

Dick Biggerstaff	BHI, H4-91
Charlie Brandt	PNNL, K6-84
Amoret Bunn	Dames and Moore, B1-42
Sandra Cannon	PNNL, K9-13
Paul Danielson	Nez Perce Tribe
Greg deBruler	Hanford Advisory Board
Michael Blanton	PNNL, K6-75
Dennis Dauble	PNNL, K6-85
Roger Dirkes	PNNL, K6-75
Sue Finch	PNNL, K9-26
Larry Gadbois	EPA, B5-01
Ken Gano	BHI, H6-02
Stuart Harris	Confederated Tribes of the Umatilla Indian Reservation
Dave Holland	Ecology, B5-18
David Maughan	PNNL, K6-75
Jay McConaughy	WDFW, B5-18
Terri Miley	PNNL, K6-80
Dick Moos	CH2M Hill, H9-03
Nancy Myers	BHI, H4-81
Bruce Napier	PNNL, K3-54
Lino Niccoli	Yakama Indian Nation, G1-00
Tara O'Neil	PNNL, K6-75
Doug Palenshus	Ecology, B5-18
Ralph Patt	Oregon Department of Energy
Stan Sobczyk	Nez Perce Tribe
Bob Stewart	DOE-RL, H4-83
Dan Tano	DOE-RL
Mike Thompson	DOE-RL, H4-83
Steve Weiss	CH2M Hill, H9-03
JR Wilkinson	Confederated Tribes of the Umatilla Indian Reservation
Tom Woods	Yakama Indian Nation, G1-00
Jerry Yokel	Ecology, B5-18

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Internal Distribution

See attached list  
File/LB

Date January 17, 1996

To CRCIA Project Management Team

From CA Brandt *JMA for CAB*

Subject Species of Concern Presentation

The enclosed packet contains a copy of the overheads used in the Species of Concern presentation to the CRCIA management team on January 16, with the addition of a flow chart showing the process described in the presentation. Additionally, the overhead "Example Tier I Ranking in Appendix B of Document" has been corrected.

To allow completion of the screening-level risk assessment within the current time and budget constraints, we need to define a list of approximately 30 species for which we will be estimating exposures and risks from direct effects of Hanford-derived contaminants. Thus far, we have a listing of approximately 50 species derived from the resource agencies (called Tier I listing). To meet the needs of the CRCIA, this listing must be reviewed and augmented to include species of concern to the stakeholders. We will then utilize a qualitative exposure ranking system to rank-order the Tier I list as a basis for selecting species for the risk assessment (the Tier II list). The Tier II list will be based on high exposure and/or high stakeholder concern.

To that end, we need to complete the following by the dates listed:

Augmented Tier I listings to PNNL from stakeholders	Close of Business, Monday Jan. 22.
Rank-ordered scores on exposure magnitudes to stakeholders from PNNL	Start of Business, Thursday Jan 25.
Selection of top 30 Tier II candidates from stakeholders to PNNL	Close of Business, Monday Jan 29.
Final Tier II listing to stakeholders	Close of Business, Wednesday Jan 31

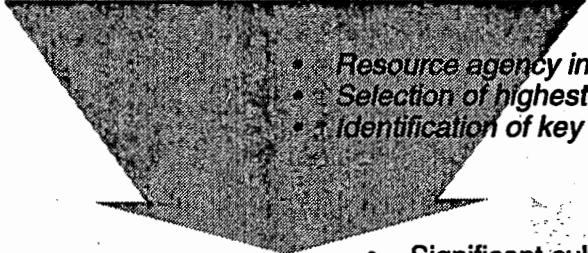
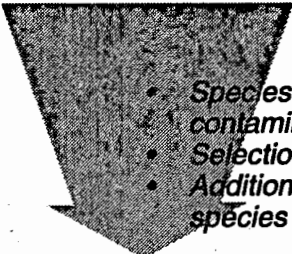
Please fax your input to Charlie Brandt at (509)372-3515.

