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CHAPTER 7.0 DISTRIBUTION LIST

U.S. Congressional Delegation

United States Senate

Honorable Maria Cantwell
Honorable Patty Murray

House of Representatives

Honorable Doc Hastings

Governor of Washington

Honorable Christine Gregoire

Indian Tribes

Confederated Tribes and Bands of the Yakama Nation, Toppenish, Yakima
Confederated Tribes of the Umatilla Reservation, Pendleton, OR
Confederated Tribes of the Warm Springs Reservation Oregon, Warm Springs, OR

Washington State Legislature

13th Legislative District

Senator Janéa Holmquist, Moses Lake, Olympia
Representative Bill Hinkle, Ellensburg, Olympia
Representative Judy Warnick, Moses Lake, Olympia

15th Legislative District

Senator Jim Honeyford, Sunnyside, Olympia
Representative Bruce Chandler, Zillah, Olympia
Representative Daniel Newhouse, Sunnyside, Olympia

Federal Agencies

Department of Agriculture
- Forest Service, Cle Elum, Naches, Wenatchee

Department of Defense
- Department of the Army
  - Corps of Engineers, Seattle, Portland OR
  - Yakima Training Center, Yakima

Department of Energy
- Bonneville Power Administration, Portland OR
- Hanford Site
  - Office of River Protection, Richland
  - Richland Operations Office, Richland
- Pacific Northwest National Laboratory, Richland

Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service, Ellensburg, Seattle
Department of the Interior
Fish and Wildlife Service, Yakima
Environmental Protection Agency, Seattle, Washington DC

State and Local Government Agencies

State of Washington

Department of Agriculture, Olympia
Department of Ecology, Olympia, Yakima
Department of Fish and Wildlife, Olympia, Yakima
Department of Natural Resources, Ellensburg, Olympia
Department of Transportation, Yakima
Historic Preservation Office, Olympia
Recreation and Conservation Office, Olympia
North Yakima Conservation District, Yakima
State Parks and Recreation Commission, Olympia
Yakima Learning Institute, Yakima

Local Agencies

Benton County
Clean Air Authority, Richland
Commissioners
City of Ellensburg
City of Kennewick
City of Pasco
City of Richland
City of Sunnyside
City of West Richland
City of Yakima
Kittitas County
Commissioners, Ellensburg
Kittitas Reclamation District, Ellensburg
Yakima County
Commissioners, Yakima
Surface Water Management, Yakima
Yakima Regional Clean Air Authority, Yakima

Irrigation Districts

Ahtanum Irrigation District, Yakima
Cascade Irrigation District, Ellensburg
Kennewick Irrigation District, Kennewick
Naches-Selah Irrigation District, Selah
Roza Irrigation District, Sunnyside

Selah-Moxee Irrigation District, Moxee
Sunnyside Valley Irrigation District, Sunnyside

Libraries

Benton County Library, Benton City
Ellensburg Public Library, Ellensburg
Kennewick Library, Kennewick
Richland Public Library, Richland
Washington State Library, Olympia
Yakima Valley Regional Library, Yakima

Organizations

American Rivers, Seattle
American Whitewater, Seattle
Benton Conservation District, Prosser
Center for Environmental Law and Policy, Seattle
Central Washington Building and Construction Trades, Pasco
Citizens for a Clean Columbia, Wenatchee
Columbia Basin Development League, Royal City
Columbia Institute for Water Policy, Spokane
Columbia River Intertribal Fish Commission, Portland OR
Desert Aire Owners Association, Desert Aire
Hop Growers of Washington, Moxee
Kittitas County Conservation District, Ellensburg
League of Women Voters of Yakima County, Yakima
Lower Columbia Audubon Society, Richland
National Wildlife Federation, Seattle
North Yakima Conservation District, Yakima
Northwest Power and Conservation Council, Portland OR
Port Of Benton, Richland
Port Of Sunnyside, Sunnyside
Sierra Club, Seattle
South Yakima Conservation District, Sunnyside
Washington Cattlemen's Association, Ellensburg
Washington Environmental Council, Seattle
Washington Farm Bureau, Lacey
Washington Trout, Duvall
Water Watch, Portland OR
Wise Use Movement, Seattle
Yakima Basin Fish and Wildlife Recovery Board, Yakima
Yakima Basin Joint Board, Sunnyside
Yakima Basin Storage Alliance, Granger, Prosser, Richland, Tieton, Yakima, Zillah
Yakima Basin Water Resource Agency, Yakima
Yakima Valley Audubon Society, Yakima
Yakima Valley Conference of Governments, Yakima

Individuals

Bob Anderson, Kennewick
Paul Andrews, Seattle
Zine A. and Najiba Badissy TR, Kirkland
Gary L. Bailey, Yakima
Duane and Dixie Baker, Chelan
Tammy Baker, Yakima
Joseph A. and Donna F. Balmelli, Chehalis
John Baranouski, Selah
Ray Benish, Bothell
Larry Bland, Ellensburg
William J. Bosch, Yakima
Tom Carpenter, Yakima Valley
Douglas Chapin, Yakima
Ernest W. Charvet, Mabton
Lyle Collins, Yakima
Charles C. Colyear, Yakima
Ben Dover, Yakima
Bob Eaton, Ellensburg
Jack W. Eaton et ux., et al., Ellensburg
Robert A. Eaton, et al., Ellensburg
Jim Esget, Sequim
James L. Eubanks, Ellensburg
Don and Delphine Fekete, Kennewick
Glen Fiedler, Puyallup
Ben Floyd, Pasco
Phelps Freeborn, Yakima
David Garretson, Yakima
Ben George, Thorp
Walter A. George, Sunnyside
Rick Glenn, Yakima
Jennifer Hackett, Ellensburg
Bob Halvorson, Toppenish
Ernie Hamm, Yakima
Kenneth Hammond, Ellensburg
David Harold, Pasco
Scott P. Holman, Yakima
Lon K. Inaba, Wapato
Matt Jenkins, Berkeley, CA
Vance Jennings, Yakima
Lydia J. Johnson, Wapato
Richard S. Koch TR, Olympia
Melburn Krueger, Toppenish
Susan Lattomus, Yakima
Kenneth E. Lewis, Prosser
Edward Lisowski, Yakima

Linda Lohse, Glenn CA
Jack Maddnes, Yakima
Darrel Martindale, Moses Lake
Simon Martinez, Moxee
Arthur Miller, Richland
Roger Moberly, Yakima
Pat Monk, Ellensburg
C. M. Moore, Naches
Ronald R. and Marilyn J. Nester, Moxee
Shirley Nixon, Port Angeles
David E. Ortman, Seattle
Stephanie Parrish, Moxee
David W. Powell, Yakima
Bruce Powers, Chelan
Richard Prigmore, Sunnyside
John Pringle, Kennewick
Felix D. Quinn, West Richland
V. Gwendolyn Rawlings, Kennewick
Pat Reynolds, Yakima
Glenn and Audrey Rice, Yakima
Victor and Martha Robert, Yakima
Jay Russell, Naches
Kurt Sharar, Ellensburg
O. D. Slagle, Richland
Paul K. Smith, Toppenish
Janet L. Taggares TR, Othello
Bob Toftdahl, Royal City
K. Tolliver, Kennewick
David Van Cleve, Selah
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Jacqui Walker, Yakima
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Scott and Pam Woodward, Richland
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HDR Engineering, Bellevue
Jacobs Associates, Seattle
MSE-Tech Applications, Richland

Petkevicius and Associates, Kennewick
Rettig Osborne and Forgette LLP, Kennewick
Schwisow and Associates, Olympia
Science Applications International Corp, Richland, Germantown, MD
Taylor Angus Ranch, Moxee
The Williams Law Firm, Bellevue
TRIDEC, Kennewick
URS Corporation, Portland, OR

