technical Services, Davenport, Washington.

Carlson, C. and M. Dell. 1992. Vernita Bar monitoring for 1991-1992. Annual report prepared by Grant County Public Utility District, Ephrata, Washington.

Carlson, C. and M. Dell. 1989. Vernita Bar monitoring for 1988-1989. Annual report prepared by Grant County Public Utility District, Ephrata, Washington.

Chaney, E. and T. Holubetz. 1980. Comprehensive plan for production and management of Columbia River Basin anadromous salmon and steelhead. Public Review Draft prepared by Columbia River Fisheries Council, Portland, Oregon.

Chapman, D.W., D.E. Weitkamp, T.L. Welsh, and T.H. Schadt. 1983. Effects of minimum flow regimes on fall chinook spawning at Vernita Bar, 1978-1982. Prepared for Grant County Public Utility District, Ephrata, Washington.

Chapman, D.W., E.E. Weitkamp, T.L. Welsh, M.B. Dell, and T.H. Schadt. 1986. *Effects of river flow on the distribution of chinook salmon redds.* Transactions of the American Fisheries Society. 115:537-547.

Chatters, J. 1991. Senior Research Scientist, Environmental Pathways and Assessment Section, Pacific Northwest Laboratory, Battelle Memorial Institute, Richland, Washington. Personal communication.

Chatters, J. 1989. Hanford Cultural Resources Management Plan. Prepared for the U.S. Department of Energy, Richland, Washington by Battelle Pacific Northwest Laboratory, Richland, Washington.

Clements, John. 1989. Flying the Colors: More than An Almanac, WASHINGTON FACTS, A Comprehensive look at Washington Today, County to County. Clements Research II, Inc., Dallas, Texas.

Coon, J.C., R.R. Ringe, and T.C. Bjornn. 1977. Abundance, growth, distribution and movements of white sturgeon in the mid-Snake River. Contribution No. 97, Forest, Wildlife, and Range Experiment Station, University of Idaho, Moscow, Idaho.

Cushing, C.E. 1990. Hanford Site National Environmental Policy Act (NEPA) Characterization. PNL-6415 Rev. 3 . Prepared for the U.S. Department of Energy, Richland, Washington by Battelle Memorial Institute, Richland, Washington.

Cushing, C.E. 1988. Hanford Site National Environmental Policy Act (NEPA) Characterization. PNL-6415 Rev. 1 . Prepared for the U.S. Department of Energy, Richland, Washington by Battelle Memorial Institute, Richland, Washington.

Dauble, D. D., K. R. Price and T. M. Poston. 1992. Radionuclide Concentrations in White Sturgeon from the Columbia River. PNL-8221, Pacific Northwest Laboratory, Richland, Washington.

9513388.2706

Dauble, D. 1989-1991. Ph.D. Senior Research Scientist, Battelle Pacific Northwest Laboratories, Richland, Washington. Personal communication.

Dell, M., 1989. Fisheries Biologist, Grant County Public Utility District, Ephrata, Washington. Personal communication.

Dell, M.B., M.W. Erho, and B.D. Leman. 1975. Occurrence of gas bubble disease symptoms on fish in mid-Columbia River reservoirs. Public Utility Districts of Grant, Douglas and Chelan Counties, Ephrata, Washington.

Dewaard, B. 1981. Reproduction and ecology of Canada geese on the Hanford Reservation, 1953-1980. Prepared for the U.S. Department of Energy, Richland, Washington by Battelle, Pacific Northwest Laboratory, Richland, Washington.

Dirkus, Roger. 1991. Research Scientist, Battelle Pacific Northwest Laboratories, Richland, Washington. Personal communication.

Dirkes, R.L., 1988 Hanford Riverbank Springs Characterization Report, PNL-7500, December 1990, Pacific Northwest Laboratory, Richland, Washington.

Dobler, F.C. 1992. Wildlife Biologist, Washington Department of Wildlife, Ephrata, Washington. Personal communication.

Dobler, F.C. and J.R. Eby. 1990. An introduction to the shrub steppe of Eastern Washington - A brief appraisal of current knowledge and need. Washington State Department of Wildlife, Olympia, Washington.

Eldred, D. 1970. *Steelhead spawning in the Columbia River, Ringold to Priest Rapids Dam.* Progress Report. September, 1970. Washington State Department of Wildlife, Olympia, Washington.

Endangered Species Act of 1973, 16 USC 1531, December 28, 1973.

Environmental Protection Agency (EPA). 1992. Integrated Risk Information System (IRIS), U. S. Department of Health and Human Services, National Library of Medicine Toxicology Data Network (TOXNET), Bethesda, Maryland.

ERDA, 1975. Final Environmental Statement - Waste Management Operations, Hanford Reservation, Richland, Washington, ERDA-1538, 2 Vols., U.S. Energy Research and Development Administration, Washington, D.C., pp. II.3-D-11 to II.3-D-12.

Executive Order 11988, Floodplain Management, 42 USC 4321, May 24, 1977.

Executive Order 11990, Protection of Wetlands, 42 USC 4321, May 24, 1977.

Fenneman, N. 1931. Physiography of Western United States. McGraw-Hill, New York, New York.

Fickeisen, D.H., D.D. Dauble, D.A. Neitzel, W.H. Rickard, R.L. Skaggs, J.L. Warren. April 1980a. Aquatic and riparian resource study of the Hanford Reach, Columbia River, Washington. Prepared for the U.S. Army Corps of Engineers, Seattle District, Seattle, Washington by Battelle, Pacific Northwest Laboratories, Richland, Washington.

Fickeisen, D.H., R.E. Fitzner, R.H. Sauer, J.L. Warren. October 1980b. Wildlife usage, threatened and endangered species and habitat studies of the Hanford Reach, Columbia River, Washington. Prepared for the U.S. Army Corps of Engineers, Seattle District, Seattle, Washington by Battelle, Pacific Northwest Laboratories, Richland, Washington.

Fitzner, R.E. 1991. Ph.D., Senior Research Scientist, Pacific Northwest Laboratory, Battelle Memorial Institute, Richland, Washington. Personal communication.

Fitzner, R.E., and R.H. Gray. 1991. The status, distribution and ecology of wildlife on the U.S. D.O.E. Hanford Site: A historical overview of research activities. Environmental Monitoring and Assessment 18: 173-202.

Fitzner, R.E. 1980. Behavioral Ecology of the Swainson Hawk (Buteo Swainsoni) in Washington, PNL-2754/UC-11. Pacific Northwet Laboratory, Richland, WA. 65pp.

Fitzner, R.E. and W.C. Hanson. 1979. *A congregation of wintering bald eagles Haliaeetus leucocephalus.* Condor. 81:311-313.

Fitzner, L.E. 1991. Wildlife Biologist, Washington State Department of Wildlife, Yakima, Washington. Personal communication.

Fitzsimons, T.R. 1979. Letter to the U.S. Department of Energy, Richland, Washington dated May 1, 1979.

Fix, J. J., 1976. Association of Long-Lived Radioactivity with Sediment Along the Columbia River Shoreline, Islands, Bottom and Slough Area, BNWL-SA-5484, Pacific Northwest Laboratory, Richland, Washington.

Frest, T. 1988. Letter to the U.S. Fish and Wildlife Service, Olympia, Washington, dated December 19, 1988.

Gard, H. A. 1991. Cultural Resource Scientist, Pacific Northwest Laboratory, Battelle Memorial Institute, Richland, Washington. Personal communication.

Gephart, R.E., R.C. Arnett, R.G. Baca, L.S. Leonhart, and F.A. Spane, Jr., 1979. Hydrologic Studies within the Columbia Plateau, Washington: An Integration of Current Knowledge, RHO-BWI-ST-5, Rockwell Hanford Operations, Richland, Washington.

Goeke, David. 1991. Refuge Manager. Columbia National Wildlife Refuge, U.S. Fish and Wildlife Service, Othello, Washington. Personal communication.

9513388.2707

Grant County 1988. Grant County Zoning Ordinance, 4/15/80 revised 12/88. Part of Resolution 80-39-CC. Grant County Commissioners.

Gray, R.H. and D.D. Dauble. 1976. *Synecology of the fish community near Washington Public Power Supply System Nuclear Plant 1, and 4, and assessment of suitability of plant area for salmonid spawning.* Washington Public Power Supply System. Ecology Studies. Volume 2. Battelle Pacific Northwest Laboratories, Richland, Washington.

Gray, R.H. and D.D Dauble. 1979. Biology of the sandroller in central Columbia River. Transactions of the American Fisheries Society. 108:646-649.

Gustafson, E.P. 1978. The Vertebrate Faunas of the Pliocene Ringold Formation, Southcentral Washington, Museum of Natural History, Bulletin #23, University of Oregon, Eugene, Oregon.

Hajek, B.F. 1966. Soil survey: Hanford project in Benton County, Washington. Battelle Pacific Northwest Laboratory, Richland, Washington.

Hall, J.A. 1989. Aspects of Forster's tern (Sterna forsteri) reproduction on cobblestone islands in southcentral Washington. Northwest Science 63:90-95.

Hall, J.A., and R.E. Fitzner. 1988. Report to the State of Washington Department of Wildlife Nongame Program Manager on Forster's tern (Sterna forsteri) nest count trends for the Hanford Reach and adjacent areas.

Hands H., Drobney R., Ryan M.. 1989. Status of the Loggerhead Shrike in the Northcentral United States Prepared for the U.S. Fish and Wildlife Service, Twin Cities, Minnesota.

Hanson, W.C. and L.L. Eberhardt. 1971. *A Columbia River Canada goose population, 1950-1970.* Wildlife Monograph No. 28.

Hill, Randall. 1992. Refuge Biologist. Columbia National Wildlife Refuge, U.S. Fish and Wildlife Service, Othello, Washington. Personal communication.

Hitchcock, C.L., A. Cronquist, M. Ownbey & J.W. Thompson. 1964. Vascular Plants of the Pacific Northwest, Parts 1-4. University of Washington Press, Seattle.

Hitchcock, C.L. & A. Cronquist. 1973. Flora of the Pacific Northwest: an Illustrated Manual. University of Washington Press, Seattle.

IACOR. 1990. Washington Outdoors: Assessment and Policy Plan, 1990-1995, An Element of Washington's Statewide Comprehensive Outdoor Recreation Planning (SCORP) Program. Interagency Committee for Outdoor Recreation, Tumwater, Washington.

Jaquish, R.J., and R. W. Bryce. 1989. Hanford Site Environmental Report for Calendar Year 1989. PNL-6825, Pacific Northwest Laboratory, Richland, Washington.

Kathren, R.L. 1991. Radioactivity in the Environment. Harwood Academic Publishers, Philadelphia. 397pp.

Kent, R.D. 1989. Letter to the National Park Service, Seattle, Washington dated November 27, 1989.

Kerwin, John. 1991. Statewide Hatchery Coordinator, Washington Department of Wildlife. Olympia, Washington.

Kimball, Mark. 1991. Fisheries Biologist, Washington Department of Fisheries. Olympia, Washington.

Leonhart, L.S., 1979. Surface Hydrologic Investigations of the Columbia Plateau Region, Washington, RHO-BWI-ST-6, Rockwell Hanford Operations, Richland, Washington.

Landeen, D. S., M. R. Sackschewsky, and S. G. Weiss. 1993 (Draft). 100 Area CERCLA Ecological Investigations. WHC-EP-0620. Westinghouse Hanford Company, Richland, Washington.

Linehan, D. 1991. Refuge Manager. McNary National Wildlife Refuge, Burbank, Washington. Personal communication, 1991.

Marratt, W.J. December 1988. Study of landslides along the Columbia River in the block 15 area of Franklin County, Washington. Franklin Conservation District, Pasco, Washington.

Mastrogiuseppe, J. 1991. Wetland rare plant survey, Priest Rapids Reservoir: for proposed expansion of Priest Rapids Dam. Survey Report for Grant County Public Utilities District, Washington.

Mastrogiuseppe, J. 1988. *Astragalus columbianus* in McCoy Canyon, Benton County, Washington. Unpublished report to the U.S. Bureau of Land Management, Spokane, Washington.

Mastrogiuseppe, J. and S. Gill. 1987. *Astragalus columbianus* Barneby. Unpublished report to Battelle Pacific Northwest Laboratory, Richland, Washington. 1987 study, 30 pp.

McCorquodale, S.M., K.J. Raedeke, and R.D. Tabor. 1986. *Elk habitat use patterns in the shrub-steppe of Washington*. Journal of Wildlife Management. 50-664:669.

McIntosh, J. 1991. Wildlife Agent. Washington Department of Wildlife, Region 3, Yakima, Washington. Personal communication, 1991.

Meffe, G.K. 1992. Techno-arrogance and halfway technologies: salmon hatcheries on the Pacific coast of North America. Conservation Biology 6:350-354.

Miller, A. 1993. U.S. Fish and Wildlife Service, National Fisheries Research Center, Columbia River Field Station, Cook, Washington. Personal communication.

Mills, M.E. 1991. Compliance Manager. Energy Facility Site Evaluation Council, State of Washington, Lacey, Washington. Personal communication.

9513388.2708

Montgomery, J.C., D.H. Fickeisen, and C.D. Becker. 1980. *Factors influencing smallmouth bass production in the Hanford area, Columbia River.* Northwest Science. 54:296-305.

Murphy P.J., and G.D. Johnpeer, 1981. An Assessment of Geothermal Resource Potential, Pasco Basin and Vicinity, Washington, RHO-BW-CR-128 P, Ertec Western Inc., for Rockwell Hanford Operations, Richland, Washington.

National Environmental Policy Act of 1969, Title 42 USC 4321, approved January 1, 1970.

National Historic Preservation Act, Title 16 USC 470, October 15, 1966.

National Marine Fisheries Service. 1989. Review of 1988 ocean salmon fisheries. Pacific Fishery Management Council. Funded by National Marine Fisheries Service, Portland, Oregon.

Netboy, A. 1980. The Columbia River salmon and steelhead trout, their fight for survival. University of Washington Press, Seattle, Washington.

Northwest Power Planning Council. February, 1987. Columbia River Basin fish and wildlife program. Northwest Power Planning Council, Portland, Oregon.

Noxious Weed Control Board of Grant County, Washington. Letter to National Park Service on the Hanford Reach draft EIS, 10/5/92.

Payne, M.F., and G.P. Munger, J.W. Matthews, and R.D. Tabor. 1975. Inventory of vegetation and wildlife in riparian and other habitats along the upper Columbia River. Volume 4A, College of Forest Resources, University of Washington, Seattle, Washington.

Parker, P.L., and King, T.F. 1990. Guidelines for Evaluating and Documenting Traditional Cultural Properties. National Register Bulletin No. 38, U.S. Department of the Interior, National Park Service, Interagency Resources Division.

Peterson, R. E., and Johnson, V. E.. 1992. Riverbank Seepage of Groundwater along the 100 Areas Shoreline, Hanford Site. WHC-EP-0609. Westinghouse Hanford Company, Richland, Washington.

Price, K.R. 1986. Environmental Monitoring at Hanford for 1985, PNL-5817, Pacific Northwest Laboratory, Richland, Washington.

Public Law 100-605, Study of the Hanford Reach of the Columbia River, 102 Stat. 3043, November 4, 1988.

Radke, W.R. 1991. Wildlife Biologist, U.S. Fish and Wildlife Service. Columbia National Wildlife Refuge, Othello, Washington. Personal communication.

Reiman, R. T., and T. S. Dahlstrom. 1990. An Aerial Radiological Survey of the Hanford Site and Surrounding Area, Richland, Washington, EGG-10617-1062, EGG&G Energy Measurements, Las Vegas, Nevada.

Rice, D. 1980. Cultural Resources Assessment of the Hanford Reach of the Columbia River, State of Washington.Prepared for the U.S. Army Corps of Engineers, Seattle, Washington.

Rickard, W.H. 1991-1992. Senior Research Scientist. Pacific Northwest Laboratory, Battelle Memorial Institute, Richland, Washington. Personal communication.

Rickard, W.H., W.C. Hanson and R.E. Fitzner. 1982. *The non-fisheries biological resources of the Hanford Reach of the Columbia River.* Northwest Science. 56: 62-76.

Rickard, W.H. and L.D. Poole. 1989. *Terrestrial wildlife of the Hanford site: past and future*. Northwest Science. 63:183-193.

Rickard, W.H., L.E. Rogers, B.E. Vaughan, and S.F. Liebetrau (eds.). 1988 Shrub-steppe, balance and change in a semi-terrestrial ecosystem. Elseuier Science Publishers, New York.

Ritchie, David. 1991. Director of Planning. Franklin County Planning Department, Pasco, Washington. Personal communication.

Roler, Ron. 1991. Fisheries Biologist. Washington Department of Fisheries, Olympia, Washington. Personal communication.

Rondorf, Dennis. 1990. Fishery Research Biologist. U.S. Fish and Wildlife National Fishery Research Center, Cook, Washington. Personal communication.

Sackschewsky, M.R., D.S. Landeen, J.L. Downs, W.H. Rickard, and G.I. Baird. 1992. Vascular Plants of the Hanford Site. Westinghouse Hanford Co. for U.S. Department of Energy, Office of Environmental Restoration and Waste Management.

SAI/PMX/DC. 1979. Aquatic and Wildlife Resources of the Hanford Reach of the Columbia River with Particular Emphasis upon the Impact of Water Resource Development. Prepared for the U.S. Army Corps of Engineers, Seattle District, Seattle, Washington by SAI/PMX/DC, Bellevue, Washington.

Sauer, R.H. and J.E. Leder. 1985. *The status of Persistentsepal Yellowcress in Washington.* Northwest Science. 59:198-203.

Scott, W.B. and E.J. Crossman. 1973. *Freshwater fishes of Canada.* Fisheries Research Board of Canada. Bulletin 184. Ottawa, Canada.

Schuster, R.L., A.F. Chleborad, and W.H. Hays. 1987. *Irrigation-Induced Landslides in Fluvial-Lacustrine Sediments, South-Central Washington State*. ANZ-Slide 87, Fifth International Conference and Field Workshop on Landslides. pp. 147-156.

Snodgrass. 1904. *A list of land birds from central and southeast Washington*. Auk. 21:223-233.

Sprague, M. 1991. Range Conservationist, U.S. Department of Agriculture, Soil Conservation Service. Letter to National Park Service, Seattle, Washington dated January 15, 1991.

9513388.2709

State v. Miller, 102 Wash. 2nd 678, 682 Pacific 2nd 81 (1984).

Steiger, W.D. Jr. and J.T. Flinders. 1980. *Mortality and movements of mule deer fawns in Washington*. Journal of Wildlife Management. 44:381-388.

Swan, G.A., E.M. Dawley, R.D. Ledgerwood, W.T. Norman, W.F. Cobb, D.T. Hartman. 1988. Distribution and relative abundance of deep-water redds for spawning fall chinook salmon at selected study sites in the Hanford Reach of the Columbia River. Final Report to the U.S. Army Corps of Engineers, Seattle District, Seattle, Washington by the National Marine Fisheries Service, Seattle, Washington.

Swindell, Edward G. Jr. 1942. Report on source, nature, and extent of the fishing, hunting and miscellaneous related rights of certain Indian tribes in Washington and Oregon together with affidavits showing location of a number of usual and accustomed fishing grounds and stations. U.S. Department of the Interior, Office of Indian Affairs, Los Angeles, California.

Tabor, J., B. Thompson, C. Turner, R. Stocker, C. Detrick, and J. Howerton. 1980. Study of impacts of project modification and river regulation on riparian habitats and associated wildlife along the Columbia River. Prepared for the U.S. Army Corps of Engineers, Seattle, Washington by the Washington State Department of Game, Olympia, Washington.

Thompson, B.C., and J.E. Tabor. 1981. Nesting populations and breeding chronologies of gulls, terns, and herons on the upper Columbia River, Oregon and Washington. Northwest Science 55: 209-218.

Thompson, Michael. 1992. Hydrologist. U.S. Department of Energy, Richland Field Office, Richland, Washington. Personal communication.

U.S. v. Hicks, 587 F. Supp. 1162 (W.D. Wash. 1984).

U.S. Army Corps of Engineers. 1976. Inventory of riparian habitats and associated wildlife along Columbia and Snake Rivers. Vol.1, John L. McKern, Fish and Wildlife Biologist, Walla Walla District, U.S. Army Corps of Engineers, Vol 4a, 4b, College of Forest Resources, University of Washington, Seattle, Washington. Sponsored by the U.S. Army Corps of Engineers, Pacific Northwest Division.

U.S. Army Corps of Engineers. 1981. Impacts of Ben Franklin Dam, Hanford Reach study report. U.S. Army Corps of Engineers, Seattle District, Seattle, Washington.

U.S. Army Corps of Engineers. 1979. The Effects of the Ben Franklin Dam on the Hanford Site. U.S. Army Corps of Engineers, Seattle District, Seattle, Washington.

U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service. 1989. *Crops grown within one-quarter mile of the Hanford Reach study area.* Pasco, Washington.

U.S. Department of Agriculture, Soil Conservation Service. 1984. Soil Survey of Grant County Washington. Soil Conservation Service in cooperation with Washington State University, Agricultural Research Center. Soil Conservation Service and/or Cooperative Extension, Grant County, Washington.

U.S. Department of the Army. November, 1990. Final environmental impact statement Yakima Firing Center proposed land acquisition, Yakima Firing Center, Washington. Department of the Army, I Corps and Fort Lewis, Fort Lewis, Washington.

U.S. Department of Commerce. 1990. Local Area Personal Income 1983-1988 Volume 5, Far West Region, Alaska, and Hawaii, Bureau of Economic Analysis for the U.S. Department of Commerce, 1990.

U.S. Department of Energy, Richland Field Office (RL). 1992. Sampling and Analysis of 100 Area Springs, DOE/RL-92-12, Revision 1, Department of Energy, Richland, Washington.

U.S. Department of Energy, Richland Field Office (RL). 1992. Columbia River Impact Evaluation Plan. DOE/RL-92-28, Revision 0, Department of Energy, Richland, Washington.

U.S. Department of Energy, Richland Field Office (RL). 1992. "The Future for Hanford: Uses and Cleanup". Summary of the final report of the Hanford Future Site Uses Working Group. Westinghouse Hanford, Richland, Washington. December, 1992.

U.S. Department of Energy. 1982. Site Characterization Report for the Basalt Waste Isolation Project, DOE/RL 82-3, 3 Vols., Rockwell Hanford Operation for the U.S. Department of Energy, Washington, D.C.

U.S. Department of Energy, 1979. The Effects of the Ben Franklin Dam on the Hanford Site, prepared for the U.S. Department of Energy by Battelle, Pacific Northwest Laboratories, Richland, Washington.

U.S. Department of the Interior, National Park Service, 1990. Criteria for Parklands. G.P.O. document #1990-262-100/00214.

U.S. Fish and Wildlife Service. March, 1988. Planning Aid Report for the Mid-Columbia Navigation Project. U.S. Fish and Wildlife Service, Olympia, Washington, unpublished study.

U.S. Fish and Wildlife Service. May, 1980. Important fish and wildlife habitat of Washington -- An inventory. U.S. Fish and Wildlife Service, Portland, Oregon.

U.S. Fish and Wildlife Service. August, 1979. Fact Sheet on the Pygmy Rabbit. Prepared by Tracy Lloyd, U. S. Fish and Wildlife Service, Ephrata, Washington.

U.S. Fish and Wildlife Service, Umatilla National Wildlife Refuge, Umatilla, Oregon, unpublished study.

U.S. Fish and Wildlife Service, Columbia National Wildlife Refuge, Othello, Washington, unpublished study.

Walters, W. H., Dirkes, R. L., Napier, B. A. 1992. Literature and Data Review for the Surface Water Pathway: Columbia River and Adjacent Coastal Areas. PNLWD-2034 HEDR, UC70, Pacific Northwest Laboratories, Richland, Washington.

Washington Administrative Code 173-201A. Water Quality Standards for Surface Waters of the State of Washington, Olympia, Washington. December 26, 1992.

9513388.2710

Washington Natural Heritage Program. 1987. Endangered, threatened, and sensitive vascular plants of Washington. Washington State Department of Natural Resources. Olympia, Washington.

Washington Natural Heritage Program Data System. 1989. Plant species of concern, Hanford Reach, Columbia River, Washington. Extracts from the California, Idaho and Oregon databases. Washington State Department of Natural Resources. Olympia, Washington.

Washington State Department of Ecology. 1993. Hanford Land Transfer Report. Prepared by the Washington State Department of Ecology, Olympia, Washington.

Washington State Department of Energy. 1985. Pacific Northwest Rivers Study: Washington. Prepared for the Bonneville Power Administration, Portland, Oregon by Washington State Department of Energy, Olympia, Washington.

Washington State Department of Fisheries. 1989b. Hanford Reach fall chinook sport catch, 1985-1989 and Hanford Reach sampling, catch and effort statistics for fall chinook fishery, 1985-1989. Letter dated 12/28/89 from Columbia River Fisheries Laboratory, Washington State Department of Fisheries. Battle Ground, Washington.

Washington State Department of Fisheries. 1987. Scoping comments: Middle Columbia River Navigation (MCRN) Study. Letter dated 2/19/87 from Duane E. Phinney, Chief of the Habitat Management Division, Washington State Department of Fisheries. Olympia, Washington.

Washington State Department of Licensing. Vessel Registration Count by Moorage County and Length for 12/87, 12/88, 12/89, 11/90, and 12/90. Olympia, Washington.

Washington State Department of Wildlife. 1989. 1988-89 Steelhead Sport Catch Summary. Washington State Department of Wildlife. Olympia, Washington.

Washington State Office of Financial Management. 1990. 1990 Population Trends for Washington State. Forecasting Division, Washington State Office of Financial Management. Olympia, Washington.

Watson, D.G. 1970. Fall chinook salmon spawning in the Columbia River near Hanford 1947-1969. Battelle, Pacific Northwest Laboratories, Richland, Washington.

Watson, D.G. 1976. Temporal and spatial fall chinook salmon redd distribution near Hanford, 1967-1976. Battelle, Pacific Northwest Laboratories, Richland, Washington.