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## Derivation of Listing of Species to be Evaluated in the Screening-Level Exposure Risk Assessment.

<u>Listing Name</u>	<u>Content of List</u>	<u>Criteria for Listing</u>	<u>No. of Species in List</u>
<u>Base Listing</u>	Listing of species in study area	<ul style="list-style-type: none"> <li>• Riparian &amp;/or aquatic species</li> <li>• Occur within the study area</li> </ul>	~360
			
<u>Tier I Listing</u>	Listing of species of concern for risk assessment purposes	<ul style="list-style-type: none"> <li>• Resource agency input on questionnaire</li> <li>• Selection of highest-scoring species within major taxa</li> <li>• Identification of key species by CRCIA management team</li> <li>• Significant cultural importance</li> <li>• Significant concern from resource management perspective</li> <li>• Potential indicators of effects</li> <li>• Potentially exposed to contaminants</li> <li>• Includes representatives of major taxa</li> </ul>	~80
			
<u>Tier II Listing</u>	Listing of species to be evaluated in screening risk assessment for direct effects	<ul style="list-style-type: none"> <li>• Species ranked on potential level of exposure to contaminated media and food</li> <li>• Selection of highest-scoring species within major taxa</li> <li>• Addition by CRCIA management team of most important species not included in the highest-scoring group</li> <li>• Potential high exposure to contaminants</li> <li>• High concern re cultural/resource management</li> <li>• Includes representatives of major taxa</li> </ul>	~30

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## Composite Scores

- Rankings on Exposure Magnitude did not change greatly with changes in "source" area:
- Because toxicological/radiological reference benchmarks are commonly acute (<96 hr), duration rankings >2 are probably equivalent. Composite based on Exposure Magnitude may therefore be the better option.

# Overall Ranking Results

	Muskrat	Otter	Beaver	Deer	Deer mouse	Harvest mouse	Mink	Bullfrog	Emergent veg	Macrophytes	Periphyton	Phytoplankton	Crayfish	Snails/Gleams	Insects
Grand Average Exposure	25	22	20	19	18	18	16	30	27	27	23	13	41	41	41
Exposure Rank	1	2	3	4	5	5	7	1	1	1	3	4	1	1	1
Duration of Exposure	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Composite Rank	1	2	2	4	5	5	7	1	1	1	3	4	1	1	1

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# Overall Ranking Results

	Channel catfish	Sucker	Carp	Sculpin	Sturgeon	Whitefish	Shiner	Bass	Squawfish	Trout	Lamprey	Salmon
Grand Average Exposure	41	38	31	34	31	31	27	24	24	24	27	24
Exposure Rank	1	2	4	3	4	4	7	8	9	9	7	9
Duration of Exposure	4	4	4	4	4	4	4	4	4	4	2	2
Composite Rank	1	1	3	3	3	3	7	8	8	8	11	12

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## Scoring Sensitivity to Contaminant

- Ranked according to LD<sub>50</sub> for radiation exposure
- Little differentiation within major taxa
- Mammals/birds = 4
- Fish/Reptiles/Amphibians = 3
- Higher plants/Insects = 2
- Primitive plants = 1

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## Overall Ranking Results

	Terr veg	Cod	Goose/Mallard	Heron	Grebe	Pelican	Ouail	Dabblers (wigeon)	Harrier	Kestrel	Owl	Divers (bullfinch)	Tern	Blackbird	Belted Kingfisher	Crow	Robin	Blue Jay	Sandhill crane
Grand Average Exposure	25	32	24	24	22	22	18	32	12	12	12	25	22	18	16	16	15	24	24
Exposure Rank	1	1	4	4	7	7	10	1	15	15	15	3	7	10	12	12	12	12	1
Duration of Exposure	4	4	4	4	4	4	4	2	4	4	4	2	2	2	2	2	2	2	1
Composite Rank	1	1	2	2	2	2	6	7	7	7	7	11	12	13	14	14	14	16	17

