DRAFT ECONOMIC ANALYSIS OF CRITICAL HABITAT DESIGNATION FOR THE BULL TROUT

Draft - March 18, 2004

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TABLE OF CONTENTS

EXECUTIVE SUMMARY ES-1

1 INTRODUCTION AND BACKGROUND 1-1

1.1 Description of Species and Habitat 1-2
1.2 Proposed Critical Habitat 1-5
1.3 Framework and Methodology 1-6
1.3.1 Types of Economic Effects Considered 1-6
1.3.2 Defining the Baseline 1-9
1.3.3 Direct Compliance Costs 1-10
1.3.4 Indirect Costs 1-10
1.3.5 Benefits 1-14
1.3.6 Analytic Time Frame 1-14
1.3.7 General Analytic Steps 1-15
1.4 Information Sources 1-16

2 RELEVANT BASELINE INFORMATION 2-1

2.1 Socioeconomic Profile of the Critical Habitat Areas 2-1
2.1.1 Population 2-1
2.1.2 Land Ownership and Major Uses 2-2
2.1.3 Employment 2-12
2.1.4 Economic and Demographic Characteristics of the 74 Counties Containing Bull Trout Critical Habitat 2-15
2.1.5. Tribes of the Columbia and Klamath Basins 2-18
2.2 Baseline Elements 2-21
2.2.1 Recovery Plan 2-21
2.2.2 Overlap with Other Listed Species 2-22
2.2.3 Federal and State Statutes and Regulations 2-25
2.2.4 Summary Discussion of Impacts of Baseline Regulations on Economic Analysis 2-38
2.2.5 Discussion: Impacts of Existing Fisheries Policies on Timber and Grazing Activities 2-41

3 FORECASTED ECONOMIC IMPACTS 3-1

3.1 Categories of Economic Impacts 3-1
3.1.1 Section 7 Consultations 3-2
3.1.2 Technical Assistance 3-4
3.1.3 Project Modifications 3-5
3.1.4 Distributional and Regional Economic Effects 3-5

3.2 Consultation History for Bull Trout Since Listing 3-7
3.2.1 Action Agencies and Activities Involved in Past Bull Trout Consultations 3-7
3.2.2 Formal Section 7 Consultations History on Bull Trout Since Listing . 3-13
3.2.3 Informal Section 7 Consultations History on Bull Trout 3-16
3.3 Project Modifications 3-17
3.3.1 Modifications to FHWA Bridge Projects 3-17
3.3.2 Modifications to Grazing Permits 3-18
3.3.3 Modifications to Timber Harvest 3-19
3.3.4 Modifications to Mining Operations 3-21
3.3.5 Modifications to Agricultural Irrigation Projects 3-22
3.3.6 Modifications to Dams and Hydroelectric Projects 3-25
3.3.7 Modifications to Forest Management and Road Maintenance Projects 3-30
3.3.8 Activities Unlikely to Involve Significant Modification 3-30
3.4 Projected Future Section 7 Consultations Involving the Bull Trout 3-30
3.4.1 Projected Future Formal Section 7 Consultations 3-34
3.4.2 Projected Future Informal Section 7 Consultations 3-37

4 ESTIMATING THE CO-EXTENSIVE COSTS OF THE DESIGNATION 4-1

4.1 Summary of Estimated Impacts 4-2
4.1.1 Annual Administrative Costs of Consultation 4-2
4.1.2. Annual Bull Trout Project Modification Costs 4-3
4.1.3 Proposed Critical Habitat Units Expected to Generate the Greatest Economic Impacts 4-4
4.2 Discussion of Impacts by Action Agency 4-5
4.2.1 Army Corps of Engineers 4-6
4.2.2 Bureau of Land Management 4-8
4.2.3 Bonneville Power Administration 4-9
4.2.4 Bureau of Reclamation 4-24
4.2.5 Federal Highway Administration 4-31
4.2.6 Federal Energy Regulatory Commission 4-33
4.2.7 U.S. Forest Service 4-55
4.2.8 Other Action Agencies 4-82
4.3 Potential Impacts on Small Entities 4-82
4.3.1 Identifying Activities That May Involve Small Entities 4-84
4.3.2 Costs Associated with Agriculture Water Diversions 4-86
4.3.3 Hydroelectric Facility Re-licensing 4-88
4.3.4 Mining 4-91

4.4 Potential Impacts on the Energy Industry 4-93
4.4.1 Evaluation of Whether the Designation will Result in a Reduction in Electricity Production in Excess of One Billion Kilowatt-Hours Per Year or in Excess of 500 Megawatts of Installed Capacity 4-94
4.4.2 Evaluation of Whether the Designation will Result in an Increase in the Cost of Energy Production in Excess of One Percent 4-95

APPENDIX A: Detailed Description of Critical Habitat Units A-1

APPENDIX B: Ownership of Lands Adjacent to Proposed Critical Habitat Unit and Subunit B-1

APPENDIX C: Overlap of Proposed Bull Trout Critical Habitat and Salmon and Steelhead Habitat C-1

APPENDIX D: Listing of All Suggested Project Modifications Found in Formal Biological Opinions: By Activity Type D-1

APPENDIX E: Length (stream) and area (lakes) of proposed designated bull trout critical habitat that is within U.S. Forest Service Land and Forest Service Wilderness Areas E-1

APPENDIX F: Breakdown of Total Annual Estimated Costs by Proposed Critical Habitat Unit F-1

EXECUTIVE SUMMARY

1. The purpose of this report is to identify and analyze the potential economic impacts associated with the designation of critical habitat for the Columbia River and Klamath River Distinct Population Segments (DPSs) of bull trout *(Salvelinus confluentus)*, hereafter "bull trout." This report was prepared by Bioeconomics, Inc. of Missoula, Montana, for the U.S. Fish and Wildlife Service's (the Service) Division of Economics.

KEY FINDINGS

- Coextensive costs associated with critical habitat designation for the bull trout are forecast to be $230 million to $300 million over the next ten years.
- Federal agencies are expected to bear 75 percent of these costs (most significantly dam and reservoir operations and timber harvest); with private entities incurring the remaining 25 percent (most significantly irrigated agriculture, mining, and hydroelectric facility re-licensing).
- U.S. Forest Service (USFS) and Bureau of Reclamation (BOR)-related activities account for approximately two-thirds of forecast costs.
- Project modification costs account for as much as 70 percent of forecast costs. Administrative costs represent the remaining 30 percent.
- Dam and reservoir-related activities, including power facility re-licensing, account for 51 percent of forecast costs. Timber harvest, agricultural water diversions and mining account for 22 percent, 13 percent, and six percent of costs, respectively.
- On a cost per unit basis, the highest costs are expected to occur in Unit 20, the Middle Columbia River Basin (17 percent). The next most costly unit is Unit 4, the Willamette River Basin (15 percent), followed by Unit 16, the Salmon River Basin (11 percent).
- In terms of river miles, approximately 15 percent of the total forecast costs are associated with one percent of the proposed designation, 30 percent with four percent of the proposed designation, and 45 percent with ten percent of the proposed designation. When expressed in terms of the expected cost per river mile, the three most costly units are the Willamette River (Unit 4), Middle Columbia River (Unit 20) and Malheur River (Unit 13) basins.
- Small business impacts are expected in the Middle Columbia River Basin (Unit 20) for agriculture, Lower Columbia River (Unit 19) and Northeast Washington River basins (Unit 22) for hydroelectric producers, and John Day River Basin (Unit 8) and Hells Canyon Complex (Unit 12) for placer mining.

2. Section 4(b)(2) of the Endangered Species Act (the Act) requires the Service to designate critical habitat on the basis of the best scientific data available, after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat. The Service may exclude areas from critical habitat

designation when the benefits of exclusion outweigh the benefits of including the areas within critical habitat, provided the exclusion will not result in extinction of the species.

Framework for the Analysis

3. The primary purpose of this analysis is to estimate the economic impact associated with the designation of critical habitat for the bull trout. This information is intended to assist the Secretary in making decisions about whether the benefits of excluding particular areas from the designation outweigh the benefits of including those areas in the designation.[1] It addresses distribution of impacts, including an assessment of the potential effects on small entities and the energy industry. This information can be used by decision-makers to assess whether the effects of the designation might unduly burden a particular group or economic sector.

4. This analysis focuses on the direct and indirect costs of the rule. However, economic impacts to land use activities can exist in the absence of critical habitat. These impacts may result from, for example, local zoning laws, State and natural resource laws, and enforceable management plans and best management practices (BMPs) applied by other State and Federal agencies. For example, as discussed in detail in this report, regional management plans, such as the Northwest Forest Plan, PACFISH and INFISH provide significant protection to bull trout and its habitat while imposing significant costs within the region. Economic impacts that result from these types of protections are not included in this assessment as they are considered to be part of the regulatory and policy "baseline."

5. The measurement of direct compliance costs focuses on the implementation of section 7 of the Act. This section requires Federal agencies to consult with the Service to ensure that any action authorized, funded, or carried out will not likely jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat. The administrative costs of these consultations, along with the costs of project modifications resulting from these consultations, represent the direct compliance costs of designating critical habitat. Importantly, this analysis does not differentiate between consultations that result from the listing of the species (i.e., the jeopardy standard) and consultations that result from the presence of critical habitat (i.e., the adverse modification standard).

6. The analysis examines activities taking place both within and adjacent to the proposed designation. It estimates impacts based on activities that are "reasonably foreseeable," including, but not limited to, activities that are currently authorized, permitted, or funded, or for which proposed plans are currently available to the public. Accordingly, the analysis bases estimates on activities that are likely to occur within a ten-year time frame, beginning on the day that the current proposed rule became available to the public (November 30, 2002). The ten-year time frame was chosen for the analysis because, as the time horizon for an economic analysis is expanded, the assumptions on which the projected

[1] 16 U.S.C. § 1533(b)(2).

number of projects and cost impacts associated with those projects becomes increasingly speculative. An exception to the 10 year analysis time horizon used in this analysis is for Federal Energy Regulatory Commission (FERC) licenses, which are renewed for up to 50 years. Accordingly, this analysis estimates the annualized costs of the expected impacts associated with section 7 bull trout consultations involving FERC re-licensing over a 50 year time horizon.

7. The analysis is based on a wide range of information sources. Numerous individuals were contacted from the Service, as well as from the U.S. Forest Service (USFS), Federal Highway Administration (FHWA), Bureau of Land Management (BLM), Army Corps of Engineers (ACOE), Bureau of Reclamation (BOR), Bonneville Power Administration (BPA), Natural Resource Conservation Service (NRCS), U.S. Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA) and other Federal agencies. The analysis of the hydroelectric facilities and other dam structures in the region also relied in information from the Northwest Power and Conservation Council (NWPCC), the Pacific Northwest Utility Coordinating Council as well as information from utilities owning dams in bull trout proposed critical habitat (e.g., Avista Corporation (Avista), Eugene Water and Electric Board, Pacificorp and Portland General Electric (PGE)). Native American Tribes (e.g., Confederated Salish and Kootenai Tribes), State agencies (e.g., State Departments of Environmental Quality (DEQ) and State Departments of Transportation (DOTs)) and industry organizations (e.g., American Forest Resource Council, American Farm Bureau and Northwest Mining Association) were also contacted, as were numerous individuals in the private sector on topics ranging from irrigation to forestry to bull trout conservation. Census Bureau and other Department of Commerce data was relied on to characterize the regional economy.

8. The bull trout was listed as a threatened species in 1998.[2] Since that time, numerous Action agencies have participated in well over 200 formal consultations and thousands of informal consultations involving bull trout. The past consultation record was used as a starting point from which to predict future consultation activity. Action agencies provided additional information on likely changes in future consultation activity following designation of critical habitat. In some cases these agencies saw little change in future consultation levels. For example, FHWA projects are planned for many years in advance and bridge or road-related bull trout consultations are generally quite certain and foreseeable. In some cases (e.g., mining activity, irrigation diversions) it was determined that the historical consultation record understated the potential level of future consultation activity for the species and adjustments to future predicted consultation levels were made. For dam and reservoir operations, a wide spectrum of information from agency representatives, as well as the actual FERC re-licensing schedules for privately operated hydropower facilities were used to augment historical consultation rates and develop future annual cost estimates associated with bull trout consultations on dam, reservoir and power-related activities.

[2] This economic analysis applies only to the Columbia River and Klamath River DPSs of bull trout and is not a rangewide analysis. The rangewide listing of the bull trout occurred in 1999 and critical habitat will be proposed for the remainder of the range at a later date.

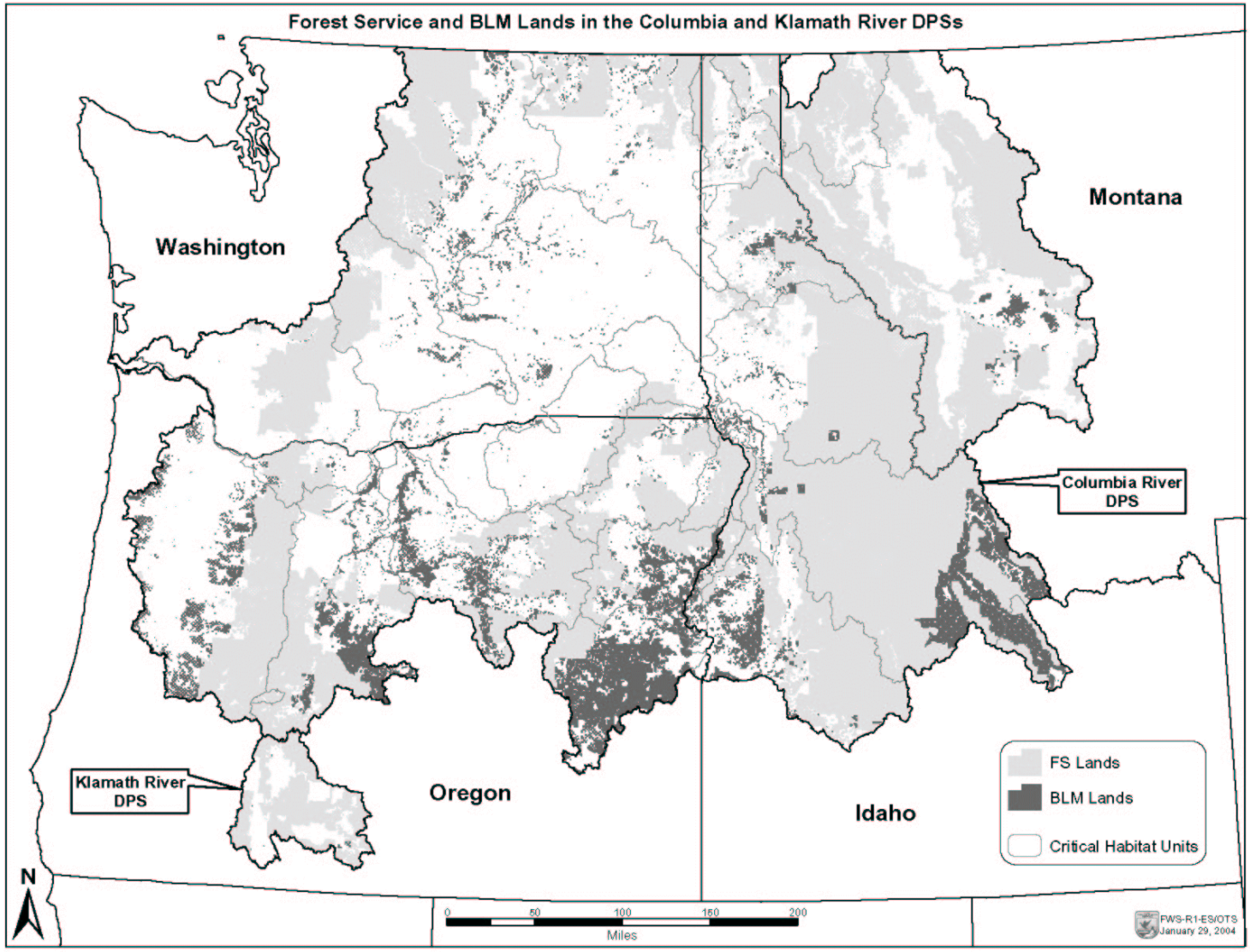
Exhibit ES.1 provides a summary of the wide range of activities that may be impacted by bull trout-related consultations.

Exhibit ES.1 **PROJECTED ACTIVITIES AFFECTED BY BULL TROUT**	
Action Agency	**Activities Consulted on**
Army Corps of Engineers	Dam and reservoir operations, streambank stabilization, dredging, bridge replacement, stream restoration.
Bureau of Land Management	Forest management, grazing, timber harvest, resource maintenance and road construction, weed management, streambank stabilization, flood control projects.
Bonneville Power Administration	Federal Columbia River Power System (FCRPS)-dam operation, fisheries restoration and augmentation, agricultural practices and irrigation systems.
Bureau of Reclamation	Dam and reservoir operations, irrigation diversions.
Federal Highway Commission	Highway bridge replacement.
Federal Energy Regulatory Commission	Dam re-licensing and removal.
U.S. Forest Service	Timber harvest, grazing, mining, resource maintenance and road construction, weed management, streambank stabilization, recreation, special use permits, watershed restoration, road decommissioning, irrigation diversions, culvert replacement, and prescribed fuel reduction programs.
Other agencies, including NPS, BIA, U.S. Department of Agriculture (USDA), U.S. Geological Survey (USGS), U.S. Fish and Wildlife Service and NOAA Fisheries	Assorted activities, primarily fisheries and stream and wetland restoration.

Results of the Analysis

9. The economic impacts associated with the designation of critical habitat for the bull trout are expected to range from $230 million to $300 million over the next ten years ($23 million to $30 million per year). Federal agencies are expected to bear approximately 75 percent of the total costs of this designation. A significant portion of the land adjacent to the proposed designation is Federally owned (58 percent), 36 percent is under private ownership and the remainder is comprised of Tribal, State or local interests. Of the Federal lands, the majority is managed by the USFS (85 percent) and the BLM (12 percent). The remaining 25 percent of costs are expected to be borne by private entities. Exhibit ES.2 shows the location of USFS and BLM managed land within the proposed designation.

Exhibit ES.2


Forest Service and BLM Lands in the Columbia and Klamath River DPSs
Washington
Montana
Columbia River DPS
Klamath River DPS
Oregon
Idaho
FS Lands
BLM Lands
Critical Habitat Units
N
0
50
100
150
200
Miles
FWS-R1-ES/OTS
January 29, 2004

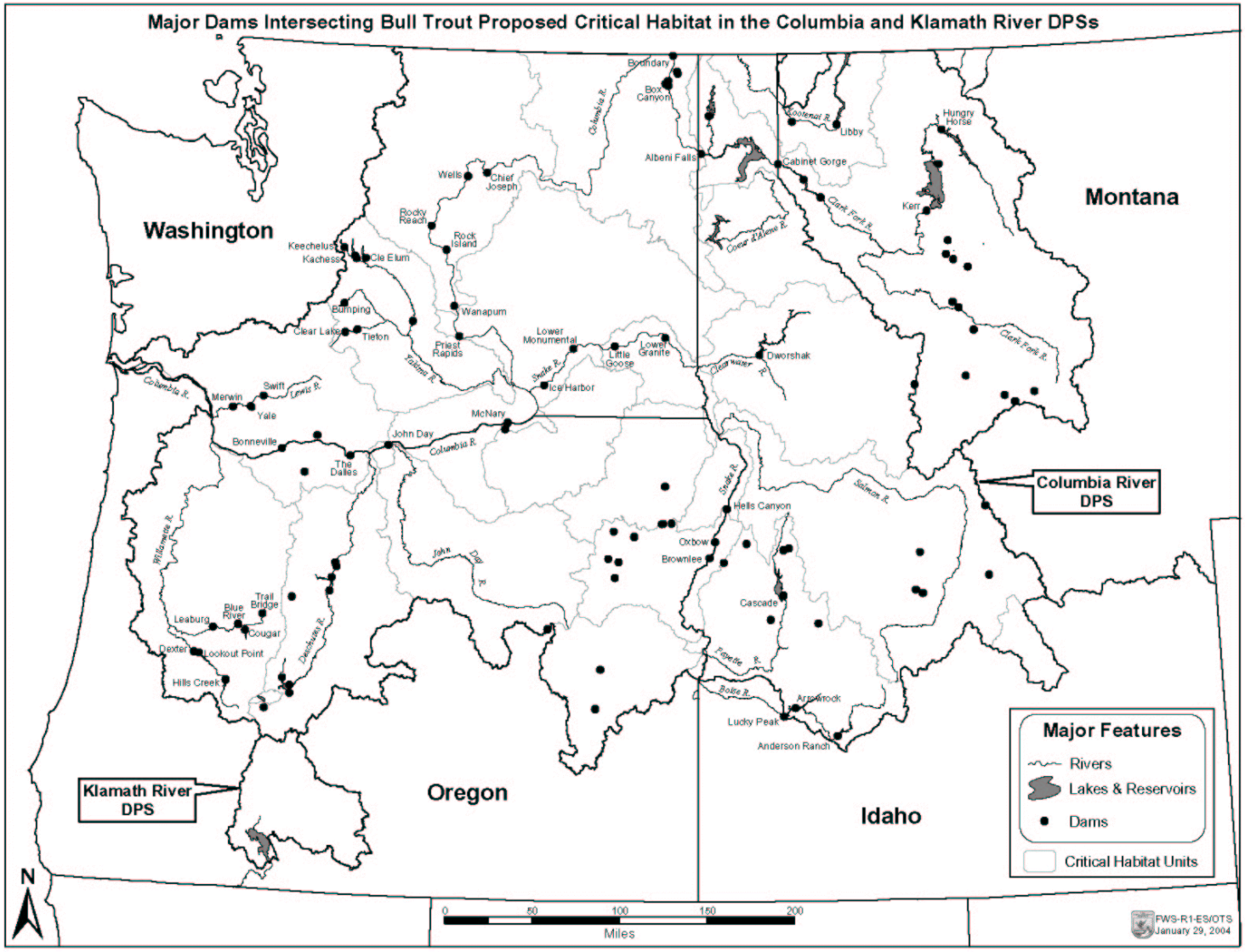
10. In some cases, the cost associated with consultation is not borne by the Action agency, but passed onto other parties. For example, while farmers and ranchers typically do not consult on the operation of Federal irrigation impoundments, irrigators could be impacted by potential reductions in water deliveries to maintain instream flow during dry years. The costs associated with BOR-related water diversions is expected to occur in the Middle Columbia Basin (Unit 20). While the unit location of USFS-related water diversions is uncertain, it is likely to occur in the Salmon River (Unit 16), Clark Fork (Unit 2), Southwest Idaho River and Clearwater River (Unit 15) Basins, as these units contain the largest portion of USFS managed lands.

Klamath River Basin (Unit 1) Agriculture

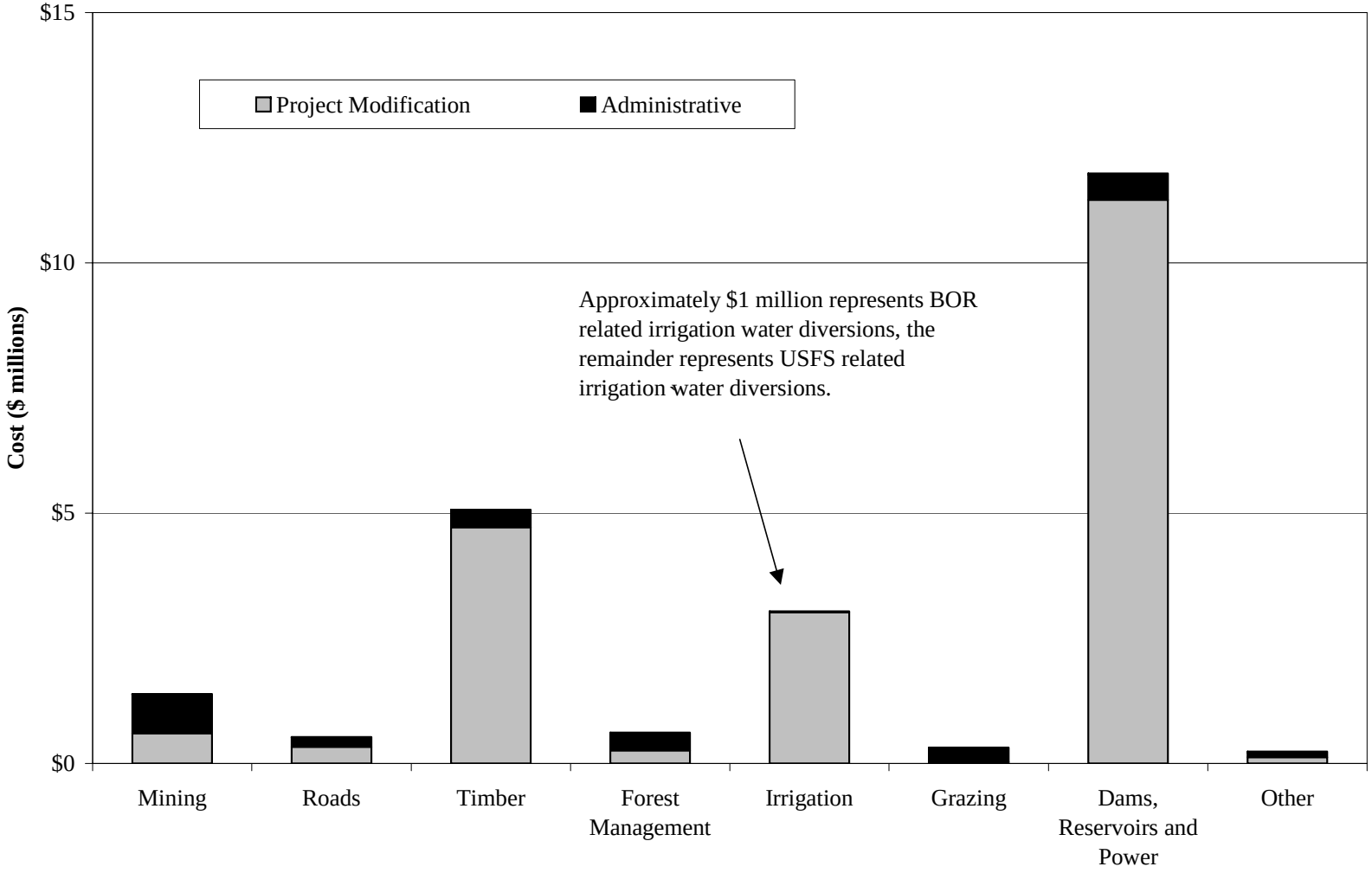
The issues surrounding bull trout are quite different than those leading to the high-profile conflicts seen in recent years within the Klamath River Drainage between salmon or sucker fish conservation and agricultural water withdrawals. The primary habitat for the bull trout is located higher in the drainage than for the other listed fish species. Thus most conflicts associated with water levels in Klamath Lake or agricultural water withdrawals are not the consequence of bull trout conservation. This economic analysis does estimate costs associated with USFS irrigation diversions related to bull trout conservation within the Klamath River Basin, but these costs are relatively small when compared to potential impacts associated with salmon or sucker fish conservation in the drainage.

11. Consultations that may involve private entities include those related to timber harvest, grazing, mining and power facility re-licensing. Some of the costs associated with these consultations, however, are expected to be borne directly by or passed onto the Federal government (e.g., increased logging and yarding costs passed onto the USFS through lower bids for timber). Most of the forecast costs resulting from designation (51 percent) are dam and reservoir related (excluding water diversions). These costs result from consultations on ACOE and BOR dams and reservoirs, BPA consultations on the FCRPS, and FERC re-licensing consultations. Exhibit ES.3 illustrates the location of major dams within the proposed critical habitat. The remaining costs are associated with timber harvest (22 percent), BOR and USFS-related water diversions (13 percent) and placer gold mining (six percent). Grazing, forest management, road and bridge construction and maintenance and other activities each account for less than three percent of forecast costs. Exhibit ES.4 provides the distribution of total costs by activity.

Exhibit ES.3


Major Dams Intersecting Bull Trout Proposed Critical Habitat in the Columbia and Klamath River DPSs
Washington
Montana
Oregon
Idaho
Columbia River DPS
Klamath River DPS
Boundary
Box Canyon
Albeni Falls
Libby
Hungry Horse
Cabinet Gorge
Kerr
Wells
Chief Joseph
Rocky Reach
Rock Island
Keechelus
Kachess
Cle Elum
Bumping
Clear Lake
Tieton
Wanapum
Priest Rapids
Lower Monumental
Little Goose
Lower Granite
Dworshak
Ice Harbor
McNary
Merwin
Swift
Yale
Bonneville
John Day
The Dalles
Hells Canyon
Oxbow
Brownlee
Cascade
Trail Bridge
Blue River
Leaburg
Cougar
Dexter
Lookout Point
Hills Creek
Arrowrock
Lucky Peak
Anderson Ranch
Columbia R.
Snake R.
Salmon R.
Clearwater R.
Clark Fork R.
Kootenai R.
Coeur d'Alene R.
Yakima R.
Lewis R.
Willamette R.
Deschutes R.
John Day R.
Payette R.
Boise R.
Major Features
Rivers
Lakes & Reservoirs
Dams
Critical Habitat Units
N
0
50
100
150
200
Miles
FWS-R1-ES/OTS
January 29, 2004

ES-4
Annualized Total Cost By Activity Impacted, High Range ($ millions)



Consumer and Producer Surplus

This rulemaking is not expected to result in higher prices or a reduced supply of agriculture goods and wood products to consumers. As a result, consumer surplus is not expected to be significantly affected. Producer surplus losses, from the timber contractor's perspective, are also expected to be negligible. Publically owned forests produce profit, or economic rent, which is the difference between the market prices of trees and the cost of harvesting them. The government obtains the rent through competitive bidding for cutting rights on public land, and the open bidding process assures that the price paid equals the present value of the future rents from the forest. This analysis expects that most of the projected project modification costs resulting from the designation will be incorporated into the timber bid and passed onto the Federal government. As logging costs and road restoration costs increase for the private contractor, or as timber sale volume decreases, the corresponding bid for the timber decreases. From the USFS's standpoint all costs are sunk (sale preparation, cruising, etc.) and the change in stumpage is a net revenue change for the agency. The rulemaking may, however, effect farmer profits (i.e., producer surplus), as some farmers incur additional costs to obtain irrigation water. In the analysis of producer surplus impacts resulting from agricultural water diversions, it is assumed that farmers will purchase lost water from another source and that water will be available at its opportunity cost (i.e., market price). Thus, proxy for producer surplus losses (assuming, that the farmer does not change irrigation practices because of the higher water cost) is the additional cost of the purchased water.

12. Costs can be expressed in terms of unit or river mile; both of these metrics are useful in describing economic impacts.[3] On a cost per unit basis the largest portion of forecast costs are expected to occur in Unit 20, the Middle Columbia River Basin (17 percent). This is due primarily to fish passage, annual operating and maintenance and fish study costs, and costs associated with irrigation water diversions at BOR's Yakima River Project (five impoundments). The next most costly unit is Unit 4, the Willamette River Basin (15 percent). These costs are attributable to fish passage and temperature control projects and annual operating and maintenance and fish study costs at ACOE's facilities in the Upper Willamette River System (Dexter, Lookout Point, Hills Creek and Blue River Dams). The third most costly unit is Unit 16, the Salmon River Basin (11 percent). Because this is the largest unit in terms of river miles and proportion of USFS managed land, and because future USFS activities are expected to generate approximately 70 percent of the consultation activity, this unit bears the greatest number of future bull trout-related consultations. Therefore, the administrative costs account for a large portion of the costs in this unit.

[3] Twelve of the units also contain more than 500,000 lake acres of critical habitat. These units account for approximately 40 percent of the potential economic impacts associated with the proposed designation. The Clark Fork River Basin (Unit 2) contains almost 60 percent of the lake acres and accounts for seven percent of the cost. Because all 25 units contain river miles, the costs are expressed in terms of dollars per river mile for comparison.

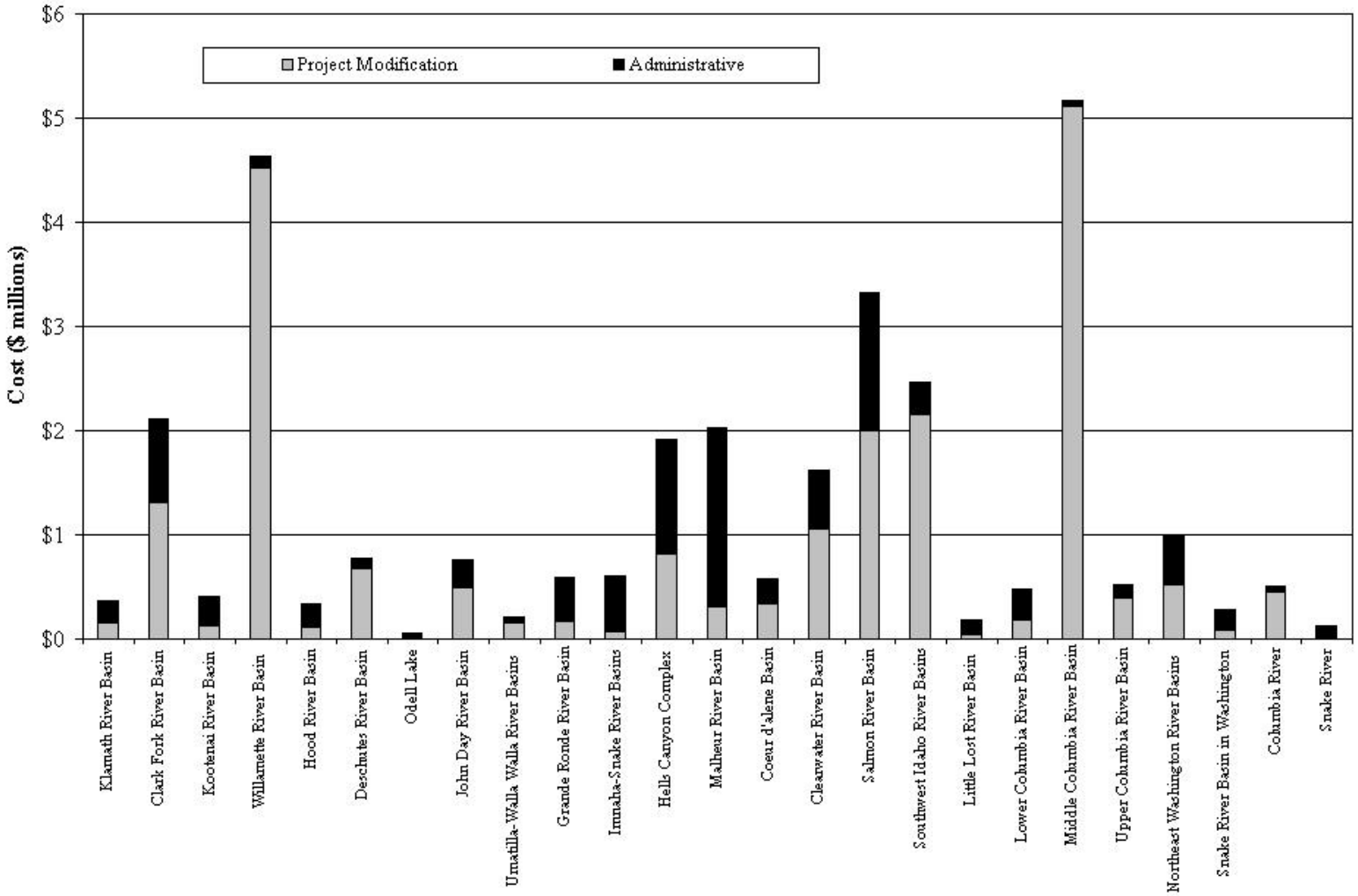
13. Project modifications or other restrictions that engender cost and revenue impacts involving commercial enterprises can have a subsequent detrimental effect on other sectors of the local economy, especially when the affected industry is central to the local economy. Industries within a geographic area are interdependent in the sense that they purchase output from other industries and sectors, while also supplying inputs to other businesses. Therefore, direct economic effects on a particular enterprise can affect regional output and employment in multiple industries. The extent to which regional economic impacts are realized depends largely on whether a significant number of projects are stopped or fundamentally altered. For example, impacts to the timber or grazing industries depend on whether required project modifications substantially reduce output within economic sectors below that which would be seen in the absence of the trout consultation. Regional economic impacts are estimated for irrigation diversion reductions in the Yakima River System (Unit 20). The estimated direct impacts on annual crop revenues associated with allocating additional water to instream flows in the Yakima River would also lead to indirect impacts on total economic output, income, and employment within the three-county region encompassing the Yakima River System (i.e., Yakima, Kittitas and Benton counties). The estimated regional impact associated with lost crop revenues is a loss of up to 39 jobs, $1.92 million in regional output and $1.15 million in regional income.

14. Examination of BOs involving timber harvest and grazing show only small and sporadic reductions in either grazing opportunity or available timber harvest. Therefore, this analysis assumes that regional economic impacts associated with these activities will be unpredictable (in terms of geographic location and timing) and small in the context of the overall economy of the Columbia River Basin. In the case of agricultural water diversions on Forest Service lands, regional economic impacts are not modeled due to uncertainty about the magnitude and potential location of impacts.

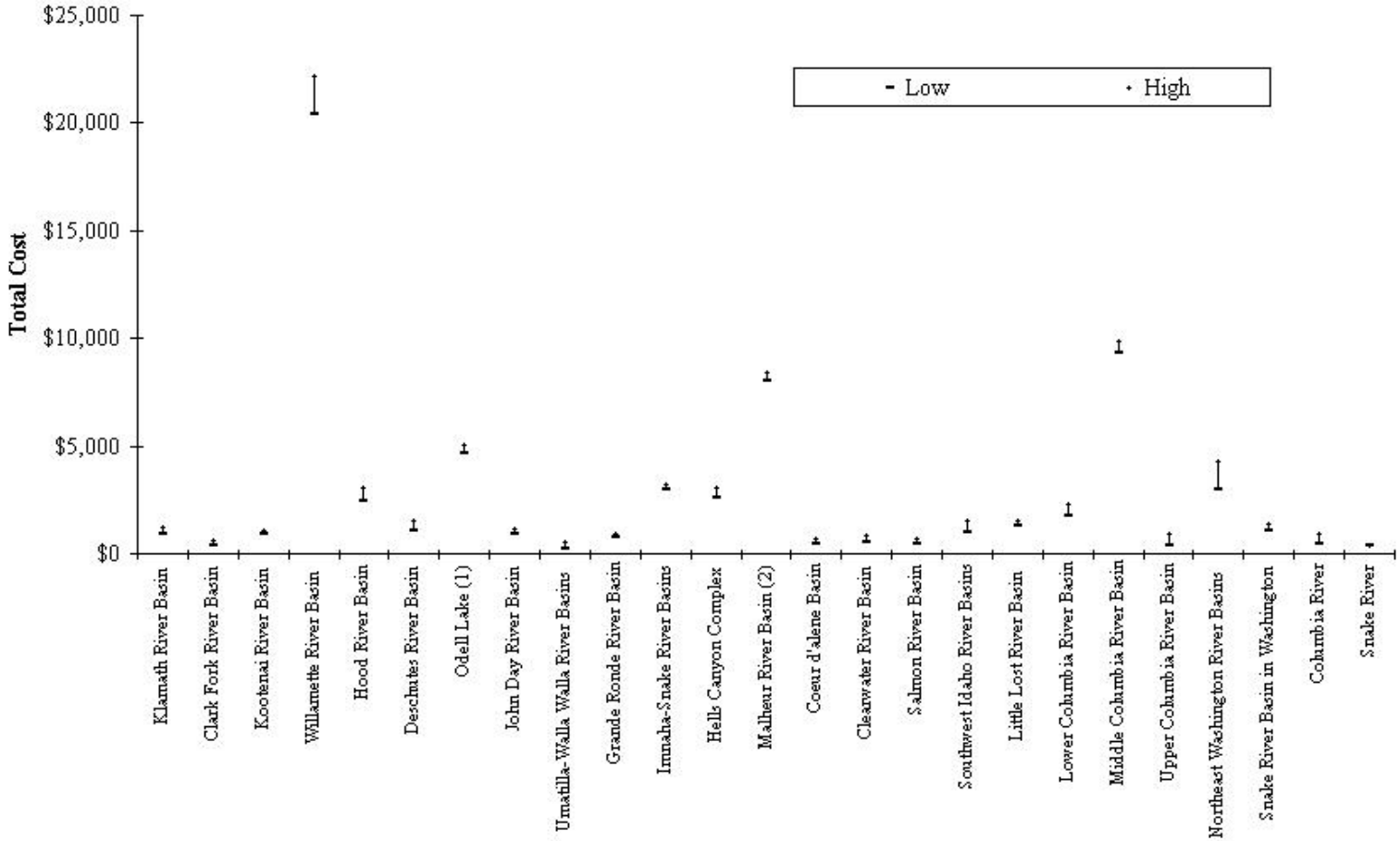
15. Exhibit ES-5 highlights the relative contributions of each unit to total forecast costs. Exhibit ES- 6 then presents the unit cost by river mile. Considering the cost per river mile, the Willamette River (Unit 4) and Middle Columbia River (Unit 20) Basins are the most costly units. Together these two units account for 30 percent of the costs (approximately $10 million, annualized) over four percent of the proposed miles of the designation. Overall, nine percent of the river miles account for approximately 45 percent of the total costs.[4]

[4] In terms of cost per lake acre, the Willamette River Basin is the most expensive unit (Unit 4), followed by the Northeast Washington River (Unit 22), Middle Columbia River Basins (Unit 20) and Upper Columbia River (Unit 21). These four units account for almost 40 percent of the cost and five percent of the river miles in the proposed designation.

ES-5
Annualized Total Cost By Unit, High Range ($ millions)



ES-6
Total Annual Cost Range Per River Mile



(1) Proposed Odell Lake critical habitat consists of 6,610 lake acres and only 11 river miles.
(2) Malheur River basin costs are dominated by administrative costs of consultation (approximately 85 percent).