Appendix A.
Summary of Scoping Comments

Comment Summary
Address the need for both additional out-of-stream water supply and the needs of aquatic resources (including correcting instream flow problems, protecting and restoring habitat, and restoring fish passage into historic habitat).
Consider the impacts of the components of the package cumulatively.
Storage elements should assume a portion of new stored water would be available for fishery purposes at the discretion of the Yakama Nation.
The 70% proratable supply standard for success/failure should not be applied in this analysis.
All structural alternatives require a thorough assessment of cultural resources, wildlife, and other resources within the footprint of the reservoirs and other facilities.
Consider a prioritized package of components for the project (list submitted).
Raising the pool's elevation would flood considerable forest area, removing wildlife habitat.
Expansion area has a high potential for the presence of rare plants and plant communities.
Consider impacts on historic and prehistoric cultural properties.
Facilities, improvements, and roads are within the footprint of the Bumping Lake expansion, or would have their access cut off by the lake.
Fish passage alternative: effective upstream fish passage should be permanently established at Clear Lake Dam.
Potential water supply: install pump facility at Kachess Lake.
Look at the Yakima River watershed in its entirety and consider a suite of actions that can restore watershed processes.
Instream flow improvement to key tributaries should be part of the discussion.
Recognize the benefits of increased flows for fish in the Yakima Basin.
Fish Passage Improvements, Bumping Lake: Address bull trout impacts and terrestrial impacts, including impacts to spotted owls.
Address winter habitat conditions.
Address the timing, temperature, and rate of flow change (ramping) aspects of connectivity.
The DSS model could be used as a tool to refine and prioritize where floodplain connectivity would result in the greatest fish benefit or incorporate modifications to the set that are proposed. Gaming the model would highlight which restoration alternatives resulted in greatest production.
Include information from technical reports and other documents and models to support conclusions rather than inclusion by reference.
Expand benefit analysis to quantify the synergistic benefits to on-going habitat protection and restoration projects.

Comment Summary
When calculating anadromous and resident fish benefits, address the following: • Include sockeye salmon in the benefits analysis; • Include use values for wild and hatchery Yakima steelhead in the benefit analysis; • Calculate use values for non-listed resident fish species in the benefit analysis; • Include "non-use" (non-consumptive) values for both anadromous and resident fish in the benefit analysis.
Look comprehensively at the river system, taking account of the seven major issue findings in the "Reaches Project" report
Land use planning, designation, and zoning are the jurisdiction of the local governments, not of the State.
A scoping meeting should be held in Richland, Kennewick, or Prosser.
The Lower Basin should be considered for on-the-ground water quality, water quantity, and habitat enhancements.
Change the term "modifying floodplains" to "reconnecting and restoring floodplains."
Consider combinations of alternatives in the context of each other and existing policy guidance.
Establish economic water supply reliability and habitat joint values, wants, needs, and priorities for the many basin interests through a collaborative process.
Include fish goals, a procedure, or criteria for assessment.
Address the drought resistance impacts analysis resulting from climate change.
It is important to provide specific restoration and water supply goals, and then develop transparent criteria/rationale for prioritizing options.
Need criteria for higher priority existing structures.
Pay attention to bull trout.
Access several iterations of the RiverWare software to test prime or suggested alternatives.
Include reasonably foreseeable actions by YRBWEP and YP BiOp in all alternatives.
Include bypass canal relative to Spring Chinook spawning in the Upper Yakima River.
Include special emphasis on flip-flop revisions or removal.
Include Naches tributaries on the list of tributary enhancements, including Tieton, Little Naches, Rattlesnake, Cowiche.
Include the Upper Naches reach on the list of mainstream enhancements
Include conservation planning on the already publicly owned and managed properties and conservation future. Lots of folks are willing to preserve functional habitat floodplains, not a lot are willing to actively restore degraded floodplains. Need to identify possible sponsors for floodplain restoration in Kittitas and Benton Counties, and reasonably foreseeable floodplain restoration actions in the basin. Should include Bark Ranch/West Richland in reaches (possibly in association with KID pumps).
Language on major issues to be considered should include flood flows and floodplain restoration and connectivity. Wildlife should have special emphasis on listed species.

Comment Summary
Legal restrictions on goals and objectives of the study were severely restricted from the start. Scope of actions and alternatives should be broadened.
Fish ladders need additional water.
Consideration needs to be given to the amount of habitat above the existing reservoirs.
Will climate change, and the possible change in the timing of runoff, have an affect on the reservoirs?
Storage/Modification to existing facilities and operation has been reviewed many times.
The review needs to evaluate how much new water would be available and how many fish would be credited to that habitat. What is the cost/benefit ratio?
Existing programs and projects that have been completed on tributaries need to be identified. Title XII money is available for tributary enhancements.
Use the 2004 Yakima Subbasin Plan, the 2005 Yakima Subbasin Salmon Recovery Plan, and the Yakima Steelhead Recovery Plan as guides to identify actions to be assessed in the supplemental EIS and to assess the impacts of assessed actions in the broader context of ongoing fish habitat improvement efforts in the basin. (Submitted summary of actions from these plans).
Look at the effect of fish passage and habitat restoration projects when combined with each other and with the enhanced conservation/efficiency and water market alternatives discussed in the draft EIS released last January.
Construction of new storage should not be seriously considered unless it appears that a package of less expensive, less environmentally harmful alternatives is not capable of sustaining healthy salmon and steelhead populations or providing reasonable improvements in the reliability of the Yakima Basin's water supply.
Apply a litmus test in deciding which potential water supply and habitat improvement projects will be the subject of the SEIS. The test should include realistic, up-front analysis of the costs of the project, as well as analysis of who will pay. Infrastructure projects should be able to demonstrate real and substantial fish and aquatic habitat benefits.
Remove two unaffordable and non-sustainable infrastructure projects from consideration: the Wymer Dam project modifications and the Bumping Lake enlargement.
Analyze a pricing program as part of the SEIS analysis of water supply alternatives.
Analyze the benefits of implementing a water piping and pressurization system for the basin irrigation districts.
Analyze the benefits of amending water transfer laws and procedures to allow irrigation district members to freely transfer their rights.
Adopt a wide scope of study for habitat improvements for fisheries.
The public notice for scoping opportunity was inadequate.
Black Rock Reservoir will cost too much.
A more detailed analysis is needed (suggestions more appropriate to a project-level EIS were given).

Comment Summary
Commenter is in support of Wymer Reservoir, additional storage at Bumping Lake, raising of Cle Elum lake, a pipeline from Lake Kachess to Lake Keechelus, and a pump station at Price Rapids Dam.
Too many studies. Expand holding basins. Fish passage is possible in existing dams.
Project has been a waste of taxpayer money. Commenter is opposed to Black Rock Dam; in support of expanding Bumping Lake and Rim Rock Lake.
Evaluate pressurizing all irrigation systems and converting most irrigation practices to drip irrigation.
The EIS must have an aggressive conservation alternative.
Look at multiple alternatives to the present situation.
The figure for the cost of additional instream water at Parker is misleading. A careful analysis should indicate a significantly lower cost for gains in instream flows.
More consideration should be given to water transfers, including systematic land fallow with associated water transfers on a temporary or permanent basis.
Look at storage in Kittitas County: Manastash, Taneum, Nanaeum, Teanaway and others.
Commenter is in opposition to the Black Rock alternative.
Find an ecologically sound approach that makes economic sense.
Conservation of existing water sources should be the first priority.
The supplemental processes should mimic natural processes.
Improve habitat.
Be mindful of the future of both fish and agriculture.
Make use of water released form Rimrock Lake. Look at how we manage Lakes Cle Elum, Kachess, and Keechelus. They may provide additional water during the dry years.
Build a dam on Lmuma Creek similar to the Black Rock dam. It could possibly include a salmon hatchery.
Add catch basins.
Improve the water distribution system in the Kittitas Valley. Replace the KRD’s open canals with fully metered pressurized pipe all the way from Lake Easton to the end of the system.
Commenter in support of Black Rock Reservoir. Worried about implications of no action.
Aquifer system recharge is an inadequate solution to this problem. Conservation is inadequate to meet the needs of the environment, fish, and irrigation. Need a secure supply of water.
Commenter suggested an alternative for storage in the Kittitas Basin: a series of small off-stream ponds along Taneum creek to hold spring high flows.
Look at upgrades to the existing irrigation systems and a change in law (when landowners subdivide their property, assign a state water right to the water “lost” to the acreage covered by roads and roofs).
Black Rock is too expensive. Find a solution without pumping water.