Watson, J. 1989. Area Extension Agent. Cooperative Extension, Washington State University, Benton County. Prosser, Washington. Personal communication.

Warren, J.L. 1980. Vegetation maps of the Hanford Reach, Columbia River. Prepared for the U.S. Army Corps of Engineers, Seattle District, Seattle, Washington by Battelle Pacific Northwest Laboratory, Richland, Washington.

Weed, Cliff. 1992. Program Manager of Compliance. Washington State Department of Agriculture, Olympia, Washington. Personal communication.

Whitelatch, R.C. 1990. Cooperative Extension, Washington State University, Benton County. Prosser, Washington. Personal communication.

Woodruff, R. K., R. W. Hanf and R. E. Lundgren. 1992. Hanford Site Environmental Report for Calendar Year 1991. PNL-8148, Pacific Northwest Laboratory, Richland, Washington.

Woodruff, R. K., R. W. Hanf, . G. Hefty, and R. E. Lundgren. 1991. Hanford Site Environmental Report for Calendar Year 1990, PNL-7930, Pacific Northwest Laboratory, Richland, Washington.
WPPSS, 1981. Final Safety Analysis Report, WPPSS Nuclear Project No. 2, Amendment 18, Washington Public Power Supply System.

Wydoski, R.S. and R.R. Whitney. 1979. Inland fishes of Washington. University of Washington Press, Seattle, Washington.

Public Law 100-605
100th Congress

An Act

To authorize a study of the Hanford Reach of the Columbia River, and for other purposes.

Nov. 4, 1988
[H.R. 3614]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. COMPREHENSIVE RIVER CONSERVATION STUDY.

The Secretary of the Interior ("Secretary"), in consultation with the Secretary of Energy, shall prepare a comprehensive river conservation study for that segment of the Columbia River extending from one mile below Priest Rapids Dam downstream approximately fifty-one miles to the McNary Pool north of Richland, Washington, as generally depicted on the map entitled "Proposed Columbia River Wild and Scenic River Boundary" dated May 17, 1988, hereinafter referred to as the "study area" which is on file with the United States Department of the Interior. The study shall identify and evaluate the outstanding features of the study area and its immediate environment, including fish and wildlife, geologic, scenic, recreational, natural, historical, and cultural values, and examine alternatives for their preservation. In examining alternatives means for the preservation of such values, the Secretary shall, among other things, consider the potential addition of all or a portion of the study area to the National Wild and Scenic Rivers System, and recommend a preferred alternative for the protection and preservation of the values identified. The Secretary shall cooperate and consult with the State and political subdivisions thereof, local, and tribal governments, and other interested entities in preparation of such a study and provide for public comment. The study shall be completed and presented to Congress within three years after the date of enactment of this Act.

Washington.

State and local governments.

SEC. 2. INTERIM PROTECTION.

(a) For a period of eight years after the enactment of this Act, within the study area identified in section 1 of this Act:

(1) No Federal agency may construct any dam, channel, or navigation project.

(2) All other new Federal and non-Federal projects and activities shall, to the greatest extent practicable:

(A) be planned, designed, located and constructed to minimize direct and adverse effects on the values for which the river is under study; and

(B) utilize existing structures and facilities including, but not limited to, pipes, pipelines, transmission towers, water conduits, powerhouses, and reservoirs to accomplish the purposes of the project or activity.

(3) Federal and non-Federal entities planning new projects or activities in the study area shall consult and coordinate with the Secretary to minimize and provide mitigation for any direct and adverse effects on the values for which the river is under study.

(4) Upon receiving notice from the entity planning the new project or activity, the Secretary shall, no later than ninety days after receiving such notice and consulting with the entity:

(A) review the proposed project or activity and make a determination as to whether there will be a direct and adverse effect on the values for which the river segment is under study; and

(B) review proposals to mitigate such effects and make such recommendations for mitigation as he deems necessary.

(5) If the Secretary determines that there will be a direct and adverse effect that has not been adequately mitigated, he shall notify the sponsoring entity and the Committee on Interior and Insular Affairs of the United States House of Representatives and the Committee on Energy and Natural Resources of the United States Senate of his determination and any proposed recommendations..

(b) During the eight year interim protection period, provided by this section, all existing projects that affect the study area shall be operated and maintained to minimize any direct and adverse effects on the values for which the river is under study, taking into account any existing and relevant license, permit, or agreement affecting the project.

SEC. 3. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated not more than $150,000 for the purpose of conducting the study pursuant to section 1 of this Act.

Approved November 4, 1988.

LEGISLATIVE HISTORY—H.R. 3614:

HOUSE REPORTS: No. 100-960 (Comm. on Interior and Insular Affairs).
CONGRESSIONAL RECORD, Vol. 134 (1988):
Sept. 26, considered and passed House.
Oct. 12, considered and passed Senate, amended.
Oct. 19, House concurred in Senate amendment.

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C. Study Task Force

Federal Representatives

Ann Aldrich - Bureau of Land Management
David Goeke - Saddle Mountain National Wildlife Refuge
Bill Gray - Bureau of Reclamation
Nicholas Iadanza - National Marine Fisheries Service
John Malek - Environmental Protection Agency
David Rice - Army Corps of Engineers

State Representatives

Roger Dovel - Washington Department of Natural Resources
Lisa Fitzner - Washington State Department of Wildlife
David Geist - Washington State Department of Fisheries
Doug Pineo - Washington Department of Ecology
Mark Sheehan - Washington State Department of Natural Resources
Steve Starlund - Washington State Parks and Recreation Commission
Steve Tilley - Washington State Department of Natural Resources
Robert Whitlam - Washington State Office of Archaeology and Historic Preservation

Local Representatives

Gary Chandler- Grant County Commissioners
Robert Drake - Benton County Commissioners
Merle Gibbens - Grand Coulee Project Hydroelectric Authority
Ed Hendler - City of Pasco
David Osborn - Grant County Public Utility District
Bob Leedy - Department of Community Development
Hal Lindberg - Port of Benton
Harold Mathews - Franklin County Commissioners
Jeff Rolph - Department of Community Development
Carl VanHoff - Washington Public Power Supply System
Rick White - City of Kennewick
Sue Miller - Congressman Sid Morrison

Indian Representatives

Lonora Buck - Wanapum Indians
Jim Heffernan - Columbia River Inter-Tribal Fish Commission
Clifford Moses - Yakama Indian Nation Tribal Council
Larry Wasserman - Yakama Indian Nation

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Private Landowner Representatives

Erick Hanson - Sagemoor Farms
Tiny Huntzinger - Ringold Ranch
David MacHugh
Simon Martinez - Martinez Farms
Mel McInturf - Ringold Grange
Neal Sparks - Rio Vista Farms
Bob Whitelach - Franklin County Farm Bureau

Organization Representatives
Karen Anderson - Washington Rivers Coalition
Jeb Baldi - Northwest Rivers Council
Jay Lavendar - Washington State Sportsmens Council
Rick Leaumont - Lower Columbia Basin Audubon Society
Kim Simmons - Mid-Columbia Archaeology Society
Laura Smith - The Nature Conservancy
Richard Steele - Columbia River Conservation League
Dick Watts - Federation of Fly Fishers

D. Reference Sites within the Study Area

National Environmental Research Park

The 570-square mile Hanford Site was designated as a National Environmental Research Park (NERP) in November 1976, pursuant to a Memorandum of Understanding between the Energy Research and Development Agency (ERDA), the Environmental Protection Agency and the Federal Energy Administration (now known as the Federal Energy Regulatory Commission) (DOE 1985) (Map #8). The purpose of a NERP is to study the environmental impacts of energy developments, and to inform the public of the environmental and land use options open to them (ERDA 1976 - Charter for NERPs). Specifically, NERPs have three general objectives: 1) to develop methods to quantitatively and continuously assess and monitor the environmental impact of human activities; 2) to devlop methods to estimate or predict the environmental response to proposed and ongoing activities; and 3) to demonstrate the impact of various activities on the environment and evaluate methods to minimize adverse impacts.

The Hanford Site is one of five DOE sites designated as a NERP. The types of research occurring on the Hanford NERP include biotic transport processes, the dynamics of arid land ecosystems, mineral cycling processes, designs for environmental field studies, dynamics of wild populations, and remote sensing studies. The long-term trend data that is being collected and analyzed include 40 years of censusing of chinook salmon redds, 35 years of nesting Canada geese, 17 years of wintering bald eagles, and 22 years of darkling beetles (n.d. Department of Energy).

Much of the research occurs on the Arid Land Ecology Reserve (ALE), an 120 square mile area established in 1968 to provide a protected area for long-term ecological studies. The reserve is entirely fenced and patrolled to minimize illegal trespass and stray animals.

Saddle Mountain National Wildlife Refuge

The Saddle Mountain National Wildlife Refuge is approximately 30,200 acres and is administered by the U.S. Fish and Wildlife Service (USFWS) (Map #8). The Saddle Mountain National Wildlife Refuge was created November 30, 1971 pursuant to a permit agreement between the U. S. Atomic Energy Commission (now Department of Energy), U. S. Bureau of Sport Fisheries and Wildlife (now U.S. Fish and Wildlife Service), and the Washington Department of Wildlife. The permit allows the USFWS to implement its respective programs involving wildlife management and prohibits public access to the National Wildlife Refuge.

The land affected by the 1971 Permit remains subject to the Bureau of Reclamation's (BR) management objectives relating to the construction, operation, and maintenance of the Wahluke Canal and related facilities and structures pursuant to a February 27, 1957 Memorandum of Agreement between the BR and U.S. Atomic Energy Commission. Full and free access to the wildlife areas by the Deparatment of Energy, Bureau of Reclamation, and their contractors was permitted to continue. Additionally, the permittees were authorized to establish and maintain a range management program to allow for cattle grazing.

Wahluke State Wildlife Recreation Area

The Wahluke State Wildlife Recreation Area is approximately 55,000 acres and is administered by the Washington Department of Wildlife (WDW) (Map #8). The Wahluke State Wildlife Recreation Area was created in November 30, 1971 pursuant to a permit agreement between the U. S. Atomic Energy Commission (now Department of Energy), U. S. Bureau of Sport Fisheries and Wildlife (now U.S. Fish and Wildlife Service), and the Washington Department of Wildlife (MAp #8). The permit allows the WDW to implement its respective program involving wildlife management and regulated public recreational activities. Additionally, the Permit specifically excluded a 4,000-acre area north of Ringold previously used by the BR pursuant to the Cooperative Agreement of October 31, 1962.

The 1971 agreement prohibits the WDW from allowing the public to access the eastern portion of the Recreation Area located within 5.5 miles of the 100-N Reactor. Public fishing, shotgun and bow hunting, and other recreational activities, as regulated by WDW, are permitted outside of this area during daylight hours. The 1971 permit also prohibited recreational activities from occurring on the shoreline or in the Columbia River from the Vernita Bridge downstream to the power line crossing at the old Hanford townsite. A Supplemental Agreement No. 3, dated March 18, 1987, modified this restriction by allowing the state agency to construct and maintain a public boat launching facility west of Vernita Bridge and south of State Route No. 243. Shoreline fishing was subsequently allowed in this vicinity. Administrative responsibilities were modified slightly to permit the state to manage these facilities within the boundary of the National Wildlife Refuge. Public vehicular traffic is confined to roads and WDW-designated parking areas.

McNary National Wildlife Refuge

Six islands in the Hanford Reach study area are managed as part of the McNary National Wildlife Refuge, administered by the USFWS (Map #8). The islands are closed to public access from February 1 to June 30 each year to provide protected habitat for nesting birds, especially Canada Geese and colonial nesters like Forster's Tern. Public access is permitted on five of six of the islands from July 1 to January 31, and waterfowl hunting is allowed during that time period as per the seasons established by the Washington Department of Wildlife. Island #20 has additional public access restrictions to provide for resting migratory waterfowl. This island is closed to public access from October 1 to June 30. Enforcement responsibilites are primarily the responsibility of the U.S. Fish and Wildlife Service. This agency enforces island closure regulations and other refuge management laws.

The WDW and Benton and Franklin Counties also conduct enforcement activities in the vicinity that contribute to the protection of habitat and species. The state agency patrols the area to enforce hunting and fishing regulations. The counties conduct boat patrols to enforce boating and waterskiing regulations, and to monitor for disorderly conduct.

Columbia River Islands Area of Critical Environmental Concern

There are three islands in the Hanford Reach which are administered as part of the Columbia River Islands Area of Critical Environmental Concern. Located north of the south study area boundary, the designation was established in 1982 to protect important waterfowl sightseeing opportunities and waterfowl and shorebird habitat (Bureau of Land Management 1981 - Management Framework Plan) (Map #8). These

islands collectively provide 95 acres of nesting and wintering habitat for Great Basin and lesser Canada geese and ducks. They also provide important mule deer fawning areas, staying areas for the long billed curlew (a federal candidate species), and supports at least one small population of Rorippa columbiae (a federal candidate plant species).

These islands are permanently closed to off-road vehicle use and seasonally closed to other recreational uses during nesting seasons.

The 100-acre McCoy Canyon ACEC was established in May 1987 and is located on the south shore of the Hanford Reach near the north study area boundary.

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E. Potential Designations

National Wildlife Refuge

National Wildlife Refuges are congressionally designated lands managed by the USFWS for the purpose of preserving wildlife and wild lands for public enjoyment. Establishment legislation is tailored to the specific resource needs and management goals of the site and focus efforts on specific groups of refuge resources such as endangered species, migratory birds, wetland areas, archaeological and historic resources, Wilderness Areas, and Research Natural Areas. In a broader framework, the management agency also assumes stewardship responsibilities for "non-status" refuge resources which are recognized by state resource managers for their unique qualities but have not been granted specific protection under existing federal regulations or policies.

Refuges within the National Wildlife Refuge System are consistent with a set of broad national goals: "1) to preserve, restore, and enhance in their natural ecosystems (when practicable) all species of animals and plants that are endangered or threatened with becoming endangered; 2) to perpetuate the migratory bird resource; 3) to preserve a natural diversity and abundance of fauna and flora on refuge lands; and 4) to provide an understanding and appreciation of fish and wildlife ecology and man's role in his environment, and to provide refuge visitors with high quality, safe, wholesome, and enjoyable recreational experiences oriented toward wildlife to the extent these activities are compatible with the purposes for which the refuge was established" (USFWS 1982 - Refuge Manual).

National Wild and Scenic River

National Wild and Scenic Rivers are rivers or river segments set aside by Congress or the Secretary of the Interior to be preserved in their free-flowing condition. The river is or would be bordered by a narrow ribbon of land, no more than an average of 320 acres per mile, in order to protect scenic, natural, and cultural values. Public use that does not adversely affect the values for which the Wild and Scenic River was established is permitted.

National Conservation Area

A National Conservation Area is an area of the public lands managed by the Bureau of Land Management which has been established by Congress for the purpose of protecting and conserving identified resource values of national interest (it is a legislative action not an administrative one). An NCA is managed for multiple use and sustained yield in conformance with the Resource Management Plan, and in accordance with a plan which reflects dominant and compatible uses for specific tracts.

National River

National Rivers are one of two types of federal designations used by the National Park Service to protect and manage nationally significant rivers and their corridor lands. Congressional legislation is required to establish a National River designation, and the legislation for each of the designated areas has been written for the unique resources and management needs of the area.

Similar to all units of the National Park System, a National River is managed in accordance with the provisions of the August 25, 1916 act that established the National Park Service (16 USC 1). This organic act spells out the fundamental purpose of the National Park System:

> "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

It is the principles of this organic act which distinguishes the National Park Service from the other three major federal landholding agencies (USFS, BLM, and USFWS), which have their own separate organic acts to operate under.

F. National Wild and Scenic River Eligibility

National Wild and Scenic River designation is one of the options that the Secretary of the Interior is directed to investigate in the authorizing legislation for the Hanford Reach study. The following findings document the eligibility and classification stages of the Wild and Scenic River evaluation.

Eligibility

There are two criteria for eligibility for Wild and Scenic River status:

1. *The river must be "free-flowing."*

2. *The river and/or corridor must have at least one "outstandingly remarkable" resource value.*

Findings

Free-Flowing Criterion: Under the Wild and Scenic River Act (P.L. 90-542, as amended), the term free-flowing is defined as "existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway." (section 15(b)) Through its actions in designating rivers, Congress has shown that the definition allows for prior impoundments and diversions upstream and downstream of the designated segment, even if they result in modifications of the natural flow regime in the reach being considered.

While the flow within the Hanford Reach is modified by Priest Rapids Dam and other upstream facilities, the river is without impoundments, substantial diversions, and straightening within the study segment. The Hanford Reach is therefore found to be free-flowing under the definitions of the Wild and Scenic Rivers Act.

Outstandingly Remarkable Value Criterion: The Act specifies that eligible rivers must possess at least one of the following values to an "outstandingly remarkable" degree: scenic, recreational, geologic, fish and wildlife, historic, or cultural. The term "outstandingly remarkable" is not further defined, but has been interpreted to indicate resource values which are exceptional in quality or rarity in a regional or national context.

The resource assessment identified seven resources of the Hanford Reach which are nationally important by virtue of their rarity or exceptional quality. The resources are:

- Fall Chinook Salmon
- Intact Ecosystem
- American Indian Cultural Resources
- Archeological Sites
- Hydrology and Geology (for Energy Facility Siting)
- Federally Recognized Rare Plant Species
- Federally Recognized Rare Animal Species

All of these resources can be defined as "outstandingly remarkable" under the Wild and Scenic Rivers Act. These resources are described in greater detail in Chapter III, Affected Environment, beginning on page 50.

Conclusions: The Hanford Reach is found to be free-flowing and to possess at least one outstandingly remarkable value. Therefore, it is eligible for Wild and Scenic River status.

Classification

Three classifications are possible for rivers in the Wild and Scenic Rivers System: wild, scenic, and recreational. The terms indicate the degree of land use development along the river at the time of the evaluation and also serve as a prescription for future management.

- Wild rivers have shorelines and watersheds which are essentially primitive and are generally inaccessible except by trail. Wild river areas have little or no evidence of human activity along them.

- Scenic rivers have shorelines and watersheds which are largely primitive and shorelines which are largely undeveloped. Structures must be limited to relatively short reaches of the segment under evaluation. Scenic rivers may be accessible in places by roads.
- Recreational rivers may have a substantial amount of land use development along their shorelines and within their watersheds and may be readily accessible by roads. Unlike other classifications, recreational rivers may have a wide variety of timber and agricultural activities along them.

The classification process consists of an evaluation of the type and extent of development and access along the river and corridor. On-site visits, maps, and aerial photography are commonly used for the evaluation. The evaluation focusses on conditions within the study area, although adjacent land uses may be considered if they have a direct impact on the character of the river and corridor. The river may be segmented, with each segment separately classified.

Findings

The classification of the Hanford Reach study area was investigated in numerous site visits on and along the river and through evaluation of maps and aerial photographs.

Type and Extent of Access: The Columbia River is bridged only once in the Hanford Reach, and few improved roads are evident from the river. There are three improved boat launch areas, each of which has a parking lot and access road. In addition, there are roads to each of the reactors and to their attendant facilities, such as intakes and discharges, within the 100 area.

Type and Extent of Development: In terms of the extent of development, the Hanford Reach is notable for the low density of development within the corridor. Structures are widely-spaced along the river. They are also fairly evenly spaced, with no segment having a disproportionately high or low density of development.

However, the large scale of structures such as the eight deactivated reactor buildings, the six powerline crossings, and the Vernita Bridge makes them evident even at some distance upstream and downstream. Additional facilities beyond the study area, such as the WPPSS reactors and the structures in the 300 area of

the Hanford Site, are equally apparent from the river. The evidence of these facilities discounts their widely-spaced placement along the river.

Conclusions: The governing factor in classification of the Hanford Reach must be the evidence of human use and activity along the river. Despite the low density of development and access, the size of the facilities which are present and the topographic characteristics of the corridor make the existing development highly evident to the visitor. The even distribution of these facilities prevents segmentation. For this reason, the proper classification for the entire study area is **recreational**. This is the least restrictive in terms of future management of Wild and Scenic River designation along the river.

G. National River Eligibility

National River designation is one of the options investigated in the Hanford Reach study. A National River is a unit of the National Park System, and therefore, the Hanford Reach must be considered eligible for inclusion into the National Park System before designation. The following findings document the eligibility of the Hanford Reach to be a unit of the National Park System.

Eligibility

The Criteria for Parklands (Department of the Interior, National Park Service, 1990) defines three criteria which must be met to qualify an area for inclusion in the National Park System:

1. The area must "possess nationally significant natural, cultural, or recreational resources."

2. The area must "be a suitable and feasible addition to the National Park System."

3. The area must "require direct National Park Service management instead of alternative protection by other agencies or the private sector."

Findings

Determination of National Significance:
In order for the Hanford Reach to be considered nationally significant, it must meet all of the following criteria:

A) *Be considered an outstanding example of a particular type of resource.* The Hanford Reach is the last free-flowing segment of the Columbia River and maintains habitat for the fall chinook salmon, one of the few wild stocks that is thriving in the Columbia River system. The variety and quality of biodiversity in the area is unparalleled elsewhere on the Columbia River.

B) *It must possess exceptional value or quality in illustrating or interpreting the natural or cultural themes of our Nation's heritage.* The Hanford Reach has been recognized for the density of historically significant sites, which include 2 National Register sites, 5 archeological districts, and 122 prehistoric archaeological sites. These sites represent Native American and early settlers in the Hanford Reach.

C) *It must offer superlative opportunities for recreation, for public use and enjoyment, or for scientific study.* The Hanford Reach provides a variety of exceptional recreational opportunities ranging from flatwater boating, fishing, and hunting to nonconsumptive activities such as nature observation and hiking. It is also considered one of the most significant fishing destinations because of the prized Upriver Bright Fall Chinook Salmon. The Hanford Reach also provides extensive opportunities for scientific study, specifically cultural resources and natural resources.

D) *It retains a high degree of integrity as a true, accurate, and relatively unspoiled example of the resource.* Because the Hanford Reach is the last unimpounded segment of the Columbia River and because the Hanford Site has been generally closed to public access since 1943, the topographic and geographic relationships of the sites are still intact. That this river segment has been strictly controlled for the past 45 years has contributed to the unique quality of preservation and geographic context that cannot be duplicated.

Suitability and Feasibility Criterion:

Suitability

To be suitable for inclusion in the National Park System, an area "must represent a natural or cultural theme or type of recreational resource that is not already adequately represented in the National Park System or is not comparably represented and protected for public enjoyment by another land-managing entity. Adequacy of representation is determined on a case-by-case basis by comparing the proposed area to other areas in the National Park System for differences or similarities in the character, quality, quantity, or combination of resources, and opportunities for public enjoyment.". The Hanford Reach represents a number of cultural and natural history themes identified as significant by the National Park Service. The following summarizes some themes relevant to the Hanford Reach.

A) Natural History

1. Landforms of the Present -- River Systems and Lakes
The Hanford Reach is significant because it is the last free-flowing segment of the Columbia River. The Reach also contains an intact ecosystem unparalleled elsewhere on the Columbia River due to years of restrictions on public access, and the lack of water resource development projects which tend to alter river hydraulics.

2. Land Ecosystems -- Grassland (steppe)
Much of the shrupsteppe habitat that once dominated the Columbia Basin has been lost or disturbed by agriculture. The restrictions on public access from the Hanford Site have largely preserved this habitat within the Hanford Reach study area.

B) Cultural Resources

1. The Original Inhabitants
The Hanford Reach study area includes areas which are the traditional and continuing homeland of several Native American tribes and historic features of the Euroamerican pioneers. Important cultural resources include ancestral cemeteries or burial grounds, usual and accustomed fishing sites, sites for current practice of traditional Indian religion, anadromous fisheries, subsistence and medicinal plants, Euroamerican homesteads and ranches, historic roadways, steamboat navigation and landings, and remnants of historic settlements.

None of these resources are present in the National Park System currently. Furthermore, they are not available for public enjoyment and education. While they could be made available by the U.S. Department of Energy, U.S. Fish and Wildlife Service, or the Bureau of Land Management, the National Park Service has the clearest mandate within the Federal Government for natural and cultural resource preservation and for presenting it to the public for enjoyment.

Feasibility

Feasibility is defined as being of "sufficient size and appropriate configuration to ensure long-term protection of the resources and to accommodate public use". The Hanford Reach study area consists of over 130 square miles and approximately 51 miles of river, already in federal ownership. Land managing responsibility would be transferred to the National Park Service, no land acquisition costs would be incurred. The enabling legislation would prohibit dams and dredging and the National Park Service management would provide long-term protection of the natural and cultural resources of the Hanford Reach.

Conclusions: In evaluating the cultural, natural and recreational resources of the Hanford Reach, it appears that they meet the criteria for national significance. Therefore, the Hanford Reach is considered suitable and feasible as an addition to the National Park System.