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## Pathway Sensitivity Results

	Channel catfish	Sucker	Sculpin	Crappie	Whitefish	Lamprey	Sturgeon	Shiner	Bass	Salmon	Squawfish	Trout
TOTAL-bioaccum	27	24	23	21	21	18	22	19	18	18	18	18
TOTAL-nonbioaccum	26	25	22	20	20	19	19	18	15	15	15	15
In-River Total - bioaccum	46	40	38	34	34	28	36	30	28	28	28	28
In-River Total - nonbioacc	44	42	36	32	32	30	30	28	22	22	22	22
Outfall Total - bioaccum	38	33	32	29	29	24	31	26	25	25	25	25
Outfall Total - nonbioacc	36	35	30	27	27	26	25	24	19	19	19	19
In-River average	45	41	37	33	33	29	33	29	25	25	25	25
Outfall average	37	34	31	28	28	25	28	25	22	22	22	22

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## Scoring Exposure Duration

- Rare = 1
- Part-year = 2
- Lifetime = 4

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# Pathway Sensitivity Results

	Terr veg	Coot	Dabblers (Wigeon)	Divers (Bufflehead)	Goose/Mallard	Heron	Sandhill crane	Tern	Grebe	Pelican	Quail	Blackbird	Belted Kingfisher	Osprey	Great egret	Red-tail	Kestrel	Owl
TOTAL-bioaccum	13	22	22	19	15	18	18	16	17	17	11	12	13	13	12	9	9	9
TOTAL-nonbioaccum	16	21	21	16	16	15	15	15	14	14	12	11	10	10	9	6	6	6
In-River Total - bioaccum	24	32	32	26	20	26	25	20	22	22	14	17	18	18	17	14	14	14
In-River Total - nonbioacc	30	30	30	20	22	20	19	18	16	16	16	15	12	12	11	8	8	8
Outfall Total - bioaccum	20	34	34	30	26	28	29	26	28	28	20	21	20	20	19	16	16	16
Outfall Total - nonbioacc	26	32	32	24	28	22	23	24	22	22	22	19	14	14	13	10	10	10
In-River average	27	31	31	23	21	23	22	19	19	19	15	16	15	15	14	11	11	11
Outfall average	23	33	33	27	27	25	26	25	25	25	21	20	17	17	16	13	13	13

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# Pathway Sensitivity Results

	Muskrat	Beaver	Otter	Deer	Deer mouse	Harvest mouse	Mink	Bullfrog	Emergent veg	Macrophytes	Periphyton	Phytoplankton	Crayfish	Shells/clams	Insects
TOTAL-bioaccum	17	13	17	12	11	12	13	22	15	15	13	7	26	26	26
TOTAL-nonbioaccum	18	14	14	13	12	11	10	21	18	18	16	10	27	27	27
In-River Total - bioaccum	22	16	22	16	14	16	16	30	26	26	22	10	44	44	44
In-River Total - nonbioacc	24	18	18	18	16	14	10	28	32	32	28	16	46	46	46
Outfall Total - bioaccum	26	22	26	20	20	22	22	32	22	22	18	10	36	36	36
Outfall Total - nonbioacc	28	24	22	22	22	20	16	30	28	28	24	16	38	38	38
In-River average	23	17	19	17	15	15	13	29	29	29	25	13	45	45	45
Outfall average	27	23	25	21	21	21	18	31	25	25	21	13	37	37	37

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## Exposure Magnitude Results