Appendix B.
Special Status Species Tables

Table B-1. Special Status Species in the Vicinity of the Individual Elements Proposed in the Yakima River Basin Water Storage Feasibility Study SEIS

	Yakima River (main stem)	Keechelus Lake	Kachess Lake	Cle Elum Lake	Naches River (main stem)	Bumping Lake	Rimrock Lake	**Naches River Tributaries**	Bumping River	Tieton River	**Yakima River Tributaries**	Cle Elum River	Kachess River	Big Creek	Teanaway River	Swauk Creek	Taneum Creek	Manastash Creek	Naneum Creek	Ahtanum Creek	Toppenish Creek	Satus Creek	Cowiche Creek
PRIORITY SPECIES																							
Mammals																							
Gray wolf (*Canis lupus*); SE, FE		X	X				X																
Wolverine (*Gulo gulo*); SCAN, FSOC			X			X																	
Lynx (*Lynx canadensis*); ST, FT						X			X														
Marten (*Martes americana*); SNONE, FNONE							X			X													
Fisher (*Martes pennanti*) SE, FCAN																X							
Western gray squirrel (*Sciurus griseus*); ST, FSOC										X											X	X	
Townsend's ground squirrel (*Spermophilus townsendii*); SCAN, FSOC	X																						
Grizzly bear (*Ursus arctos*); SE, FT			X	X									X			X							
Reptiles and Amphibians																							
Western toad (*Bufo boreas*); SCAN, FSOC		X				X	X												X				
Sharptail snake (*Contia tenuis*); SCAN, FSOC	X																						
Larch mountain salamander (*Plethodon larselli*); SSEN, FSOC			X	X																			
Columbia spotted frog (*Rana luteiventris*); SCAN, FNONE	X						X									X							
Birds																							
Northern Goshawk (*Accipiter gentilis*); SCAN, FSOC		X	X	X	X	X	X		X	X			X	X		X			X				
Golden eagle (*Aquila chrysaetos*); SCAN, FNONE	X									X													
Great blue heron (*Ardea herodias*); SNONE, FNONE	X		X										X		X						X		
Vaux's swift (*Chaetura vauxi*); SCAN, FNONE																			X				
Pileated woodpecker (*Dryocopus pileatus*); SCAN, FNONE							X									X							
Merlin (*Falco columbarius*); SCAN, FNONE				X												X							
Prairie falcon (*Falco mexicanus*); SNONE, FNONE	X						X			X						X							
Peregrine falcon (*Falco peregrinus*); SSEN, FSOC					X		X																
Common loon (*Gavia immer*); SSEN, FNONE					X	X																	
Bald eagle (*Haliaeetus leucocephalus*); SSEN, FSOC	X			X			X					X								X			
Harlequin duck (*Histrionicus histrionicus*); SNONE, FNONE					X					X		X											

Table B-1. Special Status Species in the Vicinity of the Individual Elements Proposed in the Yakima River Basin Water Storage Feasibility Study SEIS

Lewis' woodpecker (*Melanerpes lewis)*; SCAN, FNONE									X												
Black-crowned night-heron (*Nycticorax nycticorax)*; SNONE, FNONE	X																				
Mountain quail (*Oreortyx pictus)*; SNONE, FNONE			X														X				
White-headed woodpecker (*Picoides albolarvatus)*; SCAN, FNONE							X		X												
Black-backed woodpecker (*Picoides arcticus)*; SCAN, FNONE													X								
Spotted owl (*Strix occidentalis)*; SE, FT		X	X	X		X	X	X		X		X		X							
Plants																					
Tall agoseris (*Agoseris elata*); SS, FNONE																	X				
Pauper milkvetch (*Astragalus misellus* var *pauper*); SS, FNONE	X																				
Ahtiana pallidula (*Ahtiana pallidula*)														X							
Fewflower sedge (*Carex pauciflora*); SS, FS		X																			
Thompson's pincushion (*Chaenactis thompsonii*); SS, FNONE				X						X											
Gray cryptantha (*Cryptantha leucophaea*); SS, FSOC	X																				
Clustered lady's slipper (*Cypripedium fasciculatum*); SS, FSOC				X								X		X							
Basalt daisy (*Erigeron basalticus*); ST, FSOC	X																				
Piper's fleabane (*Erigeron piperianus*); SS, FNONE	X				X																
Swamp douglasiana (*Gentiana douglasiana*); SS, FNONE		X																			
Oregon false goldenaster (*Heterotheca oregona*); ST, FNONE								X													
Longsepal wild hollyhock (*Iliamna longisepala*); SS, FNONE																	X				
Hoover's desertparsley (*Lomatium tuberosum*); SS; FSOC	X																				
Coyote tobacco (*Nicotiana attenuate*); SS, FNONE																				X	
Small phacelia (*Phacelia minutissima*); SE, FSOC																	X				
Tacky goldenweed (*Pyrrocoma hirta* var *sonchifolia*); SS, FNONE																	X				
Oregon white oak (*Quercus garryana*)														X							
Mountain blue-eyed grass (*Sisyrinchium sarmentosum*); ST, FSOC						X	X														
Creamy lady's tresses (*Spiranthes porrifolia*); SS, FNONE			X																		
American waterawlwort (*Subularia aquatica* var *americana*); SR1, FNONE			X								X										
Hoover's umbrellawort (*Tauschia hooveri*); ST, FSOC																					X
PRIORITY HABITAT TYPES																					
Bald eagle	X		X						X		X										X
Burrowing owl	X																				
Big game			X	X																	
Big horn sheep					X											X					
Cliffs/Bluffs	X	X	X	X	X		X	X	X		X			X		X	X				
Elk	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X			
Ferruginous hawk	X																				

Table B-1. Special Status Species in the Vicinity of the Individual Elements Proposed in the Yakima River Basin Water Storage Feasibility Study SEIS

Golden eagle	X								X												
Great blue heron	X																			X	
Harlequin duck									X												
Mountain goat		X	X	X		X	X			X	X										
Mule and Black-tailed deer	X				X				X				X	X		X		X			
Mule deer	X						X							X			X				
Oak woodlands	X								X					X							
Old Growth		X						X		X											
Riparian Zones	X		X	X	X				X	X	X	X	X	X	X	X	X	X	X	X	X
Rocky mountain big horn sheep	X				X				X												
Rocky mountain elk							X	X	X								X				
Rural Natural Open Space	X																				
Sharptail snake	X																				
Shrub-steppe	X																				
Spotted Owl Critical Habitat		X	X	X		X	X	X	X	X	X			X	X		X				
Talus slopes					X	X	X	X													
Urban Natural Open Space	X				X											X					X
Waterfowl concentrations	X						X														
Wetlands	X	X	X	X	X	X	X	X					X								
White-tailed deer				X																	
Wood duck	X				X				X	X			X								X

Sources: **USFWS, 2008; WDFW PHS database information September 2007; and, WDNR NHP database information April 2008**

Legend

FE=Federally endangered
FT=Federally threatened
FCAN=Federal candidate species
FS=Federal sensitive species
FSOC=Federal species of concern
FNONE=No listing

SE=State endangered
ST=State threatened
SCAN=State candidate species
SS=State sensitive species
SSOC=State species of concern
SNONE=No listing
SR1=Review group 1. Of potential concern but needs more field work to assign another rank.