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H. Endangered, Threatened, Sensitive, & Candidate Species

Federal:

ENDANGERED

Birds

Peregrine falcon	Falco peregrinus

THREATENED

Birds

Bald eagle	Haliaeetus leucocephalus

SENSITIVE

Birds

American white pelican	Pelecanus erythrorohynchus
Trumpeter swan	Cygnus buccinator
Common loon	Gavia immer
Sandhill crane	Grus canadensis
Lewis' woodpecker	Melanerpes lewis
Swainson's Hawk	Buteo swainsoni

CANDIDATE

Birds

Ferruginous hawk	Buteo regalis
Western sage grouse	Centrocercus urophasianus
Loggerhead shrike	Lanius ludovicianus

Mammals

Pygmy rabbit	Brachylagus idahoensis

Plants

Persistantsepal yellowcress	Rorippa columbiae
Columbia milkvetch	Astragalus columbianus

Invertebrates

Columbia pebblesnail (formerly great Columbia River Spire Snail)	Lithoglyphus columbiana

Source: U.S. Fish and Wildlife Service, Olympia, Washington, 1993

State:

ENDANGERED

Birds

American white pelican	Pelecanus erythrorohynchus
Peregrine falcon	Falco peregrinus
Sandhill crane	Grus canadensis

Mammals

Pygmy rabbit	Brachylagus idahoensis
Merriam's shrew	Sorex merriami
Pallid bat	Antrozous pallidus
Sagebrush vole	Lagurus curtatus

Plants

Persistantsepal yellowcress	Rorippa columbiae

THREATENED

Birds

Bald eagle	Haliaeetus leucocephalus
Ferruginous hawk	Buteo regalis

Plants

Columbia milkvetch	Astragalus columbianus

SENSITIVE

Birds

Black crowned night heron	Nycticorax nycticorax
Horned grebe	Podiceps aurtitus
Red-necked grebe	Podiceps grisegena
Western grebe	Aechmophorus occidentalis
Clark's grebe	Aechmophorus clarkii
Trumpeter swan	Cygnus buccinator
Osprey	Pandion haliaetus
Black-necked stilt	Himantopus mexicanus
Caspian tern	Sterna caspia
Arctic tern	Sterna paradisaea
Black tern	Chilidonias niger
Great blue heron	Ardea herodias
Common loon	Gavia immer
Great egret	Casmerodius albus
Forster's tern	Sterna forsteri

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Prairie falcon	Falco mexicanus
Turkey vulture	Cathartes aura
Northern goshawk	Accipiter gentilis
Golden eagle	Aquila chrysactos
Merlin	Falco columbarius
Gyrfalcon	Falco rusticolus
Western sage grouse	Centrocercus urophasianus
Long-billed curlew	Numenius americanus
Flammulated owl	Otus flammeolus
Snowy owl	Nyctea scandiaca
Burrowing owl	Athene cunicularia
Lewis' woodpecker	Melanerpes lewis
Grasshopper sparrow	Ammodramus savannarum
Sage sparrow	Amphispiza belli
Sage thrasher	Oreoscoptes montanus
Mammals	
Northern grasshopper mouse	Onychomys leucogaster
Long-eared myotis	Myotis evotis
Reptiles and Amphibians	
Woodhouse's toad	Bufo woodhousei
Night snake	Hypsiglena torquata
Striped whipsnake	Masticophis taeniatus
Invertebrates	
Shortface lanx (formerly giant Columbia River limpet	Lanx nuttalli
Columbia pebblesnail (formerly great Columbia River Spire Snail)	Lithoglyphus columbiana
Short-tailed black swallowtail	Papilio indra
Fish	
Mountain sucker	Catostomus platyrhynchus
Sand roller	Percopsis transmontana
Piute sculpin	Cottus beldingi
Reticulate sculpin	Cottus perplexus
Plants	
Dense sedge	Carex densa
Bristly cryptantha	Cryptantha interrupta
gray cryptantha	Cryptantha leucophaea
Shining flatsedge	Cyperus rivularis
Southern mudwort	Limosella acaulis
False pimpernel	Lindernia aragallidea
Dwarf desert primrose	Oenothera pygmaea

I. Animal and Plant Species (Partial List)

Birds

Common Name	Scientific Name
American white pelican	Pelecanus erythrorohynchus
Canada goose	Canadensis leucopareia
Mallard	Anas platyrhynchos
Pintail	Anas acuta
Green-winged teal	Anas carolinensis
Common merganser	Mergus merganser
Turkey vulture	Cathartes aura
Goshawk	Accipiter gentilis
Cooper's hawk	Accipiter cooperii
Sharp-shinned hawk	Accipiter striatus
Northern harrier	Circus cyaneus
Swainson's hawk	Buteo swainsoni
Red-Tailed hawk	Buteo jamaicensis
Rough-legged hawk	Buteo lagopus
Ferruginous hawk	Buteo regalis
Golden eagle	Aquila chrysaetos
Bald eagle	Haliaeetus leucocephalus
Osprey	Pandion haliaetus
Gyrfalcon	Falco rusticolus
Prairie falcon	Falco mexicanus
Peregrine falcon	Falco peregrinus
Merlin	Falco columbarius
American kestrel	Falco sparverius
California quail	Lophortzy californicus
Ring-Necked pheasant	Phasianus colchicus
Great blue heron	Ardea herodias
American coot	Fulica americana
Killdeer	Charadrius vociferus
Long-billed curlew	Numenius americanus
Spotted sandpiper	Actitis macularia
Common snipe	Capella gallinago
California gull	Larus californicus
Ring-billed gull	Larus delawarensis
Forster's tern	Sterna forsteri
Caspian tern	Sterna caspia
Mourning dove	Zenaida macroura
Rock dove	Columba livia
Long-eared owl	Asio otus
Screech owl	Otus asio
Flammulated owl	Otus flammeolus

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Great-horned owl	Bubo virginianus
Short-eared owl	Asio flammeus
Snowy owl	Nyctea scandiaca
Burrowing owl	Athene cunicularia
Saw-whet owl	Aegolius acadicus
Barn owl	Tyto alba
Common nighthawk	Chordeiles minor
Belted kingfisher	Megaceeryle alcyon
Northern flicker	Colaptes auratus
Eastern kingbird	Tyrannus tyrannus
Western kingbird	Tyrannus verticalis
Say's phoebe	Sayornis saya
Horned lark	Eremophila alpestris
Barn swallow	Hirundo rustica
Cliff swallow	Petrochelidon pyrrhonota
Tree swallow	Iridoprocne bicolor
Rough-winged swallow	Stelgidopteryx ruficollis
Black-billed magpie	Pica pica
Common raven	Corvus corax
American robin	Turdus migratorius
Loggerhead shrike	Lanius ludovicianus
Northern shrike	Lanius excubitor
Starling	Sturnus vulgaris
Yellow-rumped warbler	Dendroica coronata
Townsend's warbler	Dendroica townsendi
Nashville warbler	Vermivora ruficapilla
MacGillivray's warbler	Oporornis tolmiei
Wilson's warbler	Wilsonia pusilla
Western meadowlark	Sturnella neglecta
Yellow-headed blackbird	Xanthocephalus xanthocephalus
Red-winged blackbird	Agelaius phoeniceus
Brewer's blackbird	Euphagus cyanocephalus
Brown-headed cowbird	Molothrus ater
Northern oriole	Icterus galbula
Western tanager	Piranga lusdoviciana
House sparrow	Passer domesticus
Lark sparrow	Chondestes grammacus
Savannah sparrow	Passerculus sandwishensis
Sage sparrow	Amphispiza belli
Song sparrow	Melospiza melodia
Vesper sparrow	Pooecetes gramineus
White-crowned sparrow	Zonotrichia lencophrys
Golden-crowned sparrow	Zonotrichia atricapilla
Chukar	Alectoris chukar
Lazuli bunting	Passerina amoena
Western sage grouse	Centrocercus urophasianus

Yellow-breasted chat	Icteria virens
Rock wren	Salpinctes obsoletus
Canyon wren	Catherpes mexicanus
Winter wren	Troglodytes troglodytes
House wren	Troglodytes aedon
Marsh wren	Cistothorus palustris
Dark eyed junco	Junco hyemalis
Ruby-crowned kinglet	Regulus calendula
Golden-crowned kinglet	Regulus satrapa
Black-headed grosbeak	Pheucticus melanocephalus
Rufous-sided towhee	Pipilo erythrophthalmus
Willow flycatcher	Empidonax traillii
Dusky flycatcher	Empidonax oberholseri
Western wood pewee	Conotopus sordidalus
Red-eyed vireo	Vireo olivaceus
Warbling vireo	Vireo gilvus
Solitary vireo	Vireo solitarius
Varied thrush	Ixoreus naevius
Hermit thrush	Hylocichla guttata
Townsend solitaire	Myadestes townsendi
Rufous hummingbird	Selasphorus rufus

Source: U.S. Army Corps of Engineers 1980.

Amphibians and Reptiles

Common Name	Scientific Name
Amphibians:	
Great Basin spadefoot toad	Scaphiopus intermontanus
Pacific chorus frog	Pseudacris regilla (Hyla regilla)
Spotted frog	Rana pretiosa
Leopard frog	Rana pipiens
Bullfrog	Rana catesbeiana
Painted turtle	Chrysemys picta
Reptiles:	
Sagebrush lizard	Sceloporus graciosus
Side-blotched lizard	Uta stansburiana
Short-horned lizard	Phrynosoma douglassii
Striped whipsnake	Masticophis taeniatus
Racer	Coluber constrictor
Gopher snake	Pituophis melanoleucos
Western garter snake	Thamnophis elegans
Night snake	Hypsiglena torquata
Western rattlesnake	Crotalus viridis

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Western skink	Eumeces skiltonianus
Territorial woodhouse's toad	Bufo woodhousei

Source: Department of Energy 1988.

Fish

Common Name	Scientific Name
White sturgeon	Acipenser transmontanus
Bridgelop sucker	Catostomus columbianus
Largescale sucker	Catostomus macrocheilus
Mountain sucker	Catostomus platyrhynchus
Pumpkinseed	Lepomis gibbosus
Bluegill	Lepomis macrochirus
Smallmouth bass	Micropterus dolomieui
Largemouth bass	Micropterus salmoides
White crappie	Pomoxis annularis
Black crappie	Pomoxis nigromaculatus
American shad	Alosa sapidissima
Prickley sculpin	Cottus asper
Mottled sculpin	Cottus bairdi
Piute sculpin	Cottus beldingi
Reticulate sculpin	Cottus perplexus
Torrent sculpin	Cottus rotheus
Chiselmouth	Acrocheilus alutaceus
Carp	Cyprinus carpio
Peamouth	Mylocheilus caurinus
Northern squawfish	Ptychocheilus oregonensis
Longnose dace	Rhinichthys cataractae
Leopard dace	Rhinichthys falcatus
Speckled dace	Rhinichthys osculus
Redside shiner	Richardsonius balteatus
Tench	Tinca tinca
Burbot	Lota lota
Threespine stickleback	Gasterosteus aculeatus
Black bullhead	Ictalurus melas
Yellow bullhead	Ictalurus natalis
Brown bullhead	Ictalurus nebulosus
Channel catfish	Ictalurus punctatus
Yellow perch	Perca flavescens
Walleye	Stizostedion vitreum vitreum
Sand roller	Percopsis transmontana
Pacific lamprey	Entosphenue tridentatus
River lamprey	Lampetra ayresi
Lake whitefish	Coregonus clupeaformis
Coho salmon	Oncorhynchus kisutch
Sockeye salmon	Oncorhynchus nerka

Chinook salmon	Oncorhynchus tshawytscha
Mountain whitefish	Prosopium williamsoni
Cutthroat trout	Salmo clarki
Rainbow trout (steelhead)	Salmo gairdneri
Dolly Varden	Salvelinus malma

Source: Department of Energy 1988.

Mammals

Common Name	Scientific Name
Merriam's shrew	Sorex merriami
Vagrant shrew	Sorex vagrans
Little brown bat	Myotis lucifugus
Silver-haired bat	Lasionycteris noctivagans
Fringed myotis bat	Myotis thysanodes
California myotis bat	Myotis thysanodes
Small-footed myotis bat	Myotis leibii
Hairy-winged myotis bat	Myotis thysanodes
Long-eared myotis bat	Myotis evotis
Big brown bat	Eptesicus fuscus
Western pipistrelle	Pipistrellus hesperus
Pallid bat	Antrozous pallidus
Lump-nosed bat	Plecotus townsendii
Hoary bat	Lasiurus cinereus
River otter	Lutra canadensis
Raccoon	Procyon lotor
Mink	Mustela vison
Long tailed weasel	Mustela frenata
Badger	Taxidea taxis
Striped skunk	Mephitis mephitis
Coyote	Canis latrans
Bobcat	Lynx rufus
Least chipmunk	Tamias minimus
Townsend's ground squirrel	Spermophilus townsendii
Northern pocket gopher	Thomomys talpoides
Great Basin pocket mouse	Perognathus parvus
Beaver	Castor canadensis
Western harvest mouse	Reithrodontomys megalotis
Deer mouse	Peromyscus maniculatus
Northern grasshopper mouse	Onychomys leucogaster
Montana meadow mouse	Microtus montanus
Bushy-tailed woodrat	Neotoma cinerea
Montane vole	Microtus montanus
Sagebrush vole	Lagurus curtatus
Muskrat	Ondatra zibethicus

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House mouse	Mus musculus
Norway rat	Rattus norvegicus
Porcupine	Erethizon dorsatum
Jack rabbit	Lepus californicus
White-tailed jackrabbit	Lepus townsendii
Nuttall's cottontail	Sylvilagus nuttallii
Mule deer	Odocoileus hemionus
White-tailed deer	Odocoileus virginianus
Elk	Cervus elaphus

Source: Rogers and Rickard 1977, cited in Department of Energy 1988.

Prominent Shoreline/Wetland Vegetation

Common Name	Scientific Name
Woody Plants	
Silver maple	Acer saccharinum*
Mountain alder	Alnus incana var. occidentalis
Water birch	Betula occidentalis
Western virgins-bower	Clematis ligusticifolia
Columbia hawthorn	Crataegus columbiana
Russian olive	Elaeagnus angustifolia*
Rocky Mountain juniper	Juniperus scopulorum
Mulberry	Morus alba*
Silver poplar	Populus alba*
Black cottonwood	Populus trichocarpa
Chokecherry	Prunus virginiana var. melanocarpa
Peach-leaf willow	Salix amygdaloides
Sandbar willow	Salix exigua ssp. exigua
Whiplash willow	Salix lasiandra
Arroyo willow	Salix lasiolepis
Corkscrew willow	Salix matsudana cv. 'Tortuosa'*
Scouler's willow	Salix scouleriana
Smooth sumac	Rhus glabra
Poison ivy	Rhus radicans
Golden currant	Ribes aureum
Wood's rose	Rosa woodsii var. ultramontana
Himalayan blackberry	Rubus discolor*
Siberian elm	Ulmus pumila*
Perennial Forbs	
Chives	Allium schoenoprasum
Common dogbane	Apocynum cannabinum
Northern wormwood	Artemisia campestris ssp. borealis var. scouleriana
Tarragon	Artemisia dracunculus

Prairie sagebrush	Artemisia ludoviciana
Showy milkweed	Asclepias specios
Asparagus	Asparagus officinalis*
Western meadow aster	*Aster campestris*
Western marsh aster	Aster hesperius
Western mountain aster	Aster occidentalis
Douglas' aster	Aster subspicatus
Cut-leaved water parsnip	Berula erecta
Hairy golden-aster	Chrysopsis (Heterotheca) villosa
Chicory	Cichorium intybus*
Canada thistle	Cirsium arvense*
Gray thistle	Cirsium undulatum
Bull thistle	Cirsium vulgare*
Canada waterweed	Elodea canadensis
Field bindweed	Convolvulus arvensis*
Watson's willowherb	Epilobium watsonii
Field horsetail	Equisetum arvense
Common scouring-rush	Equisetum hyemale
Smooth scouring-rush	Equisetum laevigatum
Northern buckwheat	Eriogonum compositum
Blanket flower	Gaillardia aristata
Columbia River gumplant	Grindelia columbiana
Sneezeweed	Helenium autumnale
Klamath weed	Hypericum perforatum*
Silky lupine	Lupinus sericeus
Wyeth's lupine	Lupinus wyethii
Rough bugleweed	Lycopus asper
Purple loosestrife	Lythrum salicaria*
Clover fern	Marsilea vestita
Alfalfa	Medicago sativa*
Fieldmint	Mentha arvensis
Spiked water-milfoil	Myriophyllum spicatum
Common evening-primrose	Oenothera strigosa
Buckhorn plantain	Plantago lanceolata*
Common plantain	Plantago major*
Smartweed	Polygonum hydropiper*
Willow weed	Polygonum lapathifolium*
Heartweed	Polygonum persicaria
Curled pondweed	Potamogeton crispus*
Fennel-leaf pondweed	Potamogeton pectinatus
Bushy cinquefoil	Potentilla paradoxa
Shore buttercup	Ranunculus cymbalaria
Creeping buttercup	Ranunculus flammula
Celery-leaf buttercup	Ranunculus sceleratus
Watercress	Rorippa nasturtium-aquaticum*
Curly dock	Rumex crispus*

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Willow dock	Rumex salicifolius ssp. triangulivalis
Alkali groundsel	Senecio hydrophilus
Balsam groundsel	Senecio pauperculus
Meadow goldenrod	Solidago canadensis
Missouri goldenrod	Solidago missouriensis
Western goldenrod	Solidago occidentalis
Marsh sowthistle	Sonchus uliginosus*
Salt rattlepod	Swainsona salsula*
Dandelion	Taraxacum officinale*
Red clover	Trifolium pratense*
White clover	Trifolium repens*
Common cattail	Typha latifolia
Stinging nettle	Urtica dioica ssp. gracilis var. holosericea
Bracted verbena	Verbena bracteata
Blue verbena	Verbena hastata
American brooklime	Veronica americana
Water speedwell	Veronica anagallis-aquatica*

Grasses, Sedges & Rushes

Quackgrass	Agropyron repens*
Redtop bentgrass	Agrostis alba*
Interrupted bentgrass	Agrostis interrupta*
Winter bentgrass	Agrostis scabra
Red three-awn	Aristida longiseta
Slenderbeak sedge	Carex athrostachya
Douglas' sedge	Carex douglasii
Woolly sedge	Carex lanuginosa
Kellogg's sedge	Carex lenticularis
Awned flatsedge	Cyperus aristatus
Straw-colored flatsedge	Cyperus strigosus
Orchardgrass	Dactylis glomerata
Alkali saltgrass	Distichlis stricta
Large barnyardgrass	Echinochloa crusgalli
Needle spikerush	Eleocharis acicularis
Common spikerush	Eleocharis palustris
Yellow lovegrass	Eragrostis lutescens
Purple lovegrass	Eragrostis pectinacea
Tall fescue	Festuca arundinacea*
Jointed rush	Juncus articulatus
Baltic rush	Juncus balticus
Slender rush	Juncus tenuis
Torrey's rush	Juncus torreyi
Alkali muhly	Muhlenbergia asperifolia
Common witchgrass	Panicum capillare
Western witchgrass	Panicum occidentale
Reed canarygrass	Phalaris arundinacea

Common reed	Phragmites communis
Annual bluegrass	Poa annua
Canada bluegrass	Poa compressa
Fowl bluegrass	Poa palustris*
Hardstem bulrush	Scirpus acutus
Three-square bulrush	Scirpus americanus
Alkali bulrush	Scirpus maritimus
Softstem bulrush	Scirpus validus
Bristly foxtail	Setaria lutescens*

Annual & Biennial Forbs

Bassia	Bassia hyssopifolia*
Nodding beggarticks	Bidens cernua
Leafy beggarticks	Bidens frondosa
Shepherd's purse	Capsella bursa-pastoris*
Diffuse knapweed	Centaurea diffusa*
Jerusalem oak	Chenopodium botrys*
Narrowleaf collomia	Collomia linearis
Horseweed	Conyza canadensis
Columbia tickseed	Coreopsis atkinsoniana
Grass pink	Dianthus armeri*
Cotton-batting cudweed	Gnaphalium chilense
Lowland cudweed	Gnaphalium palustre
Prickly lettuce	Lactuca serriola*
Spanish clover	Lotus purshianus
White sweetclover	Melilotus alba*
Yellow sweetclover	Melilotus officinalis*
Miner's lettuce	Montia perfoliata
Small forget-me-not	Myosotis laxa
Blue forget-me-not	Myosotis micrantha*
Annual Jacob's ladder	Polemonium micranthum
Biennial cinquefoil	Potentilla biennis
Norwegian cinquefoil	Potentilla norvegica
Brook cinquefoil	Potentilla rivalis
Western yellowcress	Rorippa curvisiliqua
Marsh yellowcress	Rorippa islandica
Blunt-leaf yellowcress	Rorippa obtusa
Yellow salsify	Tragopogon dubius*
Woolly mullein	Verbascum thapsis*
Cocklebur	Xanthium strumarium*

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Prominent Upland Vegetation

Woody Plants

Big sagebrush	Artemisia tridentata
Winterfat	Ceratoides (Eurotia) lanata
Gray rabbitbrush	Chrysothamnus nauseosus
Green rabbitbrush	Chrysothamnus viscidiflorus
Slender buckwheat	Eriogonum microthecum
Rock buckwheat	Eriogonum sphaerocephalum
Spiny hopsage	Grayia (Atriplex) spinosa
Bitterbrush	Purshia tridentata
Black locust	Robina pseudoacacia*
Gray-ball sage	Salvia dorrii
Greasewood	Sarcobatus vermiculatus

Perennial Forbs

White sandverbena	Abronia mellifera
Yarrow	Achillea millefolium
Western ragweed	Ambrosia psilostachya*
Buckwheat milkvetch	Astragalus caricinus
Woolly-pod milkvetch	Astragalus purshii
Carey's balsamroot	Balsamorhiza careyana
Douglas' clusterlily	Brodiaea douglasii
Sagebrush mariposa lily	Calochortus macrocarpus
Thompson's paintbrush	Castilleja thompsonii
Hoary false-yarrow	Chaenactis douglasii
Slender hawksbeard	Crepis atrabarba
Turpentine cymopterus	Cymopterus terebinthinus
Upland larkspur	Delphinium nuttallianum
Threadleaf fleabane	Erigeron filifolius
Desert yellow-daisy	Erigeron linearis
Cushion fleabane	Erigeron poliospermus
Shaggy fleabane	Erigeron pumilus
Snow buckwheat	Eriogonum niveum
Strict buckwheat	Eriogonum strictum ssp. proliferum
Rough wallflower	Erysimum asperum
Yellow bells	Fritillaria pudica
Cusick's sunflower	Helianthus cusickii
Columbia cutleaf	Hymenopappus filifolius
Bladderpod	Lesquerella douglasii
Gray's desert-parsley	Lomatium grayi
Hoary aster	Machaeranthera canescens
Blazing-star	Mentzelia laevicaulis
Pale evening-primrose	Oenothera pallida
Prickly pear cactus	Opuntia polyacantha
Flat-topped broomrape	Orobanche corymbosa

Whiteleaf phacelia	Phacelia hastata
Longleaf phlox	Phlox longifolia
Dune scurfpea	Psoralea lanceolata
Winged dock	Rumex venosus
Munro's globemallow	Sphaeralcea munroana

Grasses, Sedges & Rushes

Bluebunch wheatgrass	Agropyron spicatum
Thick-spike wheatgrass	Agropyron dasytachyum
Cheatgrass	Bromus tectorum*
Sandbur	Cenchrus longispinus
Giant wildrye	Elymus cinereus
Small fescue	Festuca microstachys
Slender fescue	Festuca octoflora
Prairie junegrass	Koeleria cristata
Indian ricegrass	Oryzopsis hymenoides
Bulbous bluegrass	Poa bulbosa*
Sandburg's bluegrass	Poa sandbergii
Bottlebrush squirreltail	Sitanion hystrix
Sand dropseed	Sporobolus cryptandrus
Needle-and-thread grass	Stipa comata

Annual & Biennial Forbs

White pigweed	Amaranthus albus
Bur ragweed	Ambrosia acanthicarpa
Tarweed fiddleneck	Amsinckia lycopsoides
Tessellate fiddleneck	Amsinckia tessellata
Lamb's quarters	Chenopodium album*
Blue mustard	Chorispora tenella*
Yellow bee plant	Cleome lutea
Small blue-eyed Mary	Collinsia parviflora
Matted cryptantha	Cryptantha circumscissa
Winged cryptantha	Cryptantha pterocarya
Western tansymustard	Descurainia pinnata
Flixweed	Descurainia sophia*
Spring draba	Draba verna
Tall willowherb	Epilobium paniculatum
Crane's-bill	Erodium cicutarium*
Shy gilia	Gilia sinuata
Common sunflower	Helianthus annuus
Jagged chickweed	Holosteum umbellatum*
Clasping peppercress	Lepidium perfoliatum*
Low lupine	Lupinus pusillus
Whitestem stickleaf	Mentzelia albicaulis
Pink microsteris	Microsteris gracilis var. humilior
Threadleaf phacelia	Phacelia linearis

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Indian wheat	Plantago patagonica
White plectritis	Plectritis macrocera
Bur buttercup	Ranunculus testiculatus
Russian thistle	Salsola kali*
Jim Hill mustard	Sisymbrium altissimum*

*non-native weed species

Source: Yakama Indian Nation 1993 and Department of Energy 1988.

United States Department of the Interior

NATIONAL PARK SERVICE

PACIFIC NORTHWEST REGION
83 SOUTH KING STREET, SUITE 212
SEATTLE, WASHINGTON 98104

IN REPLY REFER TO:
L58(PNR-RP)

FEB 0 5 1999

Mr. Jim Cole, Project Manager
Columbia Basin Irrigation Project
Bureau of Reclamation
P.O. Box 815
Ephrata, WA 98823

Subject: Hanford Reach of the Columbia River

Dear Mr. Cole:

The support and input provided by your office as we developed the Draft Comprehensive River Conservation Study and Environmental Impact Statement for the Hanford Reach was appreciated.

We are currently preparing the final Environmental Impact Statement. The Study Team has completed its review of comments received during the draft comment period. Several issues and questions have been raised related to the Bureau of Reclamation's (Bureau) operation and future plans for the Columbia Basin Project. In trying to address some of the issues raised, the Study Team believes it essential that your office participate in developing a response. The next Study Team meeting is to be held February 24-26 in Portland. We would appreciate your input before the meeting. The questions are as follows:

1) Within the foreseeable future, what is the potential and likelihood of providing irrigation water for lands on the Hanford Site as proposed by the Wahluke 2000 plan?

2) If completion of unfinished sections of the Columbia Basin Project was prioritized, how would the proposed development of the Hanford lands on the Wahluke Slope rank?

3) We understand that the Project's water delivery facilities to the Wahluke Slope area are being fully utilized at their present capacities. Would modifications to Project facilities be necessary to provide the extra water, if available, to the lands proposed for agricultural development by the Wahluke 2000 plan? If so, what might the modifications include, what might they cost, and who would bear the costs?