	Channel catfish	Sucker	Sculpin	Carp	Whitefish	Lemprey	Sturgeon	Shiner	Bass	Salmon	Squawfish	Trout	Max	Min
Ingestion - bioaccum	1	5	4	3	3	3	1	3	4	1	3	2	1	0
Ingestion - nonbioacc	1	4	3	2	2	2	1	2	3	1	2	1	1	0
Food - bioaccumulator	3	2	3	3	3	2	4	3	4	4	4	4	4	4
Food - nonbioaccum	2	3	2	2	2	3	1	2	1	1	1	1	1	1
Sediment/soil	4	4	3	3	2	2	3	2	2	1	2	1	2	1
Ground/Pore water	4	4	3	3	2	2	3	2	2	1	2	1	2	1
Surface water	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Dermal/surface water	2	4	0	1	0	1	1	1	0	1	0	0	1	0
Sediment/soil	4	3	3	2	3	2	2	2	1	2	1	2	2	1
Ground/Pore water	4	3	3	2	3	2	2	2	1	2	1	2	2	1
Surface water	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Inhalation - bioaccum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Inhalation - nonbioacc	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL-bioaccum	27	24	23	21	21	18	22	19	18	18	18	18	27	7
TOTAL-nonbioaccum	26	25	22	20	20	19	19	18	15	15	15	15	27	6

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## Sensitivity of Pathways

Exposure area	Relative Degree of Exposure				
	Air	Food	Sediment/Soil	Pore/Ground water	Surface water
Outfalls	2	2	2	1	1
Slough/nearshore	0	2	2	2	2
McNary Pool	0	2	2	2	2
Seeps/Springs	0	2	2	2	2

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# Exposure Magnitude Results

	Fer veg	Coot	Dabblers (wigeon)	Divers (bufflehead)	Goose/Mallard	Heron	Sandhill crane	Fern	Grebe	pelican	Quail	Blackbird	Belted Kingfisher	Oswego eagle	Hairy	Osprey	Great	Owl
Ingestion - bioaccum	9	1	5	1	2	6	1	2	9	1	0	0	0	0	0	0	0	0
Ingestion - nonbioacc	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Food - bioaccumulator	1	3	3	4	2	4	4	3	4	4	2	3	4	4	4	4	4	4
Food - nonbioaccumulator	4	2	2	1	3	1	1	2	1	1	3	2	1	1	1	1	1	1
Sediment/soil	4	4	4	3	4	2	2	2	2	2	2	2	2	2	2	2	2	2
Ground/Pore water	4	4	4	2	0	2	2	0	0	0	0	0	0	0	0	0	0	0
Surface water	0	4	4	4	2	4	4	4	4	4	2	2	4	4	4	4	2	2
Dermal/surface	4	4	4	4	4	4	3	4	4	4	2	3	4	4	3	2	2	2
Sediment/soil	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Ground/Pore water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Surface water	2	2	2	2	2	2	1	2	2	2	0	1	2	2	1	0	0	0
Inhalation	0	3	3	3	3	2	3	3	3	3	3	2	1	1	1	1	1	1
TOTAL-bioaccum	13	22	22	19	15	18	18	16	17	17	11	12	13	13	12	9	9	9
TOTAL-nonbioaccum	16	21	21	18	15	15	15	14	14	12	11	10	10	9	6	6	6	6

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# Exposure Magnitude Results

	Muskrat	Beaver	Otter	Deer	Deer mouse	Harvest mouse	Mink	Bullfrog	Emergent veg	Macrophytes	Periphyton	Phytoplankton	Clay/fish	Snails/clams	Insects
Ingestion - bioaccum	1	0	6	1	0	6	6	1	0	0	1	1	1	1	1
Ingestion - nonbioacc	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Food - bioaccumulator	2	2	4	2	2	3	4	3	1	1	1	1	2	2	2
Food - nonbioaccumulator	3	3	1	3	3	2	1	2	4	4	4	4	3	3	3
Sediment/soil	2	2	2	2	2	2	0	2	4	4	4	0	0	4	4
Ground/Pore water	2	0	0	0	0	0	0	2	4	4	0	0	4	4	4
Surface water	4	2	4	2	2	2	2	4	0	0	0	0	4	4	4
Dermal/surface	4	4	4	4	4	2	4	4	6	6	4	6	4	4	4
Sediment/soil	2	2	2	2	2	2	2	2	2	2	4	2	4	4	4
Ground/Pore water	0	0	0	0	0	0	0	2	0	0	4	0	4	4	4
Surface water	2	2	2	2	0	0	2	4	4	4	4	4	4	4	4
Inhalation	3	3	3	3	3	3	3	3	0	0	0	0	0	0	0
TOTAL-bioaccum	17	13	17	12	11	12	13	22	15	15	13	7	26	26	26
TOTAL-nonbioaccum	18	14	14	13	12	11	10	21	18	18	16	10	27	27	27