16. Consideration of the regulatory baseline is particularly pertinent in the context of estimating economic costs attributable to section 7 for bull trout. Specifically, existing regulations such as the Federal Power Act (FPA) and Wilderness Act of 1964, fisheries management directives (Northwest Forest Plan, INFISH and PACFISH) and the presence of other listed species (especially anadromous fish) provide for the protection of areas that could contribute to the recovery of bull trout and improve riparian habitat and water quality throughout the proposed designation. Thus, the costs of this designation is limited by the extent to which existing regulations already impose requirements on land use and resource management within the proposed designation. In addition, the cost estimates developed in this report reflect various allocations made throughout the analysis for projects benefitting more than one listed species. Since these allocations are important to the analysis, Exhibit ES.7 describes how forecasted costs were allocated among bull trout and other listed species.

Exhibit ES.7

ALLOCATION OF ESTIMATED FUTURE PROJECT MODIFICATION COSTS

Agency / Project	Allocation
ACOE - Upper Willamette River Dams and Reservoirs	NOAA Fisheries and the Service are currently consulting on salmon, steelhead and bull trout in this proposed area. No clear allocation of costs can be made between these species, as most of the projects modifications would be sought under both the NOAA and Service consultations. Therefore, one-third of estimated costs are allocated to each species. This is likely to overstate the cost of bull trout conservation rather than understate it, since the primary driving force behind these project modifications is the salmon.
BOR - Yakima River System Dams and Reservoirs	NOAA and the Service are currently consulting on the Yakima River project's impacts on steelhead and bull trout. As in the Upper Willamette River Basin, there is no clear basis for allocating between the two species, therefore, half of estimated costs are allocated to bull trout.
BPA - Federal Columbia River Power System	While there is extensive discussion of the relative magnitude of potential bull trout versus salmon mitigation actions, because of the relatively modest project modification costs (up to $400,000 associated with fishery studies) there is no allocation of costs to salmon.
FERC - re-licensing hydroelectric facilities	The estimation of section 7 bull trout costs associated with FERC re-licensing includes allocation of mitigation costs for specific dams to salmon, as well as to other aquatic species. As a result, a little more than 40 percent of total fishery-related costs are allocated to bull trout, and five percent specifically to bull trout section 7 consultation.
USFS activities	While certain costs in the sample of timber consultations were allocated to other listed species (e.g. grizzlies and cutthroat trout), there is no allocation of costs to anadromous species.

Summary of Costs

17. Exhibit ES.8 provides a detailed summary of the co-extensive costs of designation of critical habitat for the bull trout. These costs are presented on an annualized basis A detailed discussion of the estimated administrative and project modification costs by critical habitat unit is presented in the unit-by-unit summary section following Exhibit ES.8. A map of the watersheds that encompass each unit is provided in Exhibit ES.9 to assist the reader in understanding the location and distribution of estimated costs.

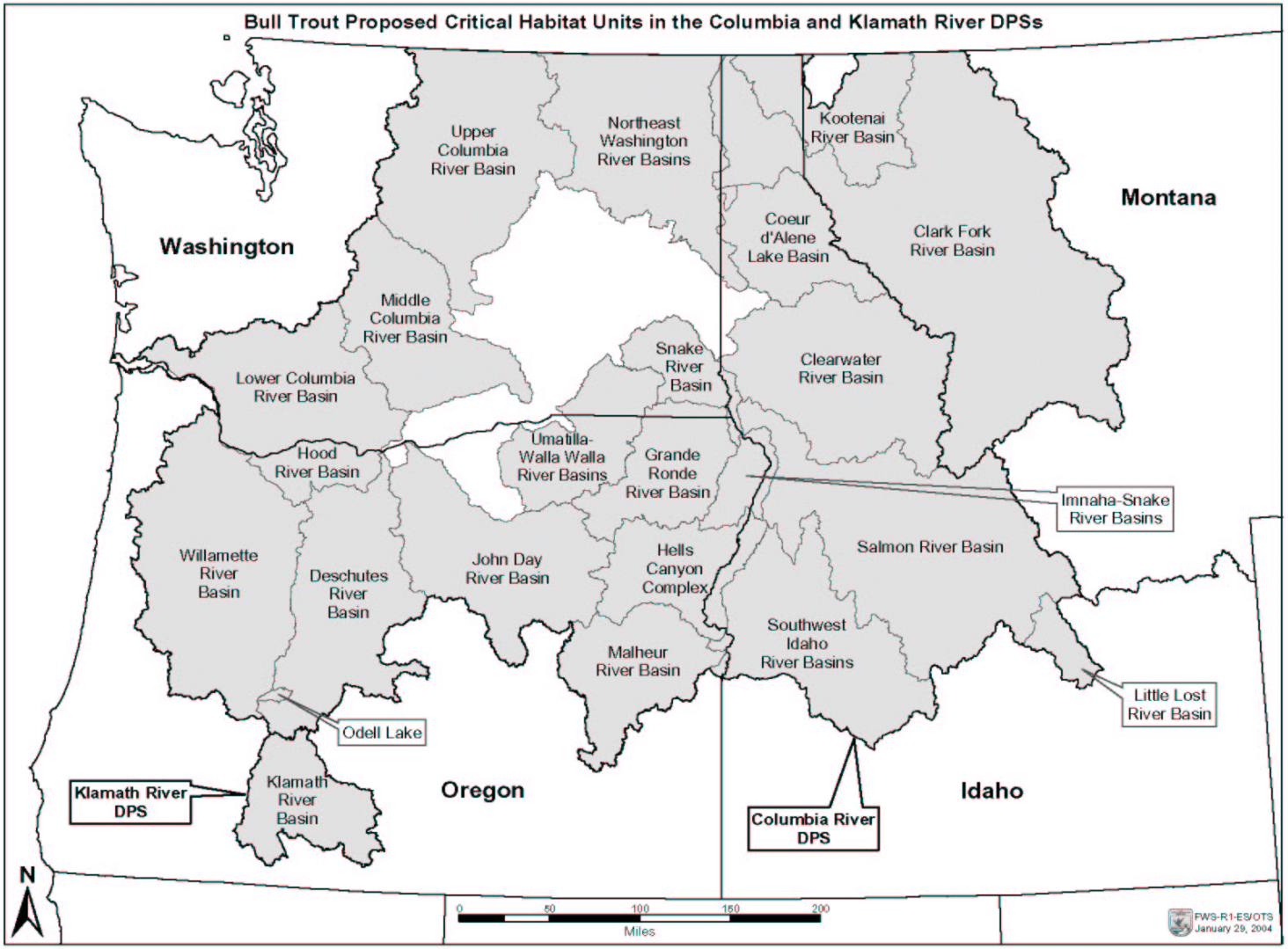
Exhibit ES.8

SUMMARY OF SECTION 7 COSTS FOR THE BULL TROUT
(Annualized)

Unit	Estimated Range of Cost ($1,000's)
Unit 1 - Klamath River Basin	$267 to $365
Unit 2 - Clark Fork River Basin	$1,308 to $2,116
Unit 3 - Kootenai River Basin	$337 to $411
Unit 4 - Willamette River Basin	$4,266 to $4,638
Unit 5 - Hood River Basin	$272 to $340
Unit 6 - Deschutes River Basin	$521 to $769
Unit 7 - Odell Lake	$52 to $56
Unit 8 - John Day River Basin	$607 to $754
Unit 9 - Umatilla-Walla Walla River Basins	$103 to $213
Unit 10 - Grande Ronde River Basin	$475 to $589
Unit 11 - Imaha/Snake River Basins	$562 to $609
Unit 12 - Hells Canyon Complex	$1,610 to $1,918
Unit 13 - Malheur River Basin	$1,940 to $2,024
Unit 14 - Coeur d'Alene Lake Basin	$362 to $571
Unit 15 - Clearwater River Basin	$946 to $1,615
Unit 16 - Salmon River Basin	$2,070 to $3,326
Unit 17 - Southwest Idaho River Basins	$1,648 to $2,461
Unit 18 - Little Lost River Basin	$152 to $178
Unit 19 - Lower Columbia River Basin	$372 to $478
Unit 20 - Middle Columbia River Basin	$4,893 to $5,164
Unit 21 - Upper Columbia River Basin	$213 to $519
Unit 22 - Northwest Washington River Basins	$693 to $999
Unit 23 - Snake River Basin in Washington	$224 to $278
Unit 24 - Columbia River Basin	$244 to $505
Unit 25 - Snake River Basin	$130
Multiple unit or unknown	$213

Notes: These estimates include all section 7 costs, including those co-extensive with the listing and designation of critical habitat for the bull trout. Costs are reported in 2003 dollars. A more detailed presentation of these costs is provided in Appendix F.

Exhibit ES-9


Bull Trout Proposed Critical Habitat Units in the Columbia and Klamath River DPSs
Washington
Montana
Oregon
Idaho
Upper Columbia River Basin
Northeast Washington River Basins
Kootenai River Basin
Coeur d'Alene Lake Basin
Clark Fork River Basin
Middle Columbia River Basin
Lower Columbia River Basin
Snake River Basin
Clearwater River Basin
Hood River Basin
Umatilla-Walla Walla River Basins
Grande Ronde River Basin
Imnaha-Snake River Basins
Willamette River Basin
Deschutes River Basin
John Day River Basin
Hells Canyon Complex
Salmon River Basin
Southwest Idaho River Basins
Malheur River Basin
Little Lost River Basin
Odell Lake
Klamath River DPS
Klamath River Basin
Columbia River DPS
N
0 50 100 150 200
Miles
FWS-R1-ES/OTS
January 29, 2004

18. Private parties are expected to bear approximately 20 to 25 percent of the estimated annualized cost of the proposed designation (Exhibit ES.10). For the purpose of this analysis, private party costs include those costs borne directly by private parties and not those costs borne directly by Federal agencies and passed on to private parties (e.g., higher electricity prices). Costs borne directly by private parties include the administrative cost of participating in section 7 consultation with the service and the costs resulting from modifying project activities to comply with the section 7 of the Act. The latter includes lost irrigation water deliveries, capital, operating and biological study costs resulting from FERC hydroelectric facility re-licensing, and project modifications associated with hard rock and placer mining activities.

Exhibit ES.10

SUMMARY OF THIRD PARTY SECTION 7 COSTS FOR THE BULL TROUT, in $1,000's (Annualized)

Unit	Administrative Costs	Project Modification Costs	Estimated Total Cost
Unit 1 - Klamath River Basin	$23	$2 to $40	$25 to $63
Unit 2 - Clark Fork River Basin	$138	$156 to $469	$294 to $607
Unit 3 - Kootenai River Basin	$50	$0 to $28	$50 to $78
Unit 4 - Willamette River Basin	$15	$66 to $157	$81 to $172
Unit 5 - Hood River Basin	$29	$20 to $67	$49 to $97
Unit 6 - Deschutes River Basin	$11	$92 to $279	$103 to $291
Unit 7 - Odell Lake	$6	$0 to $2	$6 to $8
Unit 8 - John Day River Basin	$34	$262 to $318	$296 to $352
Unit 9 - Umatilla-Walla Walla River Basins	$7	$1 to $27	$9 to $34
Unit 10 - Grande Ronde River Basin	$117	$0 to $35	$117 to $152
Unit 11 - Imaha/Snake River Basins	$153	$0 to $11	$153 to $164
Unit 12 - Hells Canyon Complex	$327	$247 to $435	$574 to $762
Unit 13 - Malheur River Basin	$507	$0 to $31	$507 to $538
Unit 14 - Coeur d'Alene Lake Basin	$64	$0 to $79	$64 to $142
Unit 15 - Clearwater River Basin	$167	$114 to $368	$281 to $535
Unit 16 - Salmon River Basin	$391	$1 to $478	$392 to $869
Unit 17 - Southwest Idaho River Basins	$91	$41 to $345	$132 to $436
Unit 18 - Little Lost River Basin	$40	$0 to $10	$40 to $50
Unit 19 - Lower Columbia River Basin	$52	$64 to $156	$116 to $208
Unit 20 - Middle Columbia River Basin	$9	$1,089 to $1,124	$1,098 to $1,133
Unit 21 - Upper Columbia River Basin	$22	$0 to $58	$22 to $80
Unit 22 - Northwest Washington River Basins	$135	$163 to $414	$298 to $549
Unit 23 - Snake River Basin in Washington	$54	$0 to $21	$54 to $74
Unit 24 - Columbia River Basin	$4	$174 to $368	$178 to $372
Unit 25 - Snake River Basin	$9	$0	$9
Multiple unit or unknown	$15	$0	$15
TOTAL	$2,469	$2,492 to $5,321	$4,962 to $7,790

19. Private third parties are expect to bear more than one-third of the total annualized section 7 costs in seven of the 25 units. These units are the Deschutes River Basin (Unit 6, 20 to 38 percent), the John Day River Basin (Unit 8, 47 to 49 percent), the Hells Canyon Complex (Unit 12, 36 to 40 percent), the Clearwater River Basin (Unit 15, 30 to 33 percent), the Lower Columbia River Basin (Unit 19, 31 to 44 percent), the Northeast Washington River Basins (Unit 22, 43 to 55 percent) and the Columbia River (Unit 24, 73 to 74 percent).

Unit-by-Unit Summary

20. The following discussion presents a unit-by-unit synopsis of the co-extensive costs of designation of critical habitat for the bull trout. Details on how these cost estimates were developed is provided in Section 4 of this report.

21. From an aggregate perspective, forecast project modification costs are dominated by dam related activities, totaling about 71 percent of all estimated costs. Typical costs include fish passage, changes in operations, habitat protection or restoration, and fishery studies at 36 FERC-licensed hydroelectric facilities and at more than 30 major Federal hydropower, irrigation and flood projects. The second largest category of costs is associated with timber harvest on Federal lands, representing about 18 percent of all estimated costs. These costs include harvest reduction, fishery study and monitoring costs, costs related to roads and culverts, and changes to log yarding systems. The remaining costs are split among a large number of activities including mining, agriculture and irrigation diversions, grazing, bridge construction and maintenance, and general forest management. Accordingly, the primary factor driving the distribution of costs across units is the location of significant dam projects for power, irrigation, and flood control. This factor is highlighted in the following unit-by-unit discussion. The second most important factor is the occurrence of federally-owned acreage within a given unit, particularly the acreage of non-wilderness lands managed by the USFS. This factor drives both timber costs and administrative consultation costs.

22. A significant component of the total estimated cost of this designation are the administrative costs associated with conducting both formal and informal consultations on the species (approximately 30 to 40 percent of total forecast bull trout-related costs). These costs accrue to the Service as well as to action agencies and the public. In some cases these administrative costs constitute a majority of the estimated costs for a unit, suggesting that there will be many activities consulted on but few resulting project modifications.

23. This discussion is presented on a unit by unit basis. A perspective on how the units compare, in both absolute terms and in terms of cost per river mile of proposed critical habitat, is provided in Exhibits ES-6 and ES-7. For purposes of this summary, proposed units with per mile costs forecast to be less than half of the proposed designation-wide average are described as having “relatively low costs.” Units with per mile costs forecast to be between 50 percent and 200 percent (i.e., twice) the designation-wide average costs are described as having “relatively moderate costs.” Units with per-mile costs forecast to be greater than twice the designation-wide average costs are described as having “relatively high costs.” Note that these descriptors are intended as a general guide, and refer to total cost

only. Individual economic sectors and entities within a unit may bear disproportionate shares of these costs, as discussed in Section 4.

24. **Unit 1: Klamath River Basin -** The Klamath River Basin is located in south-central Oregon. Proposed critical habitat within this unit includes 475 km (295 mi) of streams and 3,775 ha (9,327 ac) of lake habitat. The Klamath River Basin Unit is largely contained within Klamath County Oregon. The town of Klamath Falls is the largest community within the county. The Klamath River Basin Unit has a relatively high percentage of proposed critical habitat that is currently either unoccupied or of unknown occupancy (72 percent). Approximately 69 percent of the stream miles proposed for designation are within Federal land.

25. The Klamath River Basin Unit is a relatively moderate cost unit. Estimated total annual bull trout-related costs within this unit range between $267,000 and $365,000. These estimates include $200,000 per year in administrative costs. It is estimated that costs associated with consultations on timber harvest and agricultural irrigation withdrawals will constitute the large majority of potential future project modification costs in the unit (estimated at between 57 percent and 80 percent of total annual project modification costs). These agricultural diversion-related costs are expected to result from reductions in available irrigation water. Other activities are individually estimated to each account for less than $5,000 dollars per year in project modification costs.

26. **Unit 2: Clark Fork River Basin -** The Clark Fork River Basin Unit is the largest unit within the proposed designation. This unit includes most of Western Montana and the Idaho panhandle. This Unit includes the Missoula and Bitterroot River Valleys in Western Montana, the Kalispell-Flathead Lake Region, and the Lake Pend Orielle Region of North Idaho. These areas contain many of the larger towns and communities within Western Montana and North Idaho. Approximately 54 percent of the proposed streams and 33 percent of proposed lakes in Clark Fork Unit are within Federal lands. There is no unoccupied habitat within the proposed Clark Fork Critical Habitat Unit.

27. Forecast total annual costs associated with the bull trout within this unit are between $1.3 million and $2.1 million. These estimates include $800,000 per year in administrative costs. In addition, a number of agencies and activities will incur significant annual project modification costs associated with the bull trout in this unit. Specifically,

- Timber harvest activity is expected to generate the largest share of future project modification costs in this unit ($270,000 to $680,000 per year). These costs include harvest reduction, fishery study and monitoring costs, costs related to road and culverts, and changes to log yarding systems.

- Costs associated with forecast project modifications to irrigation diversions within this unit range from zero to $280,000. These costs represent potential costs to agricultural producers associated with reductions in available irrigation water.

28. Other significant forecast project modification costs within this unit are associated with mining (up to $100,000 annually, principally involving watershed assessment costs), FERC hydro re-licensing ($50,000 to $91,000 annually), and FHWA bridge and road work ($45,000 per year, generally involving constraints on in-stream work periods). Forecast FERC-related costs are associated with several major hydroelectric facilities within the unit, including Kerr Dam on the Flathead River and Thompson Falls Dam on the Clark Fork. Additionally, bull trout-related modifications on operation of the FCRPS have resulted in changes in operations at Hungry Horse Dam (a BOR facility on the S. Fork of the Flathead) and Albeni Falls (an ACOE facility that controls the level of Lake Pend Orielle). Bull trout study costs specific to the Clark Fork Unit and associated with FCRPS consultation are expected to cost up to $97,000 annually.

29. Although the proposed Clark Fork River Basin Critical Habitat Unit has significant forecast total annual costs, these costs should be viewed in light of the large size of this proposed unit. In fact, the Clark Fork Unit is forecast to be one of the lowest cost units, when expressed per river mile of habitat proposed for designation.

30. **Unit 3: Kootenai River Basin -** A short stretch of the Kootenai River lies in the U.S., looping down out of British Columbia. The Kootenai Unit thus comprises only the northwestern corner of Montana, including Libby Dam, and the northeastern tip of the Idaho panhandle. This unit is contained within two counties, Boundary County, Idaho and Lincoln County, Montana. Within this proposed critical habitat unit, approximately 53 percent of the rivers and streams proposed for designation are on Federal land. There is no unoccupied bull trout habitat within this unit.

31. The Kootenai River Unit is a relatively moderate cost unit, in terms of forecast costs per river mile of habitat proposed for designation. Total forecast annual costs associated with the bull trout within this unit are between $337,000 and $411,000. Of this amount, the majority, approximately $290,000 annually, are forecast administrative costs. In addition, it is estimated that project modification costs within the Kootenai River Unit will total between $47,000 and $121,000 annually. Costs associated with timber harvest are expected to be the largest category of future project modification costs in this unit ($27,000 to $69,000 per year, including costs of harvest reduction, fishery study and monitoring costs, costs related to roads and culverts, and changes to log yarding systems). Costs resulting from modifications to agricultural irrigation diversions (primarily reductions in irrigation withdrawals) could range from zero to $28,000. Other activities are individually estimated to each account for less than $5,000 per year in project modification costs. Bull trout-related modifications to operations of the FCRPS have resulted in changes in operations at Libby Dam.

32. **Unit 4: Willamette River Basin -** The Willamette River Basin Unit includes 337 km (209 mi) of stream and 1,600 ha (3,954 ac) of lake habitat in the McKenzie River and Middle Fork Willamette River subbasins of Western Oregon. The unit is located primarily within Lane County, but also extends into Linn County. The unit contains Eugene, Oregon and surrounding areas. Approximately 46 percent of the proposed waters within this unit are on

Federal land and about 23 percent of the waters in the unit are currently either unoccupied by the bull trout or of unknown occupancy.

33. Forecast total annual costs associated with the bull trout within this unit are between $4.3 million and $4.6 million. Of this amount, approximately $96,000 are forecast administrative costs. Thus, most of the costs for this unit are associated with required project modifications. While project modification costs are forecast to be associated with timber harvest activities and agricultural diversions within this unit (estimated between $17,000 and $60,000 annually), the vast majority of forecast costs are associated with dam and reservoir operations in the unit.

34. The ACOE is currently in consultation on 13 flood control facilities located in the Upper Willamette River system. Potential future costs of required modifications for bull trout will likely be driven by provisions for temperature control facilities at the Lookout Point, Hills Creek, and Blue River dams, and trap and haul passage at Lookout Point, Hills Creek, and possibly a fish ladder at Dexter Dam. It is estimated that these passage and temperature control modifications and operation at ACOE operated impoundments in the unit will cost between $4.0 and $4.3 million per year. It is further estimated that annual project modification costs associated with FERC re-licensing of hydroelectric facilities in the unit will cost between $98,000 and $136,000 annually. These costs are associated with several hydroelectric facilities operated by the City of Eugene: Trail Bridge and Carmen on the McKenzie River, and Blue River Dam.

35. The Willamette River Unit is the highest cost of the proposed units in terms of forecast cost per river mile of habitat proposed for designation (greater than $20,000 per river mile, annually). These costs are associated with dam and reservoir modifications to ACOE projects.

36. **Unit 5: Hood River Basin -** The Hood River Unit lies entirely within Hood River County, Oregon and contains the communities of Hood River and The Dalles among a number of smaller towns. The Unit includes the mainstem Hood River and three major tributaries: the Clear Branch Hood River, West Fork Hood River, and East Fork Hood River. A relatively high 43 percent of the proposed habitat in the Hood River Unit is currently either unoccupied or of unknown occupancy. Overall, about 48 percent of the waters proposed for designation within this unit are located on Federal lands.

37. The Hood River Unit is a relatively high cost unit, in terms of forecast costs per river mile of habitat proposed for designation. Forecast total annual costs associated with the bull trout within this unit are between $270,000 and $340,000. Of this amount, a substantial portion are forecast administrative costs (approximately $230,000). The remainder of the forecast costs are associated with required project modifications. Costs associated with FERC re-licensing of hydroelectric facilities ($20,000 to $54,000) and timber harvest on USFS lands ($13,000 to $33,000 per year) are expected to be the most significant categories of future project modification costs in the unit. FERC licensed facilities include Powerdale on the Hood River. Agricultural irrigation diversions in the unit could experience up to

$13,000 in annual project modification costs. Other activities are individually estimated to account for less than $5,000 per year in project modification costs.

38. **Unit 6: Deschutes River Basin -** The Deschutes River Basin Unit in central Oregon contains two critical habitat subunits: the lower Deschutes and the upper Deschutes, separated by Big Falls, an impassible barrier on the Deschutes River. The Lower Deschutes critical habitat subunit is in Wasco, Sherman, Jefferson, Deschutes, and Crook Counties. The Upper Deschutes River critical habitat subunit is located in Deschutes, Crook, and Klamath counties. Approximately 801 km (498 mi) of stream habitat in the Deschutes River basin is proposed for critical habitat designation. Overall, a relatively high 37 percent of the proposed habitat within the Deschutes River Unit is unoccupied. The entire upper Deschutes River Critical Habitat subunit is currently unoccupied by the species. A relatively low portion (35 percent) of the waters proposed for designation within this unit are on Federal land. This unit also has a substantial amount of Tribal land (23 percent of proposed waters).

39. The Deschutes River Unit is a relatively moderate cost unit, in terms of forecast costs per river mile of habitat proposed for designation. It is forecast that total annual costs associated with the bull trout within this unit will be between $521,000 and $769,000. A relatively small portion of this amount, approximately $88,000 annually, are forecast administrative costs. The vast majority of these costs are associated with required project modifications. Specifically, costs associated with operation of BOR irrigation impoundments ($275,000 annually, largely associated with fishery studies), FERC re-licensing of hydroelectric facilities, ($177,000 to $242,000) and timber harvest on USFS lands ($36,000 to $90,000 per year resulting from reduced harvest, fishery studies, road and culvert costs, and changes in yarding systems) are expected to be the most significant categories of future project modification costs in this unit. The BOR-related costs are for studies at Crane Prairie and Wickiup Reservoirs on the Upper Deschutes River. Since both of these reservoirs are in the currently unoccupied Upper Deschutes subunit, dam and reservoir modifications are not reasonably foreseeable. Projected FERC re-licensing costs are for bull trout studies and passage at the Pelton-Round Butte Project on the Deschutes River. Agricultural irrigation diversion project modification costs associated with potential reductions in irrigation water availability could range from zero to $37,000 annually. Other activities are individually estimated to account for less than $10,000 dollars per year in project modification costs.

40. **Unit 7: Odell Lake -** The Odell Lake Unit in central Oregon lies entirely within the Deschutes National Forest in Deschutes and Klamath counties. This unit is the smallest of the proposed units within the designation. Total proposed critical habitat includes approximately 2,675 ha (6,611 ac) of lake habitat and 18.1 km (11.3 mi) of streams. There is no unoccupied habitat within this unit.

41. Total annual costs associated with the bull trout within the unit are forecast to be between $52,000 and $56,000. Of this amount, almost all (approximately $50,000 annually) will be associated with the administrative costs of the consultation process. It is estimated that project modification costs within the Odell Lake Unit will total less than $10,000

annually. These project modification costs are forecast to be largely associated with USFS activities.

42. **Unit 8: John Day River Basin -** The John Day River Basin Unit in eastern Oregon includes the North Fork, the Middle Fork, and mainstem portions of the John Day River and their tributary streams in Wheeler, Grant, and Umatilla counties. A total of 1,080 km (671 mi) of stream habitat is proposed for designation as critical habitat. Overall, 19 percent of the proposed areas within the John Day River Unit are currently unoccupied by the species. Approximately 54 percent of the waters proposed for designation within the John Day Unit are located on Federal land.

43. The John Day River Unit is a relatively low cost unit, in terms of forecast costs per river mile of habitat proposed for designation. Total annual costs associated with the bull trout within this unit are forecast to be between $607,000 and $754,000. Of this amount, a large portion, approximately $268,000 annually, will be made up of administrative costs. The remainder of the forecast costs are associated with required project modifications. Specifically, project modifications associated with timber harvest on USFS lands ($55,000 to $138,000 per year from reductions in harvest, fisheries studies, road and culvert costs, and changes in yarding systems) and placer mining on USFS lands (up to $260,000 per year associated with reductions in allowed in-stream work periods) are expected to generate the greatest share of project modification costs in this unit. Costs associated with agricultural irrigation diversion reductions could range from zero to $56,000 annually. Other activities are individually estimated to each account for less than $10,000 dollars per year in project modification costs. The John Day River Basin is one of two units identified in this study as a setting where bull trout related project modifications could have a significant impact on a small placer mining business, the other is the Hells Canyon Complex (Unit 12).

44. **Unit 9: Umatilla-Walla Walla River Basins -** The Umatilla and Walla Walla Rivers Unit is located in northeastern Oregon and southeastern Washington. The unit includes 636 km (395 mi) of streams extending across portions of Umatilla, Union, and Wallowa counties in Oregon, and Walla Walla and Columbia counties in Washington. Overall, 17 percent of the proposed critical habitat within this unit is currently unoccupied by the species. A relatively low portion (32 percent) of the waters proposed for designation within the Umatilla-Walla Walla Unit are located on Federal land.

45. The Umatilla-Walla Walla River Unit is among the lowest cost units, in terms of cost per river mile of habitat proposed for designation. It is estimated that total annual costs associated with the bull trout within this unit will be between $103,000 and $213,000. Of this amount, approximately $57,000 annually will be associated with the administrative costs of the consultation process and the remainder with required project modifications. Specifically, fisheries studies associated with FCRPS consultations could cost up to $42,000 annually. Project modification associated with timber harvest on USFS lands is expected to be another significant category of future costs in this unit ($25,000 to $63,000 per year). Agricultural irrigation diversions could experience up to $26,000 in annual project

modification costs within this unit. Other activities are individually estimated to each account for less than $10,000 dollars per year in project modification costs.

46. **Unit 10: Grande Ronde River Basin -** The Grande Ronde Unit extends across Union, Wallowa, and Umatilla counties in northeastern Oregon, and Asotin, Columbia, and Garfield counties in southeastern Washington. This unit includes the Grande Ronde River from its headwaters to the confluence with the Snake River and a number of its tributaries, the largest being the Wallowa River. Approximately 1,030 km (640 mi) of stream habitat in the Grande Ronde River basin is proposed for critical habitat designation. Overall, seven percent of the proposed critical habitat within the Grand Ronde River Unit is currently unoccupied by the species. Approximately 52 percent of the waters proposed for designation within this unit are located on Federal land.

47. The Grand Ronde River Unit is a moderate cost unit, in terms of forecast costs per river mile of habitat proposed for designation. Forecast total annual costs associated with the bull trout within this unit will be between $475,000 and $589,000. Of this amount, the vast majority, approximately $415,000 annually, are forecast to be administrative costs. The remainder of the forecast costs are associated with required project modifications. Specifically, fisheries studies within the unit associated with FCRPS consultations could cost up to $18,000 annually. Timber harvest on USFS lands is expected to be another significant source of future project modification costs in this unit ($34,000 to $87,000 per year resulting from reduced harvest, fisheries studies, and road and culvert costs, and changes in yarding systems). Agricultural irrigation diversion costs could be up to $35,000. Other activities are individually estimated to each account for less than $10,000 dollars per year in project modification costs.

48. **Unit 11: Imnaha/Snake River Basins -** The Imnaha/Snake Unit extends across Wallowa, Baker, and Union counties in northeastern Oregon and Adams and Idaho counties in western Idaho. The unit contains approximately 306 km (190 mi) of proposed critical habitat. All of the proposed habitat within the Imnaha-Snake River Unit is currently occupied by the species. Approximately 51 percent of the waters proposed for designation within this unit are located on Federal land.

49. The Imnaha/Snake River Unit is a high cost unit, in terms of forecast costs per river mile of habitat proposed for designation. Forecast total annual costs associated with the bull trout within this unit are between $562,000 and $609,000. Of this amount, the large majority are made up of administrative costs (approximately $544,000, annually). The remainder of the forecast costs are associated with required project modifications. Specifically, fishery studies within the unit associated with FCRPS consultations could cost up to $18,000 annually. Timber harvest activities on USFS lands are expected to be another significant category of future project modification costs ($10,000 to $26,000 per year). Agricultural irrigation diversion related project modification costs could range from zero to $11,000. Other activities are individually estimated to each account for less than $10,000 dollars per year in project modification costs.

50. **Unit 12: Hells Canyon Complex -** The Hells Canyon Complex Unit encompasses basins in Idaho and Oregon draining into the Snake River and its associated reservoirs, from Hells Canyon Dam upstream to the confluence of the Weiser River. The Hells Canyon Complex unit includes a total of approximately 1,000 km (621 mi) of streams proposed as critical habitat. A relatively high portion (about 48 percent) of the proposed critical habitat within the Hells Canyon Complex Unit is currently unoccupied by the species. Approximately 47 percent of the waters proposed for designation within this unit are located on Federal land.

51. The Hells Canyon Complex Unit is a relatively high-cost unit, in terms of forecast costs per river mile of habitat proposed for designation. It is forecast that total annual costs associated with the bull trout within this unit will be between $1.6 million and $1.9 million. Of this amount, a majority are expected to be made up of administrative costs (approximately $1.1 million, annually). In addition, significant categories of forecast project modification costs within this unit are associated with timber harvest on USFS lands ($71,000 to $179,000 per year resulting from reduced harvest, fishery studies, road and culvert costs, and changes in yarding systems), placer mining on USFS land ($163,000 associated with reduced allowed in-stream work periods), FERC hydroelectric re-licensing ($146,000 to $199,000), and BOR reservoir activities ($296,000 annually, primarily for study related costs). The BOR reservoirs in the unit include Phillips Reservoir and Thief Valley Reservoir; projected costs are for bull trout related studies. Major FERC-licensed hydroelectric facilities in the unit include Hells Canyon, Brownlee and Oxbow. Agricultural irrigation diversions could experience up to $73,000 in annual project modification costs within this unit. Other activities are individually estimated to each account for less than 15,000 dollars per year in project modification costs. The Hells Canyon complex is one of two units identified in this study as a setting where bull trout related project modifications could have a significant impact on a small placer mining business, the other is the John Day River Basin (Unit 8).

52. **Unit 13: Malheur River Basin -** The Malheur Unit is in the Malheur River Basin in eastern Oregon, in Grant, Baker, Harney, and Malheur counties. A total of 389 km (241 mi) of streams and two reservoirs are proposed for critical habitat. About 25 percent of the proposed critical habitat within the Malheur River Unit is currently unoccupied by the species. Approximately 63 percent of the waters proposed for designation within the Malheur River Unit are located on Federal land.

53. The Malheur River Unit is the third highest cost unit, in terms of forecast costs per river mile of habitat proposed for designation. Forecast total annual costs associated with the bull trout within this unit are between $1.9 million and $2.0 million. Project modification costs make up a small portion of these costs, between $227,000 and $311,000 annually. The rest of the forecast costs are associated with administrative requirements. Major categories of forecast project modification costs within this unit are associated with timber harvest on USFS lands ($31,000 to $78,000 per year) and BOR reservoir activities ($175,000 annually). The BOR costs are for research as well as trap and haul fish passage that is ongoing at Beulah Reservoir on the Malheur River, and estimated research costs at Warm Springs

Reservoir, which is currently unoccupied by bull trout. Possible reductions in agricultural irrigation diversions could cost from zero to $31,000 annually . Other activities are individually estimated to each account for less than $5,000 per year in project modification costs.

54. **Unit 14: Coeur d'Alene Lake Basin -** The Coeur d'Alene Lake Basin Unit in Idaho is broken into two subunits. The Coeur d'Alene Lake subunit lies within Kootenai, Shoshone, Benewah and Bonner counties. The St. Joe River subunit includes streams in Shoshone, Benewah, and Latah counties, Idaho. Thirty stream reaches or tributaries (677 km (421 mi)) and lakes comprising 12,727 ha (31,450 ac) of surface area are proposed as critical habitat within this unit. Of this, a relatively high portion (46 percent) is currently unoccupied by the species. Approximately 58 percent of the waters proposed for designation within this Unit are located on Federal land.

55. The Coeur d'Alene Lake Unit is relatively low cost unit, in terms of forecast costs per river mile of habitat proposed for designation. Forecast total annual costs associated with the bull trout within this unit are between $362,000 and $571,000. A large share of this amount, approximately $226,000 annually, is forecast to be made up of administrative costs. In addition, major categories of forecast project modification costs within the unit are associated with timber harvest on USFS lands ($76,000 to $193,000 per year resulting from reduced harvest, fishery studies, road and culvert costs, and changes in yarding systems), and FHWA bridge and road work ($18,000 associated with limitations on in-stream work periods). Modifications to agricultural irrigation diversions could result in costs from zero to $79,000. Other activities are individually estimated to each account for less than $10,000 dollars per year in project modification costs.

56. **Unit 15: Clearwater River Basin -** The Clearwater River Unit includes 3,063 km (1,904 mi) of streams and 6,722 ha (16,611 ac) of lakes proposed as critical habitat for bull trout in north-central Idaho. This large unit extends from the Snake River confluence at Lewiston on the west to headwaters in the Bitterroot Mountains along the Idaho/Montana border on the east. About 13 percent of the proposed critical habitat within the Clearwater River Unit is currently unoccupied by the species. Approximately 78 percent of the waters proposed for designation within the Unit are located on Federal land.

57. Total forecast costs associated with consultation on bull trout within this unit are between $0.95 million and $1.6 million annually. Of this amount, approximately $562,000 is associated with administrative costs. In addition, major categories of forecast project modification costs within this unit are associated with timber harvest on USFS lands ($247,000 to $624,000 per year resulting from reduced harvest, fishery studies, road and culvert costs and changes in yarding systems), recreational suction mining on USFS land ($113,000 associated with reduced availability of stream access due to seasonal closures), highway bridge and road work ($24,000), and USFS management activities ($35,000 annually). Agricultural irrigation diversion project modification costs could range from zero up to $254,000 annually. These costs may result from reductions in irrigation deliveries.

Other activities are individually estimated to each account for less than $15,000 dollars per year in project modification costs.

58. Although the proposed Clearwater River Basin Critical Habitat Unit is forecast to experience significant costs associated with the bull trout, these costs should be viewed in light of the large size of the proposed unit. In fact, the Clearwater Unit is one of the lowest cost of the proposed units, in terms of forecast costs per river mile of habitat proposed for designation.

59. **Unit 16: Salmon River Basin -** The Salmon River basin is a geographically large unit that extends across central Idaho from the Snake River to the Montana border. The critical habitat unit includes 7,688 km (4,777 mi) of streams extending across portions of Adams, Blaine, Custer, Idaho, Lemhi, Nez Perce, and Valley counties in Idaho. About six percent of the proposed critical habitat within the Salmon River Unit is currently unoccupied by the species. Approximately 86 percent of the waters proposed for designation within the Unit are located on Federal land.

60. Forecast total annual costs associated with the bull trout within this unit are between $2.1 million and $3.3 million. Of this amount, approximately $1.3 million is associated with administrative costs, with the rest made up of project modification costs. Major categories of forecast project modification costs are associated with timber harvest on USFS lands ($463,000 to $1.5 million per year resulting from reduced harvest, fishery studies, road and culvert costs and changes in yarding systems), highway bridge and road work ($56,000), and USFS general forest management activities ($65,000 annually). The cost of modifications to agricultural irrigation water deliveries could range from zero up to $477,000 annually. Other activities are individually estimated to each account for less than $15,000 dollars per year in project modification costs.

61. Although the proposed Salmon River Basin Critical Habitat Unit has significant forecast costs associated with the bull trout, these costs should be viewed in light of the large size of the proposed unit. In fact, the Salmon River Unit is also one of the lowest cost of the proposed units, in terms of forecast costs per river mile of habitat proposed for designation.

62. **Unit 17: Southwest Idaho River Basins -** The Southwest Idaho Unit includes a total of approximately 2,792 km (1,735 mi) of streams in the Boise, Payette, and Weiser River basins. A number of southern Idaho counties are wholly or partially within this unit, including Ada, Adams, Boise, Camas, Canyon, Elmore, Gem, Payette, Valley, and Washington counties. The counties within the southern Idaho unit include both a significant portion of productive agricultural land as well as the largest population center in the state (the Boise Valley). About 24 percent of the proposed critical habitat within the Southwest Idaho Unit is currently unoccupied by the species. Approximately 78 percent of the proposed streams and 66 percent of proposed lakes and reservoirs within the Southwest Idaho River Basins Unit are located on Federal land.

63. The Southwest Idaho River Basins Unit is a relatively moderate cost unit, in terms of forecast costs per river mile of habitat proposed for designation. Forecast total annual costs associated with the bull trout within this unit are between $1.6 million and $2.5 million. Total administrative costs are forecast to be a relatively small portion of this total ($309,000 annually). The remainder of the forecast costs are expected to result from forecast project modifications. Specifically, project modification costs within this unit are forecast to be associated with timber harvest on USFS lands ($290,000 to $735,000 per year resulting from reduced harvest, fishery studies, road and culvert costs and changes in yarding systems) and BOR reservoir activities ($856,000 annually). Major BOR reservoirs in this unit include Anderson Ranch and Arrowrock Reservoirs on the Boise River, Cascade Reservoir on the North Fork Payette, and Deadwood Reservoir on the Payette River. Forecast project modification costs include bull trout life-cycle studies and monitoring at all the reservoirs, and trap and haul passage around the Boise River reservoirs. Costs associated with FERC relicensing at the Lucky Peak facility on the Boise River, and power facilities at the Arrowrock and Cascade impoundments, are expected to cost between $30,000 and $45,000 annually. Modifications to agricultural irrigation diversions could range from zero to $300,000 annually. These costs could potentially be associated with reductions in irrigation water withdrawals. Other activities are individually estimated to each account for less than $5,000 dollars per year in project modification costs.

64. **Unit 18: Little Lost River Basin -** The Little Lost River Unit is within Butte, Custer, and Lemhi counties in east-central Idaho. Approximately 184.6 km (115.4 mi) of stream habitat in the Little Lost River Basin is proposed for critical habitat designation. About eight percent of the proposed critical habitat within the Little Lost River Unit is currently unoccupied by the species. Approximately 76 percent of the proposed streams within the Little Lost River Basin Unit are located on Federal land.

65. The Little Lost River Unit is forecast to be a relatively inexpensive unit compared to others in the designation, and is a moderate-cost unit in terms of forecast costs per river mile of habitat proposed for designation. It is estimated that total annual costs associated with the bull trout within this unit will be between $152,000 and $178,000. Of this amount, a large share, approximately $135,000 annually, is forecast to be comprised of administrative costs, with the remainder made up of project modification costs. The largest category of project modification costs within this unit is forecast to be associated with timber harvest on USFS lands ($10,000 to $24,000 per year). Project modifications to agricultural irrigation diversions could result in costs from zero to $10,000 annually. Other activities are individually estimated to each account for less than $5,000 dollars per year in project modification costs.

66. **Unit 19: Lower Columbia River Basin -** The Lower Columbia Unit consists of portions of the Lewis, White Salmon, and Klickitat Rivers, and associated tributaries in southwestern and south-central Washington. The unit extends across Clark, Cowlitz, Klickitat, Skamania, and Yakima counties. Approximately 340 km (210 mi) of streams and three reservoirs covering 5,054 ha (12,488 ac) are proposed for critical habitat designation. About 20 percent of the proposed critical habitat within the Lower Columbia River Unit is

currently unoccupied by the species. A low portion (18 percent) of the proposed streams and 29 percent of the proposed lakes and reservoirs within the Lower Columbia River Basin Unit are located on Federal land.