Appendix C.
Fish and Fish Habitat Tables

Table C-1
Upstream Extent of Anadromous Salmonids in the Affected Area

Stream	Upstream Barrier
Naches River Tributaries	
Bumping River	Bumping Dam; otherwise, upstream at natural falls
Tieton River	Tieton Dam; otherwise, none on mainstem
Yakima River Tributaries	
Cle Elum River	Cle Elum Dam; otherwise, RM 9 at natural steep cascades
Keechelus River	Keechelus River; otherwise, none on mainstem
Kachess River	Kachess Dam; otherwise, none on mainstem
Big Creek	RM 2.10 at Kittitas Reclamation District Canal Barrier
Teanaway River	None on mainstem
Swauk Creek	None
Taneum Creek	RM 2.0 at Bruton Diversion*
Jack Creek	Culvert near stream mouth*
Indian Creek	Culvert near stream mouth*
Manastash Creek	RM 1.6 at barrier at West Side Canal
Reecer Creek	100 ft upstream of mouth of stream at diversion
Wilson/Naneum Creeks Systems[1]	RM 1.9 at irrigation diversion barrier Cherry Creek: within 1-2 miles of Wilson Creek confluence at diversion Coleman Creek: 0.5 mile upstream of Naneum Creek confluence at diversion
Ahtanum Creek[2]	Ahtanum Creek: RM 8.0 at lower Wapato Irrigation Project Diversion Wide Hollow Creek: RM 0.6 at old mill dam (adults can pass)
Toppenish Creek	RM 4.8 at Taner Gate
Satus Creek	RM 2.0 at Bruton Diversion*
Cowiche Creek	None on mainstem
Little Naches River	None on mainstem

Table Notes:

* May not be completely impassable barrier, but extremely difficult fish passage.

[1] Includes Wilson, Naneum, Coleman, and Cherry Creeks, which are all interconnected.

[2] Includes North and South Forks and Wide Hollow Creek.

Source: Haring (2001); Appendix A of Haring (2001); and Hubble (pers. comm.). The source also contains information for the smaller tributaries that flow to these creeks.

Table C-2
Habitat Conditions for Flow in Streams in the Affected Area

Stream	Description of Flow Conditions
Above-Reservoir Tributaries	
Cle Elum River above Reservoir	No flow issues because most of the flow concerns in the Cle Elum basin are concentrated downstream of Cle Elum Dam.
Bumping River above Reservoir	Not been altered and follow a natural regime. Adequate flows and low likelihood of rain-on-snow events due to abundant canopy cover and a large percentage of area in high elevation zones.
Tieton River above Reservoir	Essentially unchanged from historic conditions. Few habitat alterations have occurred upstream of the dams, and natural stream flow variability still occurs. Indian Creek, tributary to Rimrock Lake in the Tieton watershed, has three large springs that significantly contribute to instream flows. The South Fork Tieton contributes 36 percent of the total flow of the Tieton River, and North Fork Tieton/ClearCreek/Indian Creek contributes 47 percent of the total flow (USFS, 1996a).
Keechelus River above Reservoir	Gold Creek is the only tributary with enough area and flow to potentially support salmonids. In recent years, portions of the Gold Creek channel upstream of the dam have dewatered due to low flows.
Kachess River above Reservoir	Tributaries, including the Kachess River, typically go subsurface as the lake is drawn down in summer.
Yakima River Tributaries	
Big Creek	Lacks instream flow from the impassable dam at RM 2.1 to the mouth of the stream. Natural runoff is fully appropriated for irrigation, and while the stream typically flows, the channel periodically goes dry from RM 0.6 to the mouth, depending on the year.
Teanaway River	Low flows in the summer and fall have in the past precluded fish passage, but there is now some flow in the summer and fall in the lower river. However, the lower river is still impaired for instream flow. Reduction in flow is attributed mainly to irrigation withdrawals in the lower river.
Swauk Creek	Although the drainage area is fairly large, precipitation is minimal, and naturally occurring low flows occur throughout the system. Lower Swauk Creek goes dry in the summer and early fall.
Taneum Creek	Experiences very low summer and fall flows in the lower 3.3 miles downstream of its major diversion, because flows are fully appropriated for irrigation.
Jack Creek	See Teanaway River.
Indian Creek	See Teanaway River.
Manastash Creek	Instream flows are severely impacted by irrigation diversions during the irrigation season. One section of the creek goes dry.
Reecer Creek	Reecer Creek has perennial flow in headwaters, but is intermittent to Highline Canal during late summer; dry reaches downstream.
Wilson/Naneum Creeks System[1]	Along with other creeks in the area, Naneum Creek has been routed into Wilson Creek to supply irrigation needs for the area. Currently, flows are available year-round for salmonids in the lower Wilson Creek drainage, as flows are dominated by irrigation returns (KCCD, 1999). In the upper watersheds, streams dewater during summer and fall due to irrigation withdrawals. Cherry Creek tributaries have significantly increased flows during summer/early fall compared to natural conditions.

Stream	Description of Flow Conditions
Ahtanum Creek[2]	On Ahtanum Creek, stream flow typically characterized by the occurrence of high spring/early summer flows and low late summer/fall flows. Stream flow in the upper watershed is ample and is influenced primarily by snowmelt and rainfall (Ecology, 2005a). Lower in the creek, and downstream of irrigation diversions, flow is constant to the confluence with the Yakima River (CBSP, 1990) but is highly variable year-to-year (Ecology, 2005a). On Wide Hallow Creek, monthly flow variations are presumed to be similar to those in Ahtanum Creek, although Wide Hollow Creek flows are affected to a greater degree during the irrigation season by inflow from Yakima-Tieton Irrigation District operations.
Toppenish Creek	Toppenish Creek and its upper tributaries are fast-flowing streams with high gradients, while the lower half of the watershed has a lower gradient and generally slower velocities. Various parts of the creek's flow become subsurface or become dewatered during the irrigation season (primarily from the WIP diversion to Pom Pom Road).
Satus Creek	Instream flows are fair to good, except for low summer flows in the vicinity of High Bridge (CBSP, 1998). No irrigation diversions.
Cowiche Creek	Flow in the mainstem and South Fork is year-round, despite substantial irrigation withdrawals (CBSP, 1990). Diversions significantly reduce summer and fall flows in the lower 12 miles of the creek system.
Little Naches River	There are no permanent surface water diversion within the Little Naches watershed (USFS, 1994). However, the NF Little Naches has two dewatered reaches in late summer as a result of increased sediment load from landslides and debris flows.

Table Notes:

[1] Includes Wilson, Naneum, Coleman, and Cherry Creeks, which are all interconnected.

[2] Includes North and South Forks and Wide Hollow Creek.