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# Dermal Pathways

Sediment/Soil Pore/Ground Water Dermal			
Frequency	Life Stage		
	Juvenile	Adult	Lifetime
Immersion	2	2	4
Occasionally	1	1	2
None	0	0	0

Surface Water Dermal			
Degree of Exposure			
Immersion	Partial	Seidom	None
4	2	1	0

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# Inhalation Pathway

Inhalation		
Degree of Exposure		
Life < 0.5 m above surface	Mostly < 1 m above surface	Mostly > 1m above surface
3	2	1

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# Scoring Exposure Pathways

- Dermal/Ingestion/Inhalation pathways
- Food Chain - Bioaccumulating vs. Non-bioaccumulating contaminants
- Sediment/soil
- Pore/ground water
- Surface water
- Air

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# Ingestion Pathways

Food Chain Exposure Rankings		
Contaminant		
Trophic Level	Bioaccumulator	Non-bioaccumulator
Top	4	1
Middle	3	2
Bottom	2	3
Producer	1	4

Sediment/Soil Pore/Ground Water Ingestion			
Frequency	Life Stage		
	Juvenile	Adult	Lifetime
Often	2	2	4
Occasionally	1	1	2
None	0	0	0

Surface Water Ingestion			
Degree of Exposure			
Drink & Eat Wet	Drink	Eat Wet	None
4	2	2	0

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## Tier I Species for Hanford Reach and McNary Pool Areas of Columbiar River

95 Potential Species

<b>Plants</b>	Baltic rush Common cattail Common spikerush Hardstem bullrush Little buttercup ( <i>aquatilis</i> ) Sedge ( <i>vulpinoides</i> ) Watercress Black cottonwood Alkali bulrush Softstem bulrush Three-square bulrush	<b>Fish</b>	Fall chinook Salmon Channel catfish Mountain whitefish Rainbow trout Redside shiner Smallmouth bass Steelhead trout White sturgeon Common carp Northern squawfish Bull trout Mountain sucker Pacific lamprey Prickly sculpin Sockeye salmon Spring chinook salmon Summer chinook salmon
<b>Birds</b>	11 Bald eagle American coot American white pelican Bufflehead Common goldeneye Great blue heron Green-winged teal Lesser scaup Mallard Northern shoveler American wigeon Belted kingfisher Blue-winged teal California quail Caspian tern Chukar Cinnamon teal Common merganser Eared grebe Eurasian wigeon Forster's tern Gadwall Hooded merganser Northern pintail Osprey Red-breasted merganser Red-winged blackbird Sandhill crane Snow goose	<b>Rep/Amp</b>	17 Bullfrog Spotted frog
		<b>Inverts</b>	2 California floater Crayfish <i>Bosmina</i> Columbia pebblesnail <i>Cyclops</i> <i>Diaptomus</i> Midge Shortface lanx Caddis fly ( <i>campyla</i> ) Caddis fly ( <i>cockerelli</i> )
<b>Mammals</b>	29 Black-tailed deer Roosevelt elk White-tailed deer Deer mouse Mink Muskrat River otter Western harvest mouse Beaver House mouse	<b>Algae</b>	10 <i>Asterionella</i> sp. <i>Fragilaria</i> sp. <i>Melosira</i> sp. <i>Stephanodiscus</i> <i>Synedra</i> sp. <i>Achnanthes</i> sp. <i>Chlorophyta</i> sp. <i>Cladophora</i> sp. <i>Cocconeis</i> sp. <i>Cyclotella</i> sp. <i>Gomphonema</i> sp. <i>Nitzschia</i> sp. <i>Stephanodiscus</i> sp. <i>Stigeoclonium</i> sp.
		<b>Macrophytes</b>	14 Duckweed <i>Elodea</i> sp. <i>Myriophyllum</i> sp. <i>Potamogeton</i> sp.
			4