67. When forecast total costs for this unit are viewed in light of its size, the Lower Columbia River Basins Unit is a moderate-cost unit, in terms of forecast cost per river mile of habitat proposed for designation. It is estimated that total annual costs associated with the bull trout within the unit will be between $372,000 to $478,000. Total administrative costs associated with the consultation process are estimated to be a relatively large fraction of these costs ($292,000 annually). In addition, project modification costs are forecast to be associated with FERC hydroelectric facility re-licensing activities ($108,000 to $148,000 annually). These FERC re-licensing costs are for the significant hydroelectric developments on the Lewis River, including Yale, Merwin, Swift No. 1, and Swift No. 2. These costs are projected to include study costs, trap and haul passage, and habitat acquisition. Swift No, 2 is one of two hydroelectric projects identified in this study where bull trout-related project modifications could have a significant impact on a small business; the other is Box Canyon in the Northeast Washington River Basin (Unit 22). Other activities are individually estimated to each account for less than $10,000 dollars per year in project modification costs.

68. **Unit 20: Middle Columbia River Basin -** The Middle Columbia River unit encompasses the entire Yakima River basin located in south central Washington, draining approximately 15,900 square km (6,155 square mi). The basin occupies most of Yakima and Kittitas counties, about half of Benton County, and a small portion of Klickitat County. Approximately 846 km (529 mi) of stream habitat and 6,066 ha (14,986 ac) of lake and reservoir surface area are proposed as critical habitat within this unit. About 13 percent of the proposed critical habitat within the Middle Columbia River Unit is currently unoccupied by the species. Approximately 44 percent of the waters proposed for designation within the Middle Columbia River Basin Unit are located on Federal land.

69. Forecast costs associated with the bull trout within this unit are between $4.9 million and $5.2 million annually. Of this amount, a very small portion, approximately $50,000 annually, will be associated with the administrative costs of the consultation process, while the remainder will be associated with project modifications. While there are projected to be project modification costs associated with timber harvest activities (through consultation with the USFS; estimated to be between $36,000 and $90,000 annually), the vast majority of forecast costs for this unit are associated with dam and reservoir operations. The BOR operates a system of five dams in this basin (Cle Elum Lake, Kachess Lake, Keechelus Lake, Tieton Dam, and Bumping Lake) which provide power and irrigation for this agriculturally important region. It is estimated that passage, flow modifications and operation at the BOR operated impoundments in the unit will cost between $4.8 and $4.9 million per year. These forecast costs are roughly allocated as: 50 percent to dam and reservoir modifications; 25 percent reduced agricultural production due to irrigation flow reductions; and 25 percent to ongoing operation and maintenance costs. The Middle Columbia River Basin is the only unit where it is certain that irrigation delivery reductions could have a significant impact on small

farming operations. Other activities are individually estimated to account for a very small portion of forecast annual project modification costs.

70. When the forecast total costs for this unit are viewed in light of its size, the Middle Columbia River Unit is the second most costly of the proposed units (about $10,000 per mile, annually). However, over 95 percent of the forecast project modification costs are associated with dam and reservoir modifications to BOR projects. Since the BOR is also consulting with NOAA Fisheries on the impacts of these facilities on steelhead, these costs might occur even absent the bull trout.

71. **Unit 21: Upper Columbia River Basin -** The Upper Columbia River Basin includes three subunits in central and northern Washington: the Wenatchee River subunit in Chelan County; the Entiat River subunit in Chelan County; and the Methow River subunit in Okanogan County. A total of 909.7 km (565.4 mi) of streams and 1,010 ha (2,497 ac) of lake surface area are proposed for critical habitat. About nine percent of the proposed critical habitat within the Upper Columbia River Unit is currently unoccupied by the species. Approximately 58 percent of the proposed streams and 41 percent of the proposed lakes and reservoirs within the Upper Columbia River Basin Unit are located on Federal land.

72. The Upper Columbia River Basins Unit is a low-cost unit, in terms of forecast cost per river mile of habitat proposed for designation. Forecast costs associated with the bull trout within this unit are between $213,000 to $519,000 annually. Total administrative costs associated with the consultation process are estimated to be $121,000, with the remainder of the forecast costs made up of project modification requirements. Major categories of forecast project modification costs within this unit are associated with FCRPS fisheries studies (zero to $141,000 per year), and USFS timber harvest activities ($57,000 to $143,000 annually resulting from reduced harvest, fishery studies, road and culvert costs and changes in yarding systems). The FCRPS fisheries studies are for bull trout radio telemetry, snorkel and general monitoring study costs in the Entiat, Methow, and Wenatchee Rivers. In addition, modifications to agricultural irrigation diversions could result in costs from zero to $58,000 annually. Other activities are individually estimated to each account for less than $10,000 dollars per year in project modification costs.

73. **Unit 22: Northeast Washington River Basins -** The Northeast Washington unit includes bull trout above Chief Joseph Dam on the Columbia River. A total of 373.1 km (231.9 mi) of streams and 1,166 ha (2,880 ac) of lake surface area are proposed as critical habitat within this unit. A high proportion (54 percent) of the proposed critical habitat within the Northeast Washington River Basins Unit is currently unoccupied by the species, and approximately 58 percent of the proposed streams and reservoirs within this unit are located on Federal land.

74. The Northeast Washington River Basins Unit is forecast to be a relatively high-cost unit, in terms of forecast cost per river mile of habitat proposed for designation. Forecast costs associated with the bull trout within this unit are between $693,000 to $1.0 million annually. Total annual administrative costs are estimated to be a large share of these costs

($478,000), with the remainder associated with project modifications. A major category of annual project modification costs within this unit involves FERC hydroelectric facility re-licensing activities (up to $382,000 annually). The estimated FERC re-licensing costs are related to two major hydroelectric facilities on the Pend Orielle River: Box Canyon and Boundary. The Box Canyon re-licensing terms are currently in continuing settlement negotiations, and likely costs specific to this facility are not currently available. However, a recent FERC environmental impact statement (EIS) estimates that the present value of bull trout related project modifications (including habitat acquisition) could total upwards of $60 million for this relatively small (60 MW) facility. Box Canyon is one of two hydroelectric projects identified in this study where bull trout-related project modifications could have a significant impact on a small business; the other is Swift No. 2 in the Lower Columbia River Basin (Unit 19). Modifications to agricultural irrigation diversions could impose costs from zero to $32,000 annually. Other activities are individually estimated to each account for less than $10,000 dollars per year in project modification costs.

75. **Unit 23: Snake River Basin in Washington -** The Snake River Washington Unit includes two critical habitat subunits located in southeast Washington: the Tucannon River subunit located in Columbia and Garfield counties, and the Asotin Creek subunit within Garfield and Asotin counties. A total of 326 km (203 mi) of stream reaches are proposed as critical habitat within this unit. About 23 percent of the proposed critical habitat within the Snake River Basin in Washington Unit is currently unoccupied by the species. Approximately 52 percent of the proposed streams within the Snake River Basin Unit are located on Federal land.

76. The Snake River Basin Unit is a relatively moderate-cost unit, in terms of forecast cost per river mile of habitat proposed for designation. Forecast costs associated with the bull trout within the unit will be between $224,000 to $278,000. Total annual administrative costs associated with the bull trout are estimated to be a large portion of this total ($191,000). The major category of project modification costs within this unit is forecast to be associated with USFS timber harvest activities ($20,000 to $50,000 annually). Agricultural irrigation diversions could see up to $21,000 in annual project modification costs within this unit. Other activities are estimated to each account for less than $5,000 dollars per year in project modification costs.

77. **Unit 24: Columbia River -** This unit is located in the states of Oregon and Washington and includes Clatsop, Columbia, Multnomah, Hood River, Wasco, Sherman, Gilliam, Morrow, and Umatilla counties in Oregon and Pacific, Wahkiakum, Cowlitz, Clark, Skamania, Klickitat, Benton, Walla Walla, Franklin, Yakima, Grant, Kittitas, Chelan, Douglas, and Okanogan counties in Washington. All of this stretch of the Columbia River is currently considered occupied by the bull trout. A relatively low share of the land adjacent to the river in this unit is made up of Federally managed lands (approximately 39 percent).

78. The Columbia River Unit is a relatively low-cost unit, in terms of forecast cost per river mile of habitat proposed for designation. Forecast total costs associated with the bull trout within this unit will be between $244,000 to $505,000 annually. Total annual

administrative costs associated with this unit are relatively low ($50,000). The major category of annual project modification costs within the unit are forecast to be associated FERC hydroelectric facility re-licensing activities (up to $362,000 annually). Major FERC-licensed hydroelectric projects on the mainstem Columbia River include Priest Rapids, Rocky Reach, and Wells. These very large facilities are operated by PUD's. Other activities are individually forecast to account for less than $15,000 dollars per year in project modification costs.

79. **Unit 25: Snake River -** The lower Snake River is located in Washington (Franklin, Walla Walla, Columbia, Whitman, and Asotin counties) from its mouth to the confluence with the Clearwater River at the cities of Clarkston, Washington and Lewiston, Idaho. The Snake River forms the border between Washington and Idaho from Clarkston/Lewiston upstream to the Oregon border. The Snake River forms the boundary between Idaho and Oregon from that point upstream to the limit of this critical habitat unit. This portion of the Snake River is within Nez Perce, Idaho, Adams, and Washington counties in Idaho, and Wallowa, Baker, and Malheur counties in Oregon. About 20 percent of the proposed critical habitat within the Snake River Unit is currently unoccupied by the species. Approximately 50 percent of the habitat proposed for designation within the Snake River Unit is located on Federal land.

80. The Snake River Unit is a relatively low-cost unit, in terms of forecast cost per river mile of habitat proposed for designation. Forecast costs associated with the bull trout within this unit are $130,000. Administrative costs associated with the consultation process are estimated to be nearly all of that amount, or $120,000 annually.

Small Business Effects

81. Under the Regulatory Flexibility Act (RFA) (as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever a Federal agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities (i.e., small businesses, small organizations, and small government jurisdictions). The following summarizes the potential effects of critical habitat designation on small entities:

- As discussed in detail in section 4.3.2, under one modeling scenario, section 7-related reductions in contractual BOR water deliveries in the Middle Columbia River Basin (Unit 20) could significantly impact on the order of 90 to 160 small farming operations.

- Small hydroelectric producers in Washington, Oregon, Idaho and Montana could be affected by project modification costs at the time of facility re-licensing. Specifically, the resulting project modifications could have a significant economic impact on the financial operations of Cowlitz County public utility district (PUD)

(Unit 19 - Lower Columbia River) and Pend Orielle County PUD (Unit 22 - Northeast Washington River).

- Reductions in the length of the placer mining season is expected to affect approximately 15 placer mines annually in the John Day River Basin (Unit 8) and Hells Canyon Complex (Unit 12). While the financial characteristics of these mining operations are unknown, this analysis assumes the economic effect will be significant for those operations that are impacted.

Energy Industry Impacts

82. Pursuant to Executive Order No. 13211, Federal agencies are required to submit a summary of the potential effects of regulatory actions on the supply, distribution and use of energy. Two criteria are relevant to this analysis: 1) reductions in electricity production in excess of 1 billion kilowatt-hours per year or in excess of 500 megawatts (MWs) of installed capacity and 2) increases in the cost of energy production in excess of one percent. The constraints placed on energy production within the region from compliance with bull trout section 7 consultations will not result in significant decreases in production or increases in energy costs within the region.

Caveats to Economic Analysis

83. Exhibit ES.11 presents the key assumptions of this economic analysis, as well as the potential direction and relative scale of bias introduced by the assumptions.

84. These caveats below describe factors that introduce uncertainty into the results of this analysis. The Service therefore solicits from the public further information on any of the issues presented above. Additionally, information pertaining to the following questions is requested.

- Are data available to develop more accurate estimates of the number of future consultations, project modifications, and costs for the activities related to private lands?

- Are data available on additional land use practices, or current or planned activities in proposed critical habitat areas, that are not specifically or adequately addressed in this analysis?

- Are data available on additional indirect impacts (such as additional regulatory burdens from State or local laws triggered by the designation of critical habitat) that are not specifically or adequately addressed in this analysis?

ES.11 CAVEATS TO THE ECONOMIC ANALYSIS	
Key Assumption	**Effect on Cost Estimate**
Projected USFS timber harvest activity is based on recent regional history and ignores the declining long-term trend of the industry.	+
USFS water diversion reductions occur annually and representative water costs reflect the high-end of water lease rates in Washington.	+
Cost of USFS water diversion reductions and timber harvest project modifications are distributed across the units in proportion to USFS non-wilderness acreage. While this may have no effect on the total cost estimate, it may have an effect on the unit cost estimate.	+/-
Total costs of providing technical assistance is expected to be small relative to other economic impacts; therefore, this analysis does not quantify the instances and costs of technical assistance efforts.	-
Project modifications incorporating measures suggested by the Service and voluntarily agreed to by the applicant during the informal consultation process in order to minimize impact to the bull trout and/or its habitat are not quantified in this analysis.	-
Amortization of fishery-related capital investments are based on the life of the project rather than a shorter revenue recovery period.	-
Changes in hydroelectric power revenues attributable to reductions in operational flexibility at Libby and Hungry Horse dams is not quantified	-
Few new HCPs within or near the proposed designation are likely due primarily to the fact that most of the proposed designation is found on Federal land. Therefore, costs associated with HCPs are unlikely to play a significant role in future costs and were not calculated in this analysis.	-
Most of the project modification costs will either be borne directly by or passed onto the Federal government.	+/-
The FPA, the Pacific Northwest Electric Power Planning and Conservation Act, and fisheries management directives (Northwest Forest Plan, INFISH and PACFISH) provide baseline protection.	+/-
Project modification costs allocated between bull trout and other listed species.	+/-
Limited consultation with the NRCS is anticipated and based on a the record of past formal and informal consultation activity on the bull trout	-
- : This assumption may result in an underestimate of real costs. + : This assumption may result in an overestimate of real costs. +/- : This assumption has an unknown effect on estimates.	

85. In November 2002, the Service proposed to designate critical habitat for the Columbia River and Klamath River DPSs of bull trout *(Salvelinus confluentus)*, hereafter "bull trout."[5] The purpose of this report is to identify and analyze potential economic impacts associated with the proposed critical habitat designation. This report was prepared by Bioeconomics, Inc. of Missoula, Montana.

86. Section 4(b)(2) of the Act requires the Service to designate critical habitat on the basis of the best scientific data available, after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat. The Service may exclude areas from critical habitat designation when the benefits of exclusion outweigh the benefits of including the areas within critical habitat, provided the exclusion will not result in extinction of the species.

87. Under the listing of a species, section 7(a)(2) of the Act requires Federal agencies to consult with the Service in order to ensure that activities they fund, authorize, permit, or carry out are not likely to jeopardize the continued existence of the species. The Service defines jeopardy as any action that would appreciably reduce the likelihood of both the survival and recovery of the species. For designated critical habitat, section 7(a)(2) also requires Federal agencies to consult with the Service to ensure that activities they fund, authorize, permit, or carry out do not result in destruction or adverse modification of critical habitat. Adverse modification of critical habitat is currently construed as any direct or indirect alteration that appreciably diminishes the value of critical habitat for conservation of a listed species.

[5] On January 26, 2001, the Alliance for the Wild Rockies, Inc. and Friends of the Wild Swan, Inc. filed a lawsuit in the U.S. District Court of Oregon challenging the Service's failure to designate critical habitat for bull trout. The Service entered into a settlement agreement on January 14, 2002, which stipulated that the Service would make critical habitat determinations for five populations of bull trout (Civil Case No: CV 01-127-JO). The Service has proposed critical habitat for the Columbia River and Klamath River populations, which are the subject of this analysis.

1.1 Description of Species and Habitat[6]

88. Bull trout (*Salvelinus confluentus*, family Salmonidae) is a char native to waters of western North America. The historic range of bull trout includes major river basins in the Pacific Northwest from about 41° north to 60° north latitude, extending south to the McCloud River in northern California and the Jarbidge River in Nevada, and north to the headwaters of the Yukon River in Northwest Territories, Canada. To the west, bull trout range includes Puget Sound, various coastal rivers of British Columbia, Canada, and southeast Alaska. Bull trout occur in portions of the Columbia River and Snake River basins, extending east to headwater streams in Montana and Idaho, and into Canada. Bull trout also occur in the Klamath River basin of south-central Oregon. East of the Continental Divide in Canada, the bull trout's range includes the headwaters of the Saskatchewan River in Alberta, and the MacKenzie River system in Alberta and British Columbia.

89. Bull trout were first described as *Salmo spectabilis* by Girard in 1856 from a specimen collected on the lower Columbia River near The Dalles, Oregon, and subsequently described under a number of names such as *Salmo confluentus* and *Salvelinus malma*. Bull trout and Dolly Varden (*Salvelinus malma*) were previously considered a single species. However, in 1980, the American Fisheries Society formally recognized bull trout and Dolly Varden as separate species. Two of the most useful characteristics in separating the two species are the shape and size of the head. The head of bull trout is more broad and flat on top, unlike Dolly Varden. Bull trout have an elongated body and large mouth, with the maxilla (jaw) extending beyond the eye and with well-developed teeth on both jaws and head of the vomer (a bone in teleost fishes that form the front part of the roof of the mouth and often bears teeth). Bull trout have 11 dorsal fin rays, nine anal fin rays, and the caudal fin is slightly forked. Although they are often olive green to brown with paler sides, color is variable with locality and habitat.

90. Bull trout exhibit both resident and migratory life history strategies. Resident bull trout complete their entire life cycle in the tributary streams where they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear from one to four years before migrating to either a larger river or lake, where they spend their adult life, returning to the tributary stream only to spawn. These migratory forms occur in areas where conditions allow for movement from upper watershed spawning streams to larger downstream waters that contain greater foraging opportunities. Bull trout that migrate to a downstream river are referred to as "fluvial" fish, while the term "adfluvial" is used to describe fish that migrate to a lake or reservoir. Resident and migratory forms may spawn in the same areas and either form can produce resident or migratory offspring.

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[6] Information on the bull trout and its habitat is taken from the U.S. Fish and Wildlife Service, *Proposed Designation of Critical Habitat for the Klamath River and Columbia River Distinct Population Segments of Bull Trout*, November 29, 2002 (67 FR 71235-71284).

91. The Klamath River population segment consists of bull trout in the Upper Klamath Lake, Sprague River, and Sycan River watersheds in Oregon. Historical records suggest that bull trout were once widely distributed and exhibited diverse life-history traits in the Klamath River basin. Currently, bull trout in this basin are non-migratory fish that are confined to headwater streams. The local populations that remain reside in an estimated 21 percent of the historic range of bull trout in the Klamath River basin, and they are isolated from one another.

92. The Columbia River population segment includes bull trout residing in portions of Oregon, Washington, Idaho, and Montana. The Bull Trout Draft Recovery Plan (Draft Recovery Plan) (Service 2002) identifies 22 recovery units within the Columbia River basin: the Willamette River (upper tributaries including the McKenzie River), Lower Columbia River (principally the Lewis, White Salmon, and Klickitat Rivers), Hood River, Deschutes River, Odell Lake, John Day River, Umatilla and Walla Walla Rivers, Middle Columbia River (principally the Yakima River), Snake River (including Asotin Creek and Tucannon River), Grande Ronde River, Clearwater River, Salmon River, Little Lost River, Imnaha River, Hells Canyon (including Powder River), Malheur River, Southwest Idaho, Upper Columbia River (principally the Wenatchee, Entiat, and Methow Rivers), Northeast Washington, Clark Fork River, Kootenai River, and Coeur d'Alene Lake. Bull trout are estimated to have once occupied about 60 percent of the Columbia River basin; they presently occur in approximately 45 percent of their historic range. Although still somewhat widely distributed in the Columbia River basin, bull trout occur in low numbers in many areas and populations are considered depressed or declining across much of their range.

93. Many factors have contributed to the decline of bull trout in the Columbia and Klamath River basins. However, several appear to be particularly significant: (1) fragmentation and isolation of local populations due to dams and water diversions that have eliminated habitat, altered water flow and temperature regimes, and impeded migratory movements; (2) degradation of spawning and rearing habitat in upper watershed areas, particularly alterations in sedimentation rates and water temperature resulting from past forest and rangeland management practices and intensive development of roads; and (3) the introduction and spread of non-native species, particularly brook trout (*Salvelinus fontinalis*) and lake trout (*Salvelinus namaycush*), which compete with bull trout for limited resources and, in the case of brook trout, hybridize with bull trout.

94. Bull trout have more specific habitat requirements than most other salmonids. Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, spawning and rearing substrate conditions, and migratory corridors.

95. Bull trout are found primarily in cold streams; water temperatures above 15° Celsius (C) (59° Fahrenheit (F)) are believed to limit bull trout distribution. Adult bull trout have been observed in large rivers throughout the Columbia River basin in water temperatures up to 20° C (68° F); however, there are documented steady and substantial declines in abundance in stream reaches where water temperature ranged from 15° to 20° C (59° to 68° F). In large

rivers, bull trout are often observed "dipping" into the lower reaches of tributary streams, and it is suspected that cooler waters in these tributary mouths may provide important thermal refugia, allowing them to forage, migrate, and overwinter in waters that would otherwise be, at least seasonally, too warm.

96. Preferred spawning habitat consists of low-gradient stream reaches with loose, clean gravel, and water temperatures that range from 4° to 10° C (39° to 51° F). Such areas are often associated with cold-water springs or groundwater up-welling. Because bull trout eggs incubate about seven months in the gravel, they are especially vulnerable to fine sediments and water quality degradation. Increases in fine sediment appear to reduce egg survival and emergence. Juveniles are likely similarly affected, as they also live on or within the stream bed cobble.

97. Throughout their lives, bull trout require complex forms of cover, including large woody debris, undercut banks, boulders, and pools. Bull trout are opportunistic feeders, with food habits that are primarily a function of size and life-history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macro-zooplankton, and small fish. Adult migratory bull trout feed almost exclusively on other fish.

98. The ability to migrate is important to the persistence of bull trout. Maintaining the full complement of bull trout life history forms appears to be important for long-term population persistence in a dynamic and unpredictable environment. Migratory bull trout become much larger than resident fish in the more productive waters of larger streams and lakes, leading to increased reproductive potential. Migration also results in increased dispersion of the population which facilitates gene flow among local populations when individuals from different local populations interbreed, stray, or return to non-natal streams. Local populations that are extirpated by catastrophic events may also become re-established by bull trout migrants.

99. Introduced brook trout threaten bull trout through hybridization, competition, and possibly predation. Hybridization between brook trout and bull trout has been reported in Montana, Oregon, Washington, and Idaho. In addition, brook trout mature at an earlier age and have a higher reproductive rate than bull trout. This difference appears to favor brook trout over bull trout when they occur together, often leading to the decline or extirpation of bull trout. Brook trout also appear to adapt better to degraded habitat than bull trout and are more tolerant of high water temperatures. Non-native lake trout also negatively affect bull trout. In a study of 34 lakes in Montana, Alberta, and British Columbia, lake trout appeared to limit foraging opportunities and reduce the distribution and abundance of migratory bull trout in mountain lakes.

100. The Service determined the primary constituent elements of bull trout habitat from studies of their habitat requirements, life history characteristics, and population biology, as outlined above. These primary constituent elements are:

- Permanent water and associated substrate having low levels of contaminants such that normal reproduction, growth and survival are not inhibited;

- Water temperatures ranging from 2° to 15° C (37° to 59° F). Adequate thermal refugia may be necessary for persistence of bull trout if water temperatures commonly exceed this range. Specific temperatures within this range will vary depending on bull trout life history stage and form, geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local groundwater influence;

- Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures;

- Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fines less than 0.63 cm (0.25 in) in diameter and minimal substrate embeddedness are characteristic of these conditions;

- A natural hydrograph, including high, low, peak, and base flows within historic ranges or, if regulated, a hydrograph that demonstrates the ability to support bull trout populations;

- Springs, seeps, groundwater sources, and subsurface water connectivity to contribute to water quality and quantity;

- Migratory corridors with minimal physical, biological or chemical barriers between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows;

- An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish; and

- Few or no predatory, interbreeding, or competitive non-native species present.

An area need not include all of these elements to qualify for designation as critical habitat.

1.2 Proposed Critical Habitat

101. The areas proposed for designation as critical habitat for the bull trout provide one or more of the primary constituent elements described above. All of the proposed areas require special management considerations to ensure their contribution to the conservation of the bull trout. The critical habitat area consists of 18,469 river miles and 532,721 acres of lake and reservoir habitat within 25 units. While the lateral extent of proposed riverine critical habitat is the width of the stream channel defined by its bankfull elevation, the designation of critical habitat is expected to impact inland activity. How far inland the designation's effects extend

is a more or less a site specific issue. For example, with regards to land-based activities such as timber sales or grazing practices, it is a matter of site specific physical processes such as sediment transport, the local topography, and the size of the drainage basin. Descriptions of each critical habitat unit are provided in Appendix A.

1.3 Framework and Methodology

102. The primary purpose of this analysis is to estimate the economic impact associated with the designation of critical habitat for bull trout.[7] This information is intended to assist the Secretary in making decisions about whether the benefits of excluding particular areas from the designation outweigh the benefits of including those areas in the designation.[8] In addition, this information allows the Service to address the requirements of Executive Orders 12866 and 13211, the RFA, as amended by the SBREFA.[9]

103. This chapter provides the framework for this analysis. First, it defines the economic effects considered in the analysis. Second, it establishes the baseline against which these effects are measured. Third, it describes the measurement of direct compliance costs, which include costs associated with, and generated as a result of, section 7 consultations. Fourth, it identifies potential indirect economic effects of the rule resulting from (1) compliance with other parts of the Act potentially triggered by critical habitat, (2) compliance with other laws, and (3) time delays and regulatory uncertainty. Fifth, it discusses the need for an economic assessment of the benefits of critical habitat designation. Finally, the section concludes by discussing the time frame for the analysis and the general steps followed in the analysis.

1.3.1 Types of Economic Effects Considered

104. This economic analysis considers both the economic efficiency and distributional effects. For the purpose of this analysis, economic efficiency effects generally reflect the "opportunity costs" associated with the commitment of resources required to comply with the Act. For example, if the activities that can take place on a parcel of private land are limited as a result of a designation, and thus the market value of the land reduced, this reduction in value represents one measure of opportunity cost or change in economic efficiency. Similarly, the costs incurred by a Federal Action agency to consult with the Service under section 7 represent economic opportunity costs.

105. This analysis also addresses how the impacts are distributed, including an assessment of any local or regional economic impacts and the potential effects on small entities and the

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[7] This analysis considers the effects of the regulatory action as proposed in the Federal Register on November 29, 2002 (67 FR 71236).

[8] 16 U.S.C. § 1533(b)(2).

[9] Executive Order 12866, "Regulatory Planning and Review," September 30, 1993; Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," May 18, 2001; 5 U.S.C. §§ 601 *et seq*; and Pub Law No. 104-121.

energy industry. This information can be used by decision-makers to assess whether the effects might unduly burden a particular group or economic sector.

106. For example, while the designation may have a relatively small impact when measured in terms of changes in economic efficiency, individuals employed in a particular sector of the economy in the geographic area of the designation may experience relatively greater effects. The difference between economic efficiency effects and distributional effects, as well as their application in this analysis, are discussed in greater detail below.

Efficiency Effects

107. At the guidance of the OMB and in compliance with Executive Order 12866 "Regulatory Planning and Review," Federal agencies measure changes in economic efficiency in order to understand how society, as a whole, will be affected by a regulatory action.[10] In the context of this regulatory action, these efficiency effects represent the opportunity cost of resources used or benefits foregone by society as a result of critical habitat designation and other co-extensive regulations.[11] Economists generally characterize opportunity costs in terms of changes in producer and consumer surpluses in affected markets.[12]

108. In some instances, compliance costs may provide a reasonable approximation for the efficiency effects associated with a regulatory action. For example, a landowner or manager may need to enter into a consultation with the Service to ensure that a particular activity will not adversely modify critical habitat. The effort required for the consultation represents an economic opportunity cost, because the landowner or manager's time and effort would have been spent in an alternative activity had the parcel not been included in the designation. When compliance activity is not expected to significantly affect markets -- that is, not result in a shift in the quantity of a good or service provided at a given price, or in the quantity of a good or service demanded given a change in price -- the measurement of compliance costs can provide a reasonable estimate of the change in economic efficiency.

109. Where a designation is expected to significantly impact a market, it may be necessary to estimate changes in producer and consumer surpluses. For example, a designation that precludes the development of large areas of land may shift the price and quantity of housing supplied in a region. In this case, changes in economic efficiency can be measured by considering changes in producer and consumer surplus in the real estate market.

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[10] Executive Order 12866, "Regulatory Planning and Review," September 30, 1993; U.S. Office of Management and Budget, "Circular A-4," September 17, 2003.

[11] The term "co-extensive" is discussed in greater detail in Section 1.3.3.

[12] For additional information on the definition of "surplus" and an explanation of consumer and producer surplus in the context of regulatory analysis, see Gramlich, Edward M., *A Guide to Benefit-Cost Analysis (2nd Ed.)*, Prospect Heights, Illinois: Waveland Press, Inc., 1990; and U.S. EPA, *Guidelines for Preparing Economic Analyses*, EPA 240-R-00-003, September 2000, available at http://yosemite.epa.gov/ee/epa/eed.nsf/ webpages/Guidelines.html.

110. This analysis begins by measuring reasonably foreseeable compliance costs. As noted above, in some cases, compliance costs can provide a reasonable estimate of changes in economic efficiency. However, if the designation is expected to significantly impact markets, the analysis will consider potential changes in consumer and/or producer surplus in affected markets.

Distributional and Regional Economic Effects

111. Measurements of changes in economic efficiency focus on the net impact of the regulation, without consideration for how certain economic sectors or groups of people are affected. Thus, a discussion of efficiency effects alone may miss important distributional considerations concerning groups that may be disproportionately affected. OMB encourages Federal agencies to consider distributional effects separately from efficiency effects.[13] This analysis considers several types of distributional effects, including impacts on small entities; impacts on energy supply distribution and use; and regional economic impacts. It is important to note that these are fundamentally different measures of economic impact than efficiency effects, and thus cannot be added to or compared with estimates of changes in economic efficiency.

Impacts on Small Entities and Energy Supply, Distribution and Use

112. This analysis considers how small entities, including small businesses, organizations, and governments, as defined by the RFA, might be affected by critical habitat designation and other co-extensive regulatory actions.[14] In addition, in response to Executive Order 13211 "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," this analysis considers the impacts of critical habitat on the energy industry and its customers.[15]

Regional Economic Effects

113. Regional economic impact analysis provides an assessment of the potential localized effects of critical habitat designation and other co-extensive regulations. Specifically, regional economic impact analysis produces a quantitative estimate of the potential magnitude of the initial change in the regional economy resulting from a regulatory action. Regional economic impacts are commonly measured using regional input/output models. These models rely on multipliers that mathematically represent the relationship between a change in one sector of the economy (e.g., hydroelectric power generation) and the effect of that change on economic output, income, or employment in other local industries (e.g.,

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[13] U.S. Office of Management and Budget, "Circular A-4," September 17, 2003.

[14] 5 U.S.C. § 601 *et seq.*

[15] Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," May 18, 2001.

manufacturers relying on the electricity generated). These economic data provide a quantitative estimate of the magnitude of shifts of jobs and revenues in the local economy.

114. The use of regional input/output models can overstate the long-term impacts of a regulatory change. Most importantly, these models provide a static view of the economy of a region. That is, they measure the initial impact of a regulatory change on an economy but do not consider long-term adjustments that the economy will make in response to this change. For example, these models provide estimates of the number of jobs lost as a result of a regulatory change, but do not consider re-employment of these individuals over time. In addition, the flow of goods and services across the regional boundaries defined in the model may change as a result of the designation, compensating for a potential decrease in economic activity within the region.

115. Despite these and other limitations, in certain circumstances regional economic impact analysis may provide useful information about the scale and scope of localized impacts. It is important to remember that measures of regional economic effects generally reflect shifts in resource use rather than efficiency losses. These types of distributional effects, therefore, should be reported separately from efficiency effects (i.e., not summed). In addition, measures of regional economic impact cannot be compared with estimates of efficiency effects.

1.3.2 Defining the Baseline

116. The purpose of this analysis is to measure the economic impact of compliance with the protections derived from the designation of critical habitat, including habitat protections that may be "co-extensive" with the listing of the species (the term "co-extensive" is described in greater detail in the following section). Economic impacts to land use activities may exist in the absence of co-extensive protections. These impacts may result from, for example:

- Local zoning laws;
- State and natural resource laws; and
- Enforceable management plans and BMPs applied by other State and Federal agencies.

117. Economic impacts that result from these types of protections are not included in this assessment; they are considered to be part of the "baseline." Existing laws, regulations, and policies are described in greater detail in Section 2.3 of this analysis.

1.3.3 Direct Compliance Costs

118. The measurement of direct compliance costs focuses on the implementation of section 7 of the Act. This section requires Federal agencies to consult with the Service to ensure that any action authorized, funded, or carried out will not likely jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat. The administrative costs of these consultations, along with the costs of project modifications resulting from these consultations, represent the direct compliance costs of designating critical habitat.

119. This analysis does not differentiate between consultations that result from the listing of the species (i.e., the jeopardy standard) and consultations that result from the presence of critical habitat (i.e., the adverse modification standard). Consultations resulting from the listing of the species, or project modifications meant specifically to protect the species as opposed to its habitat, may occur even in the absence of critical habitat. However, in 2001, the U.S. 10th Circuit Court of Appeals instructed the Service to conduct a full analysis of all of the economic impacts of critical habitat designation, regardless of whether those impacts are attributable co-extensively to other causes.[16] Given the similarity in regulatory definitions between the terms "jeopardy" and "adverse modification," in practice it can be difficult to pre-determine the standard that drives a section 7 consultation. Consequently, in an effort to ensure that this economic analysis complies with the instructions of the 10th Circuit as well as to ensure that no costs of the proposed designation are omitted, the potential effects associated with <u>all</u> section 7 impacts in or near proposed critical habitat are fully considered. In doing so, the analysis ensures that any critical habitat impacts that are co-extensive with the listing of the species are not overlooked.

1.3.4 Indirect Costs

120. A designation may, under certain circumstances, affect actions that do not have a Federal nexus or otherwise are not subject to the provisions of section 7 under the Act. The potential exists for several types of such indirect effects: three examples are discussed in this section. First, some landowners may voluntarily elect to complete a HCP in response to having their land designated as critical habitat. Second, some State laws may require landowners and managers to consider the effects of their actions on sensitive species and habitat. Thus, designation of critical habitat could trigger additional regulatory burden due to new information provided by the designation. Third, the consultation process may result in time delays for upcoming or ongoing projects, and the designation may foster regulatory uncertainty for prospective projects. The three most common categories of indirect effects are discussed further below.

[16] *New Mexico Cattle Growers Ass'n v. U.S.F.W.S.*, 248 F.3d 1277 (10th Cir. 2001).

Creation of Habitat Conservation Plans

121. Few new HCPs within or near the proposed designation are likely due primarily to the fact that most of the proposed designation is found on Federal land. To date, few HCPs have been completed within the current proposed critical habitat designation for the species. It is therefore anticipated that costs associated with HCPs are unlikely to play a significant role in future costs and were not calculated for the species. However, they may be a factor in other economic analyses for critical habitat designations, so this discussion of this methodology has been retained. Under section 10(a)(1)(B) of the Act, a non-Federal entity (i.e., a landowner or local government) may develop an HCP for an endangered animal species in order to meet the conditions for issuance of an incidental take permit in connection with the development and management of a property.[17] The HCP intends to counterbalance potential harmful effects that a proposed activity may have on a species, while allowing the otherwise lawful activity to proceed. As such, the purpose of the habitat conservation planning process is to ensure that the effects of incidental take are adequately minimized and mitigated. Thus, HCPs are developed to ensure compliance with section 9 of the Act and to meet the requirements of section 10 of the Act.

122. However, a connection may exist between the creation of HCPs and the costs these plans impose and the designation of critical habitat. The Service, being a Federal entity, must formally consider whether an HCP will jeopardize a listed species or adversely modify its designated critical habitat before approving the plan. This review process may be a direct impact under section 7 of the Act. However, in certain circumstances, the effort involved in creating the HCP and associated conservation actions may also generate indirect effects associated with the designation of critical habitat. For example, in one past instance, landowners preemptively developed HCPs in an effort to avoid having their property designated as critical habitat.[18] In this case, the effort involved in creating the HCP and undertaking associated conservation actions were considered to be an effect of designation.

123. The following scenarios regarding HCP creation provide general guidance regarding the degree to which associated costs should be considered within the context of a critical habitat economic analysis:

- In cases in which an HCP existed prior to a proposed designation, the costs of developing the HCP and the added costs of management imposed by the HCP <u>should not be</u> considered in the analysis of the effects of the designation. These costs are appropriately considered to be part of the regulatory baseline, because their creation was driven by the listing of the species and the need to avoid take, which is prohibited under section 9 of the Act. However, in cases where designated critical habitat

[17] U.S. Fish and Wildlife Service, "Endangered Species and Habitat Conservation Planning." From: http://endangered.fws.gov/hcp/, as viewed on August 6, 2002. Sections 9 and 10 of the Act do not apply to plants.

[18] See Industrial Economics, Incorporated, *Economic Analysis of Critical Habitat Designation for the Nine Bexar County Texas Invertebrate Species*, prepared for the U.S. Fish and Wildlife Service, March 2003.

overlaps with completed HCPs, the economic analysis will need to consider the cost to the Service to re-consult on the plan's impact to critical habitat and whether or not this process may result in additional conservation actions.

- In cases in which an HCP is proposed, or reasonably foreseeable absent the designation of critical habitat, the administrative costs associated with the required internal section 7 consultation should be included in the economic analysis of total section 7 costs, because the Service will need to consider the effects of the plan on designated critical habitat. In addition, if as a result of the designation additional project modifications will be recommended by the Service and incorporated into the HCP in order to avoid adversely modifying critical habitat, the costs of these project modifications should also be included in the economic analysis of critical habitat.[19]

- In cases in which development of one or more HCPs can be documented as being precipitated by critical habitat designation (i.e., to avoid designation or to reduce the costs of the designation), the costs of development of the HCP and the added costs of management imposed by the HCP should be included in the critical habitat economic analysis. In such cases the analysis should be presented with appropriate caveats as to the uncertainty regarding the extent to which the HCP would have existed absent critical habitat designation.

As previously stated, costs associated with future HCPs are likely to be small relative to direct costs and are not considered in this analysis.

Other State and Local Laws

124. Under certain circumstances, the designation of critical habitat may provide new information to a community about the sensitive ecological nature of a geographic region, potentially triggering additional economic impacts under other State or local laws. In cases where these costs would not have been triggered "but for" the designation of critical habitat, they are included in this economic analysis. For this analysis, costs triggered under State and local laws are unlikely.

[19] Project modification costs associated with the jeopardy standard are not considered for the following reason. Section 10(a)(2)(B) of the Act requires that for the issuance of an incidental take permit, the HCP must assure that "the taking will not appreciably reduce the likelihood of survival and recovery of the species in the wild." According to the Service's *Habitat Conservation Planning and Incidental Take Permit Processing Handbook*, "the wording of this criterion is identical to the "jeopardy" definition under the section 7 regulations (50 CFR Part 402.02)...Congress was explicit about this link, stating in the Conference Report on the 1982 ESA amendments that the Services will determine whether or not to grant a permit, "in part, by using the same standard as found in section 7(a)(2) of the ESA, as defined by the [Services'] regulations.'" (U.S. Department of the Interior and U.S. Department of Commerce, *Habitat Conservation Planning and Incidental Take Permit Processing Handbook*, November 4, 1996). As a result, during the HCP process, actions undertaken to meet the jeopardy provision of section 7 are also required under section 10 of the Act. In circumstances where an HCP is reasonably foreseeable absent the designation of critical habitat, these actions are therefore considered to be part of the baseline of this economic analysis.

125. For example, the California Environmental Quality Act (CEQA) requires that lead agencies -- public agencies responsible for project approval -- consider the environmental effects of proposed projects that are considered discretionary in nature and not categorically or statutorily exempt. Among other effects, the CEQA statutes specifically require lead agencies to consider a project's effects on rare or endangered plant and animal communities. To approve qualifying projects, lead agencies must require applicants, who are not "categorically exempt," to mitigate effects to less than significant levels for projects that are not granted a "statement of overriding considerations."[20]

126. In these and other cases in which costs are incurred by landowners and managers above and beyond what would be required under State or local law and policy in the absence of the designation, these costs are considered to be an indirect effect of the designation. As stated above, costs triggered under State and local laws are anticipated to be de minimus for this proposed designation.

Time Delays and Stigma

127. In addition to the indirect effects of compliance with other laws triggered by the designation, project proponents, land managers and landowners may face additional indirect impacts. These can include costs due to project delays associated with the consultation process or compliance with other regulations, or, in the case of land located within or adjacent to the designation, loss in property value resulting from public perceptions regarding the effects of critical habitat. These categories of potential effects may exist, as Federal highway projects or gold mining projects. Furthermore, the ability of private ranchers to graze public lands affects the value of those rancher's lands. These effects are described in greater detail below.