4) If the Wahluke Slope lands on the Hanford Site are not developed for agricultural use as proposed by the Wahluke 2000 plan, will other irrigators in the Columbia Basin Project or in the South Columbia Basin Irrigation District be indirectly penalized by paying higher costs than would occur with such a development? Would existing irrigators benefit by paying less as a result of such a development?

5) If the Hanford lands on the Wahluke Slope were available for agricultural development, would Bureau sale of the lands as described in the Wahluke 2000 Plan "potentially cover a great deal of the cost of constructing water delivery systems due to the suitability of topography and existing structures," or would there be additional costs to potential irrigators on the Wahluke Slope, other Project users, and/or the public at large?

6) If lands within the "Red Zone" north and east of the White Bluffs were to be opened for agricultural development, is there any certainty that existing or proposed new irrigation technology could be utilized on those lands without threatening additional slumping of the White Bluffs into the Columbia River?

7) What is the potential for agricultural development of the Hanford lands north of the Columbia River without using Columbia Basin Project water? Is groundwater within the area considered Project water?

8) What assurance is there that Columbia Basin Project water will continue to be available to sustain Saddle Mountain Lake, the associated wetlands downstream along the Saddle Mountain Wasteway, and the wetlands located along the WB-10 Wasteway?

9) Item #5 on the third page of the February 27, 1957 Agreement between the Atomic Energy Commission and the Bureau states that, "The Bureau has a continued interest in the ultimate development of the irrigable lands of the entire Wahluke Slope as part of the Columbia Basin Project." Is this statement still valid? If so, and if these lands were to become available for agricultural development, when and/or under what conditions would you see development taking place?

10) Identification of any Bureau lands on the Wahluke Slope that may revert to the Bureau of Land Management under the recent Dept. of Interior decision on resolution of withdrawal issues.

Mr. Jim Cole
page 3

11) We are interested in receiving the following information:

a. A description of the Columbia Basin Project for inclusion in the final Environmental Impact Statement.

b. A copy of the internal memo dated 5/8/74 on the subject of the red zone, implying restriction of project development in the AEC primary zone.

c. A copy of the Draft EIS for expansion of the Columbia Basin Irrigation Project.

d. Copies of letters to Mr. Mark Hedman and Mr. Jim Curdy from the Bureau regarding the Wahluke 2000 plan.

e. Maps which illustrate location of private/public ownership along the river (specifically on the southern end and near Ringold) and Columbia Basin Project facilities located within the study area.

If you have any further questions, please contact Kristen Sycamore at (206) 553-5366.

Sincerely,

Robert J. Karotko
Chief, Recreation Programs

cc: Jim Blanchard, Bureau of Reclamation, P.O. Box 315, Ephrata, WA 98823

United States Department of the Interior

BUREAU OF RECLAMATION
Columbia Basin Project
P.O. Box 315
Ephrata, Washington 98823-0815

IN REPLY REFER TO
CBP-120
ENV-6.00

FEB 17 1993

Memorandum

To: National Park Service, Pacific Northwest Region, Seattle WA

From: ACTING Project Manager, Bureau of Reclamation, Ephrata WA

Subject: Draft Comprehensive River Conservation Study and Environmental Statement for the Hanford Reach of the Columbia River (Environmental Statement)

A detailed planning study would be required to provide an official agency response to many of the questions and issues raised in your letter of February 5, 1993. However, in view of the circumstances related to your request, we will provide comments on each of your questions with the understanding that such a study has not been conducted, and that the responses are based on information readily available to us at the Columbia Basin Project (Project) office.

1. Unless there are significant changes in national policies and priorities, it appears unlikely that Reclamation would provide irrigation water for lands on the Hanford site within the foreseeable future. Even though there are some valid arguments supporting such a development, there are serious environmental and economic concerns that would need to be addressed prior to Federal involvement. Based on our experience in preparing an Environmental Impact Statement regarding expansion of the Project, it is likely that years of negotiation, study, and analysis would be required prior to making a decision regarding a proposal such as Wahluke 2000.

2. The Hanford lands on the Wahluke Slope are within the Project area, but are not part of the Project as planned for future development, nor are they included in NEPA compliance or other planning activities presently underway. Until the necessary studies were completed and a decision was made to substitute this area for other lands presently included in planning blocks, the lands within the Hanford Reservation would not be included on a priority list.

3. To serve these lands through Project facilities, operating experience indicates that major reaches of both the Potholes Canal and the Wahluke Branch Canal would need to be enlarged. We do not have a cost estimate; however, it should be noted that enlargement of the Potholes Canal would be particularly expensive due to the geological formation (basalt) through which it was constructed. Other new facilities that would be required include lateral distribution and subsurface drainage systems.

New agreements would have to be negotiated to determine who would bear the costs for these facilities. Prerequisites to Federal expenditures would include a cost sharing agreement (likely with the State of Washington) and a new repayment agreement with the water users. Costs not repaid under these agreements would be repaid from the power revenues derived from the Columbia River's Federal power system.

4. Construction repayment obligations for any given tract are based on the land classification of the acreage in that tract. The repayment obligation of other landowners would not be affected by a decision regarding development of the Hanford lands. However, it may be possible that a very slight reduction in the average per acre operation and maintenance (O&M) costs could occur if this land proved to be exceptionally inexpensive to serve (which is not anticipated), or if the irrigation district was able to capitalize on economies of scale.

5. Under current laws and procedures, we do not have authority to use receipts from the sale of Project lands to fund construction of water delivery systems. We have not conducted any studies that would provide a basis for comparing construction costs to land values. However, it is reasonable to speculate that costs would exceed values, and that if development of the Hanford lands were to take place, some costs would need to be borne by power users and the general public.

6. Based on studies in the early 1970's, Reclamation determined that irrigation would increase the potential for landslide activity along the White Bluffs. Also, a detailed drainage investigation completed in 1967 found a large portion of the "Red Line" area infeasible to drain based on economic criteria. As part of its effort to restrict irrigation in the area, Reclamation rescinded the plats for two irrigation blocks (Blocks 36 and 55) and acquired private lands on a willing seller basis. Extensive studies would be required before Reclamation would consider revising its conclusions regarding irrigation in this area.

7. We can provide some basic information in response to this question, however, a definitive answer would require further study. With the exception of public surface water from the Columbia River, all surface waters within the Wahluke Slope area are Columbia Basin Project waters, which are not available for appropriation by third parties. In light of the existing Washington State Department of Ecology (Ecology) moratorium on new diversions from the main stem of the Columbia River, and heightened concerns regarding instream flows, public surface waters from the Columbia River may or may not be available in the future. Public ground waters within the Wahluke Slope area north of the Columbia River are regulated by Ecology.

8. As was stated in a memorandum to the Fish and Wildlife Service in 1986 (copy enclosed), Reclamation is not able to provide assurances regarding flow levels along the wasteways. While we expect limited operational flows will remain available, the South Columbia Basin Irrigation District operates the wasteways in the area and will continue to require the ability to operate and

maintain all such facilities within the Hanford Reservation including the Saddle Mountain Wasteway, the WB10 wasteway, and the Wahluke Branch Canal. Under existing agreements Reclamation and the South District retain these rights which would need to be maintained under any change in status of the area.

9. Reclamation continues to have an interest in the ultimate development of the irrigable lands of the entire Wahluke Slope as part of the Columbia Basin Project. That interest is not limited only to irrigation development, but also extends to other Project purposes including fish and wildlife, as well as to resource management and environmental concerns. We maintain that our agreement with the Atomic Energy Commission assures the return of lands which Reclamation previously controlled. As previously indicated, Reclamation would not concur in proposed changes in the present use of those lands until the necessary technical and environmental studies were completed.

10. We have enclosed the requested documents and maps. We have also enclosed a brochure describing the Columbia Basin Project and provided in Attachment 1 a description of the Project.

If you should have any additional questions, please call Mr. Jim Blanchard at (509) 754-0267.

William D. Bay

Enclosures

K. 1957 Agreement

MEMORANDUM OF AGREEMENT
between
THE BUREAU OF RECLAMATION
and
THE ATOMIC ENERGY COMMISSION

For the transfer from the Bureau of Reclamation to the Atomic Energy Commission of rights to custody, possession, and use of certain acquired and withdrawn lands situated within the Control Zone of the Hanford Works on the Wahluke Slope of the Columbia Basin Project, Washington

This Memorandum of Agreement made this 27th day of February, 1957, by and between the Bureau of Reclamation, hereinafter styled the Bureau, and the Atomic Energy Commission, hereinafter styled the Commission, acting in pursuance of the Act of Congress of June 17, 1902 (32 Stat. 388) and acts amendatory thereof and supplementary thereto, including the Columbia Basin Project Act (57 Stat. 14), as amended, and the Atomic Energy Act of 1954 (42 USCA 2011-2281); covers the transfer of all rights to custody, possession, and use in connection with the operation of the Hanford Works, from the Bureau to the Commission, of certain lands acquired by the Bureau, and certain public lands under First Form Reclamation withdrawal.

It is mutually agreed by the parties hereto as follows:

1. The restricted area, known as the Control Zone, lying on the Wahluke Slope and being a part of the Hanford Works, as established by the Manhatten Engineer District of the Corps of Engineers on November 15, 1943, and as revised by action of the Commission, as successor to the Manhatten Engineer District, as set forth in the letter of December 17, 1948, from the Acting Chairman of the Commission to the Secretary of the Interior, is shown on the map marked Exhibit "A", attached hereto and made a part hereof.

2. Transfer of all rights to custody, possession, and use from the Bureau to the Commission of the acquired lands described in Exhibit "B", attached hereto and made a part hereof, and the withdrawn lands described in Exhibit "C", attached hereto and made a part hereof, all of which are located within the Control Zone, is hereby accomplished. Such transfer is subject to the following:

(a) The right of the Bureau to construct, operate, and maintain the Wahluke Canal and related facilities and structures at about elevation 965 (USBR Datum) and any necessary wasteways and drainage ways through the Control Zone in connection with the irrigation of lands on the Wahluke Slope but outside of the Control Zone.

3. The transfer of rights under Article 2 hereof shall remain operative so long as the lands involved remain in Control Zone status, as determined by the Commission. If it is determined by the Commission that custody, possession, and use of such lands is no longer required, relinquishment of all such rights transferred hereby will be accomplished by notice in writing from the Manager, Hanford Operations Office, Atomic Energy Commission, to the Regional Director, Region 1, Bureau of Reclamation.

4. The greater portion of the lands included within the Control Zone were included in the South Columbia Basin Irrigation District and the East Columbia Basin Irrigation District at the time of their formation.

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A monetary adjustment will be necessary as to the Control Zone lands which are permanently removed from, or are rendered infeasible of, irrigation development as a part of the Columbia Basin Project, but such adjustment shall be deferred until the Secretary of the Interior concludes that such is required. Such adjustment would cover out-of-pocket costs such as purchase price, costs incurred in their acquisition and administration, and various preliminary engineering and investigative costs applicable to the lands described in said exhibit "B". Further amounts may be sought by the Bureau, after consultation with the Commission, to be included in such adjustment, with the approval of the Congress, by reason of other costs or losses incurred or to be incurred by the Columbia Basin Project as a result of diminution in the total project irrigable area through the permanent removal from irrigation development as a part of the Columbia Basin Project of any or all of the irrigable lands located within the exterior boundaries of the Control Zone, irrespective of ownership.

5. The Bureau has a continued interest in the ultimate development of the irrigable lands of the entire Wahluke Slope as a part of the Columbia Basin Project. The Commission is fully aware of that interest and hereby reaffirms its policy of keeping to a minimum its land ownership and restrictions on land use on the Wahluke Slope.

/s/ J. E. Travis
Manager,
Hanford Operations Office,
Atomic Energy Commission

/s/ H. T. Nelson
Regional Director,
Region 1,
Bureau of Reclamation

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L. Contaminants Section Figures

Figure 1: Operating Periods for the Once-Through-cooled Hanford Production Reactors

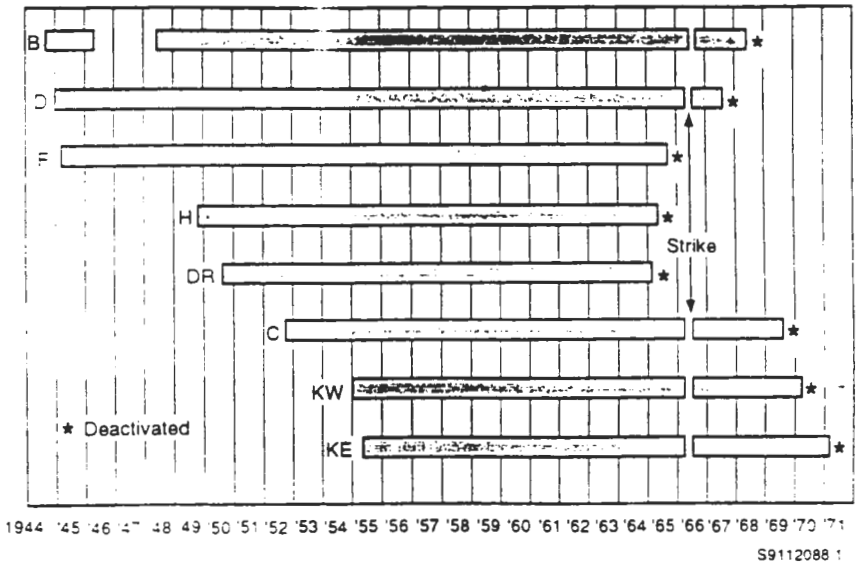

Figure 2: Annual Average Total Beta Concentrations in Columbia River Water at Pasco, Washington, 1945 through 1971

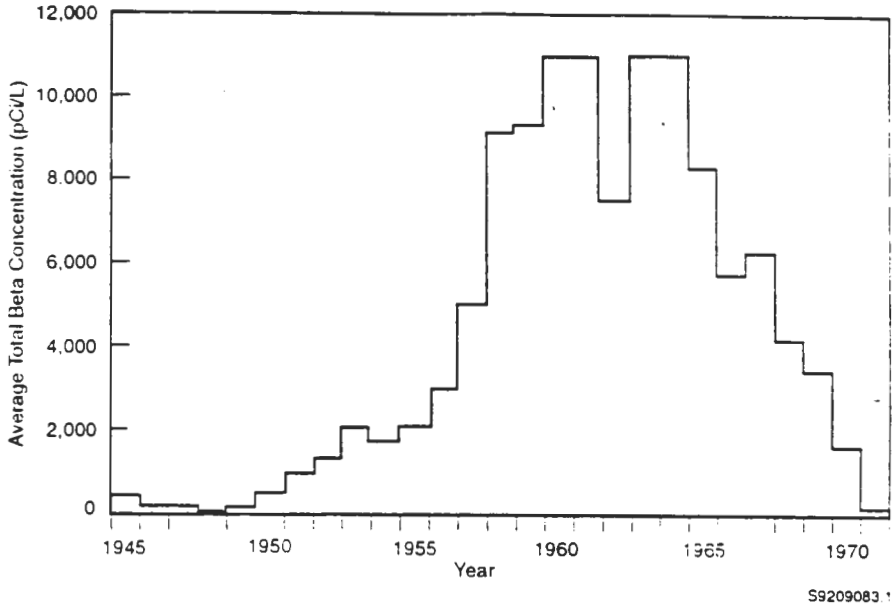

Figure 3: Nitrate in Seepage, River, and Shoreline Wells (WHC-EP-0609, 12/92)

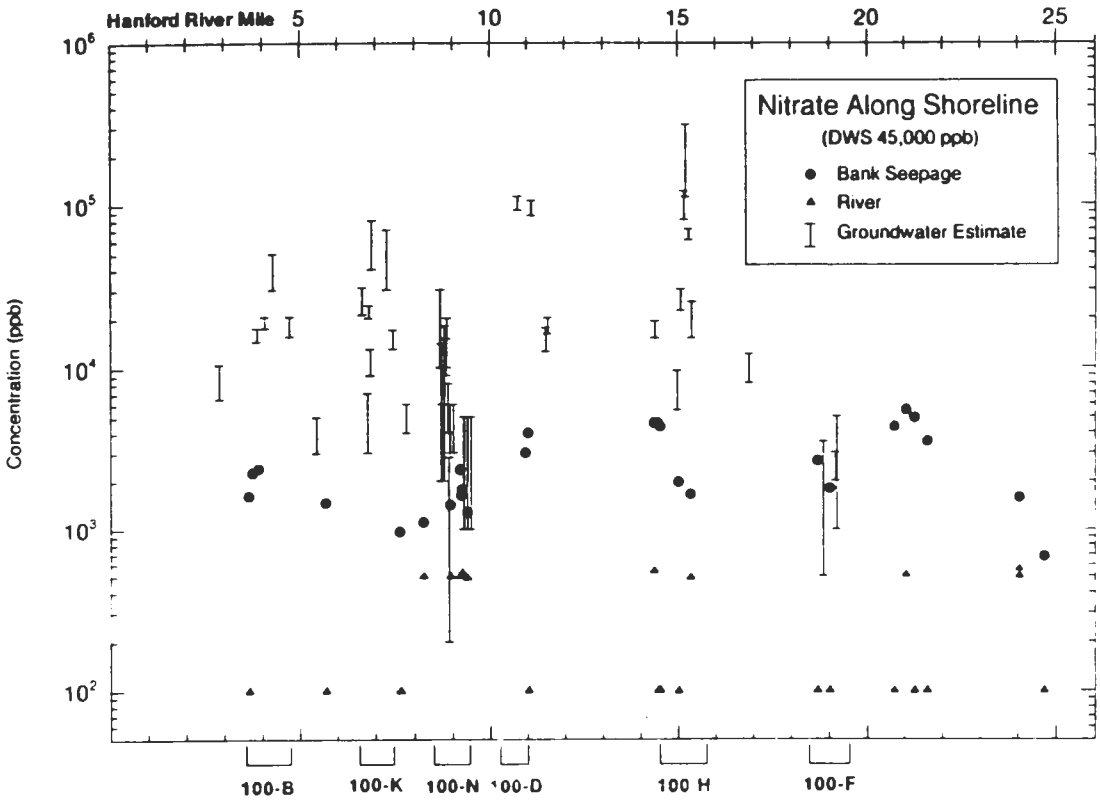

Figure 4: Chromium in Seepage, River, and Shoreline Wells (WHC-EP-0609, 12/92)

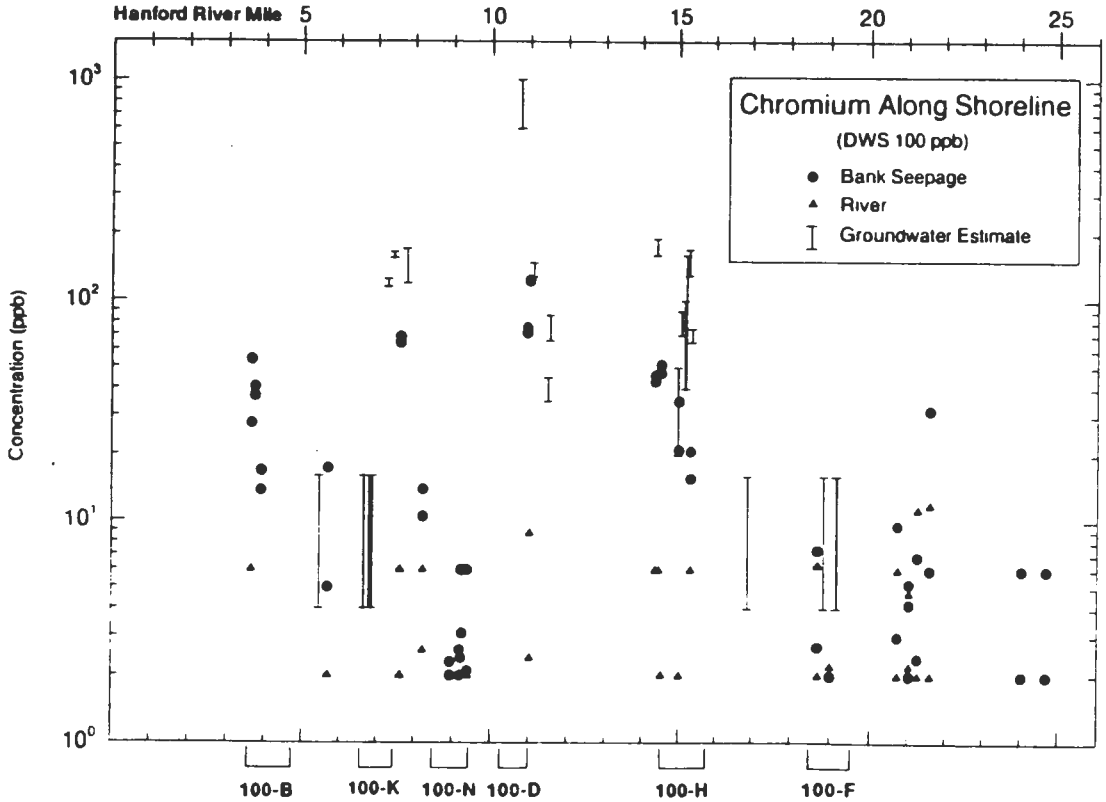

Figure 5: Tritium in Seepage, River, and Shoreline Wells (WHC-EP-0609, 12/92)

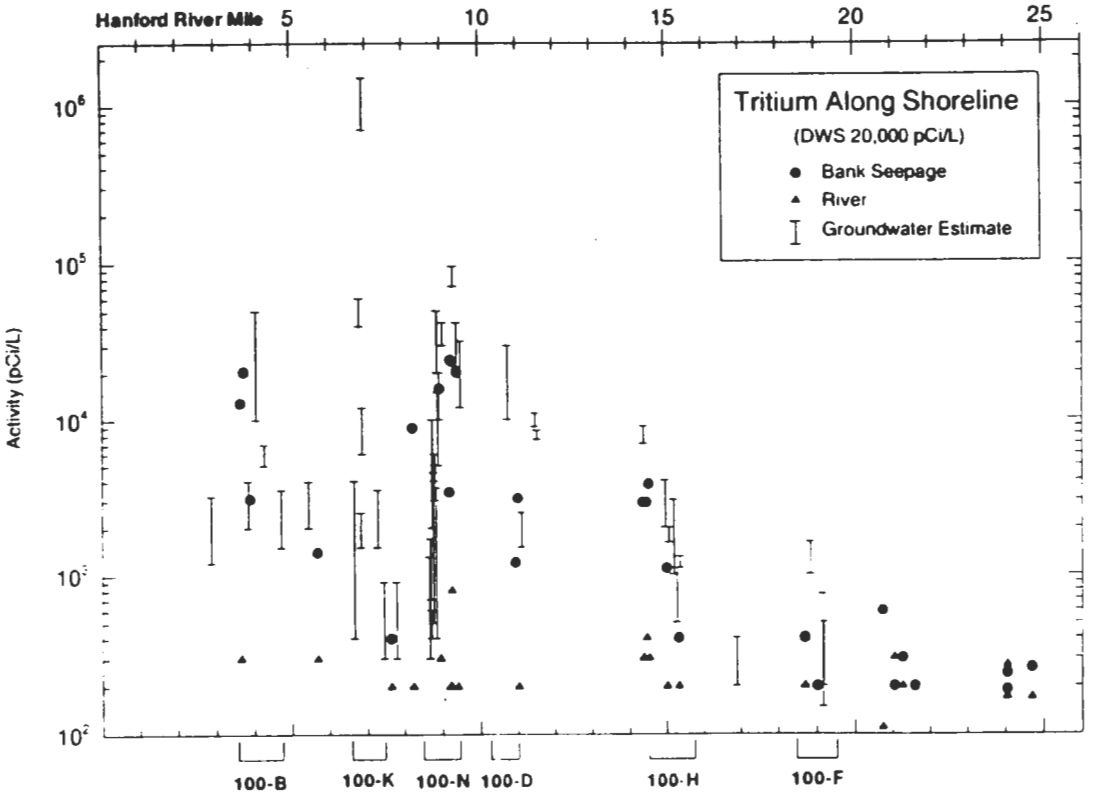

Figure 6: Gross Beta in Seepage, River, and Shoreline Wells (WHC-EP-0609, 12/92)

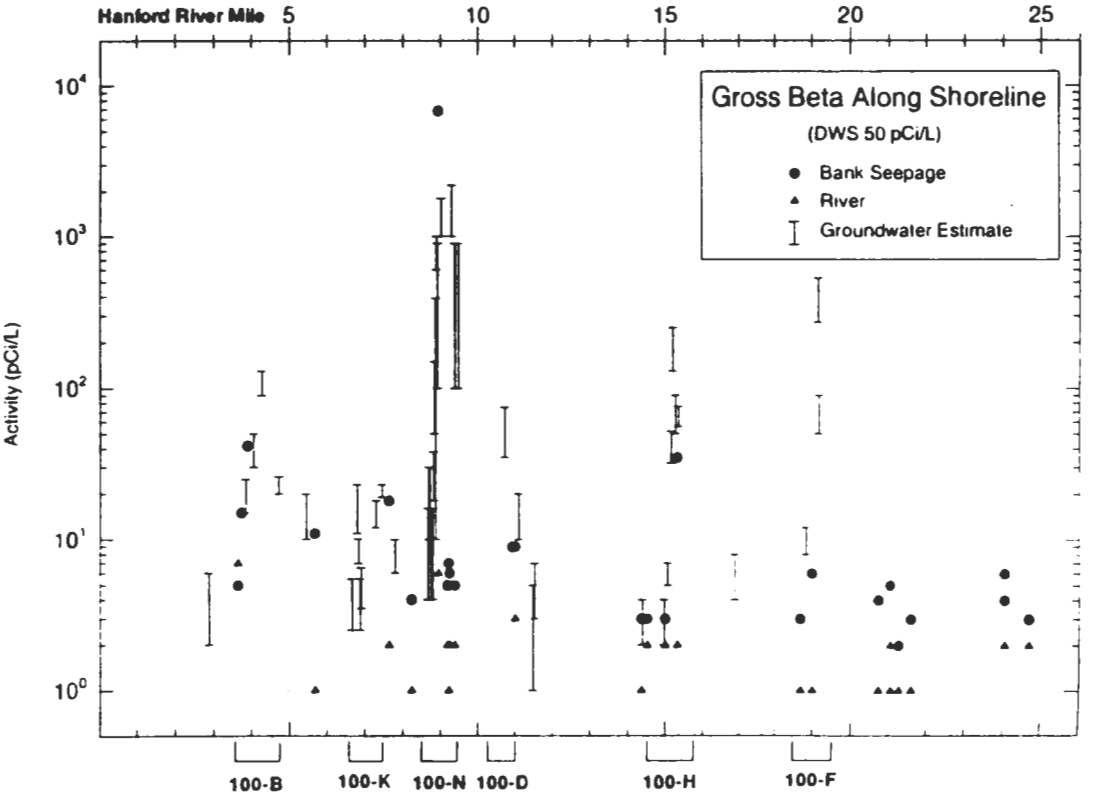

Figure 7: Strontium in Seepage, River, and Shoreline Wells (WHC-EP-0609, 12/92)