Table C-3
Habitat Conditions for Sediment in Streams in the Affected Area

Stream	Description of Sediment Conditions
Above-Reservoir Tributaries	
Cle Elum River above Reservoir	Fine sedimentation is low upstream of Cle Elum Dam (USFS, 1996a), although erosion hazards are high in the more mountainous drainages.
Bumping River above Reservoir	No research on sediment conditions on the Bumping River upstream of Bumping Dam.
Tieton River above Reservoir	Large natural slide (Blue Slide) contributes a large amount of sediment to the South Fork Tieton. Grazing and off-road vehicle use erodes streambanks on South Fork Tieton, increasing fine sediment to spawning areas. No quantitative fine sediment data (USFWS, 2001).
Keechelus River above Reservoir	No major sedimentation problems, with the exception of Coal Creek, which receives sand from Interstate 90 maintenance operations.
Kachess River above Reservoir	Rated at high risk of road-related sediment problems (USFS, 1997) as part of the Kachess and Box Canyon Forest Planning Units.
Yakima River Tributaries	
Big Creek	Erosion risk ranges from low to moderate on the river terraces to high to very high in the steeper regions of the upper watershed (KCCD, 1999), but fine sedimentation has not been a key problem for the creek.
Teanaway River	Fair to good. Sedimentation is uncommon in the North Fork. Substrate fair to good, with excellent spawning gravels in the Middle Fork and West Fork.
Swauk Creek	Fine sediment accumulations in gravels caused by past mining and dredging practices (KCCD, 1999). Fines likely heavily influenced by sanding of SR 97.
Taneum Creek	Fine sediments are a problem at most spawning and rearing habitats, attributed to bank and slope erosion from forest practices, road construction, and grazing. Upper watershed has extensive forest road network that sends high amounts of sediment to the channel.
Jack Creek	USFS Road 9738 is adjacent and delivers fine sediment to the stream.
Indian Creek	Indian Creek Road that runs parallel delivers fine sediment to the stream.
Manastash Creek	Moderate sedimentation issues, with several streams exhibiting elevated fines percentages. Sediment sources are bank cutting, slope erosion, and bank disturbances (Plum Creek, 1996).
Reecer Creek	Substrate is considered good in upper watershed and embedded through the valley.
Wilson/Naneum Creeks System[1]	Large amounts of fine sediments due to surface erosion from ground disturbances, forest practices, grazing, and recreation (WDNR, 1994). The Wilson Creek system receives high levels of fines from urban runoff and irrigation, and the Cherry Creek system receives even larger levels.

Stream	Description of Sediment Conditions
Ahtanum Creek[2]	Fine sediment deposition perhaps the single greatest limiting factor on fish production in the Ahtanum watershed (Ecology, 2005a). Fine sediment is heavy and variable due to sources of sediment from roads and logging in the upper watershed and development in the lower watershed. In the lower creek, gradients are low and bank erosion has resulted in deposition of sand and mud in the channel (CBSP, 1990). In Wide Hollow Creek, sedimentation and substrate are rated as fair (CBSP, 1990).
Toppenish Creek	Sediment embeddedness moderate to high in middle and lower Toppenish Creek due to diversions and water-slowing dams (CBSP, 1990). Substrate condition is excellent in the upper 25 miles as well as in North and South Forks, with abundant gravel of very high quality (CBSP, 1990).
Satus Creek	Sedimentation rated as fair/good, but variable throughout the watershed (CBSP, 1990). Excessive fines throughout, but upper reaches are in better condition.
Cowiche Creek	Sedimentation generally minor except in the North Fork, where low flows have allowed fines to settle out.
Little Naches River	Excessive amounts of fine sediments in gravels associated with timber harvest and roads.

Table Notes:

[1] Includes Wilson, Naneum, Coleman, and Cherry Creeks, which are all interconnected.

[2] Includes North and South Forks and Wide Hollow Creek.

Table C-4
Habitat Conditions for LWD in Streams in the Affected Area

Stream	Description of LWD Conditions
Above-Reservoir Tributaries	
Cle Elum River above Reservoir	Plentiful in at least one reach of the Cle Elum River upstream of Cle Elum Lake.
Bumping River above Reservoir	Expected to have high levels of LWD, as LWD presence in all reaches of the Bumping River has been shown to meet or exceed standards (USFS, 1998).
Tieton River above Reservoir	Expected to be abundant, as tributaries upstream of the Tieton Dam historically provided LWD source to those lower in the river. Indian Creek has little LWD in the lower 3.5 miles (25 pieces per mile) due to frequent channel changes, but LWD conditions upstream are better.
Keechelus River above Reservoir	Generally deficient in LWD due to high levels of timber harvest, with the exception of Cold Creek and Meadow Creek, which have satisfactory LWD conditions.
Kachess River above Reservoir	Little opportunity to provide LWD to the system due to removal of riparian vegetation and timber harvest near these creeks. LWD abundance generally declines moving upstream from Lake Kachess (USFS, 1997).
Yakima River Tributaries	
Big Creek	The lower reaches have little LWD; abundance increases dramatically in the upper reaches, particularly upstream of the KRD Canal.
Teanaway River	Generally absent, particularly key pieces not easily mobilized by high flows.
Swauk Creek	LWD is lacking in the lower 3 miles as well as upstream from Blue Creek.
Taneum Creek	LWD has been aggressively removed from lower Taneum Creek, and the current stream has little LWD present except in the upper reaches and in the North and South Forks.
Jack Creek	See Teanaway River.
Indian Creek	See Teanaway River.
Manastash Creek	Sparse LWD because most naturally recruited wood has been removed.
Reecer Creek	LWD is lacking.
Wilson/Naneum Creeks System[1]	Little LWD due to lack of source and the current use of the creeks for irrigation water transfer, especially in Cherry Creek tributaries.
Ahtanum Creek[2]	Lacking throughout the mainstem channel segments in Ahtanum Creek (Chesney, 1997; Dominguez, 1997), leading to reduced habitat complexity and problems related to channel stability/bed scour, off-channel habitats, and predation risk (Ecology, 2005a). In Wide Hollow Creek, LWD is generally lacking; although there is some LWD contribution from mature willows adjacent to the stream, the LWD is typically removed to minimize potential for bank erosion and channel rerouting in the tightly confined stream corridor.
Toppenish Creek	Abundant LWD due to relatively unaltered condition. In middle and lower creek, there is virtually no LWD and no significant sources for it.
Satus Creek	Largely devoid of LWD. Much of the available LWD was transported out of the active channel by floodwaters and stranded on the floodplain during the major floods of 1996 and 1997.
Cowiche Creek	LWD abundant in the mainstem, but becomes sparse in the lower creek due to the location in naturally confined canyons or low gradient in the floodplain.

Stream	Description of LWD Conditions
Little Naches Rver	Survey data from 1990 indicates an LWD rating of poor throughout this area, ranging from 4 pieces/mile at the downstream end to 20 pieces/mile at the upstream end (USFS, 1994).

Table Notes:

[1] Includes Wilson, Naneum, Coleman, and Cherry Creeks, which are all interconnected.

[2] Includes North and South Forks and Wide Hollow Creek.