Time Delays

128. Both public and private entities may experience incremental time delays for projects and other activities due to requirements associated with the section 7 consultation process and/or compliance with other laws triggered by the designation. The need to conduct a section 7 consultation will not necessarily delay a project, as often the consultation may be coordinated with the existing baseline regulatory approval process. However, depending on the schedule of the consultation, a project may experience additional delays, resulting in an unanticipated extension in the time needed to fully realize returns from the planned activity. To the extent that delays result from the designation, they are considered in the analysis. Specifically, the analysis considers costs associated with any incremental time delays

[20] Article 19 of CEQA provides a list of categorical exemptions, which are descriptions of types of projects that usually do not have a significant effect on the environment (e.g., replacement or reconstruction of existing facilities, actions taken by regulatory agencies as authorized by State law or local ordinance to assure the maintenance, restoration, or enhancement of a natural resource). (http://ceres.ca.gov/ceqa/flowchart/exemptions/ categorical.html, as viewed on April 21, 2003.)

associated with section 7 consultation or other requirements triggered by the designation above and beyond project delays resulting from baseline regulatory processes.

Stigma

129. In some cases, the public may perceive that critical habitat designation may result in incremental changes to private property values, above and beyond those associated with anticipated project modifications and regulatory uncertainty described above. That is, the public may perceive that, all else being equal, a property that is designated as critical habitat, or that is adjacent to designated habitat, will have lower market value than an identical property located elsewhere. Public attitudes about the limits and costs that critical habitat may impose can cause real economic effects to the owners of property, regardless of whether such limits are actually imposed. This analysis considers the implications of public perceptions related to critical habitat on private property values within the proposed designation.

1.3.5 Benefits

130. In Executive Order 12866, OMB directs Federal agencies to provide an assessment of costs and benefits of a proposed regulatory actions.[21] However, in its guidance for implementing Executive Order 12866, OMB acknowledges that often, it may not be feasible to monetize, or even quantify, the benefits of environmental regulations. Where benefits cannot be quantified, OMB directs agencies to describe the benefits of a proposed regulation qualitatively.[22] *In the case of the bull trout, the Service believes that the benefits of critical habitat designation are best expressed in biological terms that can be weighed against the expected cost impacts of the rulemaking.* Thus, this report does not provide a monetary measure of the benefits of the proposed designation.

1.3.6 Analytic Time Frame

131. The analysis examines activities taking place both within and adjacent to the proposed designation. It estimates impacts based on activities that are "reasonably foreseeable," including, but not limited to, activities that are currently authorized, permitted, or funded, or for which proposed plans are currently available to the public. For all activities with the exception of FERC re-licensing of dams this analysis bases estimates on activities that are likely to occur within a ten year time frame, beginning on the day that the current proposed rule becomes available to the public (November 30, 2002). In the case of FERC hydroelectric facility re-licensing, the schedule for re-licensing is on a 50 year basis (at the maximum). Therefore, as information on the timing of these hydroelectric re-licensing applications extends well beyond the ten year time frame used for other impacted activities, a 50 year time

[21] Executive Order 12866, "Regulatory Planning and Review," September 30, 1993.

[22] U.S. Office of Management and Budget, Circular A-4, September 17, 2003.

frame is used only for annualizing the expected impacts associated with section 7 bull trout consultations involving FERC re-licensing.

132. With the exception of FERC hydroelectric re-licensing, the ten-year time frame was chosen for the analysis because, as the time horizon for an economic analysis is expanded, the assumptions on which the projected numbers of projects are based become increasingly speculative. As a result, it is difficult to predict not only the numbers of projects, but also the cost impacts associated with those projects, beyond a ten-year window. Consequently, any attempt to extend the economic analysis beyond the ten-year time window would be speculative.

1.3.7 General Analytic Steps

133. This report relies on a sequential methodology and focuses on distilling the salient and relevant aspects of potential economic impacts. The steps followed in this analysis consist of:

- Describing current and projected economic activity within and around the proposed critical habitat area;
- Identifying whether such activities are likely to involve a Federal nexus;
- For activities with a Federal nexus, evaluating the likelihood that these activities will require consultations under section 7 of the Act and, in turn, result in any modifications to projects;
- Estimating the direct costs of expected section 7 consultations, project modifications and other economic impacts;
- Estimating the likelihood that projects will be delayed by the consultation process or other regulatory requirements triggered by the designation;
- Estimating indirect costs, as reflected in the cost of project delays and effects on property values;
- Assessing the extent to which critical habitat designation and other co-extensive regulations will create costs for small businesses as a result of modifications or delays to projects; and
- Assessing the effects of administrative costs and project modifications on the supply, distribution, and use of energy.

134. As noted above, this analysis considers both efficiency effects and distributional effects. It begins by considering direct compliance costs, as well as potential indirect effects, such as those effects associated with project delays and impacts to property values. As

necessary, regional economic impacts are described, as are impacts on significantly affected markets. Impacts on small entities and energy production and consumption are discussed separately.

1.4 Information Sources

135. The analysis contained in this report is based on a wide range of information sources. Service personnel provided information on past bull trout section 7 consultation project modifications and terms and conditions, as well as copies of 140 formal bull trout consultation documents. The Service also supplied maps delineating the proposed critical habitat by recovery unit as well as maps showing the location of major activities, including dams and reservoirs. The Service provided the output of requested GIS analysis for information on land ownership by recovery unit, as well as management status for several of the Action agencies, including the USFS. The bull trout listing document (June 10, 1998) and the proposed designation (November 29, 2002) were also consulted.

136. Numerous individuals were consulted within the Action agencies. This included contact with USFS personnel on the Lolo, Bitterroot, Kootenai, Idaho Panhandle, Beaverhead/Deerlodge, Colville, Flathead, Sawtooth, Helena, Fremont, Mt. Baker-Snoqualmie, Salmon/Challis and Willamette National Forests. Personnel contacted included timber sale contract administrators, planning directors, fishery biologists, economists, a Deputy Forest Supervisor, team leaders, engineers, and hydrologists. Numerous individuals associated with the USFS research branch were also consulted on topics including water quality, logging system costs, projected harvest levels, stumpage values, equations and methods for appraisal, and the relationship of bull trout populations to habitat characteristics (primary constituent elements). Forest research station publications were relied on to characterize future harvest levels, logging system costs, projected stumpage values, impacts of baseline regulations (INFISH, PACFISH, and the Northwest Forest Plan). Documents associated with the Interior Columbia Basin Ecosystem Management Plan (ICBEMP) provided important sources of information on the current status of bull trout populations, the status of habitat across the region, and in characterizing the socioeconomic conditions of the region. Census Bureau and other Department of Commerce data were also relied on to characterize the regional economy. Other Action agency contacts included the FHWA and the BLM.

137. The analysis of the hydroelectric facilities and other dam structures in the region necessitated contact with numerous individuals at the ACOE, BOR, and BPA. Specific output from hydrological planning models was requested from BPA, and BPA publications provided information on electric power values and the extent and operational characteristics of the Federal Columbia River System. Numerous individuals were contacted at the NWPCC for information on fish and wildlife mitigation costs, as well as interpretation of recent and past Biological Opinions (BOs) by both the Service and NOAA Fisheries (formerly National Marine Fisheries Service (NMFS)). NWPCC documents were relied on for estimates of mitigation costs for both salmon and resident fish. NOAA personal also contributed

information on these issues. Data sets were obtained from FERC and the ACOE on the characteristics of dams and hydroelectric facilities in the region, including ownership, MW capacity, location and stream or river. Information was also obtained from the Pacific Northwest Utility Coordinating Council (an industry group) as well as numerous individuals at utilities owning dams in bull trout proposed critical habitat. This included individuals at Avista (formerly Washington Water Power Company), Eugene Water and Electric Board, Pacificorp, and PGE.

138. Information on bull trout fisheries was provided by personnel with State agencies including Idaho Fish and Game, Montana Fish, Wildlife and Parks, Oregon Department of Fish and Wildlife, and the Washington Department of Fish and Wildlife. Individuals were also consulted at other State agencies, including both the Oregon and Montana DEQs. Additionally, the EPA provided information on aquatic habitat issues and standards.

139. Information on tribal values and uses relating to bull trout were obtained from individuals at the Confederated Salish and Kootenai Tribes, including a cultural preservation officer, biologists, and a tribal attorney. General information on socioeconomic status of Tribes in the region was obtained through NWPCC and Department of Commerce documents.

140. Numerous individuals from State and Federal agencies were contacted on topics ranging from irrigation to forestry to bull trout conservation. Specifically, in addressing potential impacts to agriculture, contacts included NRCS state biologists for the states of Idaho, Oregon, and Washington. Additionally, in researching the potential impacts associated with irrigation diversions, Service personnel in Portland, Boise, and Pocatello were contacted as well as Salmon/Challis National Forest managers. Additionally, Action agency personnel with the BOR in Boise, Idaho, and Klamath Falls, Oregon, BLM Biologists from Missoula, Montana and Vale, Oregon, and DOT personnel from Helena, Montana and Missoula, Montana were contacted regarding a range of section 7 consultation issues.

141. Several industry organizations and other private parties were also contacted. These include: American Forestry and Paper, American Forest Resource Council, National Mining Association, Northwest Mining Association, American Farm Bureau, Washington State Farm Bureau, National Home Builders, Oregon Home Builders, Jim Buell, Buell & Associates, and Steve Cramer, S.P. Cramer & Associates.

142. This section discusses the socioeconomic characteristics of areas proposed as critical habitat for the bull trout. In addition, this section provides relevant information about regulations and requirements that exist in the baseline and are potentially linked to bull trout conservation.

2.1 Socioeconomic Profile of the Critical Habitat Areas

143. This section summarizes key economic and demographic information for the counties and region containing proposed critical habitat for the bull trout. This information is presented for two spatial areas with broad overlap. The ICBEMP developed an exhaustive and detailed description of the Interior Columbia River Basin for the ICBEMP Supplemental Draft Environmental Impact Statement (EIS). The region described in the ICBEMP EIS includes all areas included in the bull trout critical habitat designation with the exception of portions of several western Oregon and Washington counties. The following discussion will highlight the findings of the ICBEMP study as it relates to the region's human population, land ownership and major uses, and employment. Additionally, this section will present tables on the subset of counties analyzed in the ICBEMP study that are included in the bull trout critical habitat designation.

2.1.1 Population[23]

144. The interior Columbia River Basin is a sparsely populated region with a density of approximately 11 people per square mile. This compares to the national average of 70 people per square mile. Population density differs greatly by county within the basin. In 1998, nearly half of the region's population lived in 12 of the region's 92 counties.

[23] Material presented under Sections 2.1.1, 2.1.2, and 2.1.3 draws on the ICBEMP Supplementary Draft EIS, Chapter 2, pages 165-220. This material refers to the 92 county ICBEMP analysis area. This area contains almost all of the 74 counties containing bull trout critical habitat, with the exception of portions of several western Oregon and Washington counties.

145. In spite of recent increases in population in the region, this area remains far more rural than the country as a whole. Only 31 percent of the population of the Interior Columbia Basin live in urban areas. This compares to over 77 percent of the U.S. population who live in urban areas.

146. The interior Columbia River Basin counties have a greater percentage of whites (92 percent) and of American Indians (2.4 percent) than the nation as a whole (80 percent and 0.8 percent, respectively), and smaller proportions of African-Americans, Hispanics, and Asians. The percentage of the basin's residents with at least a high school diploma and at least some college education is greater than the national average.

147. Within the region, two general population patterns were experienced between 1960 and the early 1990's. The spatially largest (and generally least populated) counties steadily lost population during the period. On the other hand, the more populated, urbanized, or recreation and tourism-dependent counties saw continued population growth during the entire 30 year period. Recent and projected population growth is highest in locations known as the urban-rural-wildland interface areas, where developed private lands meet undeveloped public lands.

2.1.2 Land Ownership and Major Uses

148. The area proposed for critical habitat designation for the bull trout includes 18,474 miles of rivers and streams and 532,702 acres of lakes and reservoirs within the states of Idaho, Montana, Oregon, and Washington. Of these, 58 percent of the land area is Federal, four percent is state or local, two percent is tribal, and 36 percent is private. Exhibits 2.1 and 2.2 detail the unit-by-unit allocation of critical habitat for rivers and streams and for lakes and reservoirs by adjacent land ownership. See Appendix B for additional detail.

Exhibit 2.1

Approximate Distribution of Proposed Critical Habitat: Adjacent Landownership Percentages by Unit Rivers and Streams

Unit #	Unit	Federal	State and Local	Private	Tribal
1	Klamath River Basin	69%	3%	28%	0%
2	Clark Fork River Basin	54%	6%	39%	1%
3	Kootenai River Basin	53%	3%	44%	0%
4	Willamette River Basin	46%	0%	54%	0%
5	Hood River Basin	48%	1%	51%	0%
6	Deschutes River Basin	35%	1%	41%	23%
7	Odell Lake	100%	0%	0%	0%
8	John Day River Basin	54%	0%	46%	0%
9	Umatilla-Walla Walla River Basins	32%	2%	58%	8%
10	Grande Ronde River Basin	52%	0%	48%	0%
11	Imnaha/Snake River Basins	51%	0%	49%	0%
12	Hells Canyon Complex	47%	0%	53%	0%
13	Malheur River Basin	63%	3%	34%	0%
14	Couer d'alene Lake Basin	58%	6%	35%	0%
15	Clearwater River Basin	78%	4%	17%	0%
16	Salmon River Basin	86%	1%	13%	0%
17	Southwest Idaho River Basins	78%	4%	17%	0%
18	Little Lost River Basin	76%	2%	22%	0%
19	Lower Columbia River Basin	18%	10%	55%	17%
20	Middle Columbia Basin	44%	9%	40%	7%
21	Upper Columbia Basin	58%	0%	42%	0%
22	Northeast Washington River Basins	58%	4%	37%	1%
23	Snake River Basin in Washington	52%	16%	33%	0%
24	Columbia River	39%	0%	61%	0%
25	Snake River	50%	0%	50%	0%
Total		**65%**	**3%**	**31%**	**1%**

Notes: Figures taken or calculated from U.S. Fish and Wildlife Service, “Endangered and Threatened Wildlife and Plants; Proposed Designation of Critical Habitat for the Klamath River and Columbia River Distinct Population Segments of Bull Trout”, 50 CFR part 17 (Proposed Rule).

Exhibit 2.2

Approximate Distribution of Proposed Critical Habitat: Adjacent Landownership Percentages by Unit Lakes and Reservoirs

Unit #	Unit	Federal	State and Local	Private	Tribal
1	Klamath River Basin	64%	2%	35%	0%
2	Clark Fork River Basin	33%	16%	41%	10%
3	Kootenai River Basin	53%	3%	44%	0%
4	Willamette River Basin	46%	0%	54%	0%
5	Hood River Basin	48%	1%	51%	0%
6	Deschutes River Basin	0%	0%	0%	0%
7	Odell Lake	100%	0%	0%	0%
8	John Day River Basin	0%	0%	0%	0%
9	Umatilla-Walla Walla River Basins	0%	0%	0%	0%
10	Grande Ronde River Basin	0%	0%	0%	0%
11	Imnaha/Snake River Basins	0%	0%	0%	0%
12	Hells Canyon Complex	0%	0%	0%	0%
13	Malheur River Basin	0%	0%	0%	0%
14	Couer d'alene Lake Basin	0%	0%	100%	0%
15	Clearwater River Basin	67%	12%	21%	0%
16	Salmon River Basin	87%	1%	12%	0%
17	Southwest Idaho River Basins	66%	8%	26%	0%
18	Little Lost River Basin	0%	0%	0%	0%
19	Lower Columbia River Basin	29%	7%	64%	0%
20	Middle Columbia Basin	44%	9%	40%	7%
21	Upper Columbia Basin	41%	0%	59%	0%
22	Northeast Washington River Basins	58%	4%	37%	1%
23	Snake River Basin in Washington	0%	0%	0%	0%
24	Columbia River	0%	0%	0%	0%
25	Snake River	0%	0%	0%	0%
Total		**40%**	**11%**	**43%**	**6%**

Notes: Figures taken or calculated from U.S. Fish and Wildlife Service, "Endangered and Threatened Wildlife and Plants; Proposed Designation of Critical Habitat for the Klamath River and Columbia River Distinct Population Segments of Bull Trout", 50 CFR part 17 (Proposed Rule). The Proposed Rule describes approximately 4,400 lake acres of proposed critical habitat in the Deschutes River basin and 5,900 lake acres in the Malheur River basin, however, the Proposed Rule does not describe the adjacent land ownership.

149. Approximately 65 percent of the lands adjacent to rivers and streams designated for critical habitat for the bull trout are under Federal management. Likewise, a significant percentage of the lands adjacent to critical habitat lakes and reservoirs (40 percent) are under Federal management. Percentage of each critical habitat and total area managed by each Federal land management agency are shown in Exhibit 2.3

Exhibit 2.3

Management of Federal Lands within Bull Trout Critical Habitat Units

Unit #	Unit Name	U.S. Forest Service	Bureau of Land Management	National Park Service	Other Federal Agency
1	Klamath River Basin	92.2%	0.5%	5.8%	1.5%
2	Clark Fork River Basin	90.5%	1.9%	7.3%	0.4%
3	Kootenai River Basin	99.0%	0.3%	0.0%	0.7%
4	Willamette River Basin	83.3%	15.9%	0.0%	0.8%
5	Hood River Basin	97.3%	2.5%	0.0%	0.2%
6	Deschutes River Basin	76.8%	23.2%	0.0%	0.0%
7	Odell Lake	100.0%	0.0%	0.0%	0.0%
8	John Day River Basin	78.0%	21.8%	0.2%	0.0%
9	Umatilla-Walla Walla River Basins	94.5%	2.1%	0.0%	3.4%
10	Grande Ronde River Basin	97.7%	2.3%	0.0%	0.0%
11	Imnaha/Snake River Basins	98.3%	1.7%	0.0%	0.0%
12	Hells Canyon Complex	64.3%	35.6%	0.0%	0.0%
13	Malheur River Basin	20.1%	79.4%	0.0%	0.5%
14	Couer d'Alene Lake Basin	93.8%	6.2%	0.0%	0.0%
15	Clearwater River Basin	97.9%	1.3%	0.0%	0.8%
16	Salmon River Basin	85.9%	14.1%	0.0%	0.0%
17	Southwest Idaho River Basins	86.6%	12.0%	0.0%	1.4%
18	Little Lost River Basin	48.2%	48.4%	0.0%	3.3%
19	Lower Columbia River Basin	94.1%	0.3%	5.0%	0.5%
20	Middle Columbia Basin	71.1%	3.8%	0.0%	25.2%
21	Upper Columbia Basin	90.0%	4.4%	4.6%	1.0%
22	Northeast Washington River Basins	91.5%	3.5%	0.8%	4.2%
23	Snake River Basin in Washington	92.4%	7.3%	0.0%	0.4%
	Total Area	**85.1%**	**11.7%**	**1.9%**	**1.2%**

Source: Federal Land Ownership by Bull Trout Recovery Unit in the Columbia River, Klamath River, and St. Mary-Belly Distinct Population Segments. Prepared by USFS, Pacific Region. November 13, 2002.

150. Overall, the USFS manages 85 percent of the Federal lands adjacent to the proposed critical habitat designation. The two primary land management agencies within the Western U.S., the USFS and the BLM together manage nearly 97 percent of the Federal land area adjacent to the proposed critical habitat designation.

Recreational Land Use

151. The proposed critical habitat area provides recreational opportunities of local, national, and international importance. The area offers substantially greater amounts of outdoor recreation opportunities compared to the national average, much of it supplied by Federal lands especially in undeveloped and remote settings.

152. Between 1991 and 1993, an average of 72 million recreational visits per year occurred on USFS and BLM administered lands within the interior Columbia River Basin.[24] The majority of these visits were associated with day use (24.4 percent) and motor viewing (26.1 percent). Camping (9.5 percent), trail use (8.1 percent), winter sports (8.0 percent), and fishing (7.9 percent) were the next most popular activities. In the future, recreation demands for these lands are likely to increase.

Livestock Grazing

153. Livestock grazing has been a major activity in the interior Columbia River Basin since the mid 1800's. Livestock operations are an important part of the agricultural sector within the basin. For the period 1982 to 1992 cattle and calf sales accounted for an average of 29 percent of total agricultural output in the basin. Sales of cattle raised at least in part on USFS or BLM grazing leases accounted for a much smaller portion, an average of 2 percent of total agricultural sales in the basin.

154. In 1994, the Departments of Interior and Agriculture projected that the number of cattle grazing on public lands would decline by about one percent per year over the following 20 years. This decline could result from reductions in stocking rates on Federal grazing allotments in an effort to reduce or reverse resource damage, a declining economic feasibility of livestock grazing, as well as the implementation of recovery plans for Federally listed species.

155. Grazing fees for most western public lands administered by the BLM and USFS were $1.43 per animal unit month[25] (AUM) in 2002. The grazing fee cannot fall below $1.35 per AUM according to the 1978 Public Rangeland Improvement Act.

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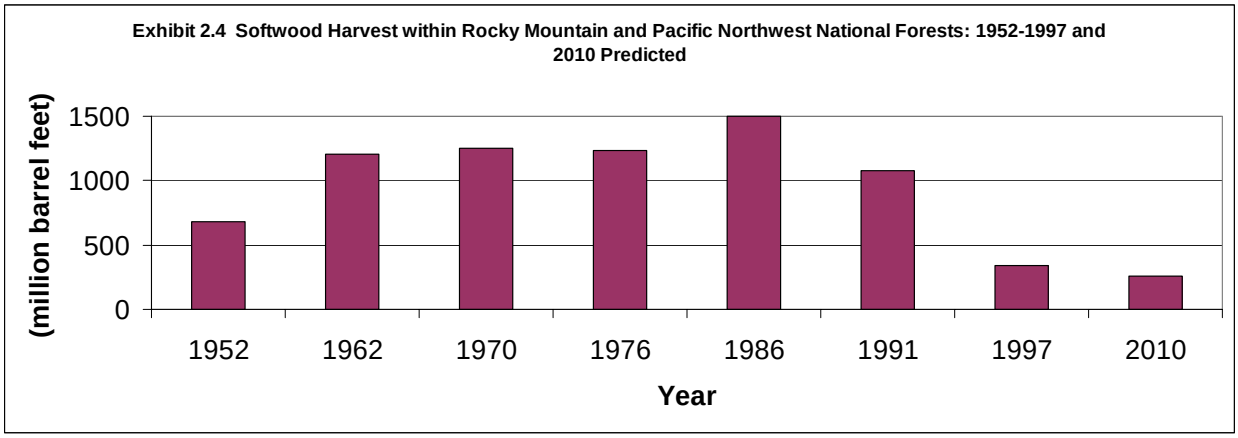
[24] ICBEMP p. 175.

[25] AUM is animal unit month and is used to calculate total annual pasture rent by multiplying the number of animal units by the number of months and the per month rate. A 1,000 pound beef cow/calf pair is one animal unit, a mature ram is 0.25 animal units. North Dakota State University Extension Service, http://www.ext.nodak.edu/extpubs/plantsci/hay/r1092w.htm, viewed January 10, 2003.

Commercial Timber Harvest

156. The historical and projected levels of timber harvest in the Pacific Northwest are summarized in Exhibits 2.4 and 2.5. National Forest timber harvests peaked in the late 1980's in the Pacific Northwest and have declined by over 75 percent in the space of ten years. They are projected to be at even lower levels over the next ten years. The single most important factor driving this change was the conflict over harvest of old growth forests in Oregon and Washington that provided habitat for the northern spotted owl and other species, including salmon and steelhead. This conflict was resolved by the Northwest Forest Plan in 1994 that led to a very large planned reduction in harvests (about 85 percent) in one of the major timber-growing regions of the U.S., the coastal douglas fir forests.



Source: Richard W. Haynes. 2002. An Analysis of the Timber Situation in the United States: 1952-2050. Draft. U.S. Department of Agriculture (USDA) USFS, Portland, Pacific Northwest Research Station.

Exhibit 2.5

National Forest Softwood Harvest: Historical and Projected Levels

Area	**Harvest (million board feet)**		
	1986	**1997**	**2010**
Pacific NW - West	659	73	46
Pacific NW - East	378	83	66
Rocky Mountain	465	186	147
Total	**1,502**	**342**	**259**

Source: Richard W. Haynes. 2002. An Analysis of the Timber Situation in the United States: 1952-2050. Draft. USDA USFS, Portland, Pacific Northwest Research Station.

157. Additionally, lower demand for timber and competition from imported timber that occurred in the later years of the decade also resulted in less harvest on Federal lands. While Federal lands supplied approximately 60 percent of all timber harvests within the Columbia River Basin over the past 40 years, that proportion is expected to decline to about 35 percent over the next 30 to 40 years.[26]

Dams and Hydroelectric Projects

158. The Pacific Northwest is an area with relatively high precipitation combined with large changes in altitude between the headwaters and the mouth of the Columbia River at Astoria, Oregon. These factors, along with the fact that much precipitation comes in the form of snowpack that is largely released to rivers during spring floods, has led to the development of an extensive system of dams for hydroelectric power, flood control, irrigation, and recreational uses. Dams in the region have been developed by federal agencies including ACOE and BOR, private and public utilities, and private individuals. The BPA manages and markets the power from the FCRPS, a network of large mainstem and tributary dams on the Columbia and Snake Rivers. This is one of the largest hydroelectric power systems in the United States, with a total of 19,600 MW of installed nameplate capacity just in the 30 main Federal dams in the basin. This system, along with the approximately 145 FERC licensed facilities (owned by private or local public utilities) provides 75 percent of the Northwest's power supply. In addition to power projects, there are additional dams operated by both the BOR and ACOE that are primarily for flood control and irrigation. Dams and related facilities, both hydroelectric and multi-purpose, represent the largest single type of capital investment located with the proposed designated bull trout critical habitat.

Agriculture

159. The areas adjacent to proposed critical habitat for the bull trout constitute an abundant agricultural region, producing a large assortment of crops and products, including grains, fruits, vegetables, forage crops, as well as dairy and forest products. The industry employs tens of thousands, providing a vital fiscal foundation for rural areas. There is a large degree of diversity in the topography and associated land uses of adjacent areas. Bull trout habitat within the Pacific Northwest ranges from near rain forest to high desert environments. Within this habitat agriculture in general, and irrigated agriculture in particular play varied roles in land uses and economic importance. Exhibit 2.6 shows the percent of farmland and irrigated farmland contained within the counties associated with each critical habitat unit. Overall, approximately 25 percent of all land is classified as farm land, and approximately 13 percent of all farmland acreage is irrigated. Additionally, about 60 percent of all farms relied on irrigation for some portion of their operation.[27]

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[26]ICBEMP.

[27] Data from U.S. Census of Agriculture, 1997.

160. While overall 25 percent of land within the counties including critical habitat for the bull trout is classified as agricultural land, Exhibit 2.6 shows that there is considerable variation across the counties encompassing critical habitat units. Percent of land in farms ranged from 3.7 percent in Unit 1 (Kootenai River Basin) counties, to 52 percent in Unit 9 (Umatilla-Walla Walla River Basin) counties. Additionally, Exhibit 2.6 shows significant variation in reliance on irrigation for farmland across critical habitat counties. The percent of farmland irrigated ranges from 0.2 percent in Unit 15 (Clearwater River Basin) counties to over 30 percent in counties containing Units 1 and 7 (Klamath River Basin and Odell Lake).

Exhibit 2.6

Importance of Agriculture and Irrigated Agriculture in Counties Encompassing Proposed Critical Habitat Units

Unit #	Unit Name	Percent in Farmland	Percent of Farms with some Irrigation	Percent of Farmland Irrigated
1	Klamath River Basin	16.1%	77.6%	30.6%
2	Clark Fork River Basin	22.4%	51.0%	11.0%
3	Kootenai River Basin	3.7%	22.0%	6.1%
4	Willamette River Basin	14.1%	28.3%	8.7%
5	Hood River Basin	8.5%	92.4%	66.0%
6	Deschutes River Basin	37.8%	74.7%	10.7%
7	Odell Lake	14.6%	81.9%	33.8%
8	John Day River Basin	51.3%	61.7%	6.0%
9	Umatilla-Walla Walla River Basins	52.2%	53.9%	9.7%
10	Grande Ronde River Basin	50.6%	50.3%	7.1%
11	Imnaha/Snake River Basins	26.0%	49.6%	9.5%
12	Hells Canyon Complex	39.6%	63.4%	11.7%
13	Malheur River Basin	26.6%	79.1%	12.4%
14	Couer d'alene Lake Basin	11.6%	18.5%	5.0%
15	Clearwater River Basin	15.5%	8.1%	0.2%
16	Salmon River Basin	10.7%	47.0%	14.1%
17	Southwest Idaho River Basins	22.2%	82.9%	27.5%
18	Little Lost River Basin	6.3%	84.4%	43.6%
19	Lower Columbia River Basin	38.8%	62.7%	12.8%
20	Middle Columbia Basin	47.0%	82.7%	17.2%
21	Upper Columbia Basin	24.9%	83.5%	6.0%
22	Northeast Washington River Basins	16.0%	15.8%	2.2%
23	Snake River Basin in Washington	66.3%	19.0%	0.5%
	Total Area	26.3%	60.4%	12.3%

Source: 1997 Census of Agriculture–County Data.
Notes: The percentages presented show farmland data associated with whole counties or groups of counties which are part of each critical habitat unit. The actual unit waters may in some cases be subsets of these counties with little associated agriculture. The data are presented to provide an illustration of the relative importance of irrigated agriculture in areas contiguous to the critical habitat units.

Mining

161. Exploration and development of hard rock minerals is authorized and regulated by the Mining Law of 1872. Over the past century, mining for gold, silver, and copper (as well as other metals such as zinc, aluminum, tungsten, nickel, chromium, magnesium, and antimony) has provided jobs and income for the Pacific Northwest, as well as for local economies.

162. While the majority of mining activity has occurred in relatively few counties within the region, mining activity is extensive throughout the range of the bull trout and is a significant activity within a number of counties encompassing critical habitat units. Mining includes not only small placer, lode, or gravel operations, but also recreational suction dredging permitted on Federal lands. Mining activity today represents a relatively small and declining portion of the economy of the Columbia River Basin accounting for less than one percent of total employment in the region in 1996.

163. While there are still substantial mineral deposits in the Columbia River Basin, the possibility of future development of these deposits depends on many factors, including the type of mineral, size and grade of the deposit, accessability and cost of extraction, and current demand and prices for the mineral. Most of these factors are not affected by USFS or BLM policies or regulations. The major effect that management agencies might have is on production costs through mitigation requirements for the mining operations on permits.

Federal Lands Road System

164. The road system on Federal lands (primarily USFS and BLM) within the Pacific Northwest supports the bulk of economic activity generated from Federal lands. The inventoried road system on USFS and BLM administered lands within the interior Columbia River Basin includes approximately 91,300 miles of roads. A large proportion of these roads (80 to 85 percent) are designed and maintained to a low standard to serve high-clearance vehicles. The remaining 15 to 20 percent are adequately maintained for passenger vehicle use. These high standard roads support both management and concentrated recreational use. It is estimated that about 30 percent of the low standard roads in the region are closed to public travel all or most of the year.

165. Use of the transportation system in Pacific Northwest national forests changed significantly during the 1990's. In the 1980s, road usage was approximately 70 percent timber harvest, 20 percent recreation, and 10 percent administrative travel. Since the reduction in Federal lands timber sale programs, this use has shifted to 25 percent timber use, 60 percent recreational use, and five percent administrative use.

2.1.3 Employment

166. The economy within the interior Columbia River Basin has undergone substantial changes over the past 30 years. In terms of jobs, the region has grown much faster than the nation as a whole. The total number of jobs in this region has increased even during periods when employment in manufacturing, mining, logging, farming, and ranching was either stagnant, declining, or moving erratically. Employment in service industries has increased substantially, as has the number of households receiving non-labor income such as transfer payments, dividends, interest, or rents. Increases in service sector employment includes increases in recreation and tourism.

167. Exhibit 2.7 shows the distribution of total employment within the counties of the interior Columbia River Basin for 1969, 1992, and 1996. There are apparent shifts in employment over this period. Services, agricultural services, and construction all gained in importance while farm and ranch employment, manufacturing, and Federal government employment declined as a percentage of total employment.

Exhibit 2.7

Distribution of Employment within the Interior Columbia River Basin Counties: 1969, 1992, and 1996

Sector	1969	1992	1996
Total Employment	908,954	1,619,923	1,921,147
Farm and Ranch Employment	13.3%	6.9%	6.6%
Non-farm Employment	86.7%	93.1%	93.4%
Agricultural Services, Forestry, Fisheries	1.0%	2.2%	2.3%
Mining	0.9%	0.6%	0.6%
Construction	4.6%	5.1%	6.1%
Manufacturing	13.2%	10.9%	10.3%
Transportation, Communications and Utilities	4.9%	4.2%	4.0%
Wholesale Trade	4.2%	4.5%	4.2%
Retail Trade	15.6%	17.3%	17.7%
Finance, Insurance, and Real Estate	5.7%	5.6%	5.3%
Services	16.9%	25.4%	26.5%
Federal Government (Civilian)	3.2%	2.3%	1.9%
Military	3.1%	1.6%	1.2%
State and Local Government	12.9%	12.8%	12.3%

Source: ICBEMP Supplemental Draft EIS, Table 2-29.

168. It should be noted that the counties and communities of the Columbia River Basin are very diverse economically. While the overall trend is one of healthy economic growth, some counties (such as the metropolitan counties) have seen tremendous economic growth while other rural counties have been relatively stagnant or shrinking in terms of economic output.

169. Although agricultural employment has declined in importance in the region in recent decades, it is a leading industry in each of the four states containing proposed bull trout critical habitat. In 2001 total farm and ranch sales in the four-state region were over $16 billion. Additionally, while a relatively small percentage of total employment in the region is associated directly with agricultural production, the total of both farm production and farm-related jobs (such as jobs related to farm inputs, processing and marketing of agricultural commodities, and wholesale and retail trade specific to agricultural commodities) is significant across the four states, ranging from 20.6 percent in Montana to 25.8 percent in Washington.[28] Rural counties within these states often have even higher dependence on agricultural employment (and the income that accompanies it) than these state averages suggest.

170. Exhibit 2.7 shows 6.6 percent of total employment within the Interior Columbia River Basin was farm and ranch employment. Exhibit 2.8, below, details how reliance on farm employment varies across the proposed critical habitat units. Economic reliance on farm employment ranged from 1.7 percent within Unit 14 (Couer d'Alene Lake Basin) to 14.9 percent of total employment within the Malheur River Basin (Unit 13). The five Units with the highest relative reliance on farm employment were Malheur River Basin (14.9 percent), Hood River Basin (12.3 percent), Hells Canyon Complex (11.6 percent), Imnaha, Snake River Basins (11.0 percent), and Middle Columbia River Basin (10.4 percent). These critical habitat units also have relatively high dependence on irrigated agriculture on their farmland (Exhibit 2.6, above).

[28] Farm and Farm-Related Employment Data reported at http://www.ers.usda.gov/StateFacts.

Exhibit 2.8 Importance of Farm Employment by Bull Trout Critical Habitat Unit (2001)				
Unit #	**Unit Name**	**Total Employment**	**Farm Employment**	**Percent Farm Employment**
1	Klamath River Basin	37,495	2,802	7.5%
2	Clark Fork River Basin	292,674	7,597	2.6%
3	Kootenai River Basin	13,784	692	5.0%
4	Willamette River Basin	238,698	6,479	2.7%
5	Hood River Basin	13,549	1,667	12.3%
6	Deschutes River Basin	141,457	6,708	4.7%
7	Odell Lake	109,883	3,762	3.4%
8	John Day River Basin	43,744	4,138	9.5%
9	Umatilla-Walla Walla River Basins	92,673	8,723	9.4%
10	Grande Ronde River Basin	69,671	6,177	8.9%
11	Imnaha/Snake River Basins	38,835	4,291	11.0%
12	Hells Canyon Complex	35,503	4,117	11.6%
13	Malheur River Basin	36,282	5,405	14.9%
14	Couer d'Alene Lake Basin	92,739	1,588	1.7%
15	Clearwater River Basin	67,879	2,923	4.3%
16	Salmon River Basin	67,958	3,188	4.7%
17	Southwest Idaho River Basins	347,168	9,718	2.8%
18	Little Lost River Basin	13,845	1,185	8.6%
19	Lower Columbia River Basin	337,397	20,016	5.9%
20	Middle Columbia Basin	224,324	23,353	10.4%
21	Upper Columbia Basin	69,883	6,030	8.6%
22	Northeast Washington River Basins	24,112	906	3.8%
23	Snake River Basin in Washington	11,609	1,008	8.7%
Source: 2001 Bureau of Economic Analysis Regional Economic Information System Data.				

Employment Associated with Federal Lands

171. Direct employment generated from USFS or BLM administered lands fall mostly into the job categories of manufacturing (such as wood products), agriculture (especially livestock grazing), agricultural services (including forestry services), mining and Federal

employment. Another employment sector affected by Federal agency land use is recreation and tourism.[29]

172. Together, these employment categories are the most likely to be affected as a result of changing Federal land uses. Currently, about 95,000 jobs are associated with livestock grazing, recreation, and timber harvest on Federal lands within the interior Columbia River Basin. It is estimated that recreation accounts for 81 percent of these jobs, timber harvest for nine percent, livestock grazing for one percent and forestry services (silviculture, thinning, and planting) for the remaining eight percent.

2.1.4 Economic and Demographic Characteristics of the 74 Counties Containing Bull Trout Critical Habitat

173. Exhibit 2.9, below, details several demographic and economic characteristics of the 74 counties containing waters proposed as bull trout critical habitat. The counties are divided by state and statewide statistics are provided for comparison.

[29] Recreation and tourism are not formally recognized economic sectors with directly measurable income and employment data. Rather, direct employment related to recreation and tourism is found primarily within various components of the retail trade and services sectors.

Exhibit 2.9

Economic and Demographic Characteristics of Counties Containing Bull Trout Critical Habitat

State / County	Population (2001)	Per capita Income (1999)	Persons / square mile (2000)	% Below Poverty (1999)
State of Idaho	1,321,006	$17,841	15.6	11.8%
Ada	312,337	$22,519	285.2	7.7%
Adams	3,428	$14,908	2.5	15.1%
Benewah	8,995	$15,285	11.8	14.1%
Blaine	19,798	$31,346	7.2	7.8%
Boise	7,011	$18,787	3.5	12.9%
Bonner	34,479	$17,263	21.2	15.5%
Boundary	9,926	$14,636	7.8	15.7%
Butte	2,856	$14,948	1.3	18.2%
Camas	1,002	$19,550	0.9	8.3%
Clearwater	8,544	$15,463	3.6	13.5%
Custer	4,292	$15,783	0.9	14.3%
Elmore	29,157	$16,733	9.5	11.2%
Gem	15,482	$15,340	27.0	13.1%
Idaho	15,423	$14,411	1.8	16.3%
Kootenai	112,297	$18,430	87.3	10.5%
Lemhi	7,606	$16,037	1.7	15.3%
Nez Perce	37,095	$18,544	44.1	12.2%
Shoshone	13,443	$15,934	5.2	16.4%
Valley	7,716	$19,246	2.1	9.3%
Washington	9,956	$15,464	6.9	13.3%
State of Montana	**904,433**	**$17,151**	**6.2**	**14.6%**
Deer Lodge	9,171	$15,580	12.8	15.8%
Flathead	76,269	$18,112	14.6	13.0%
Granite	2,889	$16,636	1.6	16.8%
Lake	26,904	$15,173	17.7	18.7%
Lewis and Clark	56,094	$18,763	16.1	10.9%
Lincoln	18,664	$13,923	5.2	19.2%
Mineral	3,843	$15,166	3.2	15.8%
Missoula	96,303	$17,808	36.9	14.8%
Powell	7,076	$13,816	3.1	12.6%
Ravalli	37,304	$17,935	15.1	13.8%

Exhibit 2.9 Economic and Demographic Characteristics of Counties Containing Bull Trout Critical Habitat				
State / County	**Population (2001)**	**Per capita Income (1999)**	**Persons / square mile (2000)**	**% Below Poverty (1999)**
Sanders	10,443	$14,593	3.7	17.2%
State of Oregon	**3,472,867**	**$20,940**	**35.6**	**11.6%**
Baker	16,743	$15,612	5.5	14.7%
Clatsop	35,586	$19,515	43.1	13.2%
Columbia	44,547	$20,078	66.3	9.1%
Crook	20,062	$16,899	6.4	11.3%
Deschutes	121,949	$21,767	38.2	9.3%
Gilliam	1,851	$17,659	1.6	9.1%
Grant	7,566	$16,794	1.8	13.7%
Harney	7,404	$16,159	0.8	11.8%
Hood River	20,439	$17,877	39.1	14.2%
Jefferson	19,425	$15,675	10.7	14.6%
Klamath	64,116	$16,719	10.7	16.8%
Lake	7,470	$16,136	0.9	16.1%
Lane	324,316	$19,681	70.9	14.4%
Linn	103,974	$17,633	45.0	11.4%
Malheur	31,456	$13,895	3.2	18.6%
Morrow	11,339	$15,802	5.4	14.8%
Multnomah	665,810	$22,606	1,517.6	12.7%
Sherman	1,827	$17,448	2.3	14.6%
Umatilla	70,751	$16,410	21.9	12.7%
Union	24,327	$16,907	12.0	13.8%
Wallowa	7,207	$17,276	2.3	14.0%
Wasco	23,895	$17,195	10.0	12.9%
State of Washington	**5,987,973**	**$22,973**	**88.6**	**10.6%**
Asotin	20,560	$17,748	32.3	15.4%
Benton	146,634	$21,301	83.7	10.3%
Chelan	67,133	$19,273	22.8	12.4%
Clark	360,760	$21,448	549.5	9.1%
Columbia	4,113	$17,374	4.7	12.6%
Cowlitz	93,716	$18,583	81.6	14.0%
Douglas	32,967	$17,148	17.9	14.4%

Exhibit 2.9 Economic and Demographic Characteristics of Counties Containing Bull Trout Critical Habitat				
State / County	**Population (2001)**	**Per capita Income (1999)**	**Persons / square mile (2000)**	**% Below Poverty (1999)**
Frankin	51,015	$15,459	39.7	19.2%
Garfield	2,342	$16,992	3.4	14.2%
Grant	76,221	$15,037	27.9	17.4%
Kittias	33,875	$18,928	14.5	19.6%
Klickitat	19,339	$16,502	10.2	17.0%
Okanogan	39,543	$14,900	7.5	21.3%
Pacific	20,844	$17,322	22.5	14.4%
Pend Oreille	11,965	$15,731	8.4	18.1%
Skamania	10,027	$18,002	6.0	13.1%
Stevens	40,641	$15,895	16.2	15.9%
Wahkiakum	3,787	$19,063	14.5	8.1%
Walla Walla	55,519	$16,509	43.4	15.1%
Whitman	39,879	$15,298	18.9	25.6%
Yakima	223,886	$15,606	51.8	19.7%
Source: U.S. Census Bureau, http://quickfacts.census.gov/qfd/, viewed January 10, 2003.				