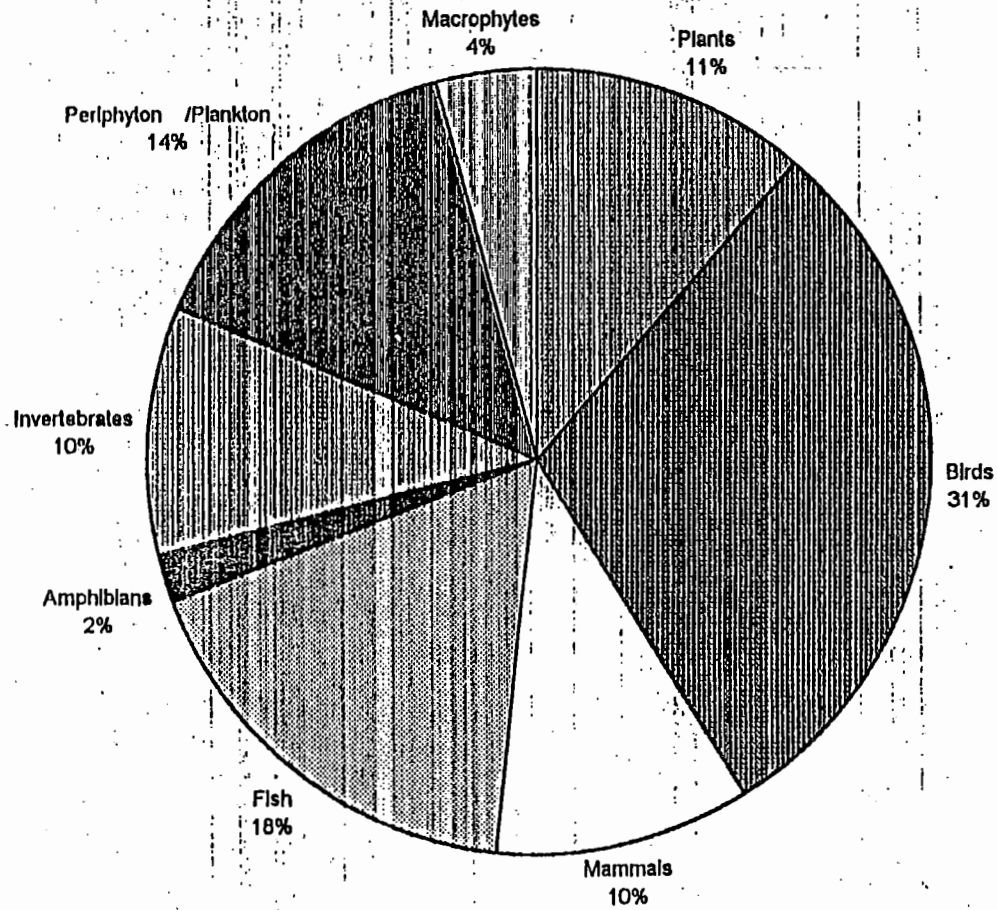


Example Tier I Ranking in Appendix B of Document

SPECIES		CRITERIA						RANK	
Life Form	Common Name	Commercial Recreational Cultural Significance	Federal/ State Protection	Key predator/ key prey/ primary producer	Maximally exposed/Bio- accumulator during Lifecycle	Available data on Chemical Stressors	Indicator Species at Trophic or Guild Level	"No" Rank	"Yes" Rank
Plants	Baltic rush	0	1	0	0	1	0	2	4
Plants	Common cattail	0	1	1	0	0	0	2	4
Plants	Common spikerush	0	1	0	0	1	0	2	4
Plants	Hardstem bulrush	0	1	0	0	1	0	2	4
Plants	Little buttercup (aquatilis)	0	1	0	0	1	0	2	4
Plants	Sedge (vulpinoides)	0	1	0	0	1	0	2	4