Table C-5
Channel Condition in Streams in the Affected Area

Stream	Description of Channel Conditions
Above-Reservoir Tributaries	
Cle Elum River above Reservoir	Various channel types, including an unconfined distributary fan near the lake, a confined canyon reach, a moderately steep alluvial reach, and two lakes. Some of these reaches have excellent habitat, and some contain low pool volume and reduced habitat complexity.
Bumping River above Reservoir	Instream conditions are excellent, as most of the Bumping River watershed exists in higher elevation, unaltered areas.
Tieton River above Reservoir	Habitat in the upper reaches of the South Fork Tieton and Bear Creek is pristine. In Rimrock Lake tributaries of the Tieton watershed, channel conditions of pool frequency and quality are rated as good.
Keechelus River above Reservoir	Tributaries differ in channel condition, but are generally degraded. Coal Creek has sedimentation problems, while Cold Creek lies within the reservoir drawdown zone and lacks an adequate riparian corridor. Meadow Creek has high temperatures, but otherwise has good habitat, while some portions of Gold Creek channel dewater during summer.
Kachess River above Reservoir	Excellent bank stability due to their rock-dominated substrates (USFS, 1995), but in-channel pools and complexity are lacking.
Yakima River Tributaries	
Big Creek	Heavily channelized downstream of RM 3.0, resulting in unstable channels and erosion in the lower 0.25 mile. Pool frequency is low (USFS, 1997) and habitat complexity is limited. Riparian condition is good in the upper watershed and gradually degrades to fair in the channelized reach near the mouth of the creek.
Teanaway River	Suitable spawning gravels and gradients for salmonids in most reaches of the mainstem and the lower portions of the forks. Riparian habitat is excellent, though there are localized impacts on the forks (CBSP, 1990). Channel widening due to lack of complexity typically does not allow shade to reach the concentrated flow in the center of the stream.
Swauk Creek	Natural substrate conditions have been altered due to dredging and past mining operations in some places. In most of the creek, the general lack of LWD and boulders from the channel have led to a loss of structural complexity and channel incision.
Taneum Creek	Channel conditions are fair. LWD and boulders are abundant on the North and South Forks, except where LWD has been cleared. Pool frequency is low in the lower reaches due to only a moderately steep gradient. Riparian habitat is good in unimpacted forest areas, but is poor where roads and campsites are present alongside the channel.
Jack Creek	See Teanaway River.
Indian Creek	See Teanaway River.
Manastash Creek	Excellent spawning and rearing habitat for anadromous salmonids, with vegetation and streambank cover in nearly all areas of the mainstem (CBSP, 1990). In some forested reaches, including the South Fork Manastash Creek, riparian conditions are poor (Plum Creek, 1994).
Reecer Creek	Few pools; channelized upstream from Dollar Way to I-90 for agricultural and irrigation purposes.

Stream	Description of Channel Conditions
Wilson/Naneum Creeks System[1]	Both Naneum and Wilson Creek are channelized and diked for irrigation delivery. Reaches are straight and incised, have high velocities, and little LWD or riparian zone. Cherry Creek has large reed canarygrass invasion (Haring, 2001).
Ahtanum Creek[2]	On Ahtanum Creek, channel has extensive bank erosion in an area with reduced and fragmented riparian canopy and cover (Chesney, 1997), as well as confined channels that do not provide adequate side channel or floodplain habitat. On Wide Hollow Creek, overgrazing has caused severe bank sloughing from RM 0.2-0.6. The reach from RM 1.3-2.5 also had significant impacts from past grazing, but land use through this reach has recently been converted to a business park. Pools and runs are fairly deep (>2 feet), and are more frequent than riffles.
Toppenish Creek	Channel conditions in the uppermost 25 miles of Toppenish Creek, as well as North and South Forks, are good (CBSP, 1990). Key issues in the rest of Toppenish Creek are channelization, diking, diversions, wastewater return flows, unmanaged grazing, and "to the bank" farming.
Satus Creek	Has been widened and straightened, and the lower 6 miles are slow moving with a mud/sand streambed and a few isolated riffles.
Cowiche Creek	Conditions are generally good, providing excellent spawning and rearing habitat. The lower portions of the creek exhibit low gradients and are confined and incised.
Little Naches River	Primary degraded portion is from mouth of the Little Naches upstream to Sand Creek. Pools are below standards identified in Forest Plan. Bank erosion and downcutting in streambed. Habitat pristine upstream of Salmon Falls (CBSP, 1990).

Table Notes:

[1] Includes Wilson, Naneum, Coleman, and Cherry Creeks, which are all interconnected.

[2] Includes North and South Forks and Wide Hollow Creek.

Table C-6
Habitat Alterations in Streams in the Affected Area

Stream	Barriers	Description of Habitat Alterations
Above-Reservoir Tributaries		
Cle Elum River above Reservoir	None except reservoir	Creation of the dam and slowing of river flows nearing the dam, as well as riparian and LWD removal due to timber harvest and residential development in the upper watershed.
Bumping River above Reservoir	None except reservoir	Tributary habitat remains generally unaltered.
Tieton River above Reservoir	None except reservoir	Tributary habitat remains generally unaltered.
Keechelus River above Reservoir	None except reservoir	Many of the small tributaries to the lake were inundated with the creation of Keechelus Dam. Prior to inundation, the lower reaches of these channels were meandering, low gradient channels with more complex habitat than what is available above the lake elevation. Coal Creek has been relocated and confined as it runs alongside Interstate 90.
Kachess River above Reservoir	None except reservoir	The tributaries have been affected by dam construction and inundation of the lower streams, as well as logging that has resulted in reduced canopy cover in the stream corridors.
Yakima River Tributaries		
Big Creek	2 non-screened diversion dams, RM 0.7 and RM 2.1 (the latter is impassable most years)	Channelization downstream of RM 3.0 to support water diversion needs, as well as removal of LWD.
Teanaway River	No constructed barriers to upstream passage on mainstem	Loss of most natural floodplain function throughout the lower watershed due to residential development. River now experiences a "flashy" runoff as a result of extensive logging in the upper watrershed.
Swauk Creek	No constructed barriers to upstream passage on mainstem	Beaver elimination, mining, and livestock grazing removed the wet meadows from the creek, and the creek now flows through a single channel. Instream substrate conditions were altered by dredging and now exhibit abundant fines and lack of complexity.
Taneum Creek	Irrigation diversions cause low flows and may preclude access for various species, typically in summer and fall; some of these have been remedied; all have fishways and screens	Channelization and LWD removal, as well as a large network of forest roads in the upper watershed lead to sediment problems downstream.
Jack Creek	See Teanaway River.	See Teanaway River.

Stream	Barriers	Description of Habitat Alterations
Indian Creek	See Teanaway River.	Indian Creek Road confines channel migration zone. Past grazing (mainly sheep) activities have had pronounced effects on riparian vegetation and streambank stability.
Manastash Creek	Irrigation diversions cause low flows which preclude access (furthest downstream is Westside Ditch Crossing)	Watershed has been altered by timber harvest and road building, which leads to sedimentation in the channel. Grazing practices have caused entrenchment of channels and erosion in the North Fork.
Reecer Creek	Unladdered/unscreened diversions upstream and downstream of SR10 and upstream of Dry Creek Road and John Wayne Trail; Unscreened Kline-Koble diversion 100 feet upstream of mouth of stream. Unscreened Mill Ditch Diversion.	Stream channelized for several miles for agricultural and irrigation purposes.
Wilson/Naneum Creeks System[1]	Irrigation diversions cause low flows which preclude access (furthest downstream is at Bull Ditch Crossings near confluence with Wilson Creek). Wilson and Cherry Creeks and tributaries have hundreds of unladdered and unscreened irrigation diversions.	Naneum and Wilson Creek system has been diked, channelized, and re-routed for water delivery. Riparian vegetation is sparse.
Ahtanum Creek[2]	On Ahtanum Creek, 13 unscreened diversions Upper WIP facility at RM 19.6 diverts all or most of the stream flow in summer and early fall. The lower WIP diversion at RM 9.8 is total barrier. On Wide Hollow Creek, adult passage available at old mill dam at RM 0.6, but juvenile salmon cannot pass.	Altered by road development for logging in the upper Ahtanum Creek. Many stream channels on lower Ahtanum Creek have been severely impacted by agriculture, irrigation, and grazing (Tri-County, 2000). Alterations have resulted in low flows, poor riparian conditions, and contributions of excess sediment to the stream. Wide Hollow Creek has stormwater runoff, leaking septics, and agricultural practices (mostly hay and pasture).