2.1.5. Tribes of the Columbia and Klamath Basins

174. Watersheds managed by Tribes of the Columbia Basin are potentially important in the protection and recovery of bull trout populations. Prior to the establishment of reservations, the economies of all the Tribes in this region depended in part on fishing. Many tribal entrepreneurs currently depend on fishing for their livelihood. Accordingly, fisheries have been and tend to remain important to the Tribes.

175. The various reservations managed by the thirteen Tribes of the Columbia Basin vary widely in area and population (Exhibit 2.10). Based upon area alone, some Tribes are more likely to be involved in consultations than others. Thus it is not surprising that the single section 7 consultation with the BIA involved the Yakama Nation (Exhibit 3.1), a Tribe which manages the second largest reservation. However, not all Tribes manage land included in the proposed designated habitat. Exhibit 2.11 lists nine Tribes with land included in the critical habitat designation and the affected waters of each reservation.

Exhibit 2.10

Tribes in the Columbia Basin

Tribe	Reservation Size (acres)	Enrolled Tribal Population	Tribal Employment[1]	Tribal HQ, Fish and Wildlife
Burns Paiute Tribe	770	3,000	296[2]	Burns, OR
Coeur d'Alene Tribe	345,000	1,700	1,040	Plummer, ID
Confederated Salish and Kootenai Tribes of the Flathead Reservation	1,300,000	6,900	1,200	Pablo, MT
Confederated Tribes of the Colville Reservation	1,414,133	8,400		
Confederated Tribes of the Umatilla Indian Reservation	180,441	2,174	951	Pendleton, OR
Confederated Tribes of the Warm Springs Indian Reservation of Oregon	650,000	3,916	1,052	Warm Springs, OR
Kalispel Tribe	4,600	280	70	USK, WA
Kootenai Tribe of Idaho	12.5	67[3]		Bonners Ferry, ID
Nez Perce Tribe	770,453	3,200	822	Lapwai, ID
Shoshone-Bannock Tribes of the Fort Hall Reservation	544,000	4,291	592	
Shoshone-Paiute Tribes of the Duck Valley Reservation	289,820	1,818	240[2]	Owyhee, NV
Spokane Tribe of Indians	157,370			Wellpinit, WA
Yakama Nation	1,390,000	9,092	1,385[2]	Toppenish, WA

[1] Government and Tribal Enterprise. [2] Estimate is just for government employment. [3] As of 1974.
Source: NWPPC 2002. Columbia Basin Tribes. Portland, Oregon.

Exhibit 2.11 Waters Proposed for Critical Habitat in the Columbia Basin and Tribes Owning Associated Surrounding Land	
Tribe	**Waters Within the Reservation**
Confederated Tribes of the Warm Springs Indian Reservation of Oregon	Deschutes River, Warm Springs River, Metolius River
Yakama Nation	Klickitat River, South Fork Ahtanum Creek
Coeur d'Alene Tribe	Lake Coeur d'Alene, St. Joe River, Coeur d'Alene River
Kalispel Tribe	Pend Oreille River, Mouth of Kalispel Creek
Nez Perce Tribe	Clearwater River (mainstem, north fork, middle fork and south fork), Lolo Creek, Clear Creek, Dworshak Reservoir
Confederated Tribes of the Umatilla Reservation	Umatilla River, Squaw Creek, Meacham Creek
Kootenai Tribe of Idaho	Kootenai River
Confederated Tribes of the Colville Reservation	Columbia River
Confederated Salish and Kootenai Tribe of the Flathead Reservation	Waters in and around Flathead Lake
Sources: Proposed Designation of Critical Habitat for the Klamath River and Columbia River Distinct Population Segments of Bull Trout, 2002 (50 FR Part 17); Personal communication, Robert Mattm Coeur d'Alene Tribe; Personal communication, Joe Maroney, Kalispel Tribe; Personal communication, Craig Contor, Confederated Tribes of the Umatilla Indian Reservation; Personal communication, Service personnel, Spokane, Washington.	

176. The Klamath Tribes were recognized by the Federal government and managed 1.8 million acres up until 1954.[30] In 1954, Congress terminated tribal recognition as part of a program of tribal assimilation. The Klamath Tribes fought this ruling and finally regained recognition in 1986. However, no lands were returned to the Tribes so they have no reservation. There are currently 3,000 enrolled members of the Klamath Tribes.

Economic Activities of the Columbia Basin Tribes

177. As with any governing body, tribal governments oversee various enterprises. The thirteen Tribes of the Columbia Basin share a number of enterprises in common. Gaming is the most common enterprise with 11 Tribes (85 percent) sponsoring various casinos. Agriculture and forestry-related enterprises are run by nine Tribes (69 percent) and seven Tribes (54 percent) respectively. The remaining enterprises managed by more than one Tribe in the basin are small businesses (e.g., gas stations, grocery stores, etc.; five Tribes),

[30] Klamath Tribes, "Klamath Tribes History", http://www.klamathtribes.org/history.html, viewed February 28, 2003.

outdoor recreation (e.g., fishing, camping, etc.; five Tribes), ranching (three Tribes), and mining (two Tribes).

178. Tribal entrepreneurs in the private sector also tend to share similar occupations. Most Tribes contain individuals running businesses in the sectors of agriculture, construction, fishing, timber, and small business.

2.2 Baseline Elements

179. "Baseline elements" consist of regulations, guidelines, and/or policies that may afford protection for bull trout in the absence of section 7 implementation. Baseline protections for bull trout include Federal and State laws, as well as voluntary environmental programs that provide protection to bull trout in the absence of the protection afforded by the listing and any anticipated additional protection afforded by the proposed critical habitat designation. To the extent that the existing regulations pertaining to a given Action agency/activity are already protective of fisheries or aquatic habitat, the effect of section 7 could be reduced. Conversely, for relatively unregulated activities, effects on Action agencies/activities may be more significant.

180. The following regulations provide environmental protection in the proposed critical habitat areas. Many of these regulations specifically address the maintenance or improvement of water quality. Because bull trout is an aquatic species, it benefits from these protections. Provided these regulations are properly implemented and effective, the presence of bull trout critical habitat would not be expected to result in significant additional costs.

2.2.1 Recovery Plan

181. An important component of the regulatory baseline is the Agency Draft Recovery Plan for bull trout published in November 2002, concurrently with the Proposed Designation of Critical Habitat for the trout.[31] The Recovery Plan establishes recovery criteria for the trout and proposes actions to restore viable trout populations. The ultimate goal of the Recovery Plan is to establish criteria and objectives that when implemented should enable the species to recover to the point that it can be removed from the Federal list of endangered and threatened wildlife and plants. While the Recovery Plan imposes no binding restrictions or obligations on landowners and managers, it serves as an important information source regarding habitat characteristics and bull trout populations.

[31] U.S. Fish and Wildlife Service, *Proposed Designation of Critical Habitat for the Klamath River and Columbia River Distinct Population Segments of Bull Trout and Notice of Availability of the Draft Recovery Plan*, published on November 29, 2002 (67 FR 71236).

2.2.2 Overlap with Other Listed Species

182. Generally, if a consultation is triggered for any listed species, the consultation process will also take into account all other listed species known or thought to occupy areas on or near the project lands. The Service has conducted consultations on the bull trout in combination with numerous species, as indicated in Exhibit 2.12. As such, listing or critical habitat-related protections for other threatened or endangered species may benefit the bull trout as well (i.e., provide baseline protection). In some cases, this analysis apportions forecasted costs between the bull trout and other listed species. These apportions are specific to the activity in question.

Exhibit 2.12

Other Listed Species Included in Past Service Consultations on the Bull Trout

AQUATIC SPECIES	TERRESTRIAL SPECIES
Lahontan cutthroat trout	Canada lynx
Spotted frog	Gray wolf
Coastal cutthroat trout	Grizzly bear
Lost River sucker	Columbian white-tailed deer
Shortnose sucker	Woodland caribou
Warner sucker	
Kootenai River white sturgeon	PLANT SPECIES
Chinook salmon*	Ute ladies'-tresses
Snake River snails	Wenatchee Mountains checkermallow
Bruneau hot springsnail	Bradshaw's lomatium
Idaho springsnail	Kincaid's lupine
Bliss Rapids snail	Water howellia
Utah valvata	MacFarlane's four o'clock
Snake River physa	
Banbury Springs lanx	BIRD SPECIES
	Bald eagle
	Northern spotted owl
	American peregrine falcon
	Whooping crane

Source: Proposed designation (November 29, 2002) documents.
* Chinook salmon is an anadromous species which was included in a joint consultation between the Service and NOAA Fisheries.

183. A large number of listed species have been included in past section 7 bull trout consultations. On a number of timber sales, for example, it was found that standards in place for grizzly bear dominated the environmental aspects of a given sale. Additionally, in Northern Idaho the needs of the Kootenai River White Sturgeon have been important in developing standards for releases of water from Libby Dam. The most important species in terms of potentially impacting projects or development along bull trout critical habitat streams or lakes are the anadromous salmon. Appendix C details the overlap of habitat for

threatened or endangered salmonids and proposed critical habitat for bull trout.[32] Overall, 61 percent of the total stream miles proposed as critical habitat are also classified as salmon habitat. A much smaller share of reservoir and lake bull trout critical habitat (four percent) is also salmon habitat.

184. Many dams within bull trout critical habitat are on rivers that contain listed anadromous species. This analysis finds some evidence that where bull trout and salmon co-exist, the concern for salmon or steelhead will often drive the agenda of project modification efforts. This is due to several factors:

1) In many cases salmon or steelhead stocks were listed prior to bull trout, and planning has already proceeded to remedy fishery-related impacts for salmon, which will also be protective of bull trout;

2) In most cases salmon and steelhead stocks have the potential for high population numbers, far in excess of the likely density of bull trout (e.g., passage facilities for salmon may also serve bull trout and may be far in excess of the capacity that would be required for just bull trout)[33];

3) There is considerable evidence that salmon and steelhead are more highly valued species in the region (relative to bull trout), and resource allocation decisions reflect this priority;

4) Based on the relative number of distinct population segments for salmon and steelhead relative to bull trout, the likelihood of a jeopardy finding on a given project or set of projects is relatively higher for the anadromous stocks; and

5) Some salmon stocks are listed as endangered and endangered species are given preference over threatened species.

[32] As NOAA Fisheries had not yet mapped their proposed critical habitat, this habitat (as shown in Appendix C) is a mapping of the Evolutionarily Significant Units or "ESUs" in the region of proposed bull trout habitat. An ESU is a distinctive group of Pacific salmon, steelhead, or sea-run cutthroat trout.

[33] Salmon do not outnumber bull trout everywhere. Bull trout are more abundant in some streams, including those beyond the limits of salmon distribution.

How Protective Measures for Salmon are Incorporated into this Analysis

Consideration of the regulatory baseline is particularly pertinent in the context of estimating economic costs attributable to section 7 for bull trout. Many protective measures have been and continue to be undertaken to benefit anadromous species, including salmon and steelhead, in the Columbia and Klamath River Basins. For example, through the Pacific Northwest Power Planning and Conservation Act a cumulative $6 billion has been spent since 1978, primarily for salmon restoration, to mitigate the impacts of the Federal Columbia River Power System. Salmon and steelhead have many of the same habitat requirements as bull trout, including clean water and the absence of migration barriers. In addition, these species habitats overlap with over 60 percent of the proposed bull trout designation (expressed in terms of river miles). Accordingly, the cost estimates developed in this report reflect various allocations made for projects benefitting more than one listed species. Since these allocations are important to the analysis, the table below describes how forecasted costs were allocated among bull trout and other listed species.

In addition, existing regulations such as the Federal Power Act (FPA), the Wilderness Act of 1964, and various fisheries management directives (Northwest Forest Plan, INFISH and PACFISH) provide protections that could contribute to the recovery of bull trout and improve habitat and water quality throughout the proposed designation. Thus, the costs of this designation is limited by the extent to which existing regulations already impose requirements on land use and resource management within the proposed designation.

ALLOCATION OF ESTIMATED FUTURE PROJECT MODIFICATION COSTS

Agency / Project	Allocation
ACOE - Upper Willamette River Dams and Reservoirs	NOAA Fisheries and the Service are currently consulting on salmon, steelhead and bull trout in this proposed area. No clear allocation of costs can be made between these species, as most of the projects modifications would be sought under both the NOAA and Service consultations. Therefore, one-third of estimated costs are allocated to each species. This is likely to overstate the cost of bull trout conservation rather than understate it, since the primary driving force behind these project modifications is the salmon.
BOR - Yakima River System Dams and Reservoirs	NOAA and the Service are currently consulting on the Yakima River project's impacts on steelhead and bull trout. As in the Upper Willamette River Basin, there is no clear basis for allocating between the two species, therefore, half of estimated costs are allocated to bull trout.
BPA - Federal Columbia River Power System	While there is extensive discussion of the relative magnitude of potential bull trout versus salmon mitigation actions, because of the relatively modest project modification costs (up to $400,000 associated with fishery studies) there is no allocation of costs to salmon.
FERC - re-licensing hydroelectric facilities	The estimation of section 7 bull trout costs associated with FERC re-licensing includes allocation of mitigation costs for specific dams to salmon, as well as to other aquatic species. As a result, a little more than 40 percent of total fishery-related costs are allocated to bull trout, and five percent specifically to bull trout section 7 consultation.
USFS Activities	While certain costs in the sample of timber consultations were allocated to other listed species (e.g. grizzlies and cutthroat trout), there is no allocation of costs to anadromous species.

2.2.3 Federal and State Statutes and Regulations

185. This section provides relevant information about the regulatory elements that exist in the baseline. Where proposed activities directly affect proposed critical habitat areas, these Federal and state regulations may provide a level of protection to the species even in the absence of section 7. Furthermore, these regulations may influence development and/or affect the section 7 consultation process.

186. The major baseline regulatory elements potentially relevant to this analysis are described below. As the following discussion shows, several Federal regulatory requirements could provide the bull trout with some measure of protection absent section 7 consultation.

Federal Power Act (Section 18)

187. The FPA was promulgated in 1920.[34] The purpose of the FPA was to establish a regulatory agency, the Federal Power Commission (FPC), for non-Federal hydro power generation and to require non-Federal hydro power owners/operators to obtain a license for the operation of the facility. Over the years, the FPC took responsibility for additional national regulatory issues and evolved into FERC, an independent Federal agency governing approximately 2,500 licenses for non-Federal hydro power facilities.[35] In 1986 the FPA was amended to, among other things, require FERC to give equal consideration to fish and wildlife concerns affected by hydro power facilities during the re-licensing process.

188. Specifically, section 10(j) of the FPA was promulgated to ensure that FERC considers both power and non-power resources during the licensing process. As such, section 10(j) instructs FERC to actively solicit input regarding "adequate and equitable" fish and wildlife measures from Federal and State resource agencies.[36] FERC must consider these recommendations during the licensing process but does not have to incorporate the recommendations into the license if they "may be inconsistent with the purposes and requirements of the FPA" or if the recommendations are not supported by substantial evidence.

189. Furthermore, section 18 of the FPA provides that FERC require facility owners/operators to construct, maintain, and operate fishways, at their own expense.[37]

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[34] Federal Power Act 16 U.S.C. §800 (1986).

[35] Federal Power Act Summary, American Rivers Organization, http://www.amrivers.org/hydropowertoolkit/hydroreformtoolkitlawsfpa.htm

[36] Federal Power Act, 16 U.S.C. §803(j) (1986).

[37] A "fishway" is a structure constructed at a dam that allows for fish species to pass over the dam without harm or injury. A variety of ways exist to establish a fishway, ranging from a step and pull system (fish swim along a slope with notches that act like stairs) to an elevator (fish swim into a large box that is lifted over the dam where the fish are

Fishways may be required if operation of the facility will impact the passage of fish species in the project area or planned for introduction in the area.[38] Many parties regard section 18 as a much more powerful basis for achieving fish passage at FERC-licensed facilities than section 7 of the Act.[39] There is, however, uncertainty in predicting where fishways might be required. At some dams/diversions it might be judged biologically unnecessary, at others it might be judged biologically necessary but not physically/practically feasible, and at others it might be judged both biologically necessary and feasible. There is also no predicting this in the absence of a project-specific analysis. Also, a fishway at one project could be a ladder, and at another project a potentially much less costly trap-and-haul operation (see the case studies of formal consultations of FERC re-licensing as discussed below).[40] The FPA is an important element in the regulatory baseline for bull trout critical habitat and analysis, because it provides a regulatory baseline for one of the more expensive of possible modifications for fisheries at FERC dams (fish passage). However, alterations of operations affecting timing, amount and duration of water released may be even more costly than fish passage in terms of lost generation capacity and foregone revenue over the life of a 30 to 50 year license.

PACFISH, INFISH and the Northwest Forest Plan

190. The USFS and the BLM presently manage anadromous and resident fish habitat within the Columbia River Basin under direction known as PACFISH (1995) and INFISH (1995) and their related BOs.[41] Federal aquatic habitat protection within the Columbia River drainage in western Oregon and Washington is guided by the Northwest Forest Plan 1994.

191. The goals of the PACFISH, INFISH and the Northwest Forest Plan are to:

- Establish watershed and riparian goals to maintain or restore fish habitat;
- Establish aquatic and riparian habitat management objectives;
- Delineate riparian management areas;

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released). According to Section 1701(b) of the Energy Policy Act of 1992, "[T]he item which may constitute a 'fishway' under section 18 for the safe and timely upstream and downstream passage of fish shall be limited to physical structures, facilities, or devices necessary to maintain all life stages of such fish, and project operations and measures related to such structures, facilities, or devices which are necessary to ensure the effectiveness of such structures, facilities, or devices for such fish."

[38] Federal Power Act, 16 U.S.C. §811 (1986).

[39] For example, personal communication, Service Hydro-licensing Coordinator, Portland, December 19, 2002.

[40] Personal communication, Service personnel, October 10, 2003

[41] These BOs were issued by the Service and NMFS.

- Provide specific standards and guidelines for management activities (timber harvesting, grazing, fire suppression, and mining) in riparian areas;

- Provide a system of key watersheds to protect and restore important fish habitats;

- Call for watershed analyses and subbasin reviews to set priorities and provide guidance on priorities for watershed restoration; and

- Provide general guidance on implementation and effectiveness monitoring. It is the objective of the USFS and the BLM to manage and maintain habitat, and where feasible restore habitats that are degraded.

192. PACFISH, INFISH and the Northwest Forest Plan provide for the protection of areas that could contribute to the recovery of fish and improve riparian habitat and water quality throughout the basin. These objectives are accomplished through such activities as closing and rehabilitating roads, replacing culverts, changing grazing and logging practices, and re-planting native vegetation along streams and rivers. The USFS and the BLM also provide funds and technical expertise for restoration projects on private lands. Field offices work with local watershed councils and groups to plan and carry out priority restoration projects on both Federal and non- Federal lands.

193. In general, where the Northwest Forest Plan, INFISH and PACFISH lands overlap with proposed designated critical habitat for bull trout, the objectives for protection of aquatic habitat are high. PACFISH, INFISH, and Federal Land Policy and Management Act (FLPMA) strategies are important regulations that, through the protective measures for fisheries and aquatic health, have significant impacts on the design of timber sales and the administration of grazing leases, among other activities, in bull trout critical habitat areas.

Background on the Northwest Forest Plan

194. An important aspect of the Northwest Forest Plan is the Aquatic Conservation Strategy, which provides for fishery habitat protection and restoration within the range of the northern spotted owl. Several important elements of this strategy are Riparian Reserves and the designation of Key Watersheds. Riparian Reserves are buffer areas along water bodies that are created to protect aquatic habitat from the impacts of management activities. The width of the buffer varies with the class of stream or water.[42] Key watersheds are designated based on importance to specific fish stocks, including salmon and resident fish, such as bull trout, or streams or waters that are of high quality.

[42] For example, for fish-bearing streams, the buffer should typically be equal to two site-potential tree heights or 300 feet slope distance, whichever is greater. The purpose of the buffers is to maintain existing vegetation which serves to filter sediments and nutrient flows, maintains shade and therefore lower water temperatures, provides large woody debris for complex habitat in the stream, and provides for channel stability through root structure, among other beneficial effects.

Background on INFISH and PACFISH

195. The Northwest Forest Plan resolved conservation planning issues primarily west of the Cascade crest in Oregon and Washington. However, there were concerns over forest and range management impacts on fisheries throughout the region. The USFS and BLM chose to pursue a long range planning effort for the remainder of the Columbia River basin through the initiation of the Interior Columbia Basin Ecosystem Management Project (ICBEMP), which was expected to be completed in the late 1990's. In the interim, the agencies adopted two measures to conserve fisheries east of the Cascades. One of these was aimed at protecting anadromous fish (the PACFISH strategy) and the other at resident fish, particularly bull trout (the INFISH or Inland Native Fish Strategy).[43]

196. The approach to protecting fishery habitat in the PACFISH and INFISH strategies drew heavily on the Aquatic Conservation Strategy adopted in the Northwest Forest Plan. The key elements of a buffer zone around streams and other waters (called the Riparian Habitat Conservation Area (RHCA) in PACFISH, for example) and of designating the most important streams to protect (at least initially called Key Watersheds in PACFISH and Priority Watersheds in INFISH) is present in both the interim strategies. Importantly, the 300 foot buffer width (each direction from a stream or 600 foot total) through common practice became the default guidance in all three strategies. This standard is a substantial change from BMPs that previously applied.[44] The PACFISH and INFISH strategies were amended to the relevant forest plans in the mid-1990's and are now part of the regulations that guide land management activities such as timber management. Because the ICBEMP process did not lead to a final record of decision (ROD) and apparently will not be pursued further, the interim strategies are now permanent parts of the forest plans, with authority through the National Forest Management Act (NFMA).

197. Exhibit 2.13 lists the bull trout priority watersheds (PWS) defined under the terms of INFISH. There is broad overlap between the designated PWS for bull trout under INFISH and the proposed critical habitat for the species, indicating the broad regulatory awareness of bull trout and its habitat needs on interior Columbia Basin lands. A comparison of this list with the bull trout critical habitat units shows a very large degree of overlap. The extent of the overlap is not surprising since the presence of bull trout is the primary basis for the identification of PWS under INFISH.

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[43] Because bull trout are an indicator species with more demanding needs with regard to many habitat features, such as connectivity, habitat complexity, sedimentation levels and water temperature, the management direction package for INFISH was made to be more specific to inland native fish (compared to PACFISH), particularly bull trout.

[44] For example, the previous limiting standard for stream protection under Montana BMPs was a 50 foot buffer, which also had less stringent standards in terms of what activities could actually occur within the buffer.

Exhibit 2.13 River and Stream Basins Listed as U.S. Forest Service Priority Watersheds for Bull Trout under INFISH		
River or Stream Basin	**Number of Hydrologic Unit Code (HUC-6) Sections**	**Total Priority Watershed Acres in Basin**
Bitterroot	43	852,264
Blackfoot	56	914,040
Boise-Mores Creek	2	26,194
Brownlee Reservoir	8	145,791
Coeur d'Alene Lake	1	7,660
Fisher	9	143,816
Flint-Rock Creek	37	668,912
Little Lost	9	189,035
Lower Clark Fork	35	536,962
Lower Crooked	1	20,510
Lower Kootenai	2	35,831
Lower North Fork Clearwater	11	190,519
Middle Clark Fork	40	776,651
Middle Fork Flathead	14	245,870
Middle Fork Payette	3	58,317
Moyie	1	19,521
North and Middle Fork Boise	22	381,285
North Fork Flathead	16	216,960
North Fork Payette	5	100,078
Payette	6	80,309
Pend Oreille	14	212,265
Pend Oreille Lake	7	91,430
Powder	7	242,164
Priest	7	95,135
South Fork Boise	18	285,901
South Fork Flathead	42	596,264
South Fork Payette	17	369,421
Sprague	8	189,035
St. Joe	16	261,931
Stillwater	4	68,695
Swan	11	180,881
Upper Clark Fork	40	833,236

Exhibit 2.13 River and Stream Basins Listed as U.S. Forest Service Priority Watersheds for Bull Trout under INFISH		
River or Stream Basin	**Number of Hydrologic Unit Code (HUC-6) Sections**	**Total Priority Watershed Acres in Basin**
Upper Coeur d'Alene	14	158,888
Upper Deschutes	5	115,892
Upper Kootenai	40	686,953
Upper Malheur	9	140,602
Upper North Fork Clearwater	42	653,349
Totals	**622**	**10,792,567**
Source: Scott C Woltering, USFS, Region 6. Email communication, January 14, 2003		

Clean Water Act

198. The purpose of the CWA is to restore the physical, biological, and chemical integrity of the waters of the United States using two basic mechanisms: (1) direct regulation of discharges pursuant to permits issued under the National Pollution Discharge Elimination System (NPDES) and section 404 (discharge of dredge or fill materials); and (2) the Title III water quality program.[45]

199. Under the NPDES program, EPA sets pollutant-specific limits on the point source discharges for major industries and provides permits to individual point sources that apply these limits. EPA has delegated responsibility for the NPDES permitting program to most States.[46] State-issued NPDES permits are treated as non-Federal actions. As such, the issuance of NPDES permits by States are not subject to the consultation requirements of the Act. The Service consults with the EPA on the triennial review to ensure that threatened and endangered species impacts are contemplated in the development of standards.

200. Under the water quality standards program, EPA has issued water quality criteria to establish limits on the ambient concentration of pollutants in surface waters that will still protect the health of the water body. States issue water quality standards that reflect the Federal water quality criteria and submit the standards to EPA for review. State water quality standards are subject to review every three years (triennial review). States apply the standards to NPDES discharge permits to ensure that discharges do not violate the water quality standards.[47]

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[45] Clean Water Act, 33 U.S.C. §1251 (1987).

[46] Clean Water Act, 33 U.S.C. §402.

[47] Clean Water Act, 33 U.S.C. §303, 305.

201. Under section 401 of the CWA, all applicants for a Federal license or permit to conduct activity that may result in discharge to navigable waters are required to submit a State certification to the licensing or permitting agency. Section 404 of the CWA prescribes a permit program for the discharge of dredged or fill material into navigable waters. Specifically, pursuant to section 404, permit applicants are required to show that they have "taken steps to avoid wetland impacts, where practicable, minimized potential impacts to wetlands, and provided compensation for any remaining, unavoidable impacts through activities to restore or recreate wetlands."[48]

202. The CWA will influence activities on nearly all of the proposed bull trout critical habitat units, because these activities (e.g., road/bridge construction and hydro power re-licensing) will require NPDES or section 404 permits and occur on or near all units. Because water quality is important to the recovery of bull trout, this statute will likely impact the extent, location, and nature of future activities on or near the proposed critical habitat units over the next ten years. As such, the CWA is likely to provide substantial baseline protection to bull trout.

Fish and Wildlife Coordination Act[49]

203. The 1934 Fish and Wildlife Coordination Act authorizes the Secretaries of Agriculture and Commerce to provide assistance to and cooperate with Federal and State agencies to protect, rear, stock, and increase the supply of game and fur-bearing animals, as well as to study the effects of domestic sewage, trade wastes, and other polluting substances on wildlife.

204. The Fish and Wildlife Coordination Act also directs the Bureau of Fisheries to use impounded waters for fish-culture stations and migratory-bird resting and nesting areas and requires consultation with the Bureau of Fisheries prior to the construction of any new dams to provide for fish migration. In addition, this Act authorizes the preparation of plans to protect wildlife resources, the completion of wildlife surveys on public lands, and the acceptance by the Federal agencies of funds or lands for related purposes provided that the State in which the land donations are located provides its consent.

205. The amendments enacted in 1946 require consultation with the Service and the fish and wildlife agencies of States where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified" by any agency under a Federal permit or license. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources."

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[48] Section 404 of the Clean Water Act: An Overview, http://www.epa.gov/owow/wetlands/facts/fact10.html

[49] An overview of the Fish and Wildlife Coordination Act http://laws.fws.gov/lawsdigest/fwcoord.html

Federal Land Policy and Management Act of 1976[50]

206. The FLPMA constitutes the organic act for the BLM and governs most uses of the Federal public lands, including grazing. The FLPMA requires the Bureau to execute its management powers under a land use planning process that is based on multiple use and sustained yield principles. The FLPMA also provides for public land sales, withdrawals, acquisitions and exchanges.

207. Congress declared it is the policy of the U.S. that: public lands be retained in Federal ownership; public lands and their resources be periodically inventoried and their use coordinated with other Federal and State planning; the Secretary of the Interior establish rules for administering public lands and adjudicating disputes; public lands management be based generally on multiple use and sustained yield; public lands be managed to protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values; public lands be managed to preserve and protect certain lands in their natural condition, to provide food and habitat for fish, wildlife and domestic animals and to provide outdoor recreation and human use; the U.S. receive fair market value for the use of public lands and their resources unless otherwise provided by statute; uniform procedures for the disposal, acquisition and exchange of public land be established by statute; regulations and plans for protection of public lands of critical environmental concern be promptly developed; public lands be managed in a manner that recognizes the nation's need for domestic sources of minerals, food, timber and fiber; the Federal government should compensate state and local governments for burdens created as a result of the immunity of Federal lands from state and local taxation.[51]

National Forest Management Act of 1976[52]

208. The NFMA reorganized, expanded and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on national forest lands. The NFMA requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the National Forest System. It is the primary statute governing the administration of national forests**.**

209. The NFMA requires the Secretary to promulgate an extensive list of regulations regarding the development and revision of management plans. Several of these required regulations address wildlife resources and environmental protection. For example, the Secretary must specify procedures to ensure management plans are in accordance with the National Environmental Policy Act of 1969 (NEPA). Also, the Secretary must specify

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[50] 3 U.S.C. §§ 1701-1782, October 21, 1976, as amended 1978, 1984, 1986, 1988, 1990-1992, 1994 and 1996.

[51] 3 U.S.C. § 1701.

[52] 6 U.S.C. §§ 1600-1614, August 17, 1974, as amended 1976, 1978, 1980, 1981, 1983, 1985, 1988 and 1990.

guidelines for developing management plans that: ensure consideration of both economic and environmental factors; provide for wildlife and fish; provide for the diversity of plant and animal communities; ensure timber harvesting will occur only where water quality and fish habitat are adequately protected from serious detriment; ensure clearcutting and other harvesting will occur only where it may be done in a manner consistent with the protection of soil, watersheds, fish, wildlife, recreation, aesthetic resources and regeneration of the timber resource.

210. The Secretary of Agriculture must assure that the development and administration of National Forest System renewable resources are in full accord with the Multiple-Use Sustained-Yield Act of 1960. Congress set the year 2000 as the target year for when all backlogs of reforestation treatments must be reduced to a current basis and the major portion of multiple-use, sustained-yield management procedures must be operating on an environmentally sound basis.

Wilderness Act

211. Through the Wilderness Act of 1964 Congress created the National Wilderness Preservation System from lands already administered by the Federal government. The stated purpose of the Wilderness Act is to "secure for the American people of present and future generations the benefits of an enduring resource of wilderness." Within the Wilderness Act, wilderness is defined as "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor and does not remain."

212. A substantial amount of proposed bull trout critical habitat is located within designated USFS wilderness. Approximately 24 percent of all proposed designated critical habitat bull trout streams within USFS lands are also within designated wilderness areas. Most of these lands are in the state of Idaho (Appendix B). In the act, Congress specified the uses of wilderness to be recreational, scientific, educational, historical, and for conservation. Extractive activities such as timber harvest are generally prohibited by the act, as well as by USFS regulations. However, activities that occurred prior to the designation of wilderness (such as grazing or mining) may be "grand fathered" in and allowed to continue. These activities may potentially have negative effects on bull trout and be subject to consultation.

National Wild and Scenic Rivers Act (NWSRA)

213. The NWSRA requires that "[i]n all planning for the use and development of water and related land resources, consideration shall be given by all Federal agencies involved to potential national wild, scenic and recreational river areas." It also requires that "the Secretary of the Interior shall make specific studies and investigations to determine which additional wild, scenic and recreational river areas.....shall be evaluated in planning reports by all Federal agencies as potential alternative uses of water and related land resources

involved."[53] In partial fulfillment of this requirement, the National Park Service (NPS) maintains a Nationwide Rivers Inventory (NRI), a register of river segments that potentially qualify as national wild, scenic or recreational river areas.[54] A presidential directive requires Federal agencies to avoid or mitigate adverse effects on rivers identified in the NRI. In addition, agencies are required to consult with the NPS on actions which could affect the wild, scenic or recreational status of a river on the inventory.

214. The NWSRA will provide baseline protection to several of the 25 critical habitat units for bull trout. Since Federal agencies are required to avoid or mitigate adverse effects on National Wild and Scenic Rivers and those on the NRI, this statute will likely impact the extent, location, and nature of future activities on or near seven proposed critical habitat units over the next ten years.

Fish Restoration and Irrigation Mitigation Act (FRIMA)

215. In November of 2000, Congress passed and the President signed into law the Fish Restoration and Irrigation Mitigation Act (FRIMA). This new law, Public Law 106-502, created a voluntary, cost-shared fish screen construction program for water withdrawal projects in Idaho, Oregon, Washington, and western Montana. This new program is being implemented by the Service in cooperation with State and tribal partners within the Northwest. The first implementation funds were appropriated to this program in November of 2001.

216. Under the program State, local, and tribal governments, as well as individual water diversion operators, propose projects that meet the eligibility and local cost-share requirements of this program. These are then ranked based on fish restoration benefits, cost effectiveness, and feasibility criteria. Once selected, screening and passage projects are then installed or improved by working with State, tribal, and local partners. Project sponsors assume responsibility for project operation and maintenance. The FRIMA program is coordinated with complementary state screening programs and existing programs for habitat improvements within the Columbia Basin and adjacent areas of the Pacific Northwest.

Pacific Northwest Electric Power Planning and Conservation Act

217. The Act addresses the impact of hydroelectric dams on fish and wildlife on the Columbia River. The Act establishes the Pacific Northwest Electric Power and Conservation Planning Council. This Council is required to adopt a regional energy conservation and electric power plan, and a program to protect, mitigate, and enhance fish and wildlife on the Columbia River and its tributaries.

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[53] National Wild and Scenic Rivers Act, 16 U.S.C. §1271-1287 (1968).

[54] The NRI qualifies as a comprehensive plan under section 10(a)(2)(A) of the Federal Power Act.

218. The Act directs the Administrator to use the BPA fund and applicable laws to protect, mitigate and enhance fish and wildlife populations of the Columbia River and its tributaries in a manner consistent with the Act, the plan, and the fish and wildlife program. The Act also directs the Administrator and other Federal agencies responsible for managing, operating or regulating hydroelectric facilities on the Columbia River or its tributaries to provide equitable treatment for fish and wildlife in comparison with the other purposes of the facilities. To this end, they must take the Council's program into account as much as possible at each stage of decision-making. The Administrator and other Federal agencies are to consult and coordinate activities with the Secretary of the Interior, the Administrator of the NOAA Fisheries, state fish and wildlife agencies in the region, appropriate Indian Tribes and affected project operators in carrying out their responsibilities.

Idaho Forest Practices Act

219. The State of Idaho supplements requirements of the CWA through the Idaho Forest Practices Act. This Act applies to state and private forest land in Idaho, and also to Federal forest lands within the state. The Idaho Department of Lands is responsible for administering the Act on state and private lands. The forest practices regulated through the Act include timber harvest, reforestation activities, slashing practices, salvage logging, and the use of chemicals and fertilizers. Idaho requires the use of BMPs to protect water quality during timber harvest or other forestry operations. The BMPs are designed to meet the requirements of the CWA.

Washington Forest Practices Act

220. The Washington Forest Practices Act was originally adopted in 1974. The activities regulated by the Washington Forest Practices Act and its corresponding rules include activities related to growing, thinning, harvesting or processing timber, including but not limited to road construction and maintenance, salvage logging, and use of chemicals or fertilizers.

Washington Department of Fish and Wildlife Hydraulic Project Approval Program

221. The law requires that any person, organization, or government agency wishing to conduct any construction activity in or near state waters must do so under the terms of a permit (called the Hydraulic Project Approval (HPA)) issued by the Washington State Department of Fish and Wildlife. State waters include all marine waters and fresh waters of the state.[55]

222. The major types of activities in freshwater requiring an HPA include, but are not limited to: streambank protection; construction of bridges, piers, and docks; pile driving; channel change or realignment; conduit (pipeline) crossing; culvert installation; dredging;

[55] Information on the Washington HPA program from http://www.wa.gov/wdfw/hab/hpapage.htm

gravel removal; pond construction; placement of outfall structures; log, log jam, or debris removal; installation or maintenance (with equipment) of water diversions; and mineral prospecting. If the project as proposed will adversely affect fish habitat, it may be approved with certain conditions attached, such as timing and construction methods, to prevent damage. If the project cannot be accomplished without significant adverse impacts on fish, shellfish, or their habitat, it may be denied. Of the approximately 8,200 applications received per year, less than one percent are denied.

Oregon Forest Practices Act

223. The Oregon Forest Practices Act is a set of administrative rules specifying management measures on private and state lands. Oregon was the first state to develop such standards with the passage of the Act in 1971. These rules regulate timber harvesting and reforestation, road construction and maintenance, application of chemicals, design of drainage systems. Harvesting activities require notification forms and site maps to be submitted to the Oregon Department of Forestry for approval. The amount and type of harvest allowed in riparian management areas immediately adjacent to certain streams and in other areas adjacent to sensitive resource sites (i.e., bird nesting, roosting or watering sites) is limited to minimize impacts.

Montana Streamside Management Zone Law

224. The Montana Department of Natural Resources and Conservation administers the Montana Streamside Management Zone Law. This law applies to any landowner or operator engaged in activities that will access, harvest, or regenerate trees for commercial purposes on private, state or Federal lands within the State of Montana. The law prohibits a number of activities within 50 feet within any stream, lake or other body of water. These activities include, but are not limited to, clear-cutting, discharging hazardous or toxic material, operating vehicles, and placing material within a stream or wetland.

Montana Stream Protection Act

225. This Montana law requires any agency or subdivision of Federal, State, county, or city government proposing a project that may affect the bed or banks of any stream in Montana to obtain a permit. Any government sponsored project including the construction of new facilities or the modification, operation, and maintenance of an existing facility that may affect the natural existing shape and form of any stream or its banks or tributaries must comply.

Montana Natural Streambed and Land Preservation Act

226. This Montana law requires that private, non-governmental entities obtain a permit (310 permit) for any activity that physically alters or modifies the bed or banks of perennially flowing streams.

Restoration Plan for Bull Trout in the Clark Fork River Basin and Kootenai River Basin, Montana

227. This restoration plan, adopted in June 2000, was developed by the Montana Bull Trout Restoration Team, a group representing nine State, Federal, tribal and private interests. It is a voluntary effort on behalf of the state of Montana to "...restore bull trout populations to a sufficient level of abundance and distribution to allow for recreational utilization." The restoration plan recognizes 13 restoration/conservation areas within Montana and identified core areas as the restoration and protection focus.

Flathead Lake and River Fisheries Co-Management Plan 2001-2010

228. The Fisheries Co-Management Plan was developed by the Montana Department of Fish, Wildlife and Parks and Confederated Salish and Kootenai Tribes. An objective under this plan is to develop native trout security levels for the Flathead lake and river system. Using locally derived data, a benchmark level of redds in the Flathead River and tributaries was established (300 redds), and future management is focused on maintaining a secure population based on this number. As described in the plan, "secure levels may act as triggers to direct future management activities if populations are or fall to below secure levels, but they do not represent target or management goals."

Wetland/Riparian Habitat and Bull Trout Restoration Plan

229. This restoration plan was developed by the Confederated Salish and Kootenai Tribes and finalized in March 2000. This plan addresses populations and habitat on tribal lands in the Jocko River Drainage in northwest Montana.

Blackfoot Challenge River Restoration Project

230. This Montana project is a cooperative effort between numerous individuals, land management agencies, and organizations including Trout Unlimited, The Nature Conservancy, Montana Land Reliance, Plum Creek Timber Company and many others. The Blackfoot Project is primarily focused in the Blackfoot River restoration/conservation area, but was recognized as the best working model to recover bull trout populations at the time of the listing of the species. Using a watershed approach to stream restoration, the Blackfoot Project is successfully restoring habitat for bull trout and other species while retaining the rural, agricultural setting of the Blackfoot River.

Plum Creek Native Fish Habitat Conservation Plan

231. The Plum Creek Native Fish HCP was finalized in October 2000 and resulted in the issuance of incidental take permits to the Plum Creek Timber Company for forest management activities on Plum Creek Timber Company lands. The Native Fish HCP incorporates conservation elements for stocks and species of native salmonids that were, and

currently are not, listed under the Act as well as bull trout. The duration of the permit period is 30 years.

232. The Plum Creek Native Fish HCP covers lands consisting of 1.6 million acres owned by Plum Creek in Montana (93 percent), northern Idaho (3.1 percent) and Washington (4.3 percent). Elements of the Native Fish HCP and subsequent BO important for the conservation of bull trout include improved riparian area management, improved management of the secondary transportation system, monitoring and adaptive management.

233. Associated with the Plum Creek HCP is a program to place key parcels of Plum Creek Timber lands under permanent conservation easements. Under the Federal Aid to States and Land Acquisition Grant Programs, over 140,000 acres of riparian and bench land habitat along the Thompson, Fisher, Bull and Swan Rivers will be placed in conservation easements at a cost of $32 million.