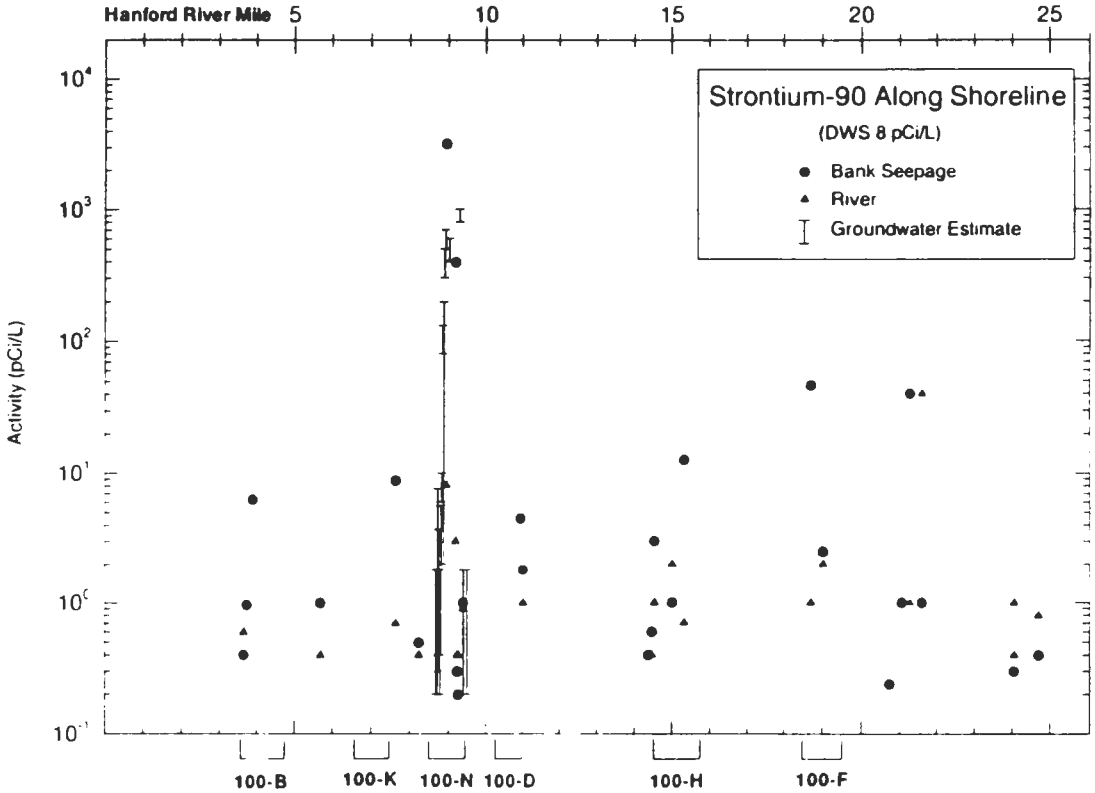

Figure 8: 3H and 90Sr Concentrations in the Columbia River Since Reactor Shutdown (DOE/RL-92-28, Rev. 0)

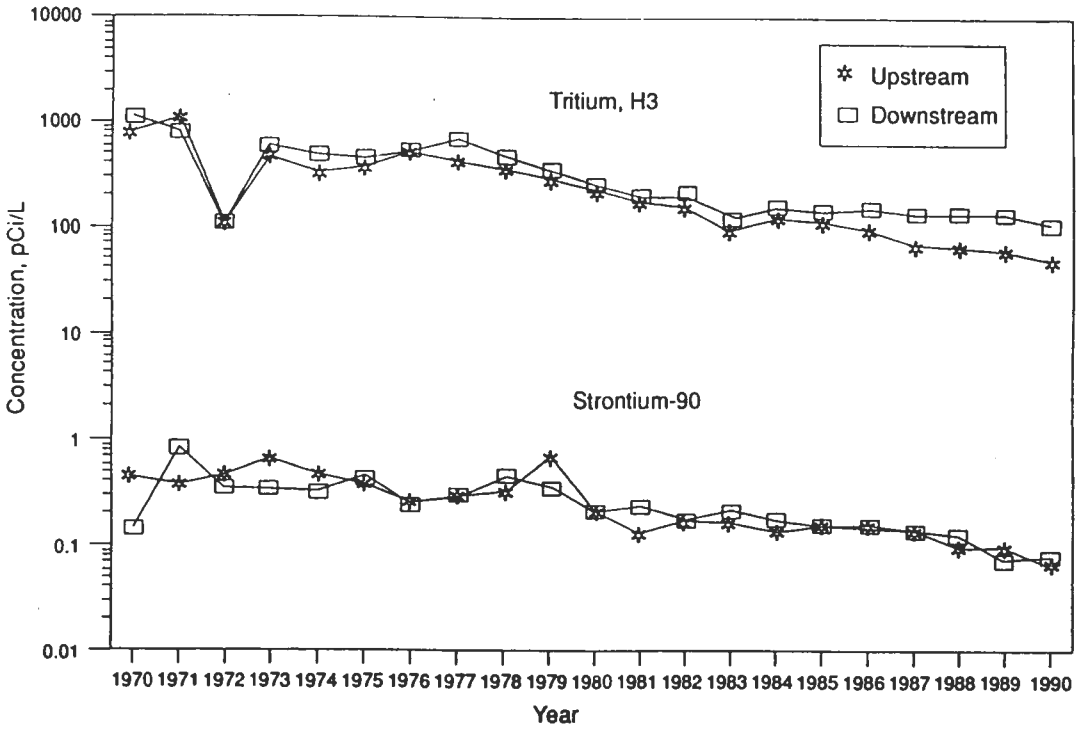

Figure 9: Uranium Concentrations in the Columbia River Since Reactor Shutdown (DOE/RL-92-28, Rev. 0)

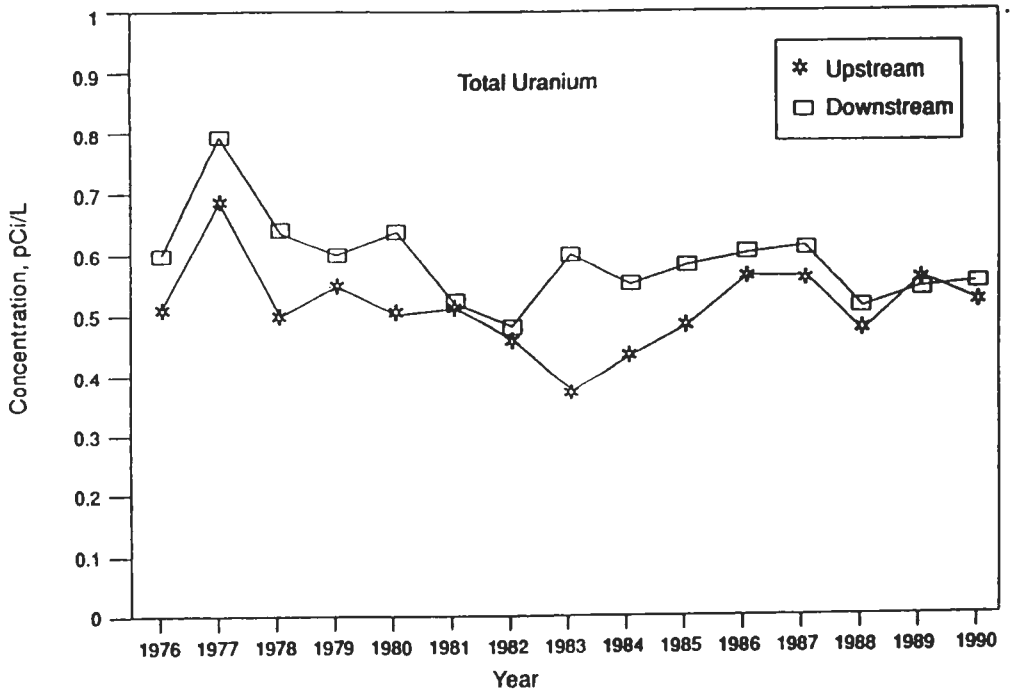

Figure 10: Location Map Showing 1991 Shoreline Sampling Locations. (WHC-EP-0609, 12/92)

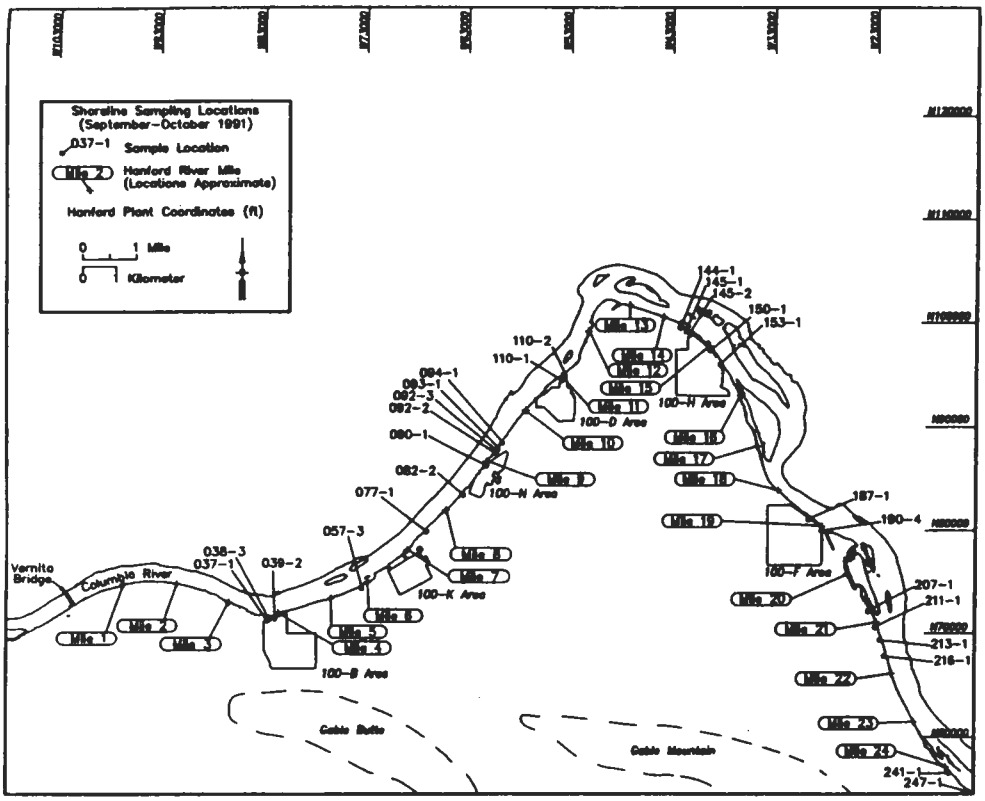

Figure 11: Nitrate in Riverbank Seepage. A drinking water standards for nitrate is 45,000 ppb. (WHC-EP-0609, 12/92)

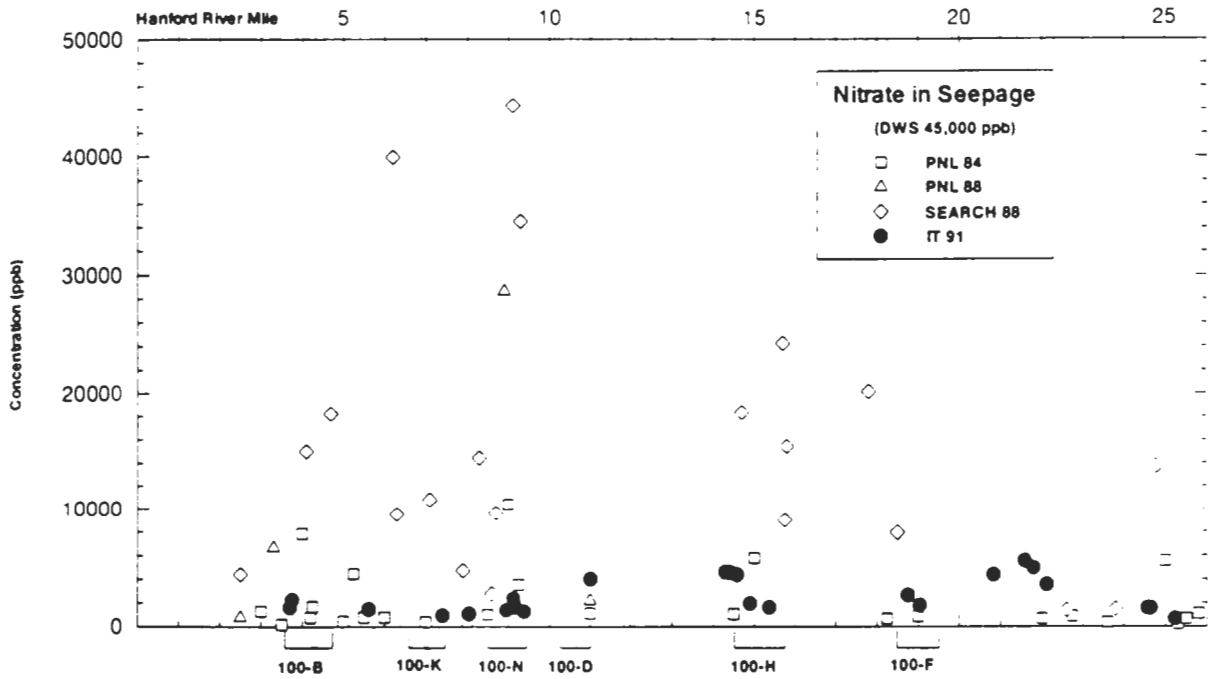

Figure 12: Chromium in Riverbank Seepage. The drinking water standard was raised from 50 to 100 as of July 30, 1992. (WHC-EP-0609, 12/92)

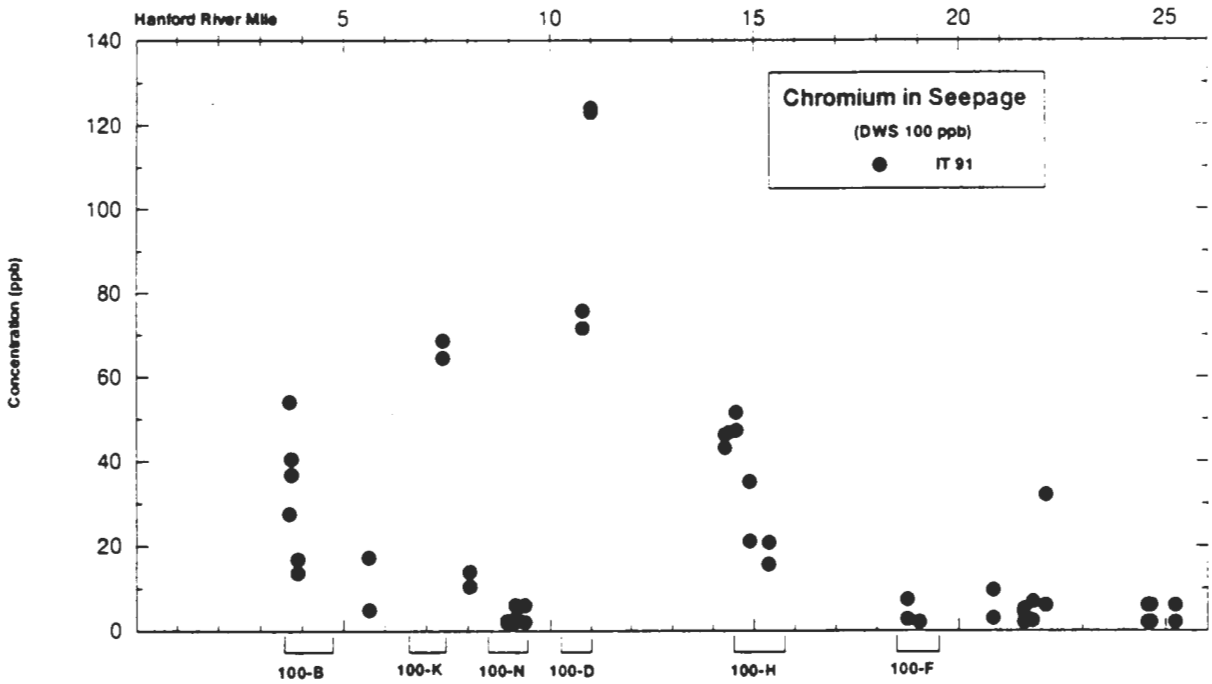

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Figure 13: Tritium (^3H) in Seepage. A drinking water standards for tritium is 20,000 pCi/L. Note logarithmic scale.

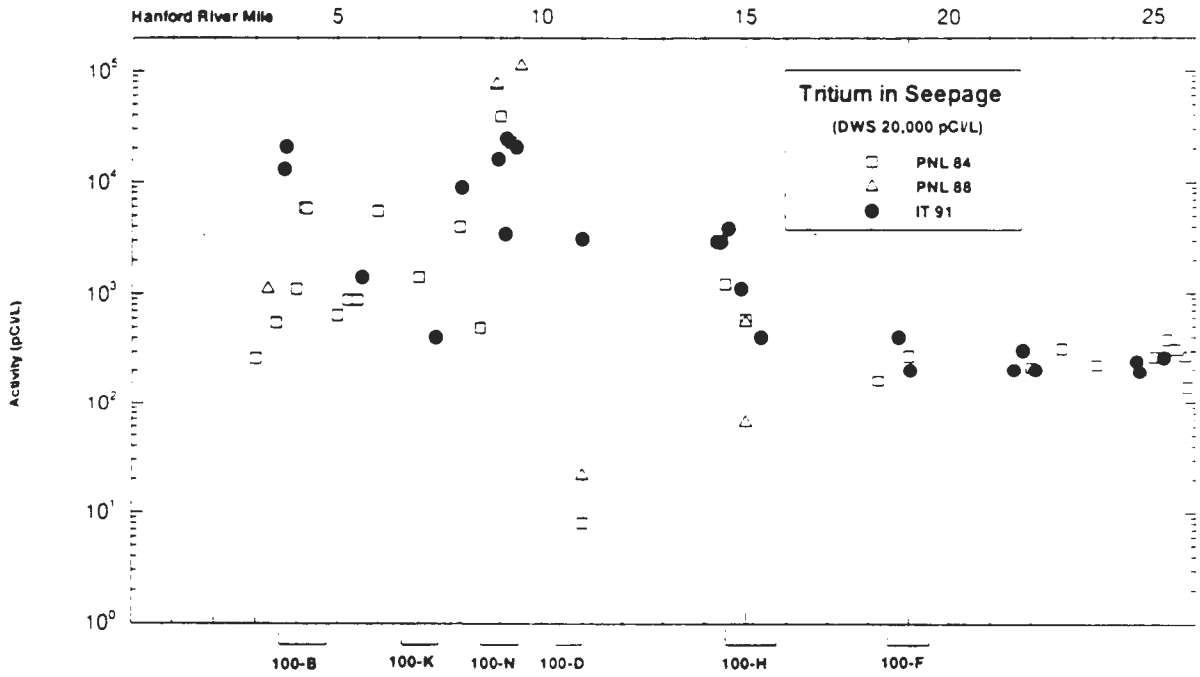


Figure 14: Gross Beta Activity in Seepage. A drinking water standards for gross beta is 50 pCi/L. Note logarithmic scale.

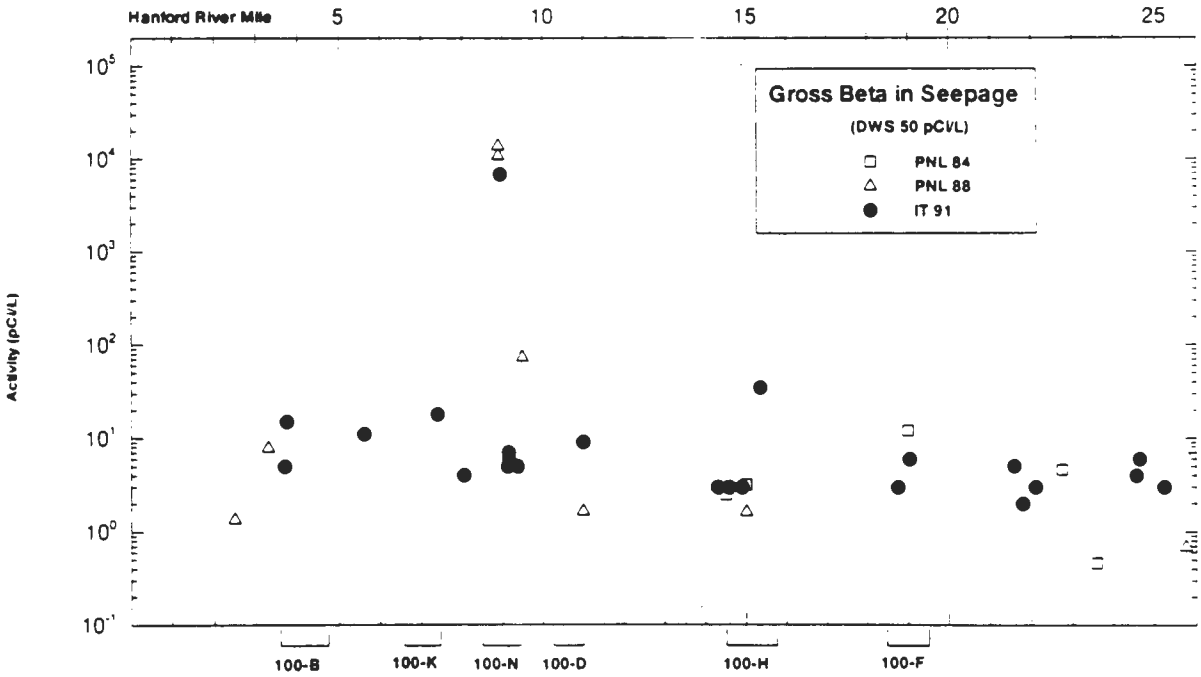


Figure 15: Strontium-90 in Seepage. A drinking water standards for strontium-90 is 8 pCi/L. Note logarithmic scale.

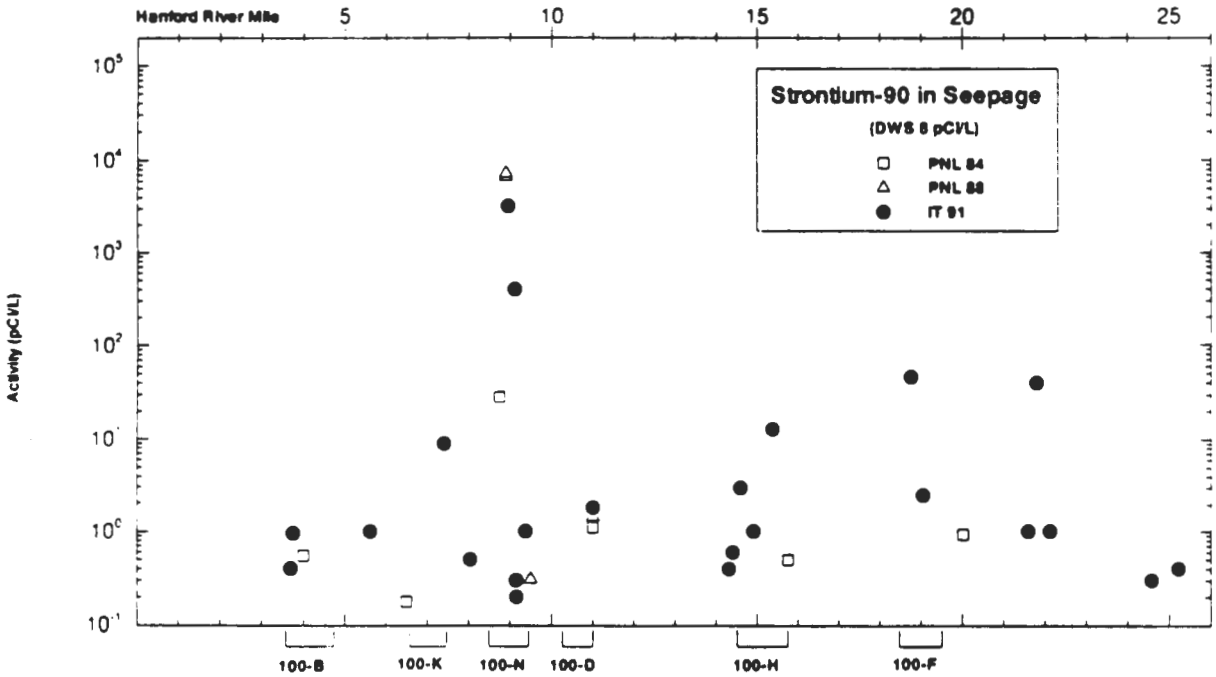


Figure 16: Chromium in Seepage, River, and Shoreline Wells.