Stream	Barriers	Description of Habitat Alterations
Toppenish Creek	Upper 25 miles, including North and South Forks, have a number of large, slightly perched culverts Irrigation dewaters stream in some areas. Fish ladder areas. Small dams for hunting club ponds.	Much alteration from historic conditions. Drainage of surrounding wetlands and water withdrawals have reduced flows in the lower Toppenish, and side channels are mostly dry during the irrigation season. Low flows cause fish passage problems mainly at the WIP diversion at river mile 44 and in lower Simcoe Creek as well as at various tributary culverts.
Satus Creek	No constructed barriers to upstream passage on mainstem	Past grazing and road construction have had a major effect. Headwater meadow systems have been incised due to timber road construction and livestock grazing, and the systems are generally degraded. Unrestricted streamside grazing is now excluded, but riparian corridor was damaged during use as open range. These weakening factors allowed the major floods of 1996 and 1997 to de-stabilize the channel in the mid-elevations of the creek.
Cowiche Creek	No constructed barriers to upstream passage on mainstem	Diversions for irrigation as well as development for housing and recreational facilities in the lower portion of the creek.
Little Naches River		High road density and timber harvest have caused excessive fine sediment load. LWD was removed through channel cleaning and flood rehabilitation efforts. Loss of off-channel habitat due to channelization.

Table Notes:

[1] Includes Wilson, Naneum, Coleman, and Cherry Creeks, which are all interconnected.

[2] Includes North and South Forks and Wide Hollow Creek.

Appendix D.
Bumping Lake Storage and Flow Volumes

Table D-1 Monthly Volume of Flow into Bumping Lake, 1981-2005

Water Year	Monthly Flow (acre-feet)												
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
1981	18,610	49,040	21,230	22,030	11,460	14,200	27,460	21,230	7,400	4,210	4,230	6,460	207,560
1982	8,300	11,930	8,040	34,260	17,410	12,200	45,640	68,000	22,780	6,670	5,900	8,600	249,730
1983	9,360	18,110	19,380	10,630	18,560	15,470	51,280	42,460	21,090	5,810	5,310	4,420	221,880
1984	17,470	11,620	25,360	11,640	14,390	13,550	35,010	54,540	23,830	6,160	3,680	5,650	222,900
1985	8,090	5,580	3,510	3,190	3,940	19,950	45,760	48,550	9,270	3,780	4,300	9,300	165,220
1986	13,440	4,280	10,610	17,650	27,050	21,380	36,560	28,520	6,210	3,280	4,120	3,930	177,030
1987	19,450	9,290	6,620	7,820	19,120	29,070	51,050	18,570	5,310	2,500	2,300	1,920	173,020
1988	2,180	8,070	5,920	6,060	11,380	28,780	39,560	28,970	9,150	3,020	3,000	4,460	150,550
1989	14,740	11,170	8,990	5,670	8,900	29,410	40,160	38,790	10,210	4,200	3,550	3,260	179,050
1990	9,690	17,670	22,460	9,050	9,010	37,250	32,820	38,150	15,450	6,260	4,730	10,790	213,330
1991	41,720	15,480	14,540	28,920	12,380	19,310	31,990	34,580	21,010	6,600	3,520	2,240	232,290
1992	9,890	10,230	10,890	12,870	17,910	26,160	28,690	10,290	4,530	2,290	2,440	2,330	138,520
1993	5,090	3,170	4,500	4,030	11,560	15,690	50,090	20,430	6,970	3,300	2,340	1,820	128,990
1994	1,390	3,620	6,600	3,920	11,950	25,240	35,710	18,060	5,770	2,570	2,310	5,650	122,790
1995	7,150	18,220	11,870	38,450	19,200	14,620	46,820	34,100	11,870	4,610	3,850	10,180	220,940
1996	58,510	32,650	27,460	52,630	17,230	29,880	30,220	31,250	12,230	6,300	4,830	5,540	308,730
1997	11,400	11,310	22,930	16,160	25,440	26,910	71,670	70,930	35,390	8,300	9,490	23,360	333,290
1998	18,800	12,780	10,840	7,100	11,630	17,700	54,290	34,740	10,360	4,850	3,180	3,440	189,710
1999	13,310	20,940	16,570	7,230	7,900	12,430	36,320	69,240	55,820	19,590	5,560	5,280	270,190
2000	31,820	20,360	8,580	7,310	7,000	27,770	40,140	41,610	13,930	5,880	4,850	5,620	214,870
2001	4,600	3,680	3,650	2,960	6,520	12,140	35,040	17,870	6,730	4,480	2,220	3,140	103,030
2002	15,150	10,170	22,880	9,540	10,410	24,690	40,190	66,720	21,540	5,820	3,440	2,860	233,410
2003	4,130	5,420	24,350	19,460	17,670	20,170	33,230	31,500	7,280	3,900	2,870	7,160	177,140
2004	11,830	9,440	8,710	8,370	11,920	26,040	38,220	24,540	7,810	5,140	6,150	5,700	163,870
2005	9,370	16,660	25,610	8,270	7,640	17,070	22,790	8,720	4,560	2,760	2,830	3,880	130,160
Average	14,620	13,636	14,084	14,209	13,503	21,483	40,028	36,094	14,260	5,291	4,040	5,880	197,128
Minimum	1,390	3,170	3,510	2,960	3,940	12,140	22,790	8,720	4,530	2,290	2,220	1,820	103,030
Maximum	58,510	49,040	27,460	52,630	27,050	37,250	71,670	70,930	55,820	19,590	9,490	23,360	333,290

Table D-2 Monthly Volume of Water Available for Storage at Bumping Lake, 1981-2005 (each month 130 cfs instream flow)

Water Year	Monthly Volume (acre-feet)												
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
1981	10,888	41,061	13,251	14,823	3,481	6,478	19,481	13,508	0	0	0	0	122,969
1982	578	3,951	61	27,053	9,431	4,478	37,661	60,278	14,801	0	0	621	158,910
1983	1,638	10,131	11,401	3,423	10,581	7,748	43,301	34,738	13,111	0	0	0	136,070
1984	9,748	3,641	17,381	4,175	6,411	5,828	27,031	46,818	15,851	0	0	0	136,882
1985	368	0	0	0	0	12,228	37,781	40,828	1,291	0	0	1,321	93,816
1986	5,718	0	2,631	10,443	19,071	13,658	28,581	20,798	0	0	0	0	100,899
1987	11,728	1,311	0	613	11,141	21,348	43,071	10,848	0	0	0	0	100,059
1988	0	91	0	0	3,401	21,058	31,581	21,248	1,171	0	0	0	78,548
1989	7,018	3,191	1,011	0	921	21,688	32,181	31,068	2,231	0	0	0	99,307
1990	1,968	9,691	14,481	1,843	1,031	29,528	24,841	30,428	7,471	0	0	2,811	124,090
1991	33,998	7,501	6,561	21,713	4,401	11,588	24,011	26,858	13,031	0	0	0	149,660
1992	2,168	2,251	2,911	5,405	9,931	18,438	20,711	2,568	0	0	0	0	64,382
1993	0	0	0	0	3,581	7,968	42,111	12,708	0	0	0	0	66,367
1994	0	0	0	0	3,971	17,518	27,731	10,338	0	0	0	0	59,557
1995	0	10,241	3,891	31,243	11,221	6,898	38,841	26,378	3,891	0	0	2,201	134,802
1996	50,788	24,671	19,481	45,165	9,251	22,158	22,241	23,528	4,251	0	0	0	221,532
1997	3,678	3,331	14,951	8,953	17,461	19,188	63,691	63,208	27,411	321	1,768	15,381	239,339
1998	11,078	4,801	2,861	0	3,651	9,978	46,311	27,018	2,381	0	0	0	108,077
1999	5,588	12,961	8,591	23	0	4,708	28,341	61,518	47,841	11,611	0	0	181,180
2000	24,098	12,381	601	0	0	20,048	32,161	33,888	5,951	0	0	0	129,126
2001	0	0	0	0	0	4,418	27,061	10,148	0	0	0	0	41,627
2002	7,428	2,191	14,901	2,333	2,431	16,968	32,211	58,998	13,561	0	0	0	151,020
2003	0	0	16,371	12,253	9,691	12,448	25,251	23,778	0	0	0	0	99,791
2004	4,108	1,461	731	905	3,941	18,318	30,241	16,818	0	0	0	0	76,522
2005	1,648	8,681	17,631	1,063	0	9,348	14,811	998	0	0	0	0	54,179
Average	7,769	6,541	6,788	7,657	5,800	13,761	32,049	28,372	6,970	477	71	893	117,148
Minimum	0	0	0	0	0	4,418	14,811	998	0	0	0	0	41,627
Maximum	50,788	41,061	19,481	45,165	19,071	29,528	63,691	63,208	47,841	11,611	1,768	15,381	239,339