2.2.4 Summary Discussion of Impacts of Baseline Regulations on Economic Analysis

234. As shown in Exhibit 2.14, the dominant land ownership adjacent to the proposed critical habitat is Federal. In the Klamath distinct population segment (DPS), 55 percent of adjacent land is Federal. In the Columbia River DPS, 58 percent of designated lands are Federal (varying from 82 percent in Idaho to 39 percent in Washington state).

Exhibit 2.14

Adjacent Land Ownership Percentages in Proposed Critical Habitat

Distinct Population Segment	State	Land Ownership (%)			
		Federal	Tribal	State	Private
Klamath River	Oregon	55%	n/a	n/a	45%
Columbia River	Idaho	82%	1%	5%	12%
	Montana	60%	1%	5%	34%
	Oregon	49%	4%	1%	46%
	Washington	39%	3%	4%	54%
TOTAL		**58%**	**2%**	**4%**	**36%**

235. A significant regulatory baseline exists for the USFS and BLM lands in the areas proposed for designation. Every national forest in these four states that contains proposed designated bull trout critical habitat is governed in part by one of the three Federal land management agency fish conservation strategies. Exhibit 2.15 provides a listing of the 32 National Forests in Idaho, Montana, Oregon and Washington that were included under these strategies. A total of 13 forests were under the Northwest Forest Plan, 12 under PACFISH, and 20 under INFISH. As is apparent from the table, several fish management strategies often apply to the same forest. Exhibit 2.16 indicates the share of a given forest that is

actually within the range of anadromous fish, varying from 100 percent for the Nez Perce National Forest in Idaho to three percent for the Okanogan National Forest in Washington.

Exhibit 2.15

National Forests in the Pacific Northwest and Fish Conservation Strategies

State	Forest[1]	NW Forest Plan[2]	PACFISH[3]	INFISH[4]	Bull Trout Critical Habitat[5]
Idaho	Boise		x	x	x
	Clearwater		x	x	x
	Idaho Panhandle			x	x
	Nez Perce		x		x
	Payette		x	x	x
	Salmon-Challis		x	x	x
	Sawtooth		x	x	x
Montana	Beaverhead-Deer Lodge			x	x
	Bitterroot		x	x	x
	Flathead			x	x
	Helena			x	x
	Kootenai			x	x
	Lolo			x	x
Oregon	Deschutes	x		x	x
	Fremont			x	x
	Malheur		x	x	x
	Mount Hood	x			x
	Ochoco		x	x	
	Rogue River	x			x
	Siskiyou	x			
	Suislaw	x			
	Umatilla		x		x
	Umpqua	x			
	Wallowa-Whitman		x	x	x
	Willamette	x			x
	Winema	x		x	x
	Colville			x	x
	Gifford-Pinchot	x			x

Exhibit 2.15

National Forests in the Pacific Northwest and Fish Conservation Strategies

State	Forest[1]	NW Forest Plan[2]	PACFISH[3]	INFISH[4]	Bull Trout Critical Habitat[5]
Washington	Mt Baker-Snoqualmie	x			x
	Okanogan	x	x	x	x
	Olympic	x			
	Wenatchee	x			x

[1]Excludes Caribou-Targhee National Forest in southeast Idaho and Gallatin, Lewis and Clark, and Custer National Forest in central Montana. [2] Forest Ecosystem Management Assessment Team, Forest Ecosystem Management: An Ecological, Economic, and Social Assessment, USDA Forest Service, 1993 (hereafter FEMAT 1993). [3] Bolon, Natalie A., C.S. Hansen-Murray, and R.W. Haynes. Estimated Economic Impacts on the Timber, Range, and Recreation Programs on NFS and BLM Public Lands from Adopting the Proposed Interim PACFISH Strategy. USDA Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-344, August 1995 (hereafter Bolon et al. 1995). [4] USDA Forest Service, Inland Native Fish Strategy, Environmental Assessment, 1995 (hereafter USDA FS 1995).
[5] Proposed designation (November 29, 2003).

Exhibit 2.16

Percent in Range of Anadromous Fish for National Forests under PACFISH Strategy[a]

State	Forest	Percent
Idaho	Boise	17%
	Challis	83%
	Clearwater	45%
	Nez Perce	100%
	Payette	77%
	Salmon	98%
	Sawtooth	80%
Montana	Bitterroot	26%
Oregon	Malheur	50%
	Ochoco	20%
	Umatilla	78%
	Wallowa-Whitman	59%
Washington	Okanogan	3%

[a] Bolon et al. 1995

2.2.5 Discussion: Impacts of Existing Fisheries Policies on Timber and Grazing Activities

236. Analyses have been conducted under NEPA of the impacts of existing fisheries policy on timber and grazing activities (FEMAT 1993, Bolon et al. 1995, USDA USFS 1995). Findings from several of these analyses are briefly summarized here, as they provide a useful perspective on the likely impacts that could be expected from listing and designation of bull trout critical habitat in the planning area.

Bolon Study: Impacts of PACFISH on Timber

237. The most accessible and clearest analysis of the impacts of these aquatic conservation strategies is the discussion of the PACFISH policy in Bolon, Hanson-Murray and Haynes (1995).[56] This report finds that, even prior to PACFISH, there was a considerable reduction (65 percent) in Federal timber harvest for the PACFISH forests due to other legal and budgetary constraints.

238. The PACFISH analysis compares three levels of timber harvest: (1) total forest plan allowable sales quantity (ASQ); (2) the actual current sales quantity (for 1993); and (3) the sales quantity with the PACFISH strategy in place. The ASQ can be regarded as a goal that due to legal and budgetary constraints was seldom actually met in terms of annual total timber harvest. The authors describe the reduction from ASQ to the actual 1993 harvest levels in the relevant forests (a decline of 517 million board feet (mmbf)) as being due to: "ESA listing and section 7 consultation, special management requirements for other fish and wildlife species taken on since plan approval, consistent under-funding compared to budgets required to implement plan levels, and so forth."[57] The value of this foregone timber harvest was estimated to be $142.1 million per year. An important factor in these changes were consultations related to the northern spotted owl and salmon and the related changes in federal land management in the Northwest Forest Plan.

239. The effect of PACFISH was estimated by surveying each forest to identify sales that would be canceled or modified in the planning period. It was determined that 45 sales would be canceled (about 47 mmbf per year) primarily in the Clearwater, Sawtooth and Boise National Forest. Twelve sales in the Nez Perce National Forest were moved outside the RHCAs without a change in size. A total of 72 sales were moved outside the RHCAs and modified in size, primarily in the Malheur, Ochoco, Sawtooth, Boise and Idaho Panhandle National Forest. The total reduction was estimated to be 67.5 mmbf per year. The authors estimated that 752,405 acres of suitable timber lands were taken out of the commercial timber base for these forests due to the designation of the RHCA (streamside buffer zones). As summarized in Exhibit 2.17, this results in a 20 percent reduction from the actual

[56] This Pacific Northwest Research Station General Technical Report appears to have provided the template for the brief INFISH analysis reported in USDA USFS (1995).

[57] Bolon et al. 1995 at 15.

achievable harvest levels prior to PACFISH. The cost of this reduction in harvest was estimated at $18.5 million in 1993 dollars, or about $274 per thousand board feet (mbf) (stumpage value). Study methods and findings were discussed with one of the authors that confirmed the view that this was a relatively substantial impact on the forests.[58]

Exhibit 2.17

Net Decrease in Timber Output from Applying the PACFISH Strategy[a]

Statistic	Annual Harvest (million board feet)	Change in Harvest	Foregone Revenue (million 1993 $)
Total Forest Plans Allowable Sale Quantity (ASQ)	845.1		
		517.0[b]	$142.1
Actual 1993 ASQ	328.1		
		67.5[c]	$18.5
With PACFISH Strategy	260.7		

[a] Bolon et al. 1995. Data for national forests in Idaho, Montana, Oregon, and Washington.
[b] Reduction from Forest Plan ASQ to actual 1993 harvest.
[c] Reduction due to PACFISH strategy.

U.S. Forest Service Study: Impacts of INFISH and PACFISH on Timber

240. A similar analysis of timber harvest impacts for the INFISH strategy was undertaken as part of an Environmental Assessment of the policy.[59] The findings from INFISH and PACFISH impacts on annual timber harvest is shown in Exhibit 2.18. The study estimated a total harvest reduction of around 90 mmbf from INFISH, valued at $23 million per year.

Exhibit 2.18

Net Decrease in Annual Forest Service Timber Output from Applying PACFISH and INFISH Restrictions Compared to Bull Trout Section 7 Impact

Policy	Change in Annual Harvest (million board feet)	Foregone Revenue (million 1993 dollars)
PACFISH[a]	67.5	$18.5
INFISH[b]	22.2	$5.5
Subtotal	89.7	$23.0

[a] Derived from Bolon et al. 1995, for Idaho, Montana, Oregon, and Washington (excludes Alaska and California) average annual data for 1994-2003.
[b] Derived from USDA USFS 1995.

[58] Personal communication, Chris Hanson-Murray, planner, Mt. Baker-Snoqualmie National Forest, December 13, 2002.

[59] USDA USFS 1995.

241. Compared to the impacts of the Northwest Forest Plan (on the order of a 500 mmbf reduction), the timber harvest impacts of PACFISH and INFISH are less substantial, but taken together, the three fishery conservation strategies explain a large share of the timber harvest reductions for the region.

PACFISH Study: Impacts of PACFISH on Grazing

242. With respect to the impact of the conservation strategies on range management, the PACFISH analysis provided a summary of impacts on both BLM and National Forest grazing programs. This data is summarized in Exhibit 2.19. A primary finding is that, for range management, mitigation costs are the primary cost, for example at about $7.6 million present value for the years 1994-2003 compared to foregone output (reduction in AUMs) at $0.12 million. This finding differs from impacts of PACFISH on timber harvest programs, where the primary cost of implementation is foregone timber production.

Exhibit 2.19

Economic Impact of PACFISH Strategy on Federal Range Programs: 1994-2003[a]

Statistic	BLM Districts (million 1993 dollars)	National Forests (million 1993 dollars)
Costs of PACFISH Implementation		
Mitigation Costs	$7.59	$13.82
Value of Foregone Output	$0.12	$1.13
Total Cost of PACFISH	$7.71	$14.94
Benefit of Current Program		
A. Gross Benefit (based on 1990 Resource Protection Act values)[b]	$4.18	$15.68
B. Gross Revenue (based on actual AUM fee charged)[c]	$1.10	$4.12

[a] Source: Bolon et al. 1995.
[b] Based on 1990 Resource Protection Act values of $6.72 in the Northern Region, $4.90 in Intermountain $5.19 in Pacific Northwest, and $5.40 in Pacific Southwest.
[c] Actual current Federal fee is $1.43/AUM.

243. The authors also compare the gross value of the current grazing programs to the cost of implementing PACFISH. The finding for BLM allotments in the planning area is that the gross value of output is only slightly more than half the cost of operating the range program up to PACFISH standards. For BLM, the range programs are valued at $4.2 million, but would cost $7.7 million to operate at PACFISH standards. The program value as stated is based on the authors' view of the fair market value of the grazing resource at up to $6.70 per AUM for the Northern Region Forest Service, for example. Using these AUM values, the Forest Service programs show (on average) a slight excess of gross program fair market value over PACFISH costs.

244. Given these findings, were changes in range allotments to occur in response to bull trout section 7 consultations, the net effect on society is likely to be relatively small, from an economic efficiency standpoint. If compensation is not provided for ranchers in such cases, there would be a distributive impact on the individual rancher. Additionally, should allotments be terminated without compensation for a number of ranchers in a given locale, there could be negative impacts on local economies and communities. However, the extent to which allotments are likely to be terminated is very limited.

245. The basic conclusion with regard to both range and timber management is that the regulatory baseline for protecting fisheries and aquatic habitat on National Forest and BLM lands in the planning area is relatively protective and, in the case of INFISH, specifically designed to protect bull trout. INFISH, the Northwest Forest Plan protections for the northern spotted owl and salmon, and PACFISH have all had significant impacts on rangeland and timber outputs from federal lands in the region. For example, on timber, the approximate effect of these three authorities and other factors, such as federal land management budgets, has been a 75 percent reduction in timber harvest in the region compared to forest plan allowed sale quantity targets. These reductions are independent of bull trout listing in 1998 and the proposed designation in 2002. Thus, it is likely that formal section 7 consultations on grazing and timber on federal lands are unlikely to have high additional costs due to project modifications.

246. The previous two sections introduced the geographic areas in which the Service is proposing to designate critical habitat for the bull trout, the socioeconomic profile of these areas, and general trends associated with population, economic and urban growth. These sections also outlined the baseline level of protection afforded the trout and its habitat, including existing Federal and state laws and policies. This section identifies the current land and water uses in or near the proposed critical habitat areas that may be affected by the bull trout. Specifically, this analysis uses the consultation history for this species combined with additional data and research to estimate future rates of consultation. Importantly, these estimates include the effects on all activities associated with the proposed critical habitat area. As such, this section does not distinguish which impacts may be attributable co-extensively to the listing of the bull trout from those impacts potentially attributable solely to the critical habitat designation.

247. This section begins with a summary of the categories of economic impact associated with section 7 implementation for the bull trout. Section 3.2 provides a broad overview of the consultation history for the bull trout since its listing in 1998. Section 3.3 (and Appendix D) provides a description of the required project modifications detailed in the consultation history of the bull trout. Section 3.4 provides a forecast of future section 7 consultations for the bull trout throughout the proposed critical habitat designation. Finally, Section 3.5 provides a summary of the forecast of future project modifications and administrative workload associated with the listing and critical habitat designation for the bull trout. These impacts are analyzed further in Section 4.

3.1 Categories of Economic Impacts

248. The following section provides an overview of the categories of economic impacts that are likely to arise due to the implementation of section 7 in the proposed critical habitat area.

3.1.1 Section 7 Consultations

249. Following the listing of a species, section 7(a)(2) of the Act requires Federal agencies to consult with the Service in order to ensure that activities they fund, authorize, permit, or carry out are not likely to jeopardize the continued existence of the species. The Service defines jeopardy as any action that would appreciably reduce the likelihood of both the survival and recovery of the species. For species with designated critical habitat, section 7(a)(2) also requires Federal agencies to consult with the Service to ensure that activities they fund, authorize, permit, or carry out do not result in destruction or adverse modification of critical habitat. Adverse modification of critical habitat is defined as any direct or indirect alteration that appreciably diminishes the value of the habitat for conservation of a listed species.

250. In some cases, consultations will involve the Service and another Federal agency only, such as the ACOE or the EPA. Action agencies may also engage in programmatic consultations; that is, they may develop strategies that consider impacts to the bull trout and its habitat at the programmatic level, rather than at the individual project level. In addition, consultations may include third parties, such as State agencies or private landowners involved in projects on non-Federal lands with a Federal nexus.

251. During a consultation, the Service, the Action agency, and the landowner applying for Federal funding or permitting (if applicable) communicate in an effort to minimize potential adverse effects to the species and/or its critical habitat. Communication between these parties may occur via written letters, phone calls, in-person meetings, or any combination of these. The duration and complexity of these interactions depends on a number of variables, including the type of consultation, the species, the activity of concern, the region where critical habitat has been proposed, and the involved parties.

252. Section 7 consultations with the Service may be either informal or formal. *Informal* consultation, which consists of discussions between the Service, the Action agency, and the applicant concerning an action that may affect a listed species or its designated critical habitat, is designed to identify and resolve potential concerns at an early stage in the planning process. By contrast, a *formal* consultation is required if the Action agency determines that its proposed action may or will adversely affect the listed species or designated critical habitat in ways that cannot be resolved through informal consultation. The formal consultation process results in the Service's determination in its BO of whether the action is likely to jeopardize a species or adversely modify critical habitat, and recommendations to minimize those impacts. Regardless of the type of consultation or proposed project, section 7 consultations can require substantial administrative effort on the part of all participants. Exhibit 3.1 presents cost estimates for several classes of section 7 consultation within the Pacific Northwest.

253. The cost estimates presented in Exhibit 3.1 take into consideration the level of effort of the Service, the Action agency, and the applicant during both formal and informal consultations, as well as the varying complexity of consultations. Section 7 consultation

costs include the administrative costs associated with conducting the consultation, such as the cost of time spent in meetings, preparing letters, and in some cases, developing a Biological Assessment (BA) or BO. BAs are prepared to determine whether proposed projects, and in some cases their alternatives, are likely to adversely affect the listed species or designated critical habitat.

254. In addition estimates were developed of the costs associated with producing the BA and the percentage of formal and informal consultations falling into each category of consultation. The cost estimates for BA development are based on labor hours estimates from both Action agencies and consultants. In calculating the costs of producing a BA, the average number of hours to complete the assessment are assumed to be the same for both third parties and Action agencies; however the BA costs for third parties are based on higher hourly rates.

255. Formal consultations are grouped into one of two classes based on specific knowledge of the expected level of complexity in upcoming consultations. The classes of consultations for which cost estimates are provided include:

Formal Class One: A formal consultation complicated by one or more of the following factors: size of consultation area, size of consultation activity, number of species considered, political sensitivity of project or species covered, familiarity of field office and/or Action agency with the consultation process, differences of opinion between Action agency and Service, jurisdiction issues, and public awareness.

Formal Class Two: A formal consultation that is straightforward, usually consisting of one or several similar projects with very few to no complicating factors.

Informal: A consultation that eventually ends with a concurrence of not likely to adversely affect.

256. Per-unit costs associated with formal and informal consultations are presented in Exhibit 3.1. Unless stated otherwise, this table is used to develop total administrative costs for consultations associated with activities within proposed critical habitat for bull trout.

Exhibit 3.1 Estimated Administrative Costs of Section 7 Consultation for the Bull Trout (Per Effort)			
	Formal Class 1	**Formal Class 2**	**Informal**
U.S. FISH AND WILDLIFE SERVICE COSTS: PACIFIC NORTHWEST			
Consult Cost	$40,600	$10,200	$1,100
ACTION AGENCY COSTS: PACIFIC NORTHWEST			
Consult Cost	$24,500	$15,100	$3,800
BA Cost	$56,700	$10,200	$3,100
THIRD PARTY COSTS: PACIFIC NORTHWEST			
Consult Cost	$4,100	$2,900	$1,200
BA Cost	$67,500	$12,100	$3,700

Notes: Formal Class 1 and Class 2 estimates primarily reflect variations in staff wages and time involvement. Third parties are defined as state agencies, municipalities, and private parties. Action agency costs include the cost of conducting a BA. Programmatic consultations are assumed to be formal. Costs are presented in 2002 dollars.

Sources: Industrial Economics, Inc. analysis based on data from the Federal Government General Schedule Rates, 2002, Office of Personnel Management, and level of effort information from the Service, ACOE, USFS, BOR, and DOT.

3.1.2 Technical Assistance

257. The Service may respond to requests for technical assistance from Federal or State agencies, local municipalities, and private landowners and developers who have questions regarding whether specific activities may affect a listed species or its critical habitat. Technical assistance costs represent the estimated economic costs of informational conversations between stakeholders and the Service. These technical assistance activities are characteristically low effort communication between two parties, the Service and the stakeholder.

258. In some instances, technical assistance may involve a request for general review of a project or activity that is not subject to section 7 requirements (e.g., activity on private land without a Federal nexus) as a safeguard to ensure adequate protection for species and habitats of concern. For example, although development of water quality standards within a State may not require a section 7 consultation with the Service, a State agency may request technical assistance from the Service as an additional precaution to ensure that individual NPDES permits conforming to these standards adequately provide for relevant species and habitat.

259. Although technical assistance is not a requirement of section 7 of the Act, the costs of these efforts are normally incorporated into the economic analysis when they are generated

by consideration of species and/or its habitat conservation. Total costs of providing technical assistance is expected to be small relative to other economic impacts; therefore, this analysis does not quantify the instances and costs of technical assistance efforts.

3.1.3 Project Modifications

260. The section 7 consultation process may involve some modifications to a proposed project. Projects may be modified in response to voluntary conservation measures suggested by the Service and agreed to by the applicant during the *informal* consultation process in order to avoid or minimize impact to a species and/or its habitat, thereby removing the need for formal consultation. Alternatively, *formal* consultations may involve modifications that are agreed upon by the Action agency and the third party and included in the project description as avoidance and minimization measures, or included in the Service's BO on the proposed action as reasonable and prudent measures (RPMs) and/or discretionary conservation recommendations to assist the Action agency in meeting their obligations under section 7(a)(1) of the Act.[60]

261. In some cases, the Service may determine that the project is likely to jeopardize the continued existence of the species and/or destroy or adversely modify its designated critical habitat. In these cases the Service will provide the Action agency with reasonable and prudent alternatives (RPAs) that will keep the action below the thresholds of jeopardy and/or adverse modification. An RPA is an alternative that: (1) can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented consistent with the scope of the Action agency's legal authority and jurisdiction; and (3) is economically and technologically feasible. These RPAs are typically developed by the Service in cooperation with the Action agency and, when applicable, the third party. Alternatively, the Action agency can develop its own RPAs, or seek an exemption for the project. All of these project modifications have the potential to represent some cost to the Action agency and/or the third party. In certain instances, these modifications can lead to broader economic effects.

3.1.4 Distributional and Regional Economic Effects

262. The consultation process and related project modifications could directly affect the operations of entities in some industries (e.g., agriculture producers and residential developers), with secondary impacts on the suppliers of goods and services to these industries, as well as purchasers of products from these industries. For example, modified or decreased grazing and haying activities could affect businesses providing agricultural equipment and supplies. Thus, project modifications or other restrictions that engender cost and revenue impacts involving commercial enterprises can have a subsequent detrimental effect on other sectors of the local economy, especially when the affected industry is central to the local economy. Industries within a geographic area are interdependent in the sense that they purchase output from other industries and sectors, while also supplying inputs to other

[60] Section 7(a)(1) requires Federal agencies to utilize their authorities to further the purposes of the Act by carrying out programs for the conservation of listed species.

businesses. Therefore, direct economic effects on a particular enterprise can affect regional output and employment in multiple industries.

263. Many methods are available for conducting economic impact assessments, depending on the particular policy interests and goals of the economic analysis. Use of an input-output (I-O) model, such as IMPLAN (Impact Analysis and Planning, a computer software package used for estimating local economic impacts), to gauge the direction and magnitude of regional economic impacts is useful in situations where the critical habitat designation may affect the commercial economy of a specific geographic area or could impose substantial costs on a specific economic sector. However, I-O modeling is not appropriate for all economic impact analyses associated with critical habitat designation and can result in misinterpretations and biased conclusions if used inappropriately. I-O models are appropriate when the following factors are present: (1) economic impacts of the proposed designation are substantial and clearly defined in the analysis; (2) impacts have a clear effect on one industry or groups of industries prevalent in the geographic region; and (3) substitution possibilities for the focal economic input or activity are not widely available.

264. Regional economic analysis was only used in a limited way for this economic analysis. To the extent to which regional economic impacts are realized depends largely on whether a significant number of projects are stopped or fundamentally altered. For example, impacts to the timber or grazing industries depend on whether required project modifications substantially reduce output within economic sectors below that which would be seen in the absence of the trout consultation. Examination of BOs involving timber harvest and grazing show only small and sporadic reductions in either grazing opportunity or available timber harvest. Therefore, this analysis assumes that regional economic impacts associated with these activities will be unpredictable (in terms of geographic location and timing) and small in the context of the overall economy of the Columbia River Basin.[61] In the case of agricultural water diversions on Forest Service lands, regional economic impacts are not modeled due to uncertainty about the magnitude and potential location of impacts.

265. Regional economic impacts are estimated for irrigation diversion reductions in the Yakima River System (Unit 20). The estimated direct impacts on annual crop revenues ($960,000) associated with allocating additional water to instream flows in the Yakima River would also lead to indirect impacts on total economic output, income, and employment within the three-county region encompassing the Yakima River System. The Montgomery Water Group Report on water supply within the Yakima System cite regional economic impact analyses for the three counties. These studies show that each $1 of reduced crop revenue translates into approximately $2 in lost total output. Additionally, each $1 in lost crop revenues translates into approximately $1.20 in lost regional income. Finally, every $25,000

[61] A general finding from regional economic research in the Pacific Northwest is that changes is employment and income are difficult to predict and tend to be overestimated, even for substantial changes in resource policy. An example is an ex post analysis recently completed on the regional economic impacts of policies to protect the northern spotted owl (Niemi, Ernie. 2002. The Sky Will Not Fall: Economic Responses to Protection of At-risk Species and Natural Ecosystems. Fisheries 27(1): 24-28).

lost in crop revenues means a reduction in one job within the economy. Therefore, a $960,000 reduction in crop revenues translates into $1.92 million in lost output within the three counties, $1.15 million in lost regional income, and 39 lost jobs.

3.2 Consultation History for Bull Trout Since Listing

266. Since the bull trout's listing in 1998, numerous Action agencies have participated in and permitted activities and projects in or adjacent to occupied bull trout habitat. As a result, the Service has conducted approximately 5,000 informal and approximately 160 formal consultations involving this species.[62] This section summarizes the agencies and activities that have been involved in section 7 consultations since listing. The discussion is organized by Action agency involved (and activity) that provides the Federal nexus. Information in this section is based on the record of past consultations provided by the Service, augmented with information from the Service on consultations in process on activities which are under-represented in the consultation record.

3.2.1 Action Agencies and Activities Involved in Past Bull Trout Consultations

267. A large share of section 7 consultations related to bull trout have been on Federal lands, due to the obvious Federal nexus associated with land management activities. For example, based on the sample of past formal consultations relating to bull trout, 67 percent have been with the two primary Federal land managers in the planning area: the USFS (52.9 percent) and BLM (14.1 percent). Almost all of the remaining formal consultations have been with Federal agencies that manage or permit activities that are within the wetted perimeter of bull trout habitat, such as dams (FERC, BPA, ACOE, BOR) and bridges (FHWA). The primary land management activities consulted on are forest management, including timber harvest (50 percent) and grazing (11 percent).

268. **Army Corps of Engineers** ACOE responsibilities include flood control and damage reduction efforts. These activities range from small, local protection projects, such as construction of levees and non-structural flood control measures, to major dams. Under the authority of the CWA, the ACOE regulates the disposal of dredge and fill materials in waters of the U.S., such as that which occurs during infrastructure development activities. These regulatory efforts are implemented through Section 404 permits. Private activities regulated under section 404 and section 10 include docks, boat launches, fishing piers, and related construction and State or local water supply projects.

269. Since the listing of the bull trout, the ACOE has been involved in consultations involving this species on two bridge replacement projects requiring bank stabilization. Additionally, the ACOE was involved in a system wide consultation on the operations of the FCRPS, as well as consulting on a proposed dam modification to provide water temperature

[62] The section 7 consultations involving bull trout analyzed for this report covered the time period between the 1998 listing of the species and December 2002.

control. The ACOE is currently involved in an ongoing consultation on the operation of 13 dams and reservoirs on the upper Willamette River system.

270. Other activities involving ACOE consultation include navigation channel dredging and disposal, and stream restoration.

271. **Bureau of Indian Affairs** While a number of Native American Tribes control lands included within the proposed critical habitat for the bull trout, the consultation record for the species contains only one formal consultation involving the Bureau of Indian Affairs (BIA).[63] This consultation was on a proposed timber sale within lands owned by the Yakama Indian Nation. This report recognizes the significant extent of tribal lands within the proposed designation; however, sufficient data are not available to estimate the likely breadth and extent of impacts associated with section 7 bull trout consultations on tribal lands.

272. **Bureau of Land Management** As detailed in Exhibit 2.1, the BLM manages approximately 12 percent of the total land area contained within the proposed critical habitat designation. Since the listing of the bull trout the BLM has been a party to a significant number of formal consultations on impacts to the species or its habitat. These consultations covered forest management including grazing, timber, and resource maintenance and road construction, as well as weed management, streambank stabilization, and flood control projects. The primary risks to bull trout from grazing activities are increased sediment loads and bank erosion and damage of the stream bed from livestock activity in the riparian area. Sedimentation can damage spawning habitat and adversely affect feeding and migration. Stream temperature can increase if too much shade-providing vegetation is browsed. The Service had a total of 12 formal consultations regarding grazing from 1997 into 2002 that considered the bull trout, three of which were with the BLM.[64] In addition, there was one forest management consultation with BLM that included grazing.

273. Similar to the USFS, the BLM leases grazing permits to ranchers, charging $1.43 per AUM in 2002. Generally, the Bureau installs fencing and monitors the grazing to make sure the number of livestock in the contract is not exceeded. Differences exist between grazing on public lands and grazing on private lands. On public lands, the permittee is in most cases charged with tending and moving the livestock, protecting the land from over grazing and monitoring the livestock. This requires the employment of riders and the rancher's time. The terms and conditions of leases on private lands are variable. In some cases the landowner hires the riders to tend, move and monitor the livestock. Differences between public and

[63] Consultations were examined for the period from the species' listing in 1998 through December 1, 2002. Since this time, one other formal and six informal consultations with the Confederated Tribes of the Warm Springs Reservation has been completed. Personal communication, Service personnel, Portland, Oregon, January 21, 2004.

[64] One consultation was joint with the USFS and BLM.

private lease terms explain in part the difference between grazing permit costs of $1.43 per AUM on public land in 2002 and $14.10 per AUM on private land in 2000.[65]

274. **Bonneville Power Administration** The BPA is a Federal power marketing agency. BPA sells power generated by Federal hydroelectric power projects (and the Washington Nuclear Plant Number 2) to utility companies in the Pacific Northwest. Since 1998 the BPA has been involved in formal consultations on fisheries restoration and augmentation projects, agricultural practices and irrigation system projects, stream restoration, and was part of a multi-agency consultation on the operation of the FCRPS. BPA is also currently involved in an on-going consultation on the operation of 13 dams and reservoirs on the Upper Willamette River System (as an entity that markets power from eight of the 13 dams).

275. **Bureau of Reclamation** Authorized by Congress in 1902, the BOR manages dams and hydroelectric plants that supply irrigation water and power throughout the West. The BOR has been involved in section 7 consultations involving the bull trout on projects involving dam and reservoir operations, including the FCRPS operation. The BOR is currently involved in a large-scale consultation on operation of the Yakima Irrigation Project in Washington State. The BOR is also involved in consultations on its management of irrigation contracts from the 13 impoundments on the Upper Willamette System.

276. **Federal Highway Administration** The FHWA provides partial funding to state DOTs for road and bridge construction projects. Bridge replacement, maintenance, and repair projects over rivers and streams within riverine critical habitat can result in section 7 consultation with either FHWA, ACOE, or both.[66] In addition, state DEQs regulate and enforce state clean water standards on road projects. Since sedimentation is a major source of stream impairment in the Northwest, especially in Idaho and Montana,[67] this permitting process carefully controls for sedimentation. The primary risk to bull trout is from increased sedimentation and pollution from equipment working in the stream or river, bank erosion and blasting.

277. For purposes of this analysis, section 7 consultations and project modifications associated with bridge projects are attributed to the FHWA nexus. The number of consultations with the FHWA is linked tightly to the FHWA budget. Although budgets are

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[65] Montana Department of Agriculture, Montana Agricultural Statistics 2001, p. 85, http://www.nass.usda.gov/mt/bulletin/BulletinDist2001.pdf, viewed January 15, 2003.

[66] Under the CWA, the ACOE regulates the disposal of dredge and fill materials in waters of the U.S., such as that which occurs during infrastructure development activities. This requirement is implemented through the CWA section 404 permitting process. In addition, placement of riprap or channel modifications are projects that often result in section 7 consultations; however, almost all of these projects are tied to a bridge replacement project. Personal communication with District Construction Engineer, Montana DOT, Missoula office, December 16, 2002.

[67] Mosley, Jeffrey C., Philip S. Cook, Amber J. Griffis and Jay O'Laughlin, "Guidelines for Managing Cattle Grazing in Riparian Areas to Protect Water Quality: Review of Research and Best Management Practices Policy," Idaho Forest, Wildlife and Range Policy Analysis Group, Report 15, December 1997, Internet edition published December 1999, p. 42.

hard to forecast, there is no indication that FHWA budgets will change significantly in the near future.

278. **Federal Energy Regulatory Commission** FERC consults with the Service on re-licensing of private, municipal, and state hydroelectric projects.[68] FERC issues licenses of varying duration to hydroelectric projects, and typically engages in section 7 consultation only when the projects are up for re-licensing. Since listing of the bull trout, FERC has been involved in a number of consultations involving the species, including dam operations, dam removal, and dam and hydroelectric power upgrades.

279. FERC also regulates the transmission of natural gas, oil, and electricity in interstate commerce, and consults with the Service regarding the construction of new pipelines and transmission lines. FERC may also consult regarding issuance of blanket approval certificates for minor structures related to the pipeline transport of oil and gas.

280. **U.S. Forest Service** The USFS manages the largest percentage of all Federal lands contained within the proposed bull trout critical habitat designation (85 percent). As a result, the largest percentage of past consultations involving the bull trout have included the USFS as the primary Action agency. The activities consulted on by the USFS include forest management including grazing, timber, and resource maintenance and road construction, as well as weed management, streambank stabilization, culvert replacement, and mining activities. It is expected that consultations involving the USFS will continue to dominate consultation activity on the bull trout and its habitat into the future.

281. **Timber** See the section on "Modifications to Timber Harvest" for details. Note that the design of timber sales is already constrained to meet the total maximum daily load (TMDL) (i.e., sedimentation) requirements for a watershed. Since these requirements can provide protection for bull trout, formal consultations may not yield additional terms and conditions relating to sediment.

282. **Grazing** The USFS leases grazing permits to ranchers, charging $1.43 per AUM in 2002. Like the BLM, the USFS most often installs fencing and monitors the grazing to make sure the number of livestock in the contract is not being exceeded.[69] The primary risks to bull trout from grazing activities are increased sediment loads and bank erosion and overall destabilization of the stream bed from livestock activity in the riparian area. The loss of streamside vegetation leads to increased solar exposure and increased and rapid runoff. Spawning areas are especially vulnerable, however increased sediment can harm adult bull trout. In addition, increased solar exposure leads to increased water temperatures.

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[68] FERC may also consult on minor power projects (less than five MWs) that are granted "exemptions" from licensing, and on amendments to existing licenses.

[69] Montana Department of Agriculture, Montana Agricultural Statistics 2001, p. 85, http://www.nass.usda.gov/mt/bulletin/BulletinDist2001.pdf, viewed January 15, 2003.

283. The Service had a total of 12 formal consultations specifically regarding grazing from 1997 into 2002. Ten of the formal consultations were with the USFS and three were with the BLM.[70] In addition, under Forest Management Consultations, 12 consultations (out of 74) contain grazing sections for National Forest land. This gives a total of 22 consultations with the USFS that involve grazing.

284. **Roads** The USFS is responsible for managing over 58 million acres of land in Montana, Idaho, Oregon and Washington.[71] This management includes maintaining thousands of miles of roads in National Forests in addition to activities such as building new roads, obliterating old roads performing recreation management, campground improvements, fire management, insect control, and other activities.[72] Since many of these activities occur in riparian areas, the USFS considers the effects on streams, creeks and rivers. For example, the USFS is working to replace culverts and stream crossings to prevent erosion and help wildlife. The USFS is aware that sedimentation is a major source of stream impairment in the Northwest,[73] and important water quality safeguards are in place that are independent of bull trout requirements. When forest management activities occur near riparian areas proposed for critical habitat, they may result in a formal section 7 consultation.

285. The primary risk to bull trout from future USFS road-related work is from increased sedimentation from erosion and blockage to fish passage by activities such as road maintenance, out-date culverts or inadequate steam crossings. The number of formal consultations with the USFS is linked closely to the number of bull trout watersheds and the road inventory within National Forests. Given that both of these parameters are both relatively stable, there is no indication that the number of formal consultations will change drastically in the near future.

286. **Irrigation Diversions** While the formal consultation record of the USFS involving the bull trout does not show a pattern of significant activity associated with irrigation diversions, there is some reason to believe that future years will see more of this type of activity. A recent agreement between the USFS and a private advocacy organization calls for BAs of 13 watersheds in the Upper Salmon River Drainage to be completed before

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[70] One consultation was joint with the USFS and BLM, so the total number of grazing consultations was 12 not 13. In addition, programmatic consultations include grazing practices.

[71] U.S. Forest Service, http://www.fs.fed.us/land/staff/lar/LAR02/table4.htm, viewed January 28, 2003.

[72] Grazing and timber harvest are considered to be separate from the general category of forest management activities, even though these actions are included in some consultations.

[73] Mosley, Jeffrey C., Philip S. Cook, Amber J. Griffis and Jay O'Laughlin, "Guidelines for Managing Cattle grazing in Riparian Areas to Protect Water Quality: Review of Research and Best Management Practices Policy," Idaho Forest, Wildlife and Range Policy Analysis Group, Report 15, December 1997, Internet edition published December 1999, p. 42.

January 1, 2008.[74] Following the completion of the series of 13 BAs on Upper Salmon River watersheds, the USFS will include consideration of permitted irrigation diversions on lands it manages when consulting on ongoing activities within the forest.[75] In recognition of the substantial role that these irrigation consultations will likely play in these areas in the future, an analysis of estimated costs associated with these future irrigation consultations is included in this report.

287. **Mining** In addition to three formal consultations involving mining activities in Montana and Idaho, a substantial number of consultations were in process during the completion of this analysis. These consultations are occurring primarily in the North Fork and Middle Fork of the John Day River in Oregon, and in the Powder River Drainage of Oregon.[76] In recognition of the substantial role that these mining consultations will likely play in these areas in the future, an analysis of estimated costs associated with these future Oregon mining consultations is included in this analysis.

288. **Natural Resource Conservation Service** The NRCS has been involved with section 7 consultations on bull trout since the listing of the species. These consultations, however, have been largely informal section 7 consultations with no associated project modifications.[77] Example of common types of activities consulted on by NRCS include funding and construction of irrigation diversion structures as well as habitat restoration activities.[78] The NRCS state fisheries biologist for Oregon estimates that the agency completes two to three informal consultations on impacts to bull trout per year. This low number is largely due to an extensive screening and analysis done by NRCS for all of its Resource Management Conservation Plans. This screening is essentially equivalent from the standpoint of NRCS to an informal consultation but has a "no effect determined" finding.[79] The NRCS State Biologist for Washington State also indicated that no formal bull trout consultations had occurred in the past five years, and at most the agency completes two to three informal consultations per year involving bull trout. Much of the NRCS Washington work involves habitat and wetland restoration.[80] In Idaho, the NRCS has done no formal consultations involving bull trout, and typically completes about four informal consultations per year

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[74] "Proposed Watershed BA Schedule" dated September 10, 2003. Personal communication, Service Biologist, Pocatello, Idaho.

[75] Personal communication, Lyle Powers, Salmon Challis National Forest. November 3, 2003.

[76] Personal communication, Service Biologist, Portland, Oregon. October 21, 2003.

[77] Service personnel have stated the point that NRCS consultations are largely informal.

[78] Personal communication, Terry Nelson, NRCS Portland, Oregon. October 30, 2003.

[79] Personal communication, Debra Virgovic, NRCS Oregon State Fisheries Biologist. October 31, 2003.

[80] Personal communication, Tim Dring, NRCS Washington State Biologist. November 6, 2003.

involving the species. Activities consulted on include riparian zone enhancement, use exclusion, and stream stabilization.[81]

289. **Other Agencies** Several other Federal agencies have been involved in formal section 7 consultations involving the bull trout since the species was listed as threatened. The NPS, Animal and Plant Health Inspection Service (APHIS), Farm Services Agency, and the Service itself have all consulted on actions potentially impacting the bull trout.

3.2.2 Formal Section 7 Consultations History on Bull Trout Since Listing

290. Exhibit 3.2 provides a tabular summary of the Action agencies involved in section 7 bull trout consultations since the listing of the species in 1998. Additionally, this exhibit briefly describes the primary activities consulted on and shows the number of formal section 7 consultations on bull trout that have occurred since listing.

[81] Personal communication, Frank Fink, Idaho NRCS State Biologist, Boise, Idaho. November 10, 2003.

Exhibit 3.2 Bull Trout Consultation History Since Listing (1998): By Action Agency		
Action Agency	**Activities Consulted on**	**Number of Formal Consultations**
Army Corps of Engineers	Bank stabilization, dredging, bridge replacement, dam modifications and operations, stream restoration.	5
Bureau of Indian Affairs	Timber sales	1
Bureau of Land Management	Forest management, grazing, timber harvest, resource maintenance and road construction, weed management, streambank stabilization, flood control projects.	18
Bonneville Power Administration	Fisheries restoration and augmentation, agricultural practices and irrigation systems, dam operations	5
Bureau of Reclamation	Dam and reservoir operations	2
Federal Highway Administration	Highway bridge replacement	18
Federal Energy Regulatory Commission	Dam re-licensing or removal, dam and hydro power upgrades	7
U.S. Forest Service	Grazing, timber harvest, resource maintenance and road construction, weed management, streambank stabilization, culvert replacement, mining.	86
Fish and Wildlife Service	Intra-service consultations on habitat restoration and fisheries projects	4
National Park Service	Bull trout recovery actions, fisheries management	1
National Marine Fisheries Service	Salmon recovery actions	2
Dept. of Agriculture	Fisheries enhancement (APHIS) Oregon Conservation Reserve Management Program (FSA)	2
U.S. Geological Survey	Water quality assessment program	1
Sources: Consultation records and personal communications, Service offices, Portland, Boise, Helena, Lacey, Spokane, Klamath Falls. For purposes of this table, multiple-agency consultations are listed here under each agency. Thus, due to double counting, the total number of formal consultations presented here (152) exceeds the actual total number of past consultations (140). Note: consultations were examined which were completed between the species listing in 1998 and November 2002.		

291. The purpose of this economic analysis is to provide information, where possible, at a critical habitat unit level regarding the estimated future costs associated with critical habitat designation for the species. Exhibit 3.3 provides a summary of the consultation history for the bull trout for each critical habitat unit. Some consultations included multiple critical habitat units. Therefore, the sum of consultations shown in the exhibit is greater than the total number of consultations that have occurred since 1998. Note that the geographic size of these units varies considerably.