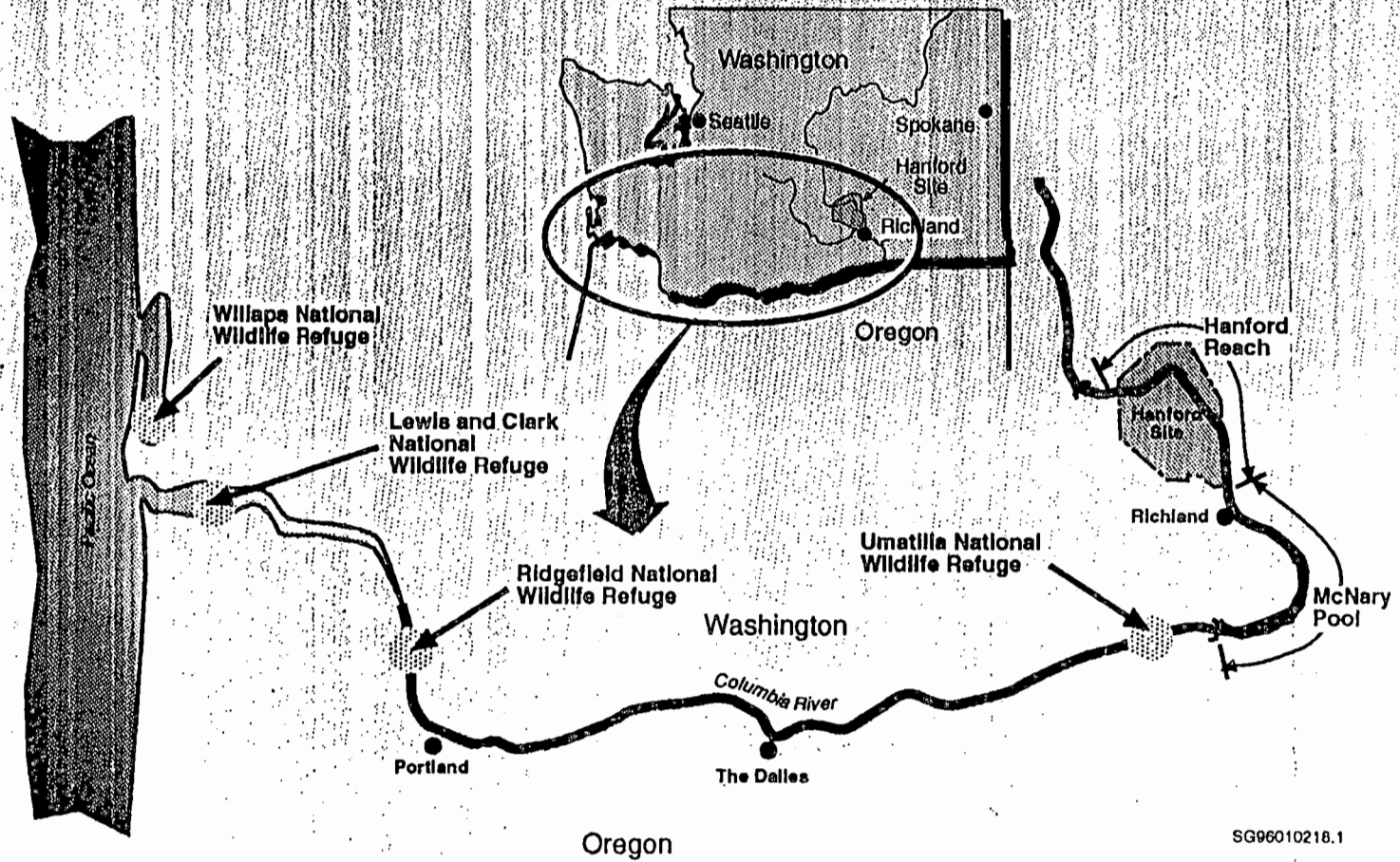
	Bins	Count	Frequency
Overall Ranking Results:	1	215	56.88%
FREQUENCY DISTRIBUTION	2	66	17.46% Cutoff
of "Yes" responses	3	45	11.90%
	4	44	11.64%
	5	6	1.59%
	6	2	0.53%
	7	0	0.00%