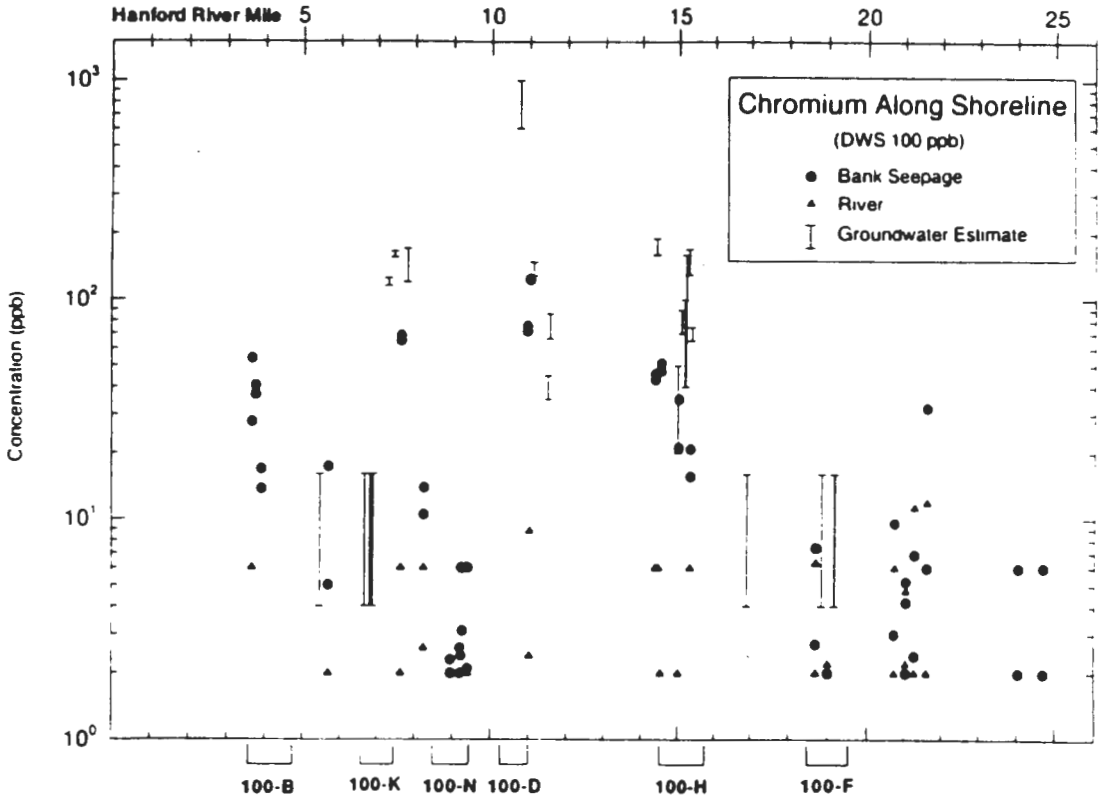


Figure 17: Cadmium in Seepage Sediment.

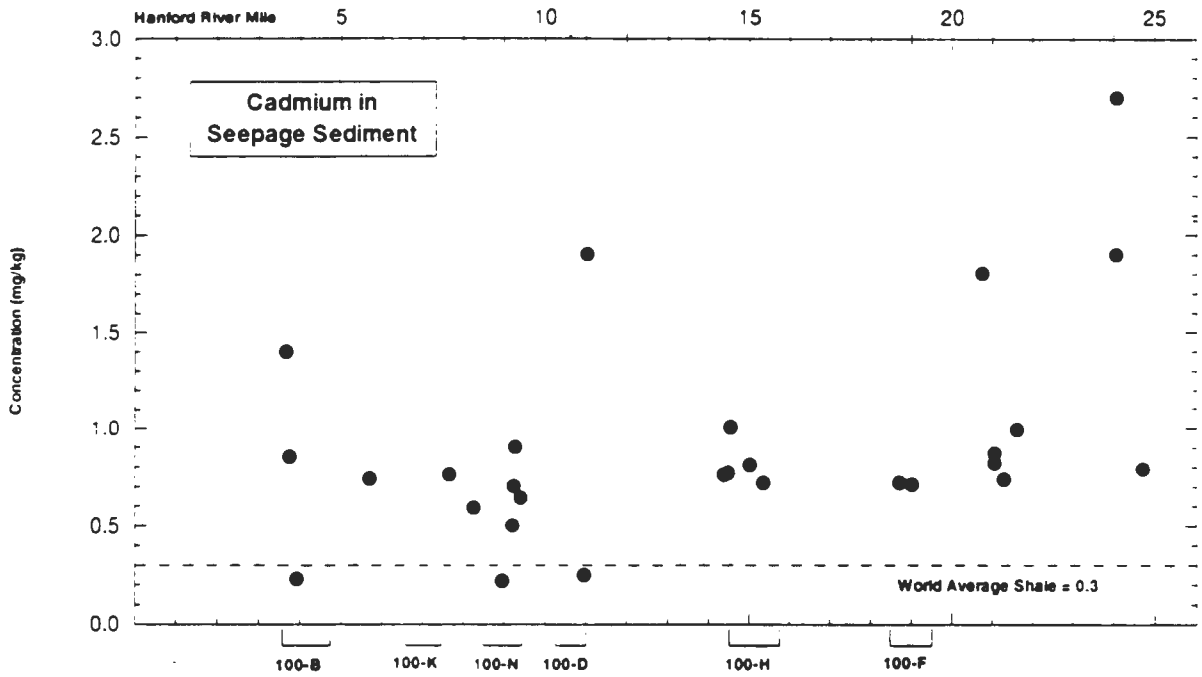


Figure 18: Silver in Seepage. .

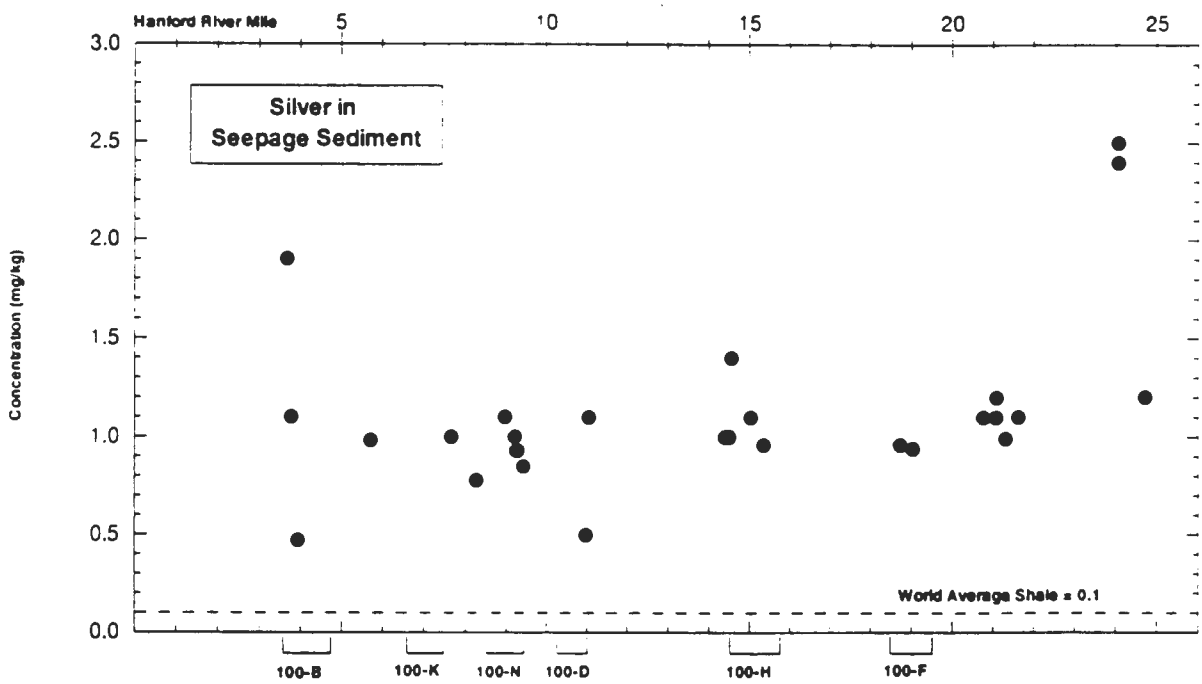


Figure 19: Zinc in Seepage Sediment.

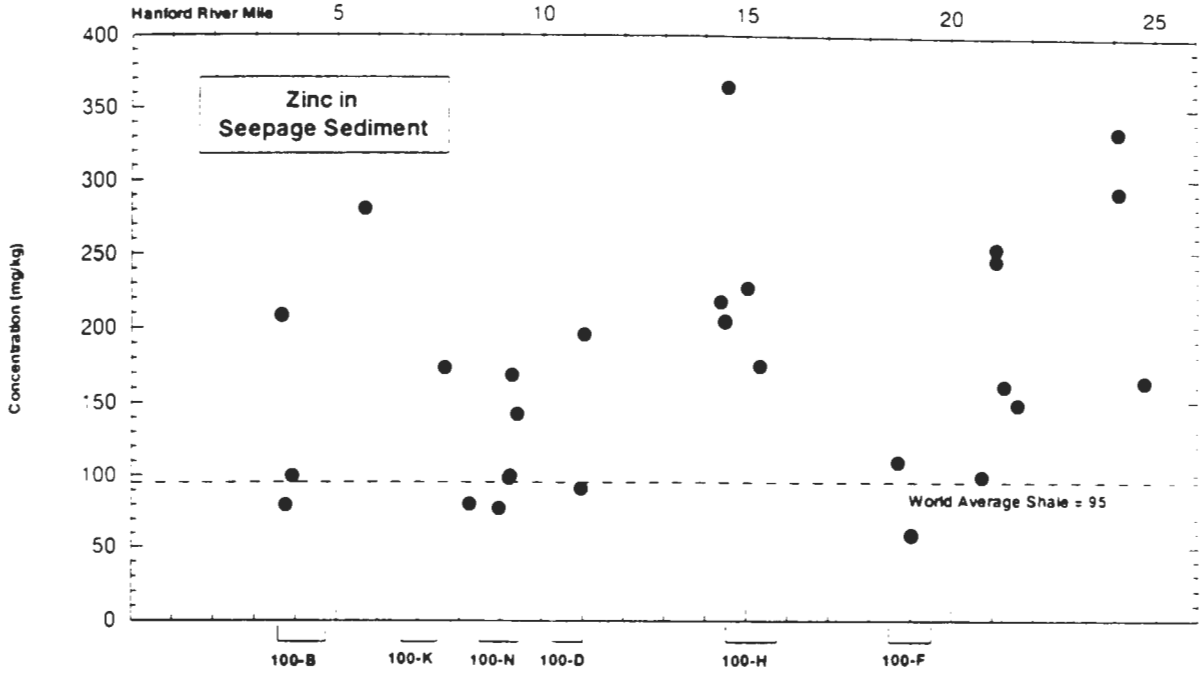


Figure 20: Chromium in Seepage Sediment.

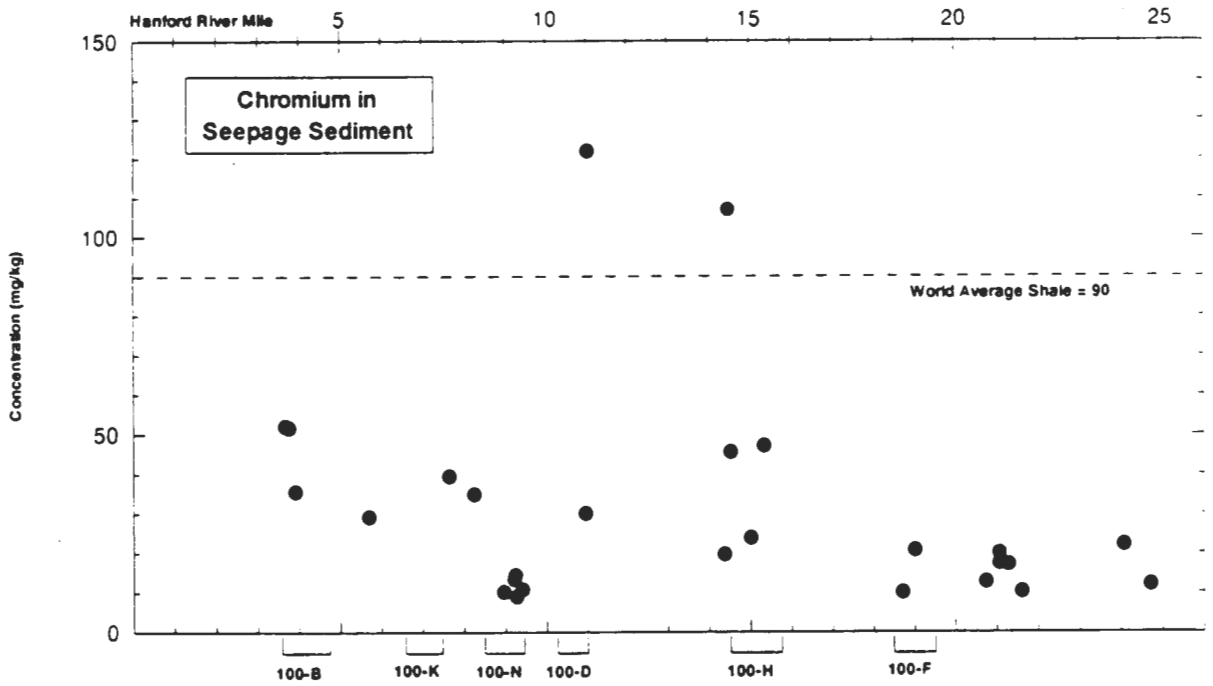


Figure 21: Strontium-90 in Seepage Sediment.

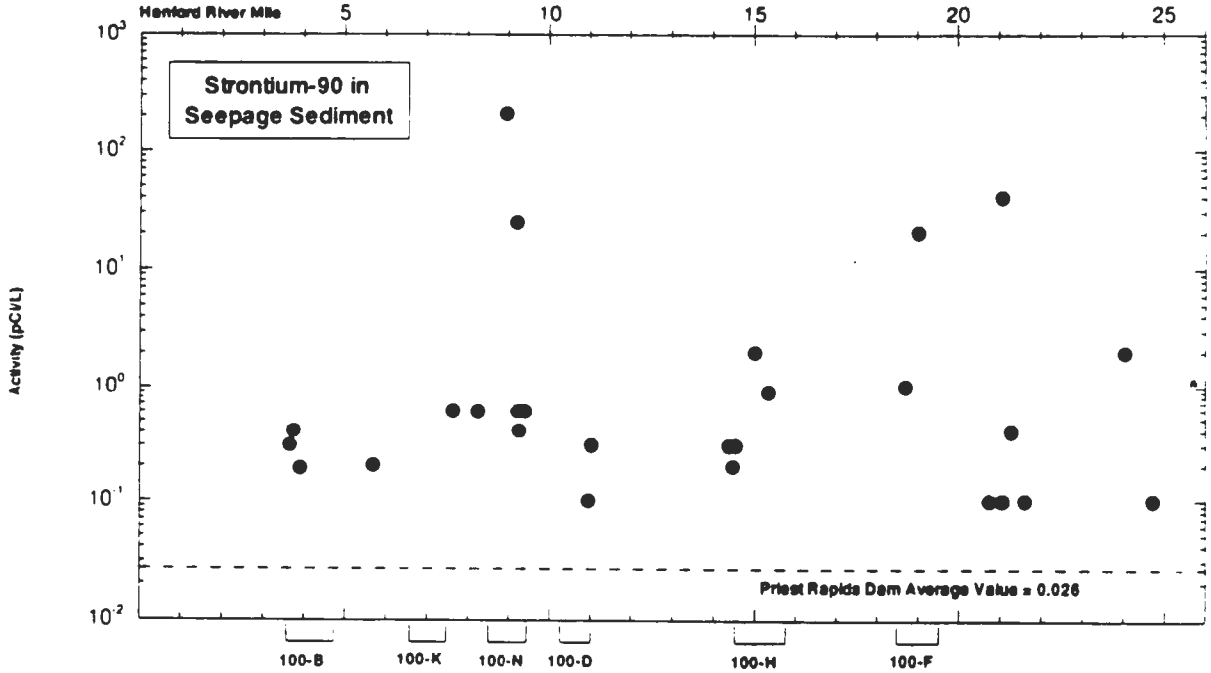


Figure 22: Gross Beta in Seepage Sediment.

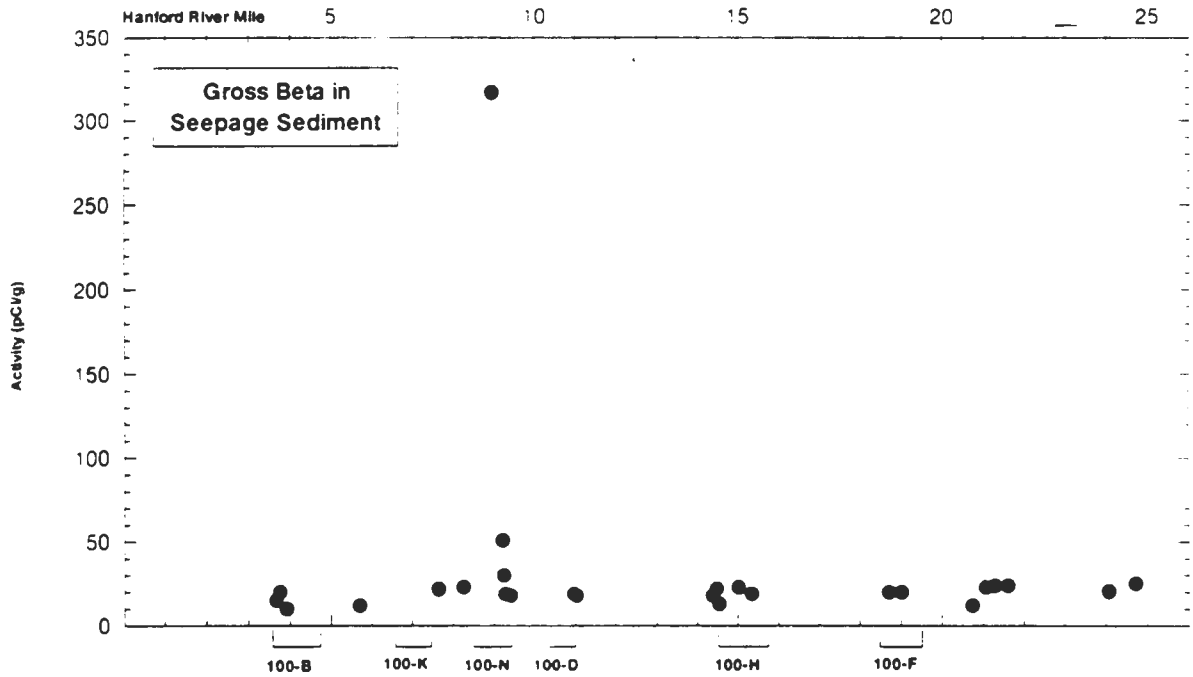
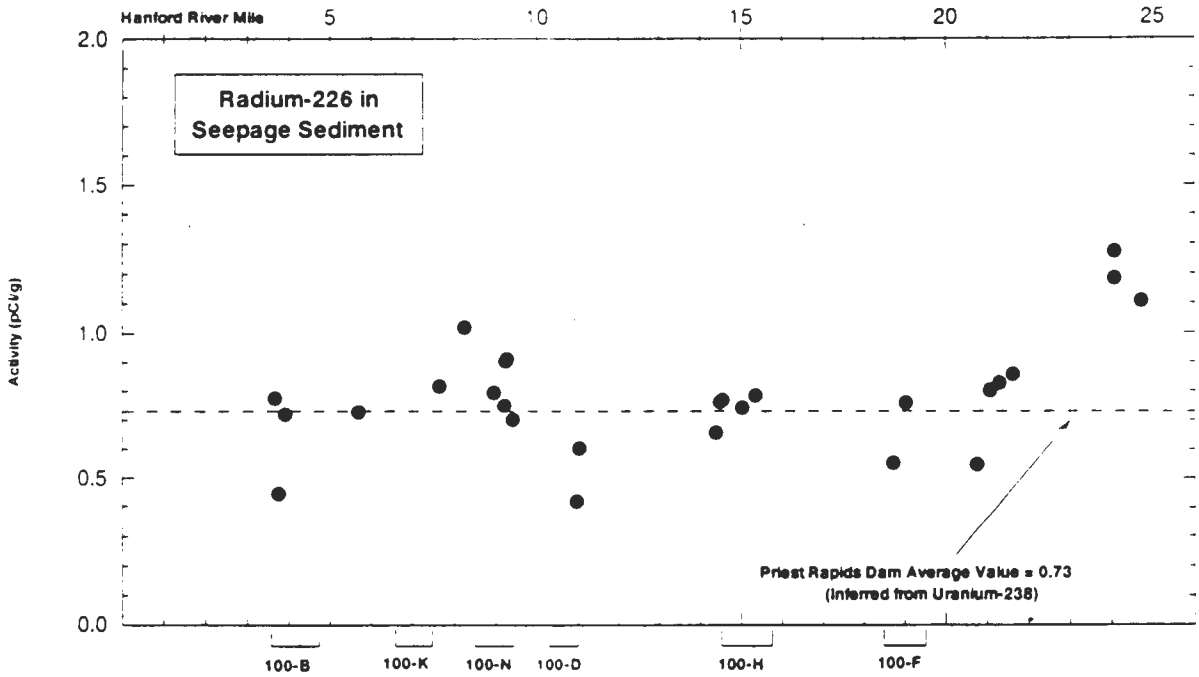


Figure 23: Radium-226 in Seepage Sediment.



M. GLOSSARY

Acquired lands: Lands in Federal ownership which are not public lands. Acquired lands were obtained by the Government through purchase, condemnation, or gift or by exchange for such purchased, condemned, or donated lands or for timber on such lands.

Alluvium: Sand, silt, gravel, etc. that has been deposited by moving water.

Anadromous fish: Fish, such as salmon or steelhead trout, that are born in freshwater, migrate, to and mature in the ocean, and return to fresh water as adults to spawn.

Aquatic: Any freshwater system, from wetlands at the dryer end, to deep lakes or rivers.

Archaeological sites (resources): Areas or objects modified or made by humans, either prehistorically or historically, and the data associated with these areas and objects.

Artifact: An object produced or shaped by human workmanship of archaeological or historical interest.

Barchan dunes: Horseshoe shaped mounds of sand which point into the wind and move in the direction of the two ends.

Candidate Species: Plant or animal species not yet officially listed but which are undergoing a status review as published in the Federal Register by the U.S. Fish and Wildlife Service. They are candidates for possible addition to the List of Endangered and Threatened Species. (See also Endangered Species and Threatened Species.)

Cobble: Stones which have been rounded by water or ice and are at least 8mm (1/3 of an inch) in size, but not larger than 256 mm (10 inches).

Contamination (contaminated material): the deposition, solvation, or infiltration of radionuclides on or into an object, material, or area; the presence of unwanted radioactive materials or their deposition, particularly where it might be harmful.

Decommissioning: Removing facilities contaminated with radiation (such as processing plants, waste tanks, and burial grounds) from service and reducing or stabilizing radioactive contamination. Decommissioning includes the following concepts: (1) decontamination, dismantling, and return of an area to its original condition without restrictions on use or occupancy and (2) partial decontamination, isolation of remaining residues, and continued surveillance and restrictions on use or occupancy.

Decontamination: The removal of radioactive contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.

Endangered Species: Any species in danger of extinction throughout all or a significant portion of its range, as identified in accordance with the Endangered Species Act of 1973, as amended.

Endemic: Native species unique to the area, not introduced or naturalized.

Forb: Leafy plants other than grasses, vines, trees, or shrubs.

Habitat: The place or type of site where a plant or animal normally lives or grows.

Hazardous waste: potentially dangerous materials that may include radioactive materials, depending ont he legal definition; those wastes that are identified as hazardous pursuant to 40 CFR 261 or 40 CFR 300.

Historic resources: The sites, districts, structures, and objects considered limited and nonrenewable because of their association with historic events, persons, or social or historic movements.

Hydrology: The science dealing with the properties, distribution, and circulation of natural water systems.

Impact: The effect, influence, alteration, or imprint of an activity.

Interpretation: communicating to visitors the nature and significance of area natural resources and processes to increase visitor enjoyment of area and its resources. In addition, it also encourages public involvement in the protection of natural resources.

Inundation: A condition in which water temporarily or permanently covers a land surface.

Leasable Minerals: Those minerals subject to lease by the Federal Government. Includes oil and gas, coal, geothermal, phosphate, sodium, potash, and oil shale.

Locatable Minerals: Minerals subject to disposal and development through the Mining Law of 1872 (as amended). Generally includes metallic minerals such as gold and silver and other materials not subject to lease or sale.

Loess: Wind blown deposits of sand, silt, etc.

Macrophyte: Any plant species that can be readily observed without the aid of optical magnification, including all vascular plant species and bryophytes, as well as large algae.

Mineral Entry: The right to enter the public lands (under the administration of the BLM) to search for minerals and to claim or lease such minerals under the mining and mineral leasing laws and regulations.

National Register of Historic Places: A list maintained by the National Park Service of architectural, historic, archaeological, and cultural sites of local, state, or national significance.

Off-Road Vehicle (ORV): Any motorized vehicle designated for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland or other terrain.

Open and Unclaimed: Are those lands which are under ownership of the federal government and which have not been reserved for uses incompatible with the exercise of American Indian Treaty reserved rights.

Overlay: a term used to describe an area which has 2 types of land use management occurring. The proposed action would have a National Wild and Scenic River corridor occurring on a National Wildlife Refuge within the boundaries of the Hanford Site. The river would be designated as a recreational river under the National Wild and Scenic Rivers Act.

Passerines: Songbirds.

Physiographic province: The lower 48 states have been split into 24 regions and provinces based on landforms and geology.

Placer: Heavy mineral concentrations found in present or past stream channels or beach areas and offshore bars. Wave action or stream current sorts and deposits the heavier minerals together.

Radionuclide: Radioactive particles composed of portions of individual atoms.

Redds: Salmon spawning nests in gravel.

Resident fish: Fish species that reside in fresh water throughout their lives.

Riparian: Situated on or pertaining to the bank of a river, stream or other body of water. Normally used to refer to plants of all types that grow along streams or around springs.

Riverine: All wetlands and deepwater habitats contained within a channel as long as no vegetation grows out of the water, and there is no more than 1/2 a percent of salt from the.

River mile: distance in miles measured upstream from river mouth.

Run-of-river dams: Hydroelectric generating plants that operate based only on available streamflow and some short-term storage (hourly, daily, or weekly)

Sensitive Species: Those species that have appeared in the Federal Register as proposed for classification and are under consideration for official listing as endangered or threatened species, that are on an official State list, or that are recognized by the State Director as needing special management to prevent their being placed on Federal or State lists.

Shear strength: The ability of a material to withstand pressure at two places from opposite directions without breaking.

Shrub-steppe: Steppes are large, non-wetland habitats where trees do not grow. Examples are prairies and high deserts. At the study site, the steppe is dominated by shrubs, especially sagebrush with grasses in between. Some steppes do not have shrubs, other steppes have more leafy plants than grasses.

Spawning: The releasing and fertilizing of eggs by fish.

Substrate: Materials such as sand, gravel, cobble, etc. that form the bottom of a stream.

Suspended load: The amount of soil, sand, gravel, or other sediments carried by the current in flowing water.

Transverse dunes: Sand mounds which form a ridge which runs perpendicular to the wind direction.

Transverse ridges: Ridges of stone formed by earthquake that run perpendicular to the earthquake waves much like waves in the ocean. Examples are Rattlesnake Mountain, Gable Mountain, and Saddle Mountain.

Upriver brights: The name commonly applied to fall chinook salmon originating on the middle Columbia River, primarily in the area below Priest Rapids Dam.

Usual and Accustomed Grounds and Stations: As defined by U.S. v Washington, all those locations where members of a tribe customarily fished at or before the time the treaty was signed, however distant from the tribe's usual home and regardless of whether other tribes also fished in the same waters. In order to prove the existence of a traditional fishing location, the tribe must show where its members fished generations ago.

Water rights: Priority claims to water. In western states, water rights are based on the principle "first in time, first in right," meaning older claims take precedence over more recent ones.

Wetland: Land where saturation with water, whether permanent or temporary, is the dominant factor of determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface.

Withdrawal: Removal, or withholding, of public lands by statute, or Secretarial order, from operation of some or all of the public land laws ("surface", mining and/or mineral leasing laws).

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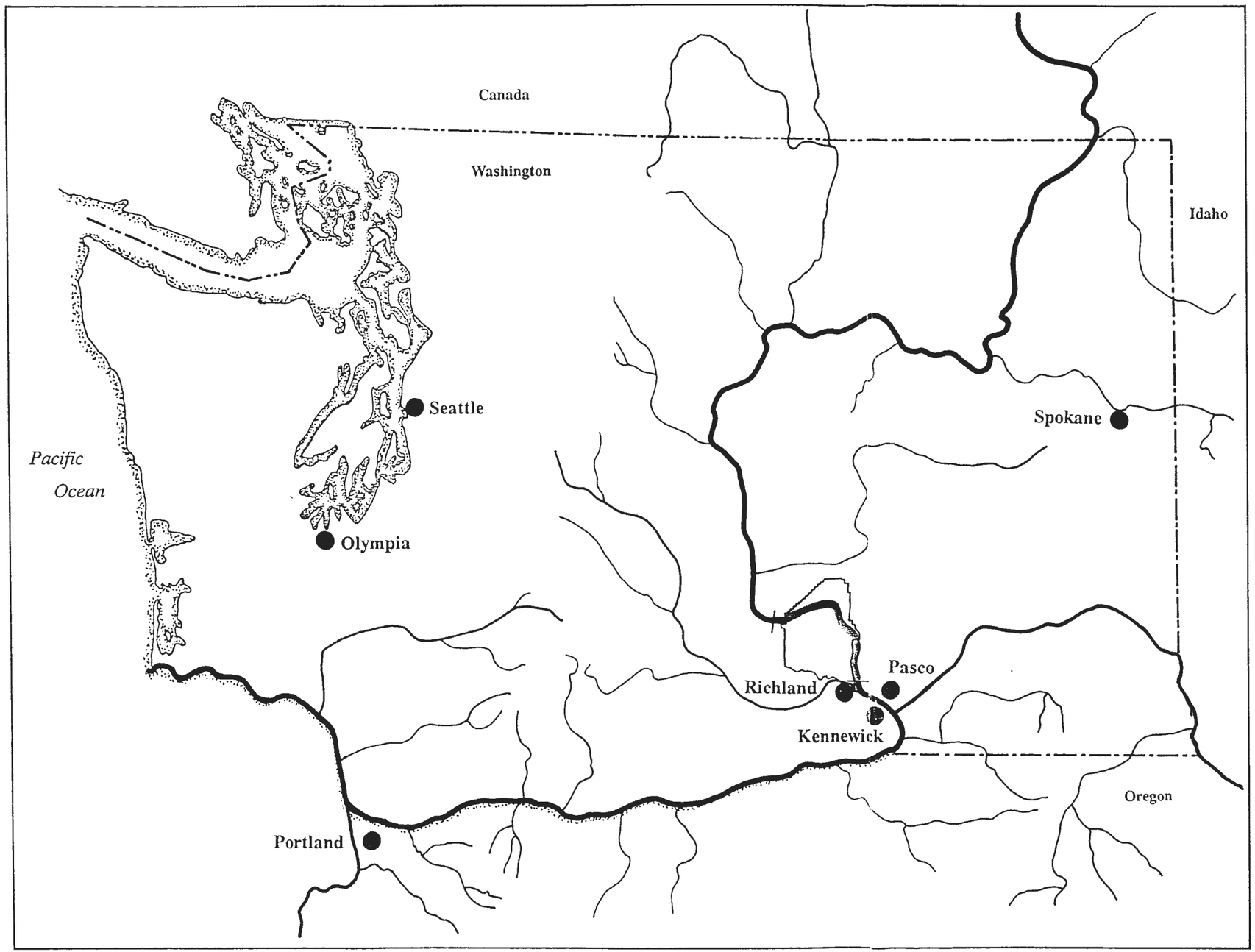
LOCATION



KEY

Hanford Site

Hanford Reach

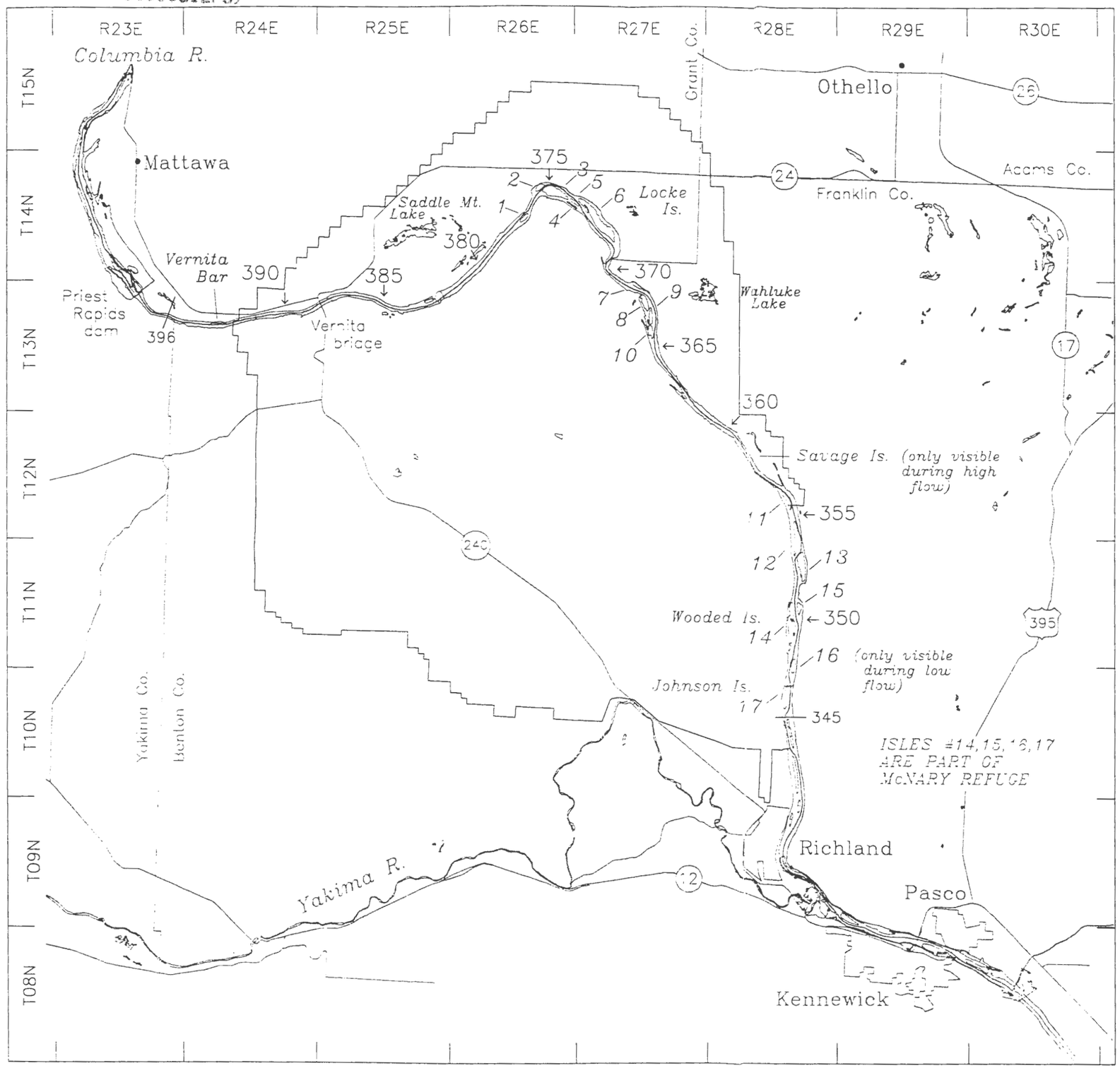
KILOMETERS
0 10 20
0 5 10
MILES

N

HANFORD REACH STUDY / EIS

National Park Service 1994 MAP #1

9513388.2739



ORIENTATION

KEY

River Miles

#1-17 Islands

KILOMETERS
0 10 20
0 5 10
MILES

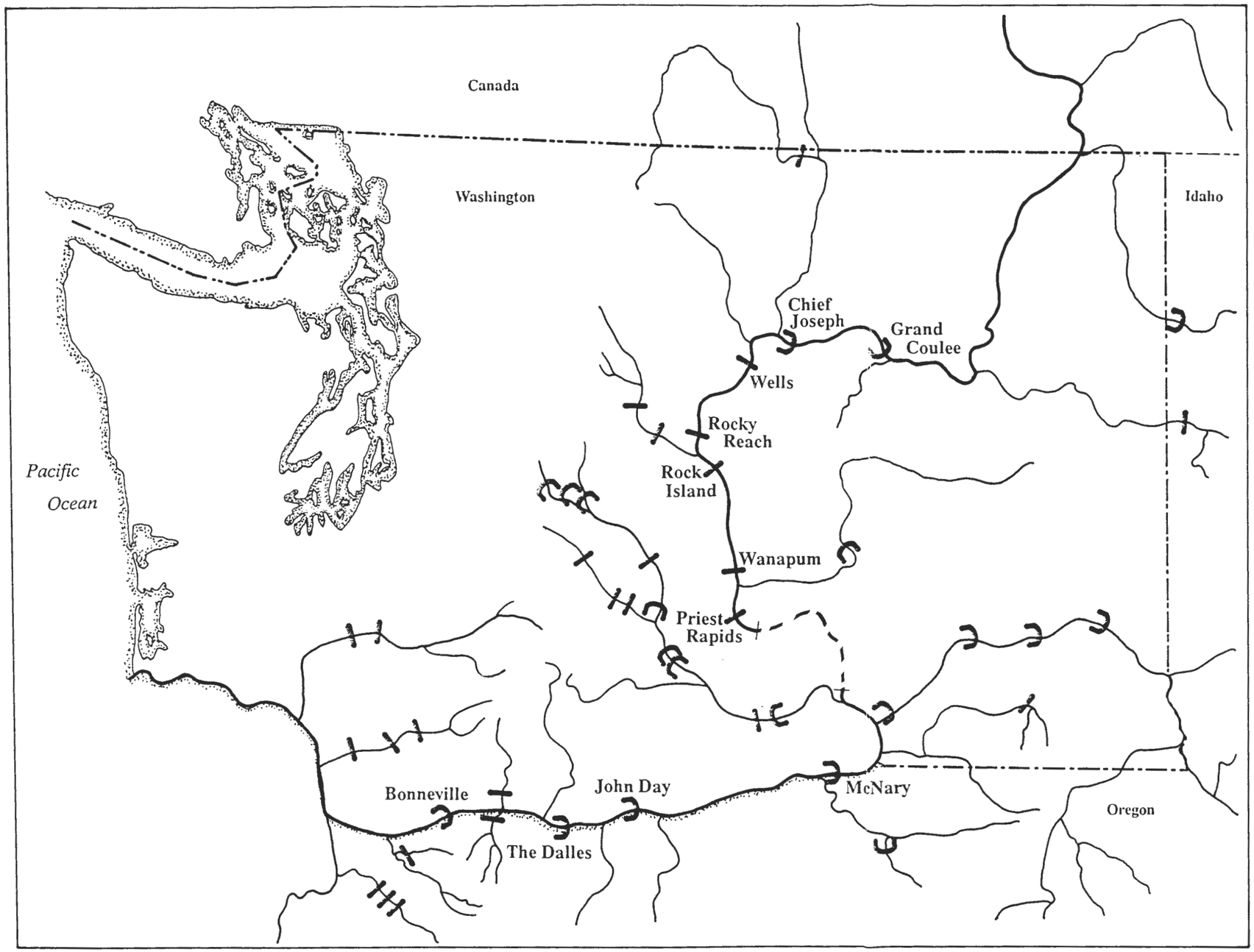
N

HANFORD REACH STUDY / EIS

National Park Service 1994 MAP #2

9513388.2740

COLUMBIA DAM SITES



KEY

Federal Dam Site

Nonfederal Dam Site

Hanford Reach
of the Columbia River

KILOMETERS
0 10 20
0 5 10
MILES

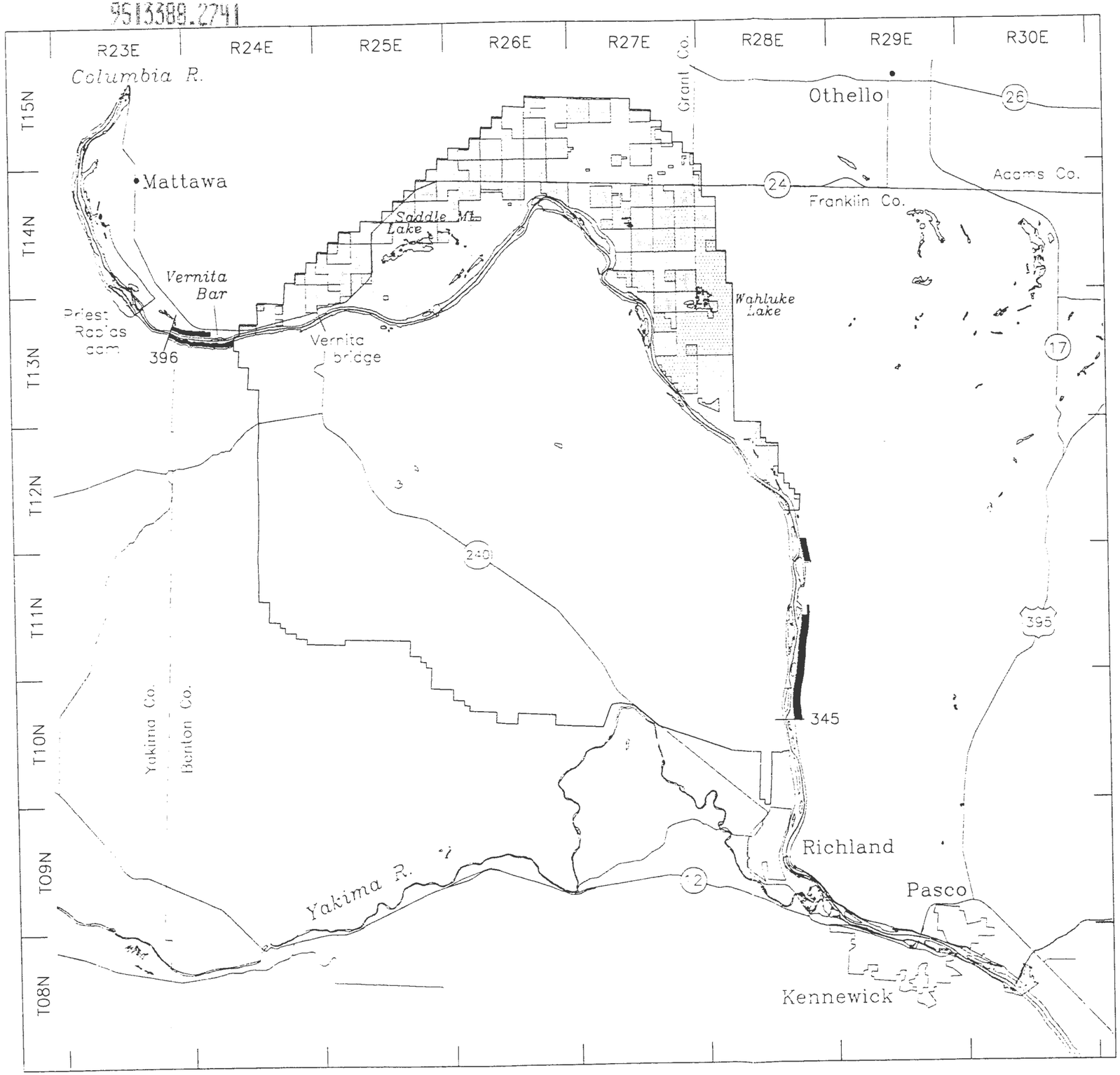
N

HANFORD REACH STUDY / EIS

National Park Service 1994

MAP #3

9513388.2741



OWNERSHIP

KEY

Federal Ownership of North Slope

U.S. Bureau of Reclamation
(Jurisdiction on BR lands given to AEC by Memorandum Agreement Feb. 27, 1957)

Public Domain
(Jurisdiction on Public Domain vested in AEC by Public Land Orders)

Fee Title Owned by DOE

Private Ownership within Study Area

Private Lands
(within 1/4 mile of the river)

KILOMETERS
0 10 20
0 5 10
MILES

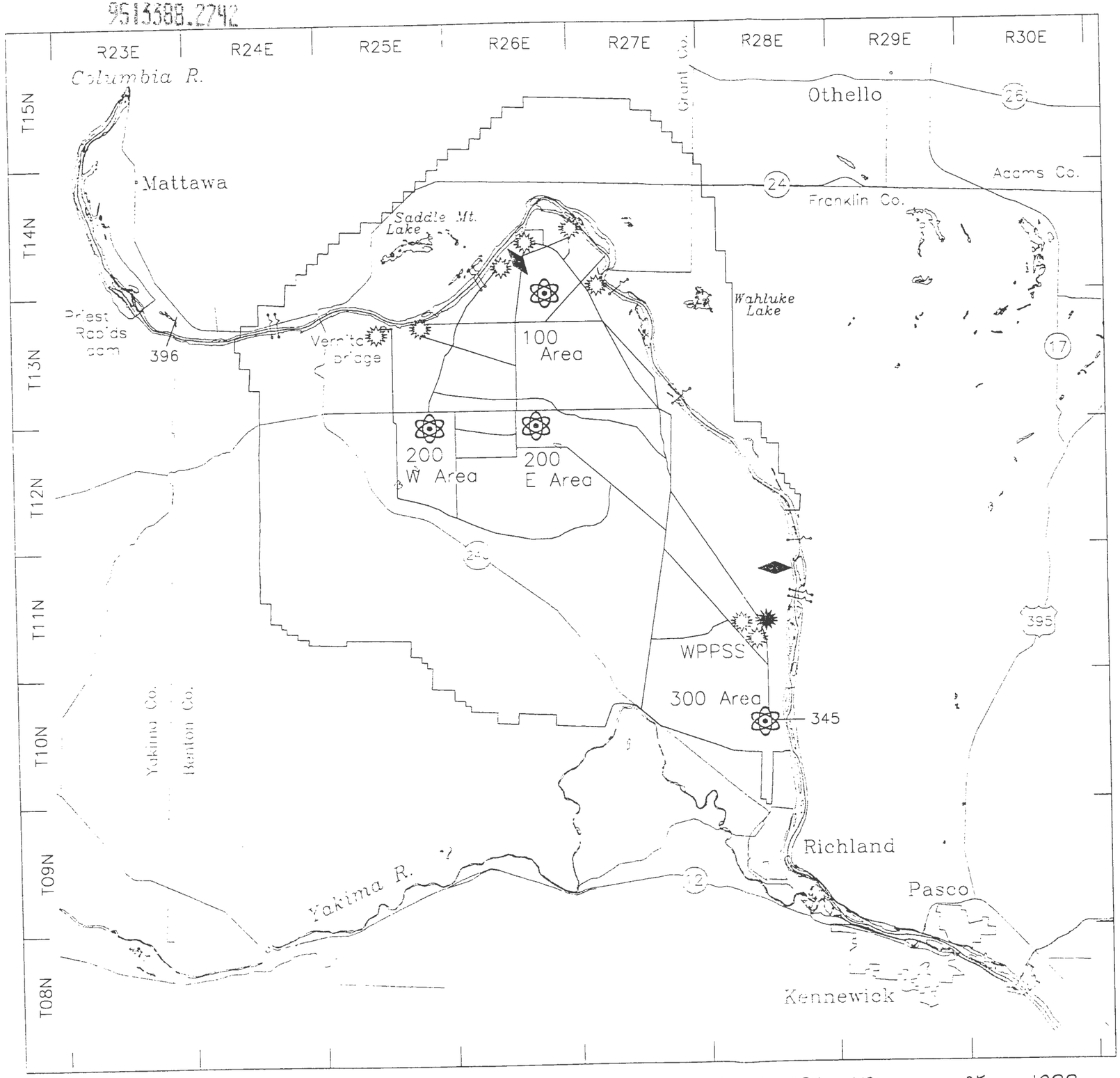
N

HANFORD REACH STUDY / EIS

National Park Service 1994 MAP #4

9513388.2742

FACILITIES



KEY

- Active Nuclear Reactor
- Inactive Nuclear Reactor
- Primary / Secondary Roads
- Powerlines
- DOE National Priority List Sites
- Outfall Area

KILOMETERS 0 10 20
MILES 0 5 10

N

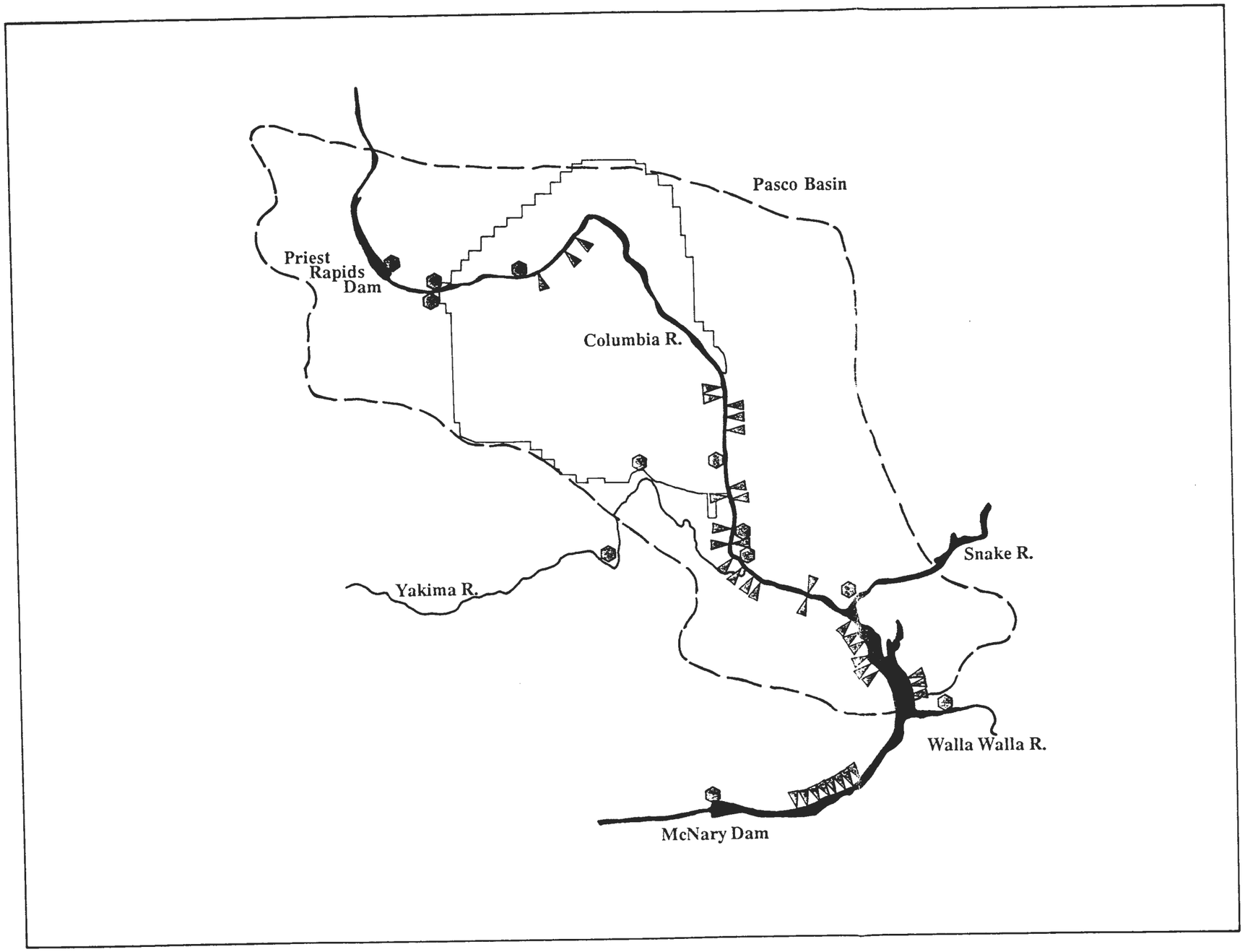
Source: Battelle 1984 and Department of Energy 1988

HANFORD REACH STUDY / EIS

National Park Service 1994 MAP #

9513388.2743

HYDROLOGY



KEY

Sampling Site

Intake

KILOMETERS
0 10 20
0 5 10
MILES

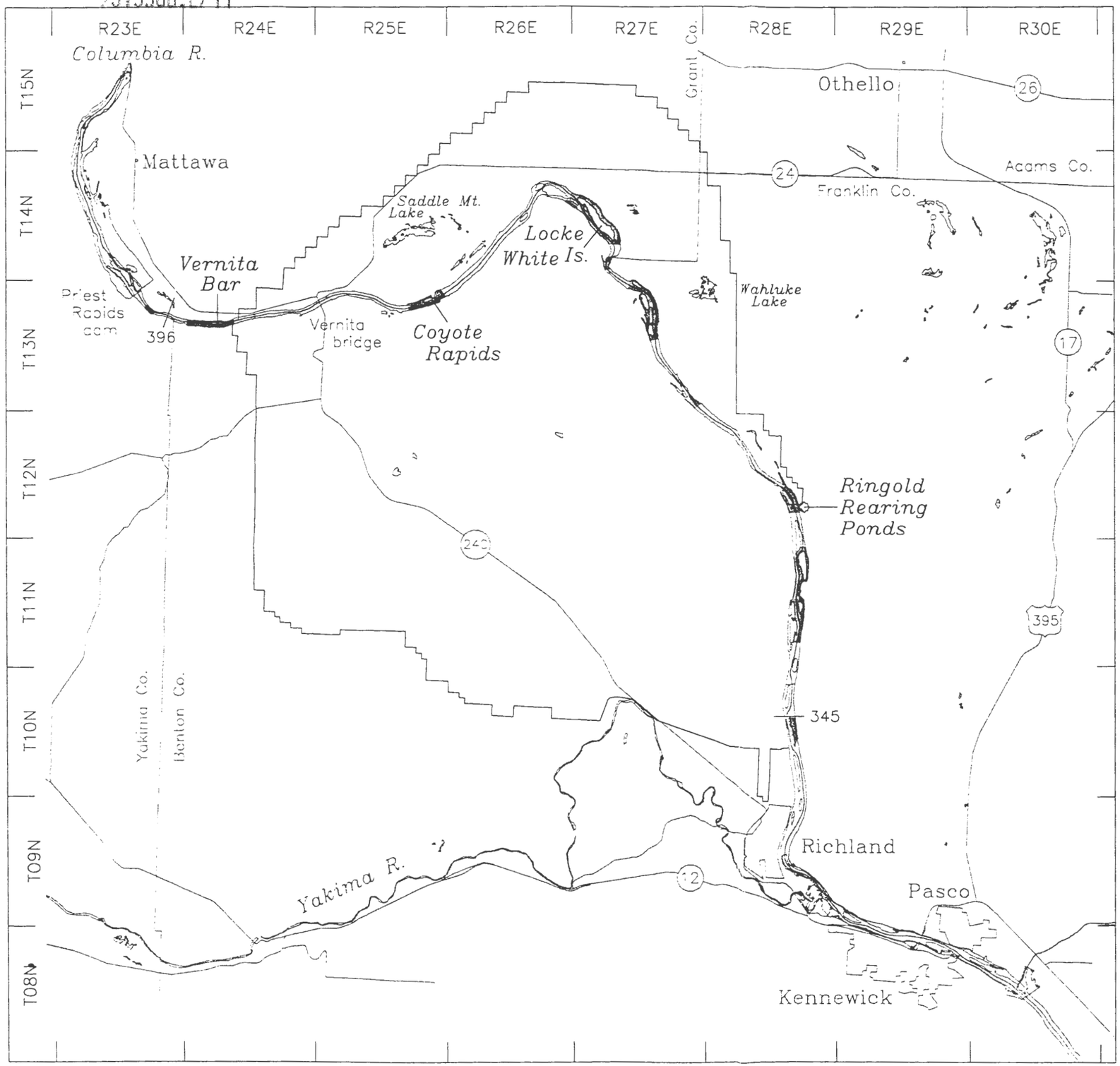
N

HANFORD REACH STUDY / EIS

National Park Service 1994 MAP #5

9513388.2744

FISHERIES



Source: Fickeisen et al. 1980

KEY

Key Spawning Areas

KILOMETERS 0 10 20

MILES 0 5 10

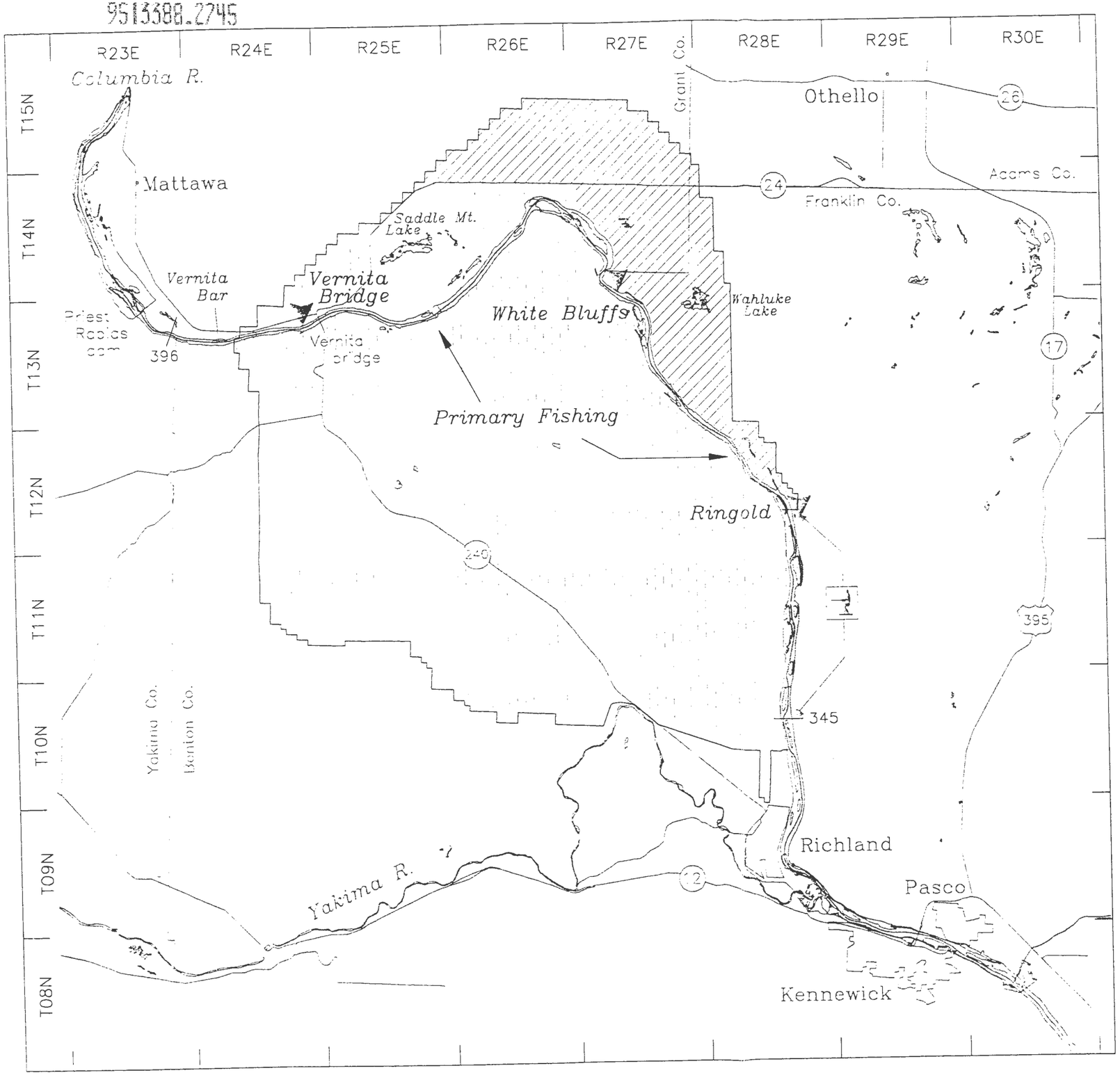
N

HANFORD REACH STUDY / EIS

National Park Service 1994 MAP #7

9513388.2745

RECREATION



KEY

- No Recreational Public Access
- Upland Hunting / Daytime Public Access
- Primary Fishing
- Seasonal Waterfowl Hunting (island habitat)
- Boat Access :
  - Vernita Bridge
  - White Bluffs
  - Ringold
- Waterskiing Area

Flatwater Boating available along entire stretch of Columbia River

Daytime Public Access also available along stretch of Columbia River from mile 345 to 396

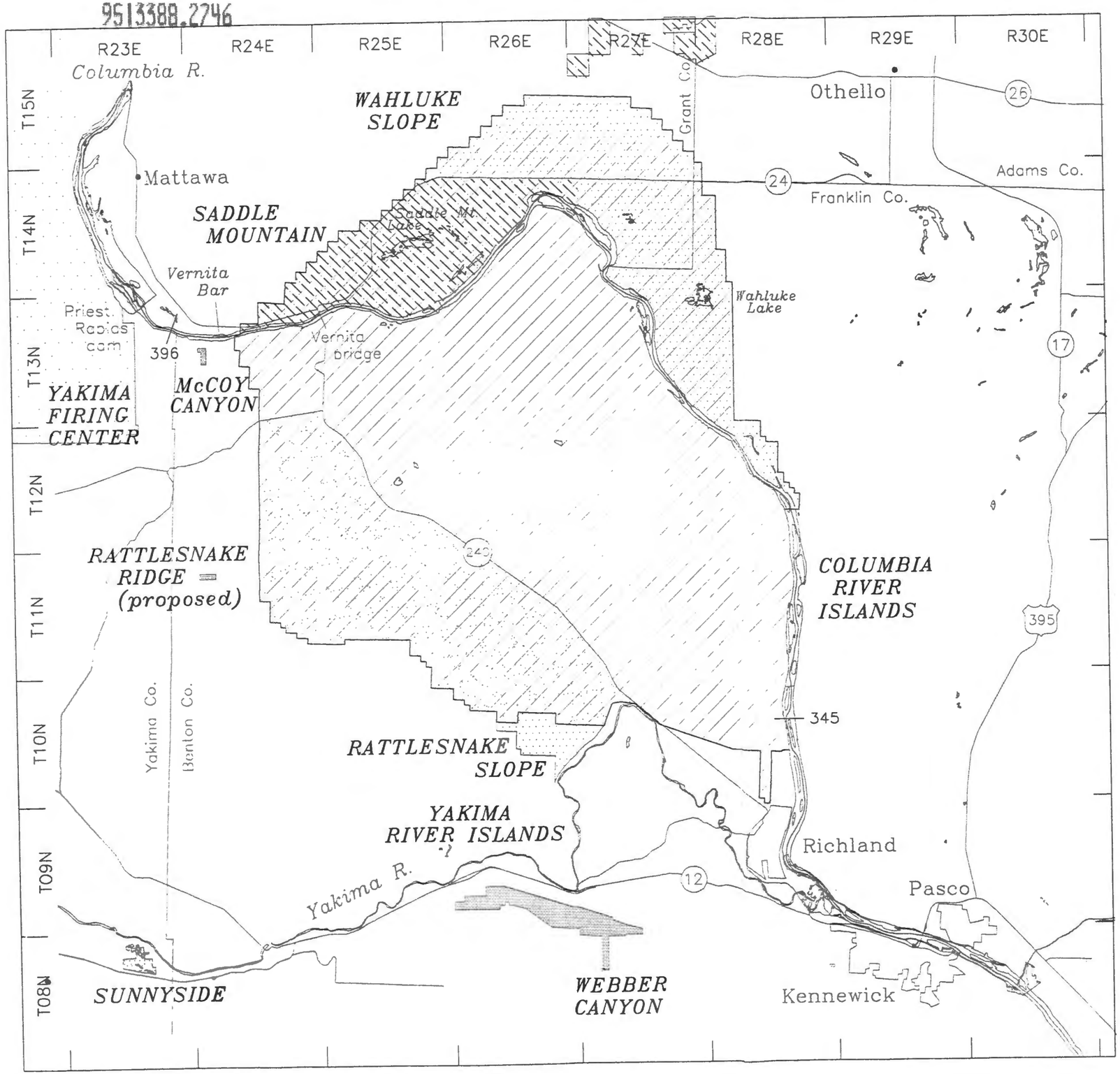
KILOMETERS 0 10 20
MILES 0 5 10

N

HANFORD REACH STUDY / EIS

National Park Service 1994 MAP #E

9513388.2746



DESIGNATED AREAS

KEY

- National Environmental Research Park (DOE)
- Arid Lands Ecology Reserve/ Research Natural Area (DOE)
- Area of Critical Environmental Concern (BLM)
- National Wildlife Refuge * (USFWS)
- State Wildlife Recreation Area * (WDW)
- Military Reservation (DOD)

* (through lease agreement with DOE)

KILOMETERS 0 10 20

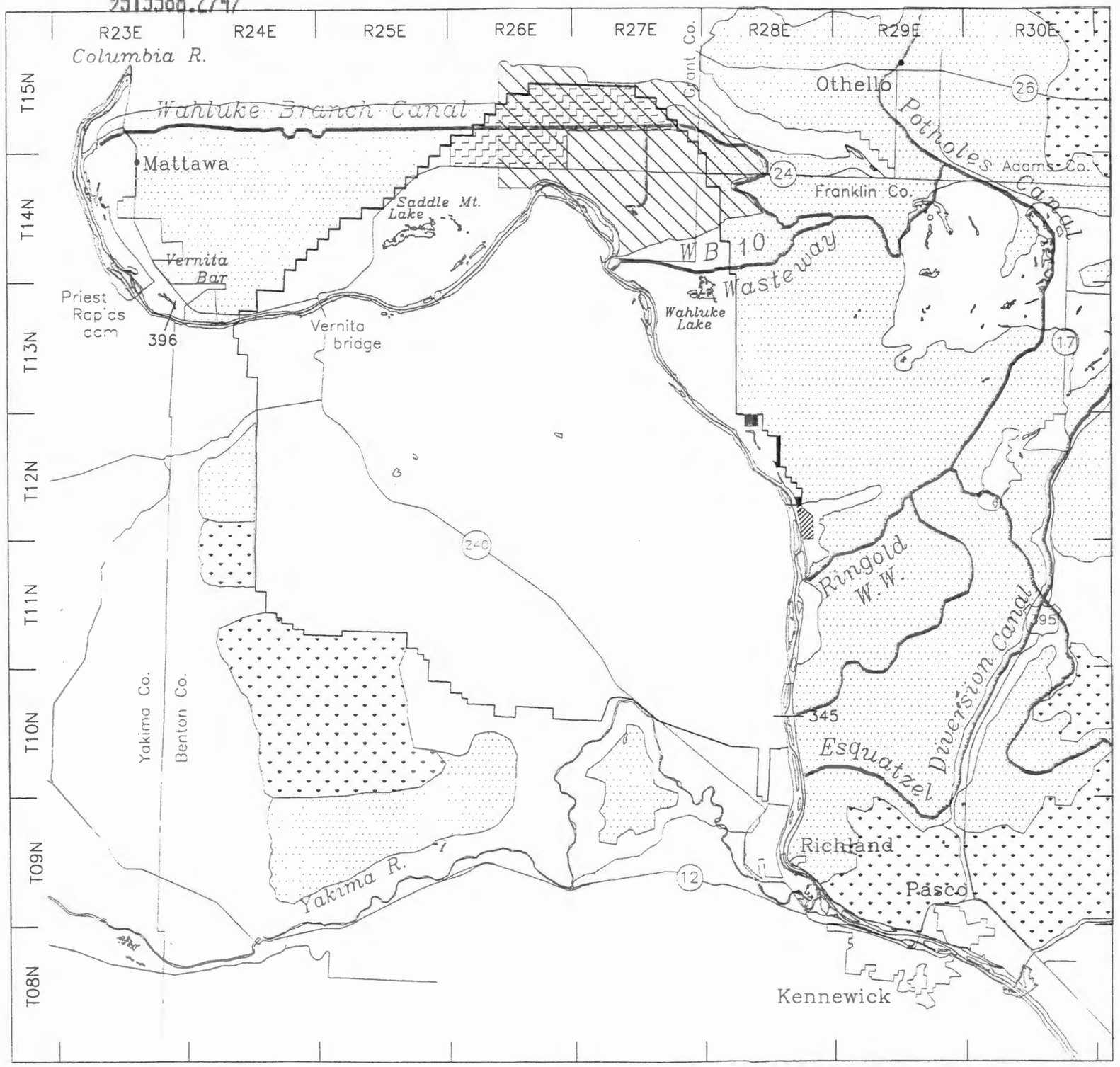
0 5 10 MILES

N

HANFORD REACH STUDY / EIS

National Park Service 1994 MAP #9

9513388.2747



Source: Battelle 1984 and Bureau of Reclamation 1984

AGRICULTURE

KEY

- Irrigated Agriculture
- Unirrigated Agriculture
- Grazing Within Study Area
- Sharecropping (WDW Lease)
- Ringold Agriculture Area
- BR "Red Zone"
- Irrigation Canals and Wasteways

KILOMETERS 0 10 20
MILES 0 5 10

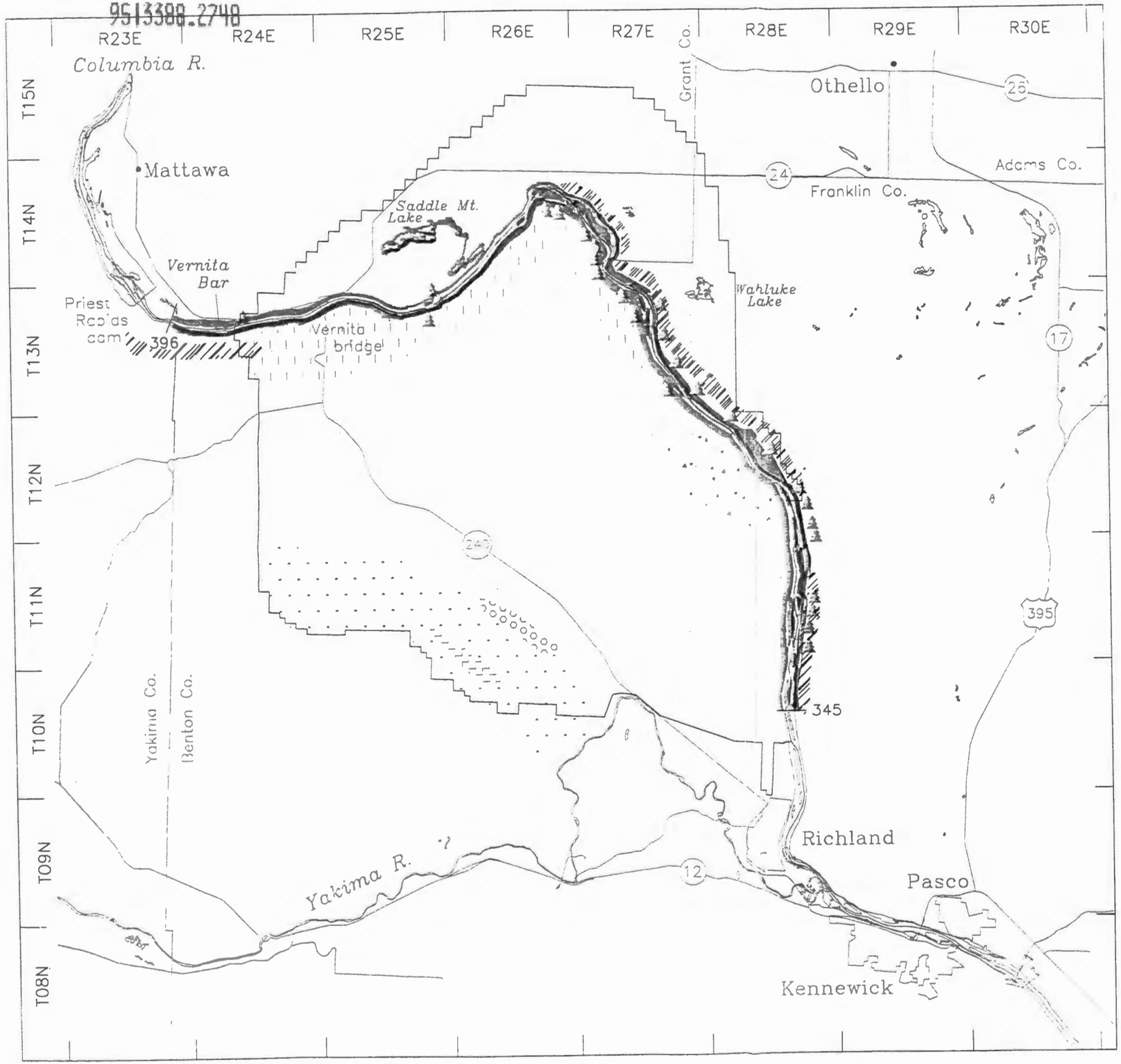
N

HANFORD REACH STUDY / EIS

National Park Service MAP #1C

9513388.2748

VEGETATION



Source: Battelle 1980 and Warren 1980

KEY

- Riverine / Aquatic
- Riparian (including Islands)
- Bluff Habitat
- Dunes
- Ridgecrest
- Annual Grass
- Sagebrush / Annual Grass
- Sagebrush / Perennial Grass
- Sagebrush-Bitterbrush / Annual Grass
- Low Shrub
- Exotic Tree

KILOMETERS 0 10 20

0 5 10 MILES

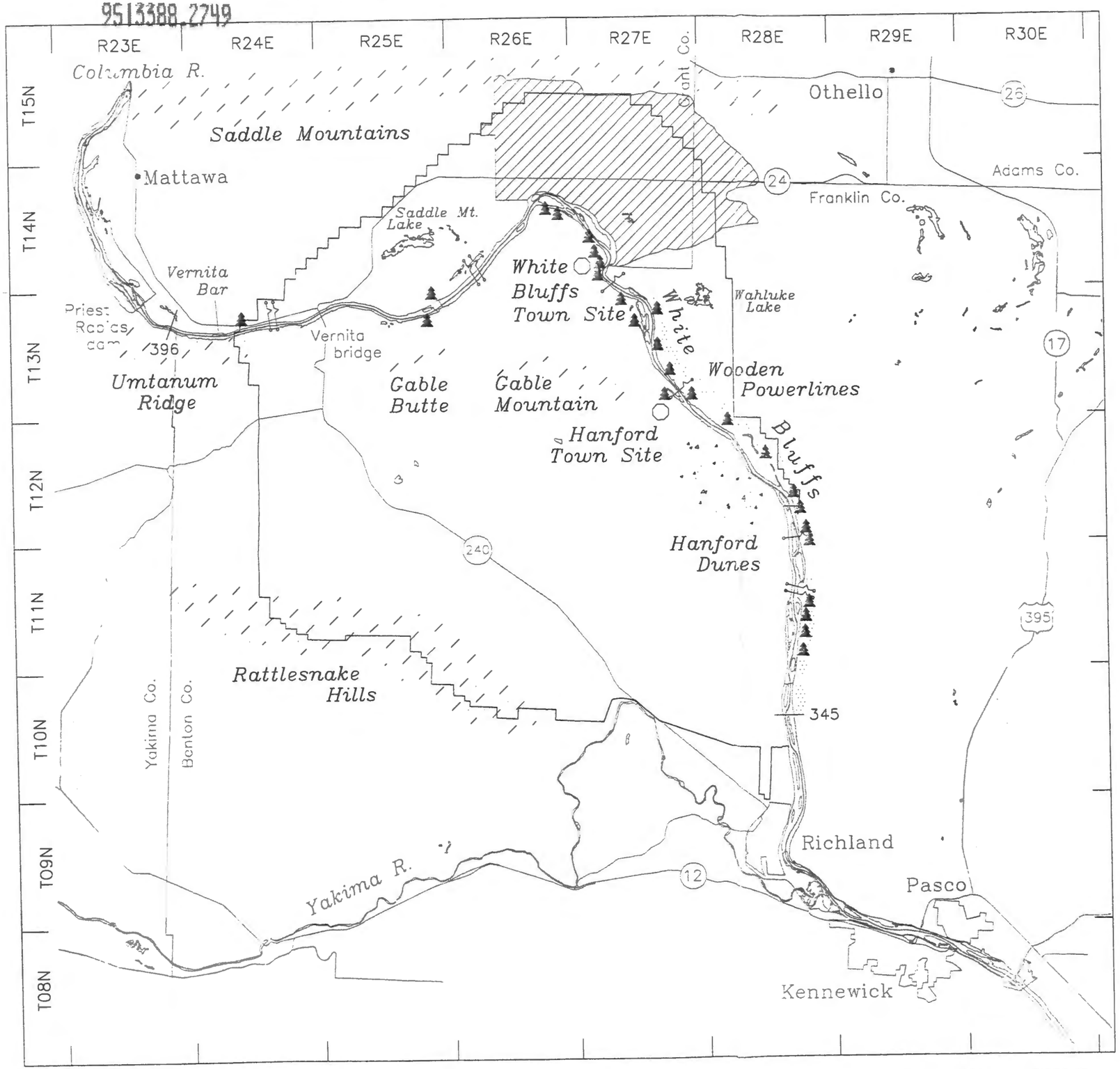
N

HANFORD REACH STUDY / EIS

National Park Service 1994 MAP #11

9513388.2749

VISUAL



KEY

- Slide Area
- Mountain / Hills
- Hanford Dunes
- White Bluffs
- Townsite
- Exotic Tree
- Powerline

KILOMETERS 0 10 20
MILES 0 5 10

N

Source: Batelle 1984; Bureau of Reclamation 1984; and Warren 1980

HANFORD REACH STUDY / EIS

National Park Service 1994 MAP #1