Exhibit 3.3

Bull Trout Consultation History Since Listing (1998): by Proposed Critical Habitat Unit

Unit	Unit Name	Agencies Consulted	Formal Consultations
1	Klamath River Basin	Service, NPS, USFS	8
2	Clark Fork River Basin	BLM, FERC, FHWA, USFS	39
3	Kootenai River Basin	BLM, FHWA, USFS	14
4	Willamette River Basin	ACOE, FERC, USFS	6
5	Hood River Basin	BLM, BPA, USFS	10
6	Deschutes River Basin	BLM, FERC, USFS	4
7	Odell Lake	BLM, USFS	3
8	John Day River Basin	USFS	4
9	Umatilla-Walla Walla River Basins	ACOE, BLM, FHWA	3
10	Grande Ronde River Basin	ACOE, BLM, FHWA, Service	5
11	Imnaha/Snake River Basins	BLM, BOR, FERC, FHWA, Service, USFS	7
12	Hells Canyon Complex	BLM	1
13	Malheur River Basin	BLM, USFS	11
14	Couer d'alene Lake Basin	BLM, USFS	2
15	Clearwater River Basin	ACOE, BPA, Service, USFS	4
16	Salmon River Basin	BPA, FHWA, Service, USFS	10
17	Southwest Idaho River Basins	USFS	2
18	Little Lost River Basin	BLM	1
19	Lower Columbia River Basin	ACOE, BIA, BPA, FERC, USFS	11
20	Middle Columbia Basin	BPA, USFS	2
21	Upper Columbia Basin	ACOE, BPA, Service, USFS	5
22	Northeast Washington River Basins	USFS	4
23	Snake River Basin in Washington	ACOE, BPA	2
24	Columbia River	ACOE, Service, USDA, USFS	4
25	Snake River	BOR, FERC, Service, USFS	8
Multiple Unit or Unknown Area		BLM, Service, USDA, USFS, USGS	17

Source: Consultation records and personal communications, Service offices, Portland, Boise, Helena, Lacey, Spokane, and Klamath Falls. Total number of consultations exceeds actual total formal consultations since many consultations include multiple critical habitat units.

3.2.3 Informal Section 7 Consultations History on Bull Trout

292. Informal section 7 consultation activity involving the bull trout is less rigorously tracked by the Service and methods of tracking, and records of these informal consultations vary by field office. Exhibit 3.4 shows the number and general breakdown of types of activities consulted on by Service field office.

Exhibit 3.4

Informal Consultation History for Bull Trout Since 1998 Listing

Service Field Office	Types of Activities Consulted on	Informal Consultations	Activity Breakdown[a b]
Portland, OR	Forest management, fisheries, dams, road/bridge construction, agriculture (irrigation), maintenance dredging, noxious weed management, mining, water treatment, stream restoration, tribal activities, fire management, pipeline/cable installation, land exchange, timber sales, Conservation Reserve Enhancement Program, NRCS projects, water system improvement	160	Forest management: (31%) Grazing: (23%) Dams: (16%) Fisheries: (8%) Other - restoration: (16%) Other - fishing access sites: (8%)
Klamath Falls, OR		6	Forest management
Boise, ID		2,034[c]	Information not available
Spokane, WA		2,470	Roads/bridges: 21% Forest management: 17% ACOE projects: 34% Dams/Irrigation: 12% Other agriculture: 3% Other: 14%
Lacey, WA		68	Information not available
Helena, MT		170	USFS/BLM: (77%) FERC: (1%) Federal Highway Administration: (12%) Other: (11%)

Source: Service field offices.
[a] Activity breakdown for Portland and Spokane field offices represent distribution for 2002 and the average of 2001 and 2002 consultations, respectively.
[b] The number of informal consultations for the most recent year (2002) for the Portland and Spokane field offices are significantly below the five year average for these offices.
[c] Includes 2002 estimated total based on 2001 levels.

3.3 Project Modifications

293. This section summarizes project modifications associated with activities likely to result in section 7 consultation. Project modifications are agreed upon by the Service, the Action agency, and, if applicable, the applicant as a result of the informal or formal consultation process.

294. This section describes typical project modifications by Action agency. Appendix D details all the modifications listed in past formal consultations including the bull trout for each type of activity. The following discussion identifies the subset of key project modifications for each activity type that have been typically requested by the Service, in addition to current existing baseline regulations.

3.3.1 Modifications to FHWA Bridge Projects

295. Between 1998 and late 2002, there were 18 formal consultations between the Service and the FHWA (or ACOE).The full spectrum of suggested project modifications from all of the projects are listed in Appendix D.

296. Despite the large number of potential terms and conditions shown in Appendix D, very few are the direct result of the bull trout. The project modifications can be divided into four major categories: (1) construction and removal, (2) environmental practice, (3) reporting, and (4) date restrictions. State environmental laws and the CWA permitting process typically impose restrictions on construction and removal and environmental practices even in the absence of a bull trout consultation. The section 404 permitting program established regulations regarding dredged and fill material disposal in waters of the U.S. and includes infrastructure development. Permits, either individual or general, require that steps be taken to avoid wetland impacts where practicable and potential impacts be minimized.[82] Hence, most of the conditions stated in the BO are likely to be redundant with conditions that will be imposed in a section 404 permit. For example, although BOs often require that the water from coffer dams be pumped into holding ponds rather than the river, this practice has been standard for years under section 404 and would be included in the permit even absent bull trout.[83] Costs associated with Reporting Conditions have minimal associated costs (i.e., a few thousand dollars per consultation or less).[84]

297. Date restrictions on project operations are likely to generate significant costs that can be traced to the bull trout. Date restrictions refer to conditions specifying either dates when

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[82] U.S. EPA, "Section 404 of the Clean Water Act: An Overview," http"//www.epa.gov/owow/wetlands/facts/fact10.html, viewed December 10, 2002.

[83] Personal communication with the District Construction Engineer, Montana DOT, Kalispell office, December 16, 2002.

[84] This observation was made by both Service biologists and DOT engineers in personal communication, various dates.

in-stream work should or should not be undertaken. For example, a typical statement is "No instream work shall be conducted with the Middle Fork of the Flathead River during the period July 1 to October 1."[85] Fall date restrictions are placed upon streams with spawning activity, while summer restrictions are usually placed on rivers to protect bull trout in migration.[86] However, not all date restrictions in a permit are attributable to bull trout because these requirements may also be placed to protect spawning cutthroat or rainbow trout or salmon. In some cases the Service has granted extensions of work windows to complete work in progress.[87]

3.3.2 Modifications to Grazing Permits

298. The majority of the grazing project modifications deal with monitoring the impacts of grazing and keeping grazing animals out of streams and off stream banks. The project modifications can be broken down into four categories: (1) monitoring, (2) elimination of conflicts, (3) implementing past commitments, and (4) review/reporting. A listing of all of the project modifications from the 12 consultations specific to grazing can be found in Appendix D.

299. The above list includes all likely modifications related to grazing permits. This list is comprehensive and therefore all of the modifications are not specific to any single project. While some very general conditions, such as assuring the consistent implementation of grazing-related standards in PACFISH, INFISH, and the Northwest Forest Plan are found in several BOs,[88] other conditions, such as fencing Tamarack Creek, are very project specific.[89]

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[85] U.S. Fish and Wildlife Service, " Endangered Species Act Section & Consultation Biological Opinion for the Effects to the threatened Columbia River basin population of Bull Trout (*Salvelinus confluentus*) from the replacement of the U.S. Highway 2 bridge over the Middle Fork of the Flathead River Southeast of Essex, in Flathead County Montana Project BR 1-2(85)180; Control Number 1763," Montana Field Office, Helena, Montana, May 4, 2001, p. 22.

[86] Personal communication, Service Biologist, Helena, Montana Office, December 16, 2002.

[87] Personal communication, Service Biologist, Boise Office, March 12, 2003.

[88] For example, this condition can be found in U.S. Fish and Wildlife Service, "Twenty Range Management Actions in the Upper Clark Fork, Rock Creek, and Middle Clark Fork River, Montana," Helena Field Office, Helena Montana, 1999 and in U.S. Fish and Wildlife Service, "Malheur National Forest, Middle and Upper Fork of John Day, Upper Malheur Sub-basin, Oregon," 2000.

[89] This appears in the Lolo National Forest Portion of the terms and conditions in U.S. Fish and Wildlife Service, "Twenty Range Management Actions in the Upper Clark Fork, Rock Creek and Middle Clark Fork River, Montana," Helena Field Office, Helena, Montana, 1999.

300. The wide range in type and size of grazing allotments introduces uncertainty into the average cost associated with project modifications. For example, in one BO for the Fremont National Forest, the terms and conditions state that cattle be monitored to ensure they do not wander into Coyote Creek. However, existing fencing and a high ridgeline make it difficult for cattle to find Coyote Creek. Therefore, in this case monitoring is all that is required.[90] In other cases, such as in the Helena National Forest, National Forests have been required to hire additional seasonal employees to help with monitoring of leases. Although no individual grazing lease may be "typical", forecast costs of project modifications associated with consultations on grazing leases, as presented in Section 4 of this report, are believed to represent reasonable average cost estimates. These estimates are then applied to the predicted number of grazing consultations within the proposed critical habitat area.

3.3.3 Modifications to Timber Harvest

301. This section provides an overview of the types of project modifications that have been required as a result of past bull trout-related consultations on proposed timber harvest actions, primarily on USFS lands. Most of these actions were either green timber sales, salvage (fire or disease-related) sales, or fuel reduction. Brief examples of past project modifications are provided below, and described in greater detail in Section 4. The examples presented here also illustrate that many modifications to timber harvest projects are required as a result of other (i.e., non-Act) regulatory and management policy authorities. The four different type of project modifications most common in timber harvest-related consultations are:

- harvest reduction;
- study and monitoring costs;
- costs related to roads and culverts; and,
- changes to log yarding systems.

302. The set of timber sales examined in detail in Section 4 of this report included several cases where harvest reductions were required as a result of bull trout-related project modifications. For example, for one sale (involving the Bitterroot Burned Area) a streamside buffer was expanded beyond that required by the agency guidelines out of concern for the more easily eroded and disturbed condition of burned areas. This resulted in a reduction in the amount of salvage timber available for harvest.

303. Another timber harvest reduction occurred in a case (White Pine Sale, Kootenai National Forest) in which findings from concurrent field investigations indicated potential impacts to bull trout not anticipated in the Action agency's BA. The BA for this sale was based on the assumption that bull trout were not present in this drainage. However, during

[90] Personal communication with Range Program Manager, Fremont National Forest, December 19, 2002.

the course of the consultation, bull trout were found to be present in White Pine Creek, and a peak flow assessment showed potential channel stability problems. In light of these findings, a project modification required by the consultation imposed a reduction in harvest acreage and total timber harvest. Note that the majority of the timber sales examined in this analysis had no harvest reductions because the Action agency was already meeting the streamside buffer (riparian conservation area) standards of INFISH, PACFISH, or the Northwest Forest Plan. As noted elsewhere in this report, the standards in INFISH were specifically designed to be protective of bull trout.

304. With regard to study and monitoring project modifications, an example consultation is provided by a group of sales on the Willamette National Forest. In the initial consultation, the Service concurred with the Action agency's BA that the proposed action was consistent with the guidelines of the Northwest Forest Plan and therefore was sufficiently protective of bull trout. However, a lawsuit was filed on these sales and ultimately resulted in the recommendation by the Service that a watershed assessment be completed prior to the timber harvest to address potential cumulative impacts in the area. Thus, for this group of proposed timber sales, the outcome of bull trout consultations were additional study costs entailed in completing a watershed assessment.

305. Project modifications related to roads and culverts were a feature of some sales. For example, road obliteration or BMP upgrades are required by the bull trout consultation on the Bitterroot Burned Area project. However, in many cases actions such as road obliteration or culvert upgrades were either one of the original project goals (based on the forest Land Resource Management Plan) or were motivated by other baseline regulations, such as the need to meet TMDL goals under the CWA or meet INFISH standards on culverts.

306. A final area of project modifications for timber harvest actions are yarding system changes made to protect soils and reduce sediment loads in streams, undertaken to benefit bull trout. For example, on the Bitterroot Burned Area sale, a number of cutting units were changed from tractor to skyline or from skyline or tractor to helicopter yarding. This requirement increases logging costs and reduces stumpage value. Another strategy to protect soils and aquatic resources is to require winter yarding and temporary snow roads for access. These activities can also increase logging costs and reduce harvest and stumpage value.

307. Thus, the most common project modifications resulting from bull trout consultations on timber sales are: (1) harvest reduction, (2) study and monitoring costs, (3) costs related to roads and culverts, and (4) changes to log yarding systems. In many cases the required project modifications are also required by and consistent with some other regulatory or management policy authority. The most important of these baseline regulations for timber harvest are USFS planning guidelines specific to the Pacific Northwest, including INFISH, PACFISH, the Northwest Forest Plan, CWA TMDL goals, state forestry BMP standards, and requirements for other endangered species in the region, including grizzly bear, spotted owl, lynx and salmon. The number and extent of project modifications will be expected to vary by type of timber harvest action, based on a review of the historical consultation record. Fire

salvage sales had the most project modifications, followed by green timber sales. Fuel reduction actions had little or no project modifications for the cases examined.

3.3.4 Modifications to Mining Operations

308. The formal consultation record for mining activities in Montana and Idaho and their potential impact on bull trout is limited. However, a significant number of formal bull trout consultations in eastern Oregon have recently been completed. Past consultations include one large-scale hard rock mine example from northwestern Montana[91] and several recreational suction-dredging consultations from the Vermillion River in Montana and Moose Creek on the North Fork of the Clearwater River in Idaho.[92] In Oregon, consultations on placer gold mining operations in the John Day and Powder River Drainages have recently been completed.

309. The section 7 consultation on the Sterling-Rock Creek Mine included concerns about both bull trout and grizzly bears. The preliminary BO recommended substantial project modifications associated with grizzly bear protection.[93] Mitigation actions associated with protection of the bull trout were limited to conducting a watershed assessment in conjunction with the development of the mine.

310. In past consultations on recreational suction dredging activities, proposed project modifications have included reiterations of the state permit regulations under which the activity is authorized,[94] monitoring by the Action agency (the USFS, in the case of the Vermillion River, and the Moose Creek in Idaho), and one case of limiting the period of in-stream activity.[95]

311. Recently completed formal consultations on gold placer mining within the John Day and Powder River Basins have involved varying sizes of operations ranging from small one-

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[91] The proposed Sterling Corporation Rock Creek Mine has been in consultation for a number of years, and the BO on this proposed action is expected to be issued in the near future.

[92] Plan of operation for the Vermillion River suction dredge project, BO, U.S. Fish and Wildlife Service, Helena, Montana, and personal communication, Fishery Biologist Supervisor, Boise Field Office, February 4, 2003.

[93] The total mitigation cost associated with protection of the grizzly in the Sterling-Rock Creek mine BO was estimated at approximately $70 million dollars.

[94] For example, the terms of the Stream Alteration Permit issued by the Idaho Department of Water Resources specifies that dredgers leave the stream much as they found it with no residual developed pools and removed matter placed back in the stream.

[95] The formal consultation BO on recreational suction dredging on Moose Creek specified that dredging should only occur between July 1 and August 15 due to the very small size of the stream relative to the scale of dredging activity. Personal communication, Service Fisheries Biologist, Boise Field Office. February 4, 2003.

person recreational suction dredges to large trackhoe operations.[96] The primary project modifications resulting from these consultations are reductions in the time period allowed for in-stream work, and additional costs associated with requirements such as rules governing allowed stream crossings.[97]

312. Section 4 of this report provides estimates of the likely future frequency of the different types of mining-related consultations (hard rock, recreational suction dredging, and placer). Additionally, Section 4 presents estimates of per-consultation and total annual project modification costs associated with these predicted mining consultations.

3.3.5 Modifications to Agricultural Irrigation Projects

313. While the history of consultation on the bull trout associated with agricultural irrigation projects is limited, the substantial number and size of irrigation projects within proposed critical habitat for the bull trout suggest that future mitigation costs associated with these projects could be substantial. Current measures being undertaken to either study or protect bull trout at BOR facilities include life-cycle monitoring, and trapping and hauling entrained bull trout around impoundment facilities.[98] Additional measures that may be considered in ongoing or future consultations include measures to reduce entrainment at dams such as barrier nets or strobe lights, or provisions for upstream or downstream passage of trout.[99] Additional mitigation actions may include requiring the screening of irrigation diversions to prevent entrainment of bull trout in irrigation systems, installation of headgates, and possibly altering reservoir release patterns to benefit the species.[100]

314. Some public commenters on the proposed critical habitat for the bull trout have expressed concern over the possibility of section 7 bull trout consultations leading to requirements for costly screens at irrigation diversions and reduced water available for irrigation. As discussed in Section 2 above, irrigated agriculture is an important component of the economies of many critical habitat units for the bull trout. Of particular concern in some of these areas is the potential for future bull trout-related section 7 consultations to result in terms and conditions of the BOs that in some way restrict the delivery of irrigation water to agricultural producers. There are only a few examples of past bull trout

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[96] Personal communication, Service Biologist, Roseburg, Oregon Field Office. November 13, 2003.

[97] Ibid.

[98] Personal communication, Richard Rieber, BOR Fishery Biologist, Boise, Idaho. January 7, 2003.

[99] Personal communication, Dave Kaumheimer, BOR Fishery Biologist, Wenatchee, Washington. January 7, 2003.

[100] Personal communication, Service Coordinator, Division of Endangered Species, Portland, Oregon. January 8, 2003.

consultations where such outcomes occurred.[101] No examples were found within the consultation record of mandatory limitations to the operation of irrigation withdrawals as mitigation within a section 7 consultation where bull trout was the only listed species (the examples from the Methow River Drainage of Washington also involved steelhead and chinook salmon). In two examples from Idaho, two diversions in the Upper Salmon River Basin were included in a formal consultation on ongoing activities on USFS lands.[102] The terms and conditions for this consultation included recommendations for "incorporating bull trout into screening priority considerations" and "Negotiate or acquire bypass flows where necessary."[103] While the RPMs in the opinion called for these actions to be in place by 2000, to date, no changes in operations have been made. Representatives of the USFS do not expect any significant changes to the operations at these diversions that would represent added cost to the permitee.[104,105]

315. Examples of cases where water historically used for irrigation has been converted to species conservation uses can be seen in the maintenance of "conservation pools" in BOR reservoirs to protect aquatic species. BOR impoundments such as Beulah, Deadwood, and Cascade Reservoirs have various conservation pool programs. In consulting with BOR on their reservoir operations and water delivery programs, the Service has encouraged BOR to lease water from agricultural users to fulfill pool needs. While the costs associated with leasing agricultural water for species protection are real costs, these accrue to the agency (BOR) rather than to the agricultural producers who lease their water to BOR in willing seller arrangements. That is, to date, minimum conservation pool requirements at BOR reservoirs have been fulfilled using willing-seller transactions with agricultural producers.

316. As noted above, there is some reason to believe that the future will see a larger number of consultations involving agricultural diversions than has been seen in the past. The primary example is in the upper Salmon River Drainage where as part of a settlement agreement with Western Watersheds, the USFS has agreed to complete BAs of impacts

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[101] A few examples of such consultation activity can be found within the NOAA Fisheries consultation record on steelhead and chinook salmon in the Methow River Drainage in Washington. In these cases minimum flow levels were negotiated with irrigation users on several streams to protect anadromous species.

[102] "Sawtooth Valley Sub-population of Columbia River Bull Trout, Ongoing Actions–Biological Assessment" U.S. Fish and Wildlife Service, Boise, Idaho. December 15, 1998.

[103] Ibid, at p. 24

[104] Personal communication, Water and Fisheries Program Leader, Sawtooth National Recreation Area, Stanley, ID. February 5, 2003.

[105] Representatives of the Sawtooth National Recreation Area (February 5, 2003) knew of no instances where costs associated with screening or instream flow requirements were born by the agricultural water user. In one instance, a diversion abandonment was negotiated as a part of a large compensation package for purchase of a "scenic easement" on ranchland in the valley. This, however, was a willing buyer-willing seller transaction. Because of the lack of bull trout consultation information on irrigation diversions from other areas, it is unknown whether the two example from the Sawtooth National Resource Area consultations regarding irrigation diversions are representative of other forests and districts. Personal communication, Lyle Powers, Salmon Challis National Forest.

associated with all diversions on USFS land within 13 Upper Salmon River Drainages over the next five years.[106] At this point in time, BAs are being prepared (or scheduled to be prepared by 2007) assessing the state of the species in these drainages. Once the BAs are completed and accepted, the USFS will be able to consult with the Service on all ongoing activities within each if the 13 Upper Salmon River Drainages, including diversions or ditches that are on USFS land.

317. It is currently unknown what the actual number of diversions and quantities of water that might be affected by these future consultations, however, the Idaho Fish and Game reports a total of 555 surface diversions and 150 pump diversions in the entire Salmon River Drainage.[107] Potential actions that could be required include installation and maintenance of headgates or screens to prevent entrainment of bull trout within the irrigation system, and possible minimum flow requirements for affected streams.[108] Conversations with USFS personnel indicate that the USFS will not recommend limitations on diversions to enhance instream flow in the foreseeable future. The USFS position reflects a strong reluctance to modify irrigation water rights until any such decisions can be done in a comprehensive manner, involving all affected Federal and state agencies within a watershed. As this is not expected to happen in the near future, the position of the USFS in the Upper Salmon River Drainage is to focus on recommending headgates and screens. The USFS also indicated they would assert their authority to consider the effect of a diversion on instream flows in the future, but as noted would not recommend changes in diverted flows at the present time.[109]

318. The BLM, unlike the USFS in the Upper Salmon Region, has taken the position that agricultural diversions predate the adoption of FLPMA and the listing of the bull trout and thus can not be considered as on-going activities on BLM land which must be consulted on. Thus, irrigation diversions on BLM land in the Salmon River Drainage should not face any section 7 related costs.[110]

319. Based on the above information, this analysis concludes that future project modifications requiring reduction in irrigation diversions are unlikely in the case of section 7 bull trout consultations with the USFS or BLM. However, such reductions have been included in the terms and conditions attached to BOs for anadromous species in the Methow drainage of Washington due to USFS consultations (Okanogan National Forest). Accordingly, in the analysis of project modification costs in Section 4 of this report, the

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[106] Personal communications, Service Biologist, Pocatello, Idaho, October 30, 2003, and Lyle Powers, Salmon Challis National Forest, November 3, 2003.

[107] Information presented at: http://salmonidaho.com/screenshop/purpose.htm

[108] It should be noted that installation of diversion fish screen is a baseline regulation within Idaho, Oregon, and Washington. That is, screens on agricultural diversions are already required under Idaho Code 36-906 (b).

[109] Personal communication, Lyle Powers, Salmon Challis National Forest. November 3, 2003.

[110] Ibid. There is a great deal of disagreement between the USFS and the BLM on this issue.

impact for five such reductions are estimated to provide information on the potential impacts of reductions in irrigation withdrawals.

320. **Modifications to Other Agricultural Operations** Most individual consultations associated with agriculture and bull trout are conducted at the informal section 7 consultation level.[111] The primary types of actions NRCS consults on typically involve in-stream diversion structures and habitat restoration activities. The typical project modifications associated with formal section 7 consultations for these types of activities often include restrictions on timing of instream work.[112] Conversations with the NRCS State Biologist in Washington indicate that more often the informal consultations NRCS is holding are on primarily beneficial activities, such as habitat restoration.[113]

3.3.6 Modifications to Dams and Hydroelectric Projects

321. After consultations involving timber management and range management actions, formal consultations associated with dams are the most numerous type of consultation. More importantly, dams, both hydroelectric and multi-purpose (flood control, irrigation, recreation, etc.) represent the single largest type of capital investment located within the proposed designated critical habitat for bull trout. Accordingly, the majority of total consultation-related costs identified in this analysis (across all types of activity and Action agencies) are associated with dam projects.

322. Dams have the potential to negatively impact bull trout through interrupting the migratory life history that connects spawning and rearing habitat with foraging habitat. Dams can isolate populations and prevent genetic exchange, as well as creating inhabitable zones through effects on water temperature or by harboring nonnative fish species that may dominate bull trout in a modified habitat setting. Individual fish can also be impacted by entrainment in turbines or subjected to gas supersaturation below high head facilities.[114]

323. The primary Action agencies for dams are FERC, the ACOE, BOR, and the BPA. The latter manages and markets the power from the FCRPS, a network of large mainstem

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[111] Personal communication, Terry Nelson, NRCS Portland. October 30, 2003. Mr. Nelson reiterated that very few NRCS consultations involving bull trout are taken beyond the informal level.

[112] Debra Virgovic, NRCS Fisheries Biologist for the State of Oregon (personal communication, October 31, 2003), indicates that project modifications associated with section 7 bull trout consultations are very rare, and most costs associated with bull trout consultation are likely found in NRCS analysis of the large number of activities with a "no effect determined" finding. These analyses never go to consultation, but still represent significant effort and cost for NRCS.

[113] Personal communication, Tim Dring, Washington State Biologist, NRCS. November 6, 2003.

[114] Note that dams can, in some instances, benefit bull trout by serving as a barrier to protect bull trout populations from competing species (e.g., Hungry Horse and Bigfork). Reservoirs can also contribute to an adfluvial life history, sometimes with very abundant forage (as in the historic kokanee-bull trout fisheries at Flathead Lake, Montana and Lake Pend Oreille, Idaho, and currently in Lake Billy Chinook, Oregon and Lake Koocanusa).

and tributary dams on the Columbia and Snake Rivers. This is one of the largest hydroelectric power systems in the United States, with a total of 19,600 MWs installed nameplate generating capacity just in the 30 Federal dams in the basin. This system, along with the approximately 145 FERC licensed facilities (owned by private or local public utilities) provides about 75 percent of the Northwest's power supply. In addition to power projects, there are additional dams operated by both the BOR and ACOE that are primarily for flood control and irrigation.

324. This analysis of dam projects is organized into four sections: (1) FERC licensed facilities (of the 145 FERC hydroelectric projects in Idaho, Montana, Oregon and Washington, 41 are located on proposed designated bull trout critical habitat streams, rivers, lakes or reservoirs); (2) the FCRPS (focusing on the main 14 Federal mainstem and upper tributary projects including Hungry Horse and Libby as well as Banks Lake Pump Storage), (3) BOR dams (primarily the Yakima System and the Deschutes, as well as the Upper Snake), and (4) ACOE dams (Willamette River flood control system).

325. The significant baseline regulations for this analysis include the FPA, the CWA (including temperature standards), and requirements of the Act associated with listed anadromous species. The FPA is also an important baseline element, particularly section 18, which provides the Service with the authority to prescribe fishways at FERC licensed projects.

326. Listed anadromous fish species have played a significant role in the region in modifying the operation of all types of dams, and including the allocation of $6 billion in expenditures for fish and wildlife mitigation through the Pacific Northwest Electric Power Planning and Conservation Act of 1980 and the creation of the NWPCC (formerly the Northwest Power Planning Council).[115] The operation of the Federal dam system is governed by a complex set of agreements, including the Columbia River Treaty, which was signed in 1961. Since 1991 and the first Act listing of an anadromous species in the basin, river operations have been managed under BOs issued by the NMFS, now called NOAA Fisheries (BPA, ACOE, and U.S. Department of the Interior (USDOI) 1995). Concurrently, the Service issued a BO addressing the affects of system operation on the Kootenai River white sturgeon, listed in June 1994. At present, river operation is in response to the NOAA and Service BOs of 2000.

327. The primary types of project modifications for the four dam classes are as follows:

1) FERC (studies, habitat mitigation (fish passage is covered under FPA, Section 18, also Sections 4c and 10j);

2) ACOE (studies, fish passage, temperature control);

[115] Northwest Power Planning Council. 2002. Second Annual Report of the Northwest Governors on Expenditures of the Bonneville Power Administration to Implement the Columbia River Basin Fish and Wildlife Program of the Northwest Power Planning Council. Council Document 2002-13.

3) BOR (studies, fish passage, reservoir operations); and

4) FCRPS (studies, modifications to current operations, possible future facility changes).

Additional detail on these project modifications is provided in Appendix D.

328. With respect to dams, the four most typical types of costs identified in consultation terms and conditions are: (1) fish passage, (2) changes in operations, (3) habitat protection, and (4) fishery studies. Far and away the highest costs, for the sample of consultations discussed below, are for fish passage which may entail major facility construction (capital costs) as well as substantial operation and maintenance costs. As developed below, the majority of dams are owned by private or local PUD entities. As such they are subject to licensing by FERC. The FERC re-licensing schedule appears to be the primary factor driving the timing of formal section 7 consultations for bull trout with regard to dams.

329. Exhibit 3.5 provides a list of all historical formal bull trout consultations relating to hydroelectric power and dams. This list of 11 consultations is believed to include all such consultations completed in the Klamath and Columbia River Basins with respect to bull trout from the date of listing in June 1998, through early summer of 2002. As can be seen, there are a total of seven FERC consultations, one FCRPS programmatic consultation with BOR and ACOE, and one consultation each with BOR and ACOE alone.

330. Section 4 of this report utilizes information from Action agencies such as BOR and ACOE, as well as the actual future re-licensing schedule for all FERC dams in conjunction with information on historical and anticipated project modification costs, to estimate total annual project modification costs associated with bull trout consultations on dam operations. These estimated costs are substantial, reflecting the important role these facilities play within bull trout habitat.

Exhibit 3.5

Formal Consultations on Bull Trout: Hydroelectric Power and Dams

CH Unit	Consulting Agency	Project Name	Activity Summary	Location	Service Office
(A) FERC Licensed or re-licensed Facilities					
2	FERC	Re-licensing of Cabinet Gorge and Noxon Rapids hydroelectric projects	Hydroelectric project re-licensing	Clark Fork River in northern ID and MT, above Lake Pend Oreille	Helena, MT
6	FERC	Installation of new turbine runners at Round Butte Dam, continued operation of Pelton Round Butte Project, implementation of Portland GE's conservation strategy	Non-capacity license amendment	Deschutes River Basin, Lake Simtustus	Portland, OR (also NMFS NW region)
19	FERC	Operations of the Merwin, Yale, Swift No. 1 and Swift No. 2 hydroelectric projects	Re-licensing of hydroelectric projects	North Fork Lewis River, Columbia River tributary	Lacey, WA
4	FERC	Re-licensing of Eugene Water and Electric Board's Leaburg-Walterville hydroelectric project	Re-licensing of hydroelectric projects	McKenzie River Basin	Portland, OR (also NMFS NW region)
4	FERC	Issuance of Original Hydro power License for McKenzie hydroelectric project	Licensing of Hydroelectric power project	Upper McKenzie River near McKenzie bridge	Portland, OR (also NMFS NW region)
11	FERC	Licensing of Atlanta Power Station hydroelectric project. Licensing of powerhouse, operation, flows to upstream fish ladder, and fish screen	Re-licensing of powerhouse, fish ladder and screen	Middle Fork Boise River near Atlanta, Elmore County, ID	Boise, ID
(B) FERC Dam Removals					
19	FERC	Continued operation of Condit hydroelectric project through 2006 and subsequent removal	Operation and removal of dam	Big White Salmon River	Lacey, WA

Exhibit 3.5

Formal Consultations on Bull Trout: Hydroelectric Power and Dams

CH Unit	Consulting Agency	Project Name	Activity Summary	Location	Service Office
(C) Federal Columbia River Power System					
19, 15, 21, 23	ACOE, BPA, BOR	Operations of the FCRPS	Operation and maintenance of dams (storage, run-of-river)	Upper and Lower Columbia River, Lower Snake/ Clearwater Rivers	Spokane, WA
(D) Bureau of Reclamation					
11	BOR	Operation and maintenance of BOR facilities, including flood control and delivery of water from storage reservoirs	Reservoir operations	Snake River and tributaries, upstream of Hells Canyon, near Lewiston, ID	Boise, ID
(E) U.S. Army Corps of Engineers					
4	ACOE	Water temperature control project at Cougar Dam	Modification to provide water temperature control	McKenzie River Subbasin, Lane County	Portland, OR (also NMFS NW region)

Source: Record of formal bull trout section 7 consultations 1998-2002.

3.3.7 Modifications to Forest Management and Road Maintenance Projects

331. Between 1998 and late 2002, there were 58 formal consultations between the Service, the USFS, and BLM involving forest management other than timber harvests. This includes recreation (trail construction, campground maintenance and construction), special use permits, watershed restoration, road decommissioning, bridge/culvert replacement, irrigation diversions, and prescribed fire/fuel reduction projects. The project modifications from all of the projects are listed in Appendix D. Many of these formal forest management consultations contain sections dealing with timber harvest and grazing, but these are considered separately and are not included in this forest management section.

3.3.8 Activities Unlikely to Involve Significant Modification

332. There have been a number of activities within the consultation record for the bull trout that have generally required very limited, or no significant project modifications. Examples of these types of activities are fishery or habitat restoration activities undertaken by the USFS, NPS, BPA, the Service, and others.

3.4 Projected Future Section 7 Consultations Involving the Bull Trout

333. The bull trout was listed as a threatened species in 1998. Since that time, there have been a wide range of activities potentially affecting the trout requiring consultation by the Service and a number of governmental agencies. For this analysis, future consultation levels were predicted based on a number of factors. In the case of all activities that were consulted on in the past, this analysis considers the historical consultation frequency as well as information from representatives of the consulting Action agencies on likely changes in future consultation rates following designation of critical habitat. In some cases (such as mining activity and agricultural irrigation diversions) it was determined that the historical consultation record would likely understate the expected level of future consultation activity; thus, adjustments to future predicted consultation levels were made. In the cases of dam and reservoir operations, a wide spectrum of information from agency representatives and FERC re-licensing schedules for privately operated hydroelectric power facilities were used to augment historical consultation rates.[116]

334. Because much of the proposed critical habitat designation is encompassed by Federal land, and is located in sparsely populated headwaters away from large urban centers, the Home Builders Association of Metropolitan Portland and biologists hired by the Home Builders Association believe bull trout will have little impact on residential development. In fact, most of the industry's attention is focused on requirements associated with the conservation of salmon populations. The National Association of Home Builders did express

[116] The schedule for the re-licensing of all FERC permitted plants within proposed bull trout critical habitat is generally set on a 50 year cycle (some recently issued or renewed licenses are for between 30 and 50 years). Therefore, it is known today in what year each facility will come up for re-licensing.

concern that bull trout has the potential to impact to residential builders in critical habitat that overlays metropolitan areas, particularly Portland. However, the impact is uncertain as it depends on the unknown increment critical habitat adds to the existing regulations (e.g., stormwater regulations).[117]

335. While the bull trout Draft Recovery Plan identifies residential development as a potential threat to the species,[118] the Federal nexus for residential development generating consultations under section 7 is uncertain. Consultations regarding residential and related development activities occur through associated infrastructure, such as construction of utility pipelines, water supply, and roads. Infrastructure associated with residential development is addressed through the forecasted informal consultations (e.g., road/bridge construction, pipeline/cable installation and water system improvements) and formal road and bridge construction and maintenance consultations. Thus, any increases in residential or related development costs are captured by associated activities.

336. Exhibit 3.6a provides a summary of the method used, by activity, to project future consultation activity levels. Exhibit 3.6b summarizes the expected activity by agency. The USFS has been the agency involved in the largest number of bull trout section 7 consultations over the past four years, and is expected to remain so in the future. It is generally expected that the specific activities each agency consults on will be representative of those activities addressed in past consultations.

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[117] Personal communication with Chris Galik, National Association of Home Builders, Washington, D.C., December 17, 2003, December 22, 2003, and December 29, 2003; personal communication with Ernie Platt, Home Builders Association of Metropolitan Portland, Portland, Oregon, December 29, 2003; personal communication with Jim Buell, Buell & Associates, Portland, Oregon, January 2, 2004; and personal communication with Steve Cramer, S.P. Cramer and Associates, Portland, Oregon, December 30, 2003.

[118] Threats to bull trout from residential development, previous and future, may include, among other things, loss of riparian vegetation, stream channelization and streambank armoring to protect structures, water quality problems from failed septic systems, fertilizers, pesticides, sedimentation and storm water runoff, and the filling of wetlands. U.S. Fish and Wildlife Service, *Proposed Designation of Critical Habitat for the Klamath River and Columbia River Distinct Population Segments of Bull Trout and Notice of Availability of the Draft Recovery Plan*, published on November 29, 2002 (67 FR 71236).

Exhibit 3.6a Methodology and Information Sources Used to Project Future Consultation Levels by Activity Type	
Activity	**Methodology / Information Sources**
Road and Bridge Projects	Record of past bull trout consultation activity augmented with information from state DOT personnel on likely changes in future consultation rates.
Grazing Leases	Record of past bull trout consultation activity augmented with information from USFS and BLM personnel on likely changes in future consultation rates.
Timber Sales	Consultation frequency for past three years augmented with USFS information on projected future timber harvest levels in the region.
Mining	Consultation frequency over the period examined (listing to late 2002) was judged to understate the likely future frequency of placer mine consultations in Oregon. Additional information on Oregon and Washington mining activity from various sources is used to predict future consultation levels. Historical consultation levels were utilized for hard rock and recreational suction dredging.
Agricultural Irrigation Diversions	Record of past bull trout consultation activity augmented with information from NOAA Fisheries consultations on anadromous species in Washington. A range of expected consultation activity was considered in order to incorporate potentially significant impacts on irrigators.
Other Agriculture Impacts	Record of past bull trout consultation activity augmented with information from state NRCS personnel on any likely changes in future consultation rates.
Dam, Reservoir, and Hydroelectric Operations	Record of past bull trout consultation activity augmented with information from BOR and ACOE personnel on project specific consultation activity. In the case of FERC-licensed dams, the actual future re-licensing schedule for these dams was used to forecast future consultation-related activity and costs.
Forest Management and Road Maintenance	Record of past bull trout consultation activity augmented with information from USFS personnel on likely changes in future consultation rates.

Exhibit 3.6b

Projected Future Annual Bull Trout Consultations: By Action Agency

Action Agency	Activities Consulted on	Projected Number of Formal Consultations (annual)
Army Corps of Engineers	a) Dam and reservoir operations. b) Bank stabilization, dredging, bridge replacement, stream restoration.	0.5 ongoing[a] 1.0
Bureau of Land Management	Forest management, grazing, timber harvest, resource maintenance and road construction, weed management, streambank stabilization, flood control projects.	3.0
Bonneville Power Administration	a) FCRPS-dam operation. b) Fisheries restoration and augmentation, agricultural practices and irrigation systems	1.0 ongoing[a] 1.0
Bureau of Reclamation	Dam and reservoir operations, irrigation diversions	0.5
Federal Highway Commission	Highway bridge replacement	4.6
Federal Energy Regulatory Commission	Dam re-licensing and removal	0.7
U.S. Forest Service	a) Timber harvest b) Grazing c) Mining d) Resource maintenance and road construction, weed management, streambank stabilization, recreation, special use permits, watershed restoration, road decommissioning, irrigation diversions, culvert replacement, and prescribed fuel reduction programs.	36.5
Other agencies including National Park Service, BIA, USDA (Farm Services and Animal, and Plant Health Inspection Services), U.S. Geological Survey, the Service, NOAA fisheries	Assorted activities, primarily fisheries and stream and wetland restoration	2.75

Notes: The predicted levels of formal consultation activity reported in this exhibit have not been adjusted to reflect the impact of currently unoccupied bull trout habitat on consultation activity.
[a] These estimates are likely greater than the actual number of consultations that will occur per year, but do represent the level of effort (administrative costs) associated with these particularly large and complex consultations.

337. While the large majority of proposed critical habitat for the trout is currently considered occupied by the species, approximately 14 percent of proposed critical habitat is either currently unoccupied or of unknown occupancy. These areas not currently occupied by the trout also may not have been actively and fully consulted on since the listing of the species. Therefore, in order to account for the larger spatial extent of the proposed critical habitat as compared to the area generally involved in past bull trout consultations the estimated annual consultation costs are increased by 14 percent overall to arrive at predicted future annual consultation levels.[119] Appendix F shows a unit-by-unit breakout of predicted consultation activity and associated costs. This appendix also details the percent of unoccupied habitat and habitat of unknown occupancy for each proposed critical habitat unit.

3.4.1 Projected Future Formal Section 7 Consultations

338. Exhibit 3.6 shows the predicted level of future formal section 7 consultations involving the bull trout by the Action agency involved. Including consultations on FERC relicensing of hydroelectric facilities, it is predicted that, on average, approximately 52 formal consultations involving the species will occur each year. As was seen in the historical record of bull trout consultations since listing, it is expected that consultations with the USFS will constitute roughly 70 percent of the total number of formal consultations. Where there are combined consultations, such as joint USFS and BLM consultations on ongoing activities on formal lands, and the programmatic consultation with ACOE, BOR, and BPA on the operations of the FCRPS, these are included as one formal or programmatic consultation for the lead Action agency.

339. Exhibit 3.7 details the FERC licensed hydroelectric facilities within proposed critical habitat for the bull trout. Also shown in the exhibit is the relicensing year scheduled for the facility. Exhibit 3.8 graphically shows that while the number of FERC re-licenses is relatively evenly distributed over the next 50 years, in terms of total MWs of capacity, nearly 80 percent of capacity will be consulted on within 10 years. The implication is that if project modification costs are a function of capacity, those costs will have a higher actual present value than if one assumed a homogenous distribution time. In the analysis of costs in Section 4, the actual FERC relicensing dates and dam-specific MW capacities are used to project future consultation and project modification related costs.

[119] See Section 4.1. This adjustment for the unoccupied portions of proposed critical habitat assumes that activities in currently unoccupied habitat will be consulted on in future years at a rate per stream mile (or per lake or reservoir acre) at the same rates as forecast consultations on occupied waters. This adjustment will overstate the actual increase in consultation activity and costs to the extent that the Service has undertaken consultations in unoccupied bull trout habitat in the past. Much of the proposed bull trout critical habitat classified as unoccupied has in the past been considered by the Service to be of "unknown occupancy," and has been consulted on for activities potentially harmful to bull trout.

Exhibit 3.7

FERC-Licensed Hydroelectric Projects within Bull Trout Critical Habitat

Project Name	Capacity MW	State	Re-license Date	River	Owner Name
Lucky Peak	101.3	ID	2030	Boise River	Boise-Kuna ID et al.
Cascade	12.4	ID	2031	N Fk Payette River	Idaho Power Co.
Shingle Creek	0.2	ID	2031	Shingle Creek	Deveny Willis & Betty
Arrowrock Dam	60.0	ID	2039	Boise River	Boise-Kuna Irrig Dist et al.
Ford	1.5	ID	2035	Jim Ford Creek	Ford Hydro Ltd Pnsp
Sunshine	0.1	ID	2037	Lake Creek	Jerry Lee & Christine Mcmillan
Big Creek	0.0	ID	2022	Mccorkle Creek	Big Creek Lodge & Outfitters Inc.
Dworshak	2.5	ID	2048	N Fk Clearwater River	Idaho Water Res Board
Atlanta Power Station	0.2	ID	2032	M Fk Boise River	Atlanta Power Company
Hells Canyon, Brownlee, Oxbow	1,166.9	ID	2005	Snake River	Idaho Power Company
Cabinet Gorge	231	ID	2046	Clark Fk.	Avista Corporation
Idaho Total	**1,576.1**				
Noxon Rapids	466.0	MT	2046	Clark Fk	Avista Corporation
Kerr	180.0	MT	2035	Flathead River	PP&L Montana, LLC
Thompson Falls	92.6	MT	2025	Clark Fk	PP&L Montana, LLC
Milltown	3.2	MT	2007	Clark Fk River	Montana Power, LLC
Lake Creek	4.5	MT	2011	Lake Creek	Northern Lights Inc.
Big Fork	4.2	MT	2002	Swan River	Pacificorp
Montana Total	**750.5**				
Rock Creek	0.8	OR	1996	Rock Creek	Oregon Trail Elec Cons Corp Inc
Pelton Round Butte	416.1	OR	2001	Deschutes River	Portland General Electric Company
Trail Bridge & Carmen	124.5	OR	2008	McKenzie River	Eugene City of Oregon
Leaburg-Walterville	23.2	OR	2037	McKenzie River	Eugene Water & Electric Board
Powerdale	6.0	OR	2000	Hood River	Pacificorp

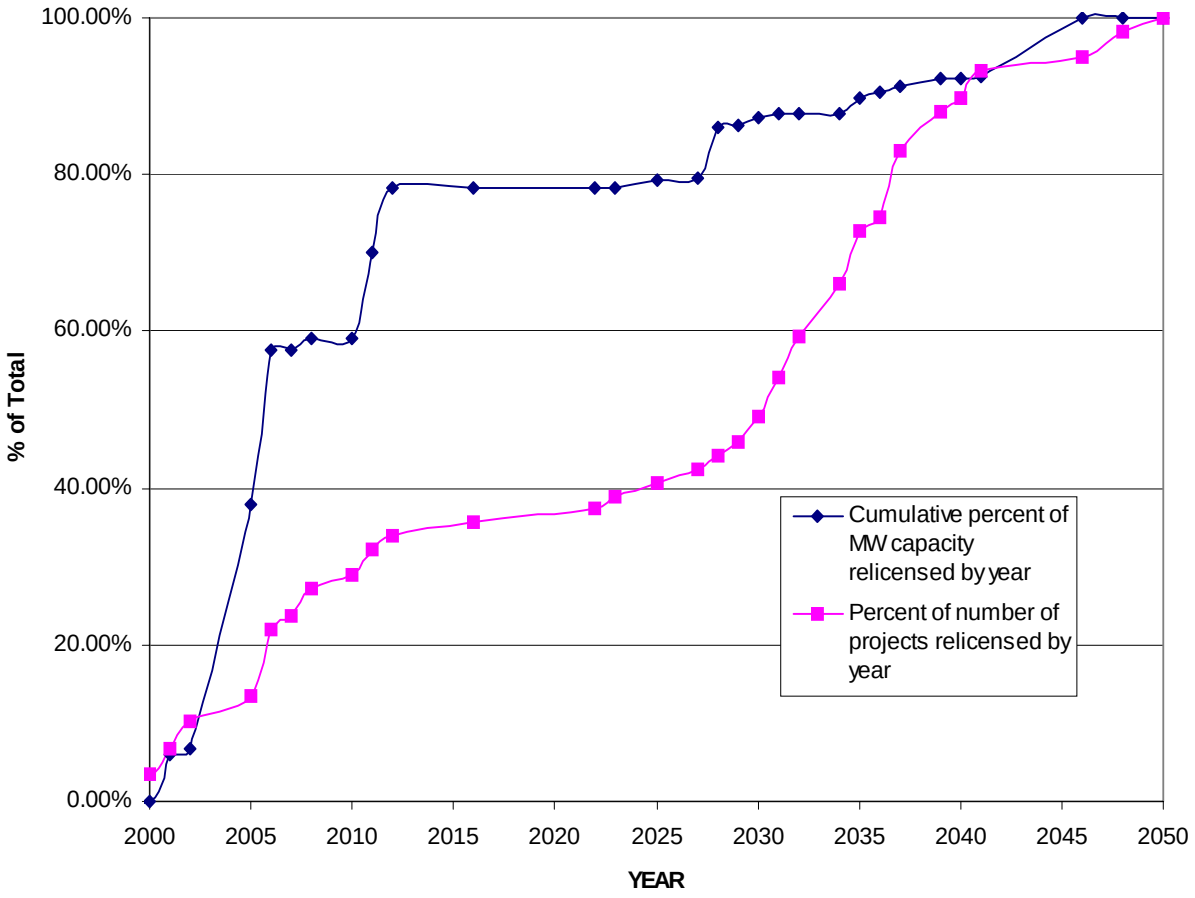
Exhibit 3.7

FERC-Licensed Hydroelectric Projects within Bull Trout Critical Habitat

Project Name	Capacity MW	State	Re-license Date	River	Owner Name
Blue River Dam	14.7	OR	2039	Blue River	Eugene City of Oregon
Opal Springs	4.3	OR	2032	Crooked River	Deschutes Valley Wtr Dist
North Fork Sprague River	1.2	OR	2035	N F Sprague River	Hdi Associates & Ehlers Fred
Jim Boyd	1.2	OR	2034	Umatilla River	Boyd James B & Janet A (Oregon)
McKenzie	0.1	OR	2050	McKenzie River	Bigelow, John H., Illinois
Oregon Total	**592.1**				
Box Canyon	60.0	WA	2002	Pend Oreille River	Pend Oreille County PUD
Lewis River Project (Merwin, Yale, Swift 1&2)	580.0	WA	2006	Lewis River	Pacificorp and Cowlitz Co. PUD 1 (Swift #2)
Rock Island	623.2	WA	2028	Columbia River	Chelan Co PUD 1
Priest Rapids	1,755.0	WA	2005	Columbia River	Grant Co PUD 2
Boundary	1,024.0	WA	2011	Pend Oreille River	Seattle City of Washington
Rocky Reach	1,237.4	WA	2006	Columbia River	Chelan Co PUD 1
Wells	774.3	WA	2012	Columbia River	Douglas Co PUD 1
Tieton Dam	13.6	WA	2041	Tieton River	American Energy, LLC
Dalles Dam North Fishway	4.9	WA	2037	Columbia River	Northern Wasco Co People's UD
McNary Dam Fish Attraction	9.7	WA	2041	Columbia River	Public Utility District No. 1
Washington Total	**6,082.0**				
Total All States	**9,000.7**				

Source: Derived from FERC re-licensing database and proposed designation (November 29, 2002).
Note: EPA has recommended the removal of Milltown Dam to clean away contaminated sediments; implementation of RPMs at Yale Dam has been postponed until 2006 to be consistent with other Lewis River Dams; Consultation on Pelton-Round Butte should occur in 2003.

Exhibit 3.8. Distribution of FERC Licensed Hydro Re-licensing within Bull Trout Critical Habitat



Source: Derived from FERC relicensing database

3.4.2 Projected Future Informal Section 7 Consultations

340. The projection of numbers of informal bull trout consultations within proposed bull trout critical habitat follows the methods used in projecting formal consultations, with one exception. Several Service field offices conducted a very large number of informal bull trout consultations in the first one or two years following the listing of the species in 1998. In more recent years (2001 and 2002, for instance) the number of informal consultations has dropped dramatically. For this reason, projections of informal consultations are based on the most recent year's average, where available, rather than on the average rate for the entire period of listing. As in the case of the projected formal bull trout consultations, past informal

rates have been inflated to adjust for the increased spatial extent attributable to including unoccupied habitat within the proposed critical habitat designation.

341. Exhibit 3.9 shows the projected distribution of future annual informal section 7 bull trout consultations by Service field office. Also included is a listing of likely consultation activities from records of past informal bull trout consultations.

Exhibit 3.9

Projected Annual Informal Consultations, by Service Field Office

Service Field Office	Types of Activities Consulted on	Informal Consultations
Portland, OR	Forest management, fisheries, dams, road/bridge construction, agriculture (irrigation), maintenance dredging, noxious weed management, mining, water treatment, stream restoration, tribal activities, fire management, pipeline/cable installation, land exchange, timber sales, Conservation Reserve Enhancement Program, NRCS projects, water system improvement.	15
Klamath Falls, OR		2
Boise, ID		401
Spokane, WA		137
Lacey, WA		18
Helena, MT		46
Total Projected Annual Informal Bull Trout Consultations		**619**

Source: Consultation rates for all offices are adjusted proportionally for the total percentage of unoccupied habitat within the designation.

ESTIMATING THE CO-EXTENSIVE COSTS OF THE DESIGNATION SECTION 4

342. This section presents the expected total economic cost of actions taken under section 7 of the Act associated with protection of the bull trout and its proposed critical habitat, including those costs attributable co-extensively to the listing of the trout as threatened. It provides per-effort administrative costs of section 7 consultation, and derives total cost estimates of the consultations and project modifications associated with the activities described in Section 3.

343. This section is organized into four subsections. The first provides a summary of total annual estimated costs for the entire proposed Columbia River Basin and Klamath River Basin critical habitat designation. Forecast costs have two components: administrative costs (associated with consultations conducted under the Act), and bull trout-related project modification costs. This summary also identifies those critical habitat units which are expected to be associated with the greatest economic impact. Projected administrative costs are based on forecasts of future consultations and expectations regarding the administrative cost per consultation, as developed in Section 3. These administrative cost estimates are not discussed further in Section 4, outside of this summary discussion.

344. The main task of this section is to develop cost estimates for forecast project modifications. This analysis is contained in the second subsection, which provides a discussion of potential economic impacts, organized by the likely consulting Action agency. The main activities examined for the ACOE, BPA, BOR and FERC are dam-related power generation, flood control and irrigation projects. The main activities for the Forest Service and BLM are timber harvest, grazing, mining, and irrigation withdrawals. The general approach in each of these discussions is to develop case studies of project modification costs. Where appropriate, these case studies are supplemented by information on consultations in process and other information. Based on these case studies, forecasts of average project modification costs are developed. Combined with projections of the number of future consultations, this subsection provides estimates of total project modification costs over the next 10 years associated with the bull trout. One exception to this approach is the use of a 50 year time horizon for FERC consultations, since the schedule of likely consultations is known for the more distant future, based on the FERC hydroelectric relicensing schedule.

345. The third subsection provides an analysis of potential impacts on small entities (e.g. small businesses, small organizations, and small government jurisdictions) as required under the Regulatory Flexibility Act. The fourth subsection evaluates the potential impacts of proposed critical habitat on the energy industry, as required by Executive Order No. 13211 for all significant energy actions.

346. It is important to note that the listing of the bull trout as threatened under the Act may result in impacts on land use activities that are not associated with section 7. For example, section 9 of the Act prohibits take of listed species, and section 10 outlines permitting procedures for entities whose activities do not involve a Federal nexus. Economic costs associated with these impacts are not included in this analysis.

4.1 Summary of Estimated Impacts

4.1.1 Annual Administrative Costs of Consultation

347. One significant category of estimated costs associated with section 7 bull trout consultations is administrative costs. Exhibit 4.1 provides an aggregation of total projected administrative consultation costs per year based on projected future consultation levels presented in Section 3. It is projected that section 7 administrative costs for the bull trout will total approximately $9.6 million per year. It is further estimated that approximately 58 percent of this cost will be born by the Federal Action agencies, 25 percent by third parties, and 17 percent by the Service.

Exhibit 4.1 Total Administrative Consultation Costs Associated with the Bull Trout (Annual Cost)					
Action Agency	**Number of Consultations/ Year**	**Costs to Service**	**Costs to Other Federal Agencies**	**Costs to Third Parties**	**Total Costs**
A) Costs for Occupied Habitat					
Informal	619	$681,000[a]	$3,312,000	$1,888,000[a]	$5,881,000
Formal/Reinitiated Consultation (Class 1)	6[b]	$244,000	$487,000	$25,000	$756,000
Formal/Reinitiated Consultation (Class 2)	46[c]	$469,000	$1,143,000	$158,000	$1,770,000
Subtotal		$1,394,000	$4,942,000	$2,071,000	$8,407,000
B) Costs for Unoccupied Habitat[d]					$1,177,000
Total Consultation Costs					**$9,584,000**

[a] Assumes 50 percent use third party BA. Implies an average agency cost of $5,350 and an average third party cost of $3,050.
[b] Assumes all dam related consultations and one consultation per year each on mining, timber, and the FCRPS, and one additional complex consultation per year. All of these assumed to have an agency BA.
[c] Assumes two consultations per year involve a private party BA (ACOE and FERC).
[d] Because an estimated 14 percent of proposed critical habitat is considered to be unoccupied, the future consultation rate and associated costs are increased by 14 percent.

4.1.2. Annual Bull Trout Project Modification Costs

348. Exhibit 4.2 provides a summary of forecast annual project modification costs associated with future section 7 consultation involving the bull trout. These estimates are based on a review of past consultation activity with the Service on impacts to the species as well as information from the Service, Action agencies, and third parties regarding specific past and likely future consultation activity. The estimates provided in Exhibit 4.2 (as well as those presented throughout this section) represent all estimated costs attributable to bull trout section 7 consultations, including both those attributable to the listing of the species as well as those attributable to critical habitat designation.

349. Total annual project modification costs associated with section 7 bull trout consultations are forecast to be between $13.7 and $20.5 million. Activities with the largest estimated annual costs associated with project modifications are BOR and ACOE dam and reservoir operations, USFS timber harvest activities, and FERC hydroelectric plant re-licensing actions. Exhibit 4.2 sums the projected annual project modification costs associated with occupied habitat with estimated project modification costs for unoccupied habitat to arrive at total annual project modification costs for all designated habitat. Adding the total annual forecast section 7 administrative costs (Exhibit 4.1) of $9.6 million results in a total annual section 7 consultation costs attributable to the bull trout between $23.3 and $30.0 million.

Exhibit 4.2 Forecast Annual Project Modification Costs within Proposed Bull Trout Critical Habitat			
Agency	**Activity / Modification**	**Annual Cost Estimate**	
		Low end	**High end**
A. Projected Costs for Occupied Habitat			
BLM	Grazing and general management	$30,000	$30,000
USFS	Timber Harvest	$1,640,000	$4,140,000
	Grazing	$100,000	$100,000
	Irrigation Diversion	$0	$1,690,000
	Mining	$530,000	$530,000
	Forest Management / Road Maintenance	$0	$230,000
FERC	Hydroelectric Facility Re-licensing	$618,000	$1,323,000
FHWA	Bridge Construction and Maintenance	$250,000	$250,000
BOR	Irrigation Projects, Dam and Reservoir Operations	$5,430,000	$5,610,000
ACOE	a) Dam and Reservoir Operations (Willamette) b) Bank stabilization, bridge replant, stream restoration	$3,290,000 $40,000	$3,490,000 $40,000
BPA	a) FCRPS b) Fisheries, restoration	$0 $10,000	$366,000 $40,000
Other	BIA, NPS, the Service, USGS, USDA, NOAA	$110,000	$110,000
Total Occupied Habitat Estimated Annual Project Modification Costs		**$12,048,000**	**$17,949,000**
B. Total Unoccupied Habitat Project Modification Costs		**$1,687,000**	**$2,512,000**
C. Total Project Modification Costs		**$13,735,000**	**$20,461,000**
D. Total Estimated Annual Consultation Costs		**$9,584,000**	**$9,584,000**
E. Total Annual Estimated Consultation and Project Modification Costs		**$23,319,000**	**$30,045,000**

4.1.3 Proposed Critical Habitat Units Expected to Generate the Greatest Economic Impacts

350. Not surprisingly (as will be discussed in the following sections), the costs of consultations involving activities at dams and dam project modification costs make up a large portion of costs forecast by this analysis. Particularly, in the cases of the Middle Columbia Basin Unit and the Willamette Basin Unit the costs of potential modifications to the BOR Yakima Project and the ACOE Upper Willamette System Dams likely will be disproportionately large when compared to costs associated with other proposed critical habitat units. As discussed below, there is some uncertainty as to whether the presence of bull trout within these systems will have an effect on the costs of modifications to these facilities, since anadromous fish are also present within the systems (steelhead on the Yakima, and chinook salmon and steelhead on the Willamette). These species may require

similar project modification to those called for to protect the bull trout. In addition, some of these facilities may require passage under currently unenforced State laws.

351. *A detailed discussion of the distribution of estimated administrative and project modification costs by critical habitat unit is presented in Appendix F to this report. A summary of costs by critical habitat unit is present in the Executive Summary.* On a cost per unit basis the largest portion of forecast costs are expected to occur in Unit 20, the Middle Columbia River Basin (17 percent). This is due primarily to fish passage, annual operating and maintenance and fish study costs, and costs associated with irrigation water diversions at BOR's Yakima River Project (five impoundments). The next most costly unit is Unit 4, the Willamette River Basin (15 percent). These costs are attributable to fish passage and temperature control projects, as well as annual operating and maintenance and fish study costs at ACOE's facilities in the Upper Willamette River System (Dexter, Lookout Point, Hills Creek and Blue River Dams). The third most costly unit is Unit 16, the Salmon River Basin (11 percent). Because this is the largest unit in terms of river miles and contains a large share of USFS managed land, and because future USFS activities are expected to generate 70 percent of forecast consultation activity, this unit is expected to generate the greatest number of future USFS-related consultations. Therefore, administrative costs account for most of the costs in this unit.

4.2 Discussion of Impacts by Action Agency

352. This subsection provides a detailed discussion of likely future project modification costs, organized by consulting Action agency. This discussion focuses on the seven Action agencies expected to be most affected by the proposed designation: ACOE, BLM, BPA, BOR, FHA, FERC and USFS. This analysis provides the basis for the forecast project modification costs presented in the summary section, Exhibit 4.2. The format of the presentation for each Action agency is to: (1) describe the number and type of past formal consultations, to provide context for the types of project modifications that might be required for the bull trout in the future; (2) estimate project modification costs for each major activity area (e.g., dams, timber, grazing, etc.) based on analysis of a subset of completed consultations; (3) compute average costs per consultation; and (4) use these average costs, along with the projected number of future formal consultations from Section 3, to project future project modification costs over the next ten years. In some cases, information from the set of completed formal consultations is supplemented with information on consultations that are in progress and other information as appropriate.

353. This analysis does not quantify project modification costs associated with activities in the informal consultation process. These costs are not quantified for two reasons. It is the judgement of the authors that the largest share of costs corresponding to the proposed critical habitat designation are related to project modifications associated with activities that enter formal consultation (e.g., dam-related consultations). Importantly, the focus of this analysis on those activities that enter formal consultation is not likely to result in a different ranking of units by relative cost than would occur with a more detailed analysis which includes informal consultation.

4.2.1 Army Corps of Engineers

354. This section provides a forecast of annual project modification costs associated with ACOE consultations involving the bull trout over the next 10 years. A summary of this section is as follows. The ACOE has participated in five formal consultations since bull trout listing in 1998. These consultations have generated only limited project modification costs, on activities including bank stabilization, dredging, bridge replacement, and stream restoration. Consultations on such projects are expected to occur at the rate of one per year in the future and generate project modification costs of $40,000 annually. However, the ACOE also has an extensive ongoing consultation, involving the impacts on bull trout of the system of 13 flood control dams operated by the ACOE in the Willamette River Basin. The cost associated with temperature control devices and fish passage to benefit bull trout on a subset of these dams is expected to be $3.3 to $3.5 million per year over the next ten years. The ACOE is also a participant in a consultation with the Service over operation of the FCRPS. This multi-agency consultation is discussed in the BPA section below.

Dam and Reservoir Operations

355. Currently, the ACOE is in consultation both with the Service and with NOAA Fisheries on their operation of 13 flood control facilities located on the upper Willamette River System. NOAA Fisheries is consulting on impacts to both chinook salmon and steelhead while the Service is consulting on bull trout. There is a large degree of uncertainty as to the eventual scope and costs associated with changes to dams in the drainage to protect the three species. However, the potential costs of any required modifications are likely to be heavily dominated by the provision of temperature control facilities at Lookout Point, Hills Creek, and Blue River Dams, trap and haul passage at Lookout Point, and Hills Creek, and a possible small ladder at Dexter Dam.[120] Estimates of the annual costs associated with the modifications listed above were developed utilizing the following assumptions.

- Costs associated with the three possible temperature control projects were based on the high-end estimate of the cost of a similar project at the ACOE Cougar Dam ($60 million per dam).[121]

- Trap and haul operations at two dams were estimated at a capital cost of $15 million each.

- A ladder at the low-head Dexter Dam re-regulation project was estimated to cost $5 million to construct.

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[120] Personal communications, Service Biologist, Portland, Oregon, and Matt Rabe, ACOE, Portland, Oregon. January, 15, 2003.

[121] ACOE personnel stated that the Cougar Dam temperature control project likely provides an upper-bound cost estimate due to the difficulties involved in modifying this project.

- The projects were assumed to be built over a 15 year period beginning in 2006 with construction costs evenly distributed through these years. The present value of construction costs incurred in the ten year period of analysis was computed using a three and seven percent real discount rate.

- NOAA Fisheries is currently consulting on two anadromous species in the drainage while the Service is consulting on one aquatic species (bull trout); it was therefore assumed that the costs associated with dam modifications would be allocated 33.3 percent to bull trout and 66.7 percent to chinook salmon and steelhead. This allocation of costs is conservative (i.e., more likely to overstate the cost of bull trout conservation rather than understate it, since the primary driving force in these project modifications is the salmon).

- Bull trout-related annual study costs at Lookout Point, Hills Creek, and Blue River Dams are estimated at $100,000 per dam, or $300,000 annually. Each dam is also expected to incur approximately $100,000 in annual bull trout related fish passage operating and maintenance costs. However, the latter costs will not begin until construction is complete and are outside the 10 year time frame of this analysis.

356. Exhibit 4.3 shows the estimated annualized costs associated with modifications to the Upper Willamette River ACOE projects. This estimate is provided as a rough approximation of the potential total costs of dam modifications and the share of those costs attributable to bull trout consultation.

Exhibit 4.3 U.S. Army Corps of Engineers Upper Willamette River System Dams Potential Costs Associated with Provision of Water Temperature Control and Passage, Ten Year Planning Period						
Reservoir	**Unit**	**Potential Bull Trout Mitigation Actions**	**Estimated Total Capital Cost**	**Low Annualized Cost Estimate[b]**	**High Annualized Cost Estimate**	**Bull Trout Annual Section 7 Share[a]**
Dexter Dam, Lookout Point, Hills Creek, and Blue River Dam	4	Capital cost of trap and haul at Lookout Point and Hills Creek, Ladder at Dexter Dam, and 3 temperature Control Projects	$215,000,000	$8,978,000	$9,580,000	$2.99 - $3.19 million
		Bull trout annual operation and maintenance and study costs	–	–	$300,000	$300,000
Total Estimated Annual Costs						**$3.29 - $3.49 million**

Sources: Service and ACOE representatives, Portland, Oregon. January 15, 2003.
[a] Assumed at 33.3 percent of total costs.
[b] Range of low and high estimates derived from use of three percent and seven percent real discount rates.

4.2.2 Bureau of Land Management

357. This section provides a forecast of annual of bull trout-related project modification costs associated with consultations conducted by the BLM. A summary of this section is as follows. The BLM manages approximately 12 percent of the total land area contained within the proposed critical habitat designation. BLM has participated in 18 formal bull trout consultations since the listing of this species. These consultations have covered a variety of management actions including forest management, grazing, timber harvest, resource maintenance and road construction, weed management, streambank stabilization, and flood control projects. Typically, the required project modifications resulting from these consultations have been limited. For example, grazing consultations have entailed additional monitoring, fencing, and off stream watering requirements averaging $10,000 per consultation. It is forecast that BLM will average three grazing or other general management consultations per year, with an estimated total annual cost due to project modifications of $30,000.

Grazing

358. With regard to range management and timber harvest, the regulatory baseline for protecting fisheries and aquatic habitat on National Forest and BLM lands in the planning area is relatively protective and in many cases specifically designed to protect bull trout. Thus, formal section 7 bull trout consultations on grazing are not found to have high costs in this analysis. The major cost components resulting from consultations involving grazing involve additional monitoring, fencing and off stream watering requirements. BLM land does not contain as many headwaters as USFS land, so there are fewer areas with bull trout. BLM also has had extensive monitoring activities for the species already in place. Thus, the additional monitoring costs are small, ranging from $2,000 to $3,000 per consultation. For similar reasons, fencing costs are low, typically $5,000 to $7,500 per consultation. This yields a forecast total cost of project modifications of $10,000 per formal consultation.[122]

359. BLM had a total of 18 formal consultations involving the bull trout since listing. Nine of these were joint consultations with the USFS following listing. The remaining nine were for a variety of general management issues, including three grazing consultations (one joint with USFS). For BLM's general management consultations, it is assumed that project modification costs are similar to those estimated for grazing. An estimated three grazing or general management consultations are projected per year, and it is estimated that total annual project modification costs associated with bull trout consultations on BLM grazing leases and general management issues will be $30,000 (Exhibit 4.4).

Exhibit 4.4

Forecast Annual Project Modification Costs Associated with BLM Grazing and General Management Activities

Activity	Modification	Projected Annual Projects	Per Effort Cost	Annual Cost Estimate
Grazing	Increased monitoring, fencing and off stream water	3	$10,000	$30,000

Sources: Personal communications, Fishery Biologists, BLM January 14, 2003 and January 15, 2003.

4.2.3 Bonneville Power Administration

360. This section provides a forecast of bull trout-related project modification costs for consultations involving the BPA over the next 10 years. Since 1998 BPA has been involved in four formal consultations that addressed the bull trout. Three of these consultations have resulted in limited project modifications and include actions concerning fisheries restoration and augmentation, agricultural practices and irrigation system projects, and stream

[122] Estimates based on personal communication with BLM Fishery Biologists in Missoula, Montana (January 14, 2003) and Vale, Oregon (January 15, 2003).

restoration. Consultations typical of this group of activities are expected to continue at the rate of one per year, with average project modification costs of $40,000 each. BPA has also been involved in one multi-agency consultation on the operation of the Federal Columbia River Power System (FCRPS) - a major system of federally owned and operated dams on the Columbia and Snake Rivers. This latter consultation is examined in detail in this section.

361. There are three components to FCRPS project modifications: (1) foregone power revenues and increased purchase costs due to operational changes to benefit bull trout, (2) fishery studies, and (3) other potential changes to operations and facilities. The findings are that the 2000 FCRPS consultation has led to changes for bull trout that entail: (1) annual losses in power revenue on the order of $2 to $4 million per year (primarily for changes in operation of Libby and Hungry Horse Dams), (2) bull trout population and related biological studies costing about $260,000 to $366,000 per year, and (3) possible future facility changes such as fish passage with annual costs of about $1.1 million to $1.3 million per year. Analysis of each of these three elements is discussed in turn below. It is anticipated that these actions would also occur under the authority of the Northwest Power Act of 1980 that provides for fishery mitigation actions for federal hydroelectric power development. The listed actions will also likely be funded by that authority through an institutional arrangement between the NWPCC and BPA. An exception is that the fishery studies may or may not occur in the absence of critical habitat. Accordingly, the estimated range of bull trout-related annual project mitigation costs for the FCRPS consultation is zero to $0.4 million per year. The remainder of this subsection focuses on the FCRPS consultation.

FCRPS Operations

362. This section provides a discussion of the project modification costs deriving from the 2000 Service programmatic consultation on a set of hydroelectric and multi-purpose dam facilities in the Columbia River DPS - the FCRPS. This BO was developed with three Action agencies: BPA, ACOE and BOR.

363. The FCRPS includes the mainstem federally owned and operated Columbia River dams (Grande Coulee, Chief Joseph, McNary, John Day, The Dalles, and Bonneville), the mainstem lower Snake River dams (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite), dams on major Columbia River Tributaries including the Kootenai River (Libby), the S. Fork Flathead River (Hungry Horse), the N. Fork Clearwater (Dworshak), Pend Oreille River (Albeni Falls) and the Banks Lake pumped storage associated with Grand Coulee. The upper tributary dams and Grande Coulee provide most of the storage in the system while the remaining dams are primarily run-of-river projects. Hungry Horse and Grand Coulee are operated by BOR while the remaining dams are operated by ACOE. As noted previously, the dams are operated under coordination agreements, including a treaty with Canada. BPA markets the power and owns the transmission system. Operation of the Federal system is also coordinated with the mainstem Columbia River PUD-owned dams described in the FERC subsection below.

364. The primary project modification costs likely to be associated with the FCRPS programmatic BOs are: (1) foregone power revenues and increased power purchase costs, (2) fishery studies, and (3) potential changes to operations and facilities. The BO emphasizes adaptive management in that the potential changes in the third category depend on the outcome of the fishery studies.

Foregone Power Revenues

365. The relevant BOs related to foregone power revenues include those issued by NMFS (now NOAA Fisheries) beginning in 1991 with Snake River sockeye, and by the Service (in 1995 for Kootenai River sturgeon), and continuing up to the most recent Service and NOAA BOs in the year 2000. These BOs have led to major changes in the way the FCRPS is operated primarily to benefit anadromous and resident Act listed species. The largest changes have been in providing water (increased flows and spills) for salmon and steelhead migration, particularly for juveniles migrating downstream to the ocean. Because this has meant increased flows during the spring runoff and in August, water is being shifted from the winter season. Historically, the winter season has been when electric power prices are generally higher due to the Northwest heating load, but forecast average spot market prices for 2005-6 now show August prices somewhat higher than during the winter season.[123] These high August prices are due to the Southwest U.S. summer cooling loads. Water that is spilled over dams (one strategy for avoiding juvenile fish passage through hydroelectric turbines) is lost to power generation. These operational changes, have historically reduced BPA system revenues and increase the cost of replacement power, and have been the single largest project modification cost stemming from the NOAA Fisheries biological opinions.

366. Information provided by BPA provides estimates of the combined cost of the 2000 NOAA and Service BOs.[124] Based on an average energy monthly-level model (HYDSIM), using a simulation of the 1929-1978 water years, the average cost of power operation changes due to species conservation is $310 million per year, with a range of $180 to $440 million, depending on the water year and energy markets. This cost is primarily due to the project modifications in the NOAA Fisheries 2000 BO for anadromous fish. While, to date, computer runs specific to the bull trout portion of the Service 2000 BO have not been completed, it is estimated that the bull trout specific operations costs would be two orders of magnitude less than the NOAA-related operation costs, or on the order of several millions of dollars.[125]

367. Recent instability in the markets for electric power has introduced uncertainty into forecast power operation costs. While much of BPA's power is sold in the Pacific Northwest,

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[123] Personal communication, John Fazio, NWPCC, December 9, 2003. The 2005-2006 forecast spot price average for December, January and August are $44.3, $37.8 and $53.0 per MW, respectively.

[124] Personal communication, Scott Bettin, BPA, Portland, December 16, 2002; Personal communication, Roger Schiewe, BPA, Portland, December 30, 2002.

[125] Ibid.

the utility also operates in other regional markets for both firm and non-firm power, including California. In late 2000 and into 2001 these typically stable markets saw very high prices, on the order of $250 to $500/mwhr, and in December prices briefly peaked over $1,300 per MW hour.[126] This is equivalent to $1.30 per kilowatt hour (the energy required to run one 100 watt bulb for ten hours) which is very expensive energy relative to historical costs. Prices have now moderated. The NWPCC predicts spot market energy prices for 2005 ranging from about 44 mills per kilowatt hour in November-December to 23 mills during spring runoff.[127] These are the values used in the current analysis for lost hydroelectric energy.

368. The primary operational changes related to bull trout are at Libby and Hungry Horse dams, both in Montana. Hungry Horse dam has historically been operated as a load-following or peaking facility. This has resulted in abrupt and frequent changes in flows below the dam on the South Fork Flathead River. For example, as described in the Service 2000 BO (at p.5), on August 10, 1997, Hungry Horse discharge rose from 145 cubic feet per second (cfs) to 11,000 cfs. In general, the dam has been operated within the limits of 145 cfs to 14,000 cfs. Libby has also been operated as a peaking facility. For example, during one day in 1998, river flows changed from 4,000 to 26,000 cfs in a four hour period. Abrupt changes in flow regimes can have a negative impact on resident fish below the dams.[128] Accordingly, one project modification indicated in the 2000 BO is to constrain the winter ramping rates at both dams and to require higher minimum as well as more stable instream flows. At Hungry Horse, the proposed minimum is 400 to 900 cfs below the project (depending on the runoff forecast) or 3,200 to 3,500 cfs at Columbia Falls further downstream on the mainstem Flathead River.

369. The costs of peaking and ramping constraints at both Libby and Hungry Horse projects have not been estimated.[129] Curtailment of load-following below Libby Dam benefits not only bull trout but is also considered to be a reasonable and prudent alternative for conservation of sturgeon in the Kootenai River. It should also be noted, when considering foregone power revenues from curtailment of load-following at Libby, that there are potentially substantial benefits in terms of reduced levee maintenance costs downstream. Twenty-five years of load-following is believed to be the major factor in degraded condition of levees in Kootenai Flats in the U.S. and Canada since the commencement of operation of Libby Dam. Some very rough estimates were made of the costs to repair these levees in 1997. In the U.S. portion that estimate was $25 million and in Canada $10 million. These

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[126] NWPPC. 2001. Annual Report to Congress: Fiscal Year 2001. Council document 2001-21A.

[127] Personal communication, John Fazio, NWPCC staff, December 9, 2003.

[128] Hauer, F. Richard and Jack A. Stanford. 1997. Long-term influence of Libby Ecology of Macrozoobenthos of the Kootenai River of Montana and Idaho. This paper also discusses the general literature on the ecology of regulated rivers as well as studies specific to Hungry Horse dam. Flathead Lake Biological Station, University of Montana, Open File Report.

[129] These estimates are forthcoming from BPA.

maintenance costs have been accumulating at well over $1 million annually. Since load-following has been discontinued, there is anecdotal evidence that levee sloughing is occurring at reduced rates.

370. At Libby, another major operational change is to maintain summer flows (from early July to the beginning of releases to benefit salmon, usually around August 1) in the range of 6,000 to 9,000 cfs as a minimum. In low water years, July flows historically were held as low as 4,000 cfs. The context here is that the NOAA Fisheries 2000 Biological Opinion has a major impact at Libby (and Hungry Horse) in requiring that the reservoirs be at the upper April 10 flood control rule curve, to maximize the possibility that the reservoir will be full in early summer and water will be available for salmon migration flows.[130] This also likely results in increased recreational opportunity and associated benefits on Lake Koocanusa in the U.S. and Canada.[131] The Service BO essentially is "shaping" these salmon flows to be more constant through the summer to avoid the double peak that used to be associated with spring runoff (and sturgeon flows), low mid-summer flows, followed by again increased releases in August for salmon. The agreement is that the reservoirs will be drafted no more than 20 feet by the end of August. This agreement is partly in recognition of still another constraint - providing for reservoir-based boat access and recreation. The primary cost associated with the Service 2000 BO modifications for bull trout is that, in low water years, some power generation may be shifted to July from August to achieve the 6,000 to 9,000 cfs minimum flows. In many years, July flows may be well in excess of these minimums and no water is shifted to July.

371. There are additional foregone power revenues resulting from changes in operations of Albeni Falls Dam (which is operated by the ACOE) through maintaining higher winter water levels on Lake Pend Oreille. Operational consideration to increase kokanee survival (important as forage for bull trout) has been undertaken. This action was first proposed by Idaho Fish and Game to benefit the declining kokanee fishery in the early 1990's, and was the subject of analysis for its impacts on power revenues by BPA and by NWPCC staff at that time (1993-1995).[132] Beginning in 1996, the lake was no longer routinely being drawn down to elevation 2,051 feet. Rather, since that time (in an experimental schedule where the "draw up" does not occur in every year) the lake has been held at elevation 2,055 feet in some years in the late fall to increase kokanee egg to fry survival. Thus, in some future years about 400,000 acre-feet (af) of water will not be available for power generation during the relatively profitable winter period. This operation is proving to be effective in increasing egg to fry survival of kokanee, a dominant forage base for bull trout adults and subadults in Lake

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[130] Personal communication, Greg Hoffman, Fisheries Biologist, ACOE, Libby Dam, Montana, December 13, 2002.

[131] Personal communication, Service personnel, Portland, Oregon, January 21, 2004.

[132] John F. Fazio, Memorandum to Administrative Record, June 29, 1995 Re: Cost of raising Albeni Falls' minimum winter elevation. This memorandum updated an earlier 1994 memorandum on the same issue, also by John Fazio of the Power Council staff. An earlier memorandum was from the BPA Assistant Administrator for Power Sales, to the Power Council: Walter E. Pollock, Memorandum to Mr. Stan Grace, October 5, 1993.

Pend Oreille. One purpose of maintaining this forage base is to assure that introduced lake trout do not become the dominant char at the expense of bull trout. Under similar conditions in other lakes in this region, bull trout populations have been severely impacted. It is believed that the lake should also be periodically drawn down to elevation 2,051 feet to allow wave action to cleanse spawning gravels. At this time, it is undetermined what frequency will be used for these "draw up" operations to elevation 2,055 feet. However, based on the life history of kokanee it is likely that these "draw up" operations will be recommended to occur at frequencies of three out of every four or four out of every five years.[133]

372. This change to the operation of Albeni Falls Dam will impact a total of 15 additional hydroelectric projects down river, through Bonneville Dam, including two Canadian hydroelectric projects. The most recent available analysis of these costs is the 1995 memorandum by NWPCC staff.[134] Based on the Council's projected wholesale spot energy rates for 2005, these earlier estimates have been updated for purposes of this analysis. Foregone power revenues associated with the change in operation are expected to average about $4.4 million to $6.7 million per year for as long as the experiment continues, expected to be the year 2006 (or indefinitely if the change in operations is made permanent).[135] Although the 2000 FCRPS consultation includes continuation of the Albeni Falls "draw up" experiment, this action was implemented several years prior to bull trout listing and so is not included in section 7 bull trout-related costs here. In addition to the power revenue costs, the action may also result in increased flooding downstream; these costs have not been estimated.[136] A combination of factors caused the flooding in the Cusick area during the four year period from 1996 to 1999. These factors include the higher releases from Albeni Falls Dam as a result of the kokanee experiment, the inadequacy of the Trimble Creek pumping facility, the uncommon string of wet winters, the failure of Pend Oreille PUD to follow their agreement with the Calispell Creek drainage district in 1997, and the unusual evacuation of Hungry Horse Reservoir in 1996. The factors are not independent of each other.[137] Offsetting these costs are the benefits of the action to the kokanee fishery, as well as the

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[133] Personal communication, Service Biologist, Spokane, WA. January 10, 2003.

[134] John F. Fazio, Memorandum to Administrative Record, June 29, 1995 Re: Cost of raising Albeni Falls' minimum winter elevation.

[135] The 1995 memorandum indicated that the energy content for a drawup to 2,056 feet was 465 MW-months. Based on estimates of power revenue loss contained in this memorandum, the drawup to 2,055 feet results in about 372 MW-months of power foregone. The forecast 2005 wholesale spot energy prices for November-December average about 44 mills/kwhr. This price was used to value the foregone winter generation, based on a personal communication with John Fazio, NWPCC, December 9, 2003. The range of spilled water assumptions in the memorandum were used to quantify offsetting spring power revenues, valued at the forecast 2005 energy prices of about 23 mills/kwhr. The range of values reflects an assumption of the "draw up" occurring in either three of four, or four of five years.

[136] Personal communication, Patrick Buckley, Pend Oreille PUD, December 3, 2003.

[137] U.S. Army Corps of Engineers. *Analysis of the KoKanee Experiment at Lake Pend Oreille on Water Levels in the Cusick, Washington Area, Seattle*. Washington. September, 1999.

Kamloops rainbow fishery on Lake Pend Oreille. There are also benefits to property owners along the lake who prefer that lake levels be held higher during the winter months.[138] Idaho Governor Kempthorne has appointed a Lake Pend Oreille Commission to evaluate the options for management of Lake Pend Oreille. Estimates of the benefits to property owners and the sport fishery are not available.

Fishery Studies

373. Another category of project modifications resulting from the 2000 BO are a number of proposed studies to determine the impacts of the FCRPS and the significance of bull trout populations in the mainstem Columbia and Snake Rivers. Exhibit 4.5 summarizes potential impacts of the FCRPS on bull trout. The issue is whether a given impact (such as total dissolved gas supersaturation) at a given facility has a significant impact on bull trout. At some facilities it is not even known if bull trout are present, and, if so, in what numbers. Accordingly, one type of study is to simply monitor for bull trout at the mainstem dams. Previously bull trout-specific counts have not been part of the fisheries work at dams such as Bonneville or John Day in the Lower Columbia and at the mainstem mid-Columbia dams. More extensive studies would likely include investigations to determine the status of bull trout stocks in the related tributaries so the Service can put the impacts occurring in the mainstem in context. One study mentioned by a Service contact is a