**Percentages of Plants and Animals (Tier I)**



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# Lower Columbia River with Hanford Reach and MaNary Pool



## Sources for Master List:

- Oregon Natural Heritage Program
- Washington Department of Natural Resources
- Oregon Department of Fish and Wildlife
- Washington Department of Fish and Wildlife
- Oregon Department of Environmental Quality
- Washington State Energy Office
- Bonneville Power Administration
- Pacific States Marine Fisheries Commission
- U.S. Fish and Wildlife Service

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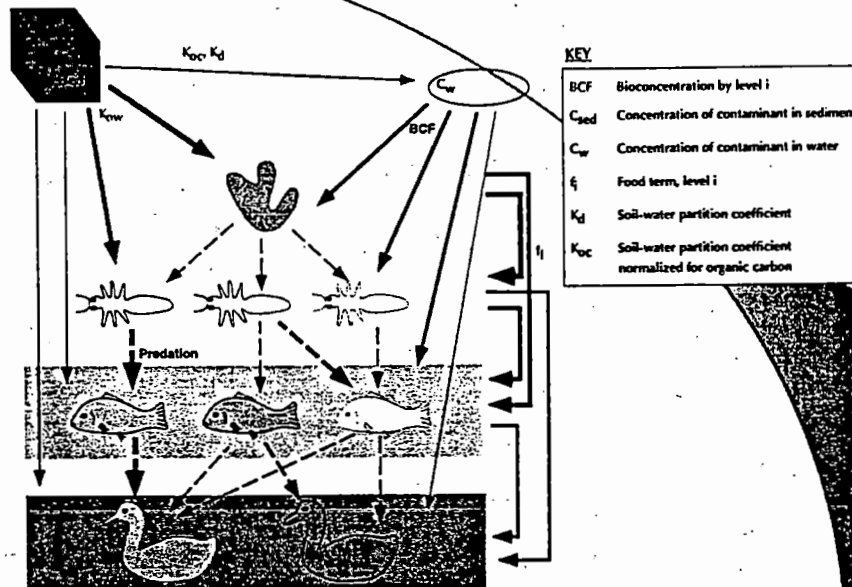
## Identification of Exposure- Impact Group

- Goal:  $\leq 30$  species to be examined in Exposure Assessment Modeling
- Use Tier I as starting point
- Apply scoring system for exposure pathways, sensitivity to contaminants, and duration of exposure
- Assure equal weighting to the above 3 criteria
- Composite rankings across exposure, duration, and sensitivity

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## Direct vs. Indirect Effects



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## Identification of Species of Concern

### ● Methods

- Assemble available data to provide an objective master listing of "all" plants and animals found in or along the lower Columbia River.
- A subset of this list is the species of potential concern which may be adversely affected by Hanford-released toxic chemicals.

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# Columbia River Study

## Species of Concern Presentation

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## Objectives

- Focus exposure-impact study on species(groups) most likely to be affected by contaminants.
- Include species of key concern to regulators, trustees, and the public.

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