Table D-3 Monthly Volume of Water Available for Storage at Bumping Lake, 1981-2005 (higher May-June instream flow)

Water Year	Monthly Volume (acre-feet)												
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
1981	10,888	41,061	13,251	14,823	3,481	6,478	0	0	0	0	0	0	89,981
1982	578	3,951	61	27,053	9,431	4,478	8,812	32,360	14,801	0	0	621	102,144
1983	1,638	10,131	11,401	3,423	10,581	7,748	14,452	6,820	13,111	0	0	0	79,303
1984	9,748	3,641	17,381	4,175	6,411	5,828	0	18,900	15,851	0	0	0	81,934
1985	368	0	0	0	0	12,228	8,932	12,910	1,291	0	0	1,321	37,049
1986	5,718	0	2,631	10,443	19,071	13,658	0	0	0	0	0	0	51,520
1987	11,728	1,311	0	613	11,141	21,348	14,222	0	0	0	0	0	60,362
1988	0	91	0	0	3,401	21,058	2,732	0	1,171	0	0	0	28,452
1989	7,018	3,191	1,011	0	921	21,688	3,332	3,150	2,231	0	0	0	42,540
1990	1,968	9,691	14,481	1,843	1,031	29,528	0	2,510	7,471	0	0	2,811	71,332
1991	33,998	7,501	6,561	21,713	4,401	11,588	0	0	13,031	0	0	0	98,791
1992	2,168	2,251	2,911	5,405	9,931	18,438	0	0	0	0	0	0	41,103
1993	0	0	0	0	3,581	7,968	13,262	0	0	0	0	0	24,811
1994	0	0	0	0	3,971	17,518	0	0	0	0	0	0	21,489
1995	0	10,241	3,891	31,243	11,221	6,898	9,992	0	3,891	0	0	2,201	79,576
1996	50,788	24,671	19,481	45,165	9,251	22,158	0	0	4,251	0	0	0	175,764
1997	3,678	3,331	14,951	8,953	17,461	19,188	34,842	35,290	27,411	321	1,768	15,381	182,572
1998	11,078	4,801	2,861	0	3,651	9,978	17,462	0	2,381	0	0	0	52,210
1999	5,588	12,961	8,591	23	0	4,708	0	33,600	47,841	11,611	0	0	124,921
2000	24,098	12,381	601	0	0	20,048	3,312	5,970	5,951	0	0	0	72,360
2001	0	0	0	0	0	4,418	0	0	0	0	0	0	4,418
2002	7,428	2,191	14,901	2,333	2,431	16,968	3,362	31,080	13,561	0	0	0	94,253
2003	0	0	16,371	12,253	9,691	12,448	0	0	0	0	0	0	50,762
2004	4,108	1,461	731	905	3,941	18,318	1,392	0	0	0	0	0	30,855
2005	1,648	8,681	17,631	1,063	0	9,348	0	0	0	0	0	0	38,370
Average	7,769	6,541	6,788	7,657	5,800	13,761	5,444	7,304	6,970	477	71	893	69,475
Minimum	0	0	0	0	0	4,418	0	0	0	0	0	0	4,418
Maximum	50,788	41,061	19,481	45,165	19,071	29,528	34,842	35,290	47,841	11,611	1,768	15,381	182,572

Table D-4 Monthly Volume of Flow into Cle Elum Lake, 1981-2005

Water Year	Monthly Flow (acre-feet)												
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Total
1981	51,180	136,700	44,820	55,880	36,440	65,290	98,010	77,510	38,410	17,800	13,850	24,630	660,520
1982	25,520	20,770	31,140	76,210	46,900	46,360	148,620	198,280	80,000	30,270	16,580	24,690	745,340
1983	20,130	42,920	64,600	31,760	61,650	64,190	157,850	105,470	59,830	29,440	19,510	9,100	666,450
1984	54,040	19,980	97,690	31,940	47,770	45,930	100,230	166,580	93,380	24,100	15,640	18,870	716,150
1985	26,160	18,470	10,030	10,210	20,340	94,160	149,550	118,010	42,460	17,320	12,910	38,570	558,190
1986	56,040	10,030	20,730	52,110	79,030	65,030	111,960	92,520	40,810	16,850	10,190	12,060	567,360
1987	57,700	22,350	13,250	13,400	54,900	95,500	147,920	65,370	25,880	8,770	5,510	4,600	515,150
1988	6,800	18,290	9,800	21,840	44,330	115,320	134,460	95,350	48,750	19,610	9,630	38,190	562,370
1989	56,050	44,140	40,230	21,720	23,190	106,990	130,320	117,270	48,350	19,430	4,320	8,770	620,780
1990	60,250	64,540	41,550	33,170	39,650	138,470	120,630	146,430	67,410	19,210	11,000	53,120	795,430
1991	199,530	45,760	47,770	76,360	32,820	80,390	124,370	110,830	87,570	31,250	10,950	6,310	853,910
1992	33,790	48,390	38,440	42,680	69,260	85,610	103,840	48,480	21,110	9,760	15,260	11,500	528,120
1993	26,160	18,250	22,900	17,530	39,460	65,250	170,730	71,570	26,810	12,510	4,800	5,970	481,940
1994	8,400	12,960	23,040	14,750	48,430	104,240	122,830	60,450	32,680	9,980	8,260	17,980	464,000
1995	27,580	43,620	25,540	99,130	54,290	62,000	176,480	103,630	48,710	20,320	8,140	52,030	721,470
1996	206,850	76,490	72,270	108,530	53,290	102,940	100,920	109,340	63,320	23,600	11,190	20,810	949,550
1997	46,710	31,390	42,200	46,350	81,500	97,870	225,940	201,050	111,690	34,900	26,070	69,700	1,015,370
1998	54,130	22,780	26,370	21,180	44,350	69,150	162,850	93,030	36,810	14,160	3,540	8,690	557,040
1999	39,410	51,040	67,390	24,860	25,590	57,630	138,580	224,080	145,880	61,660	12,690	18,010	866,820
2000	90,750	78,140	21,310	13,780	20,830	100,340	132,540	128,200	48,250	12,910	13,510	23,700	684,260
2001	11,420	7,870	10,140	7,390	27,660	53,650	119,490	57,940	29,360	11,610	6,480	19,900	362,910
2002	65,430	32,330	54,920	26,870	30,690	87,540	144,230	199,540	82,250	23,710	7,910	4,960	760,380
2003	14,340	14,180	43,470	46,970	61,500	68,480	108,280	105,320	37,920	20,330	10,050	45,270	576,110
2004	64,920	32,640	23,630	24,740	55,080	94,760	116,230	76,750	34,410	29,340	34,620	24,000	611,120
2005	51,320	64,850	86,370	28,670	29,690	57,100	69,600	33,630	23,940	13,800	6,220	21,130	486,320
Average	54,184	39,155	39,184	37,921	45,146	80,968	132,658	112,265	55,040	21,306	11,953	23,302	653,082
Minimum	6,800	7,870	9,800	7,390	20,340	45,930	69,600	33,630	21,110	8,770	3,540	4,600	362,910
Maximum	206,850	136,700	97,690	108,530	81,500	138,470	225,940	224,080	145,880	61,660	34,620	69,700	1,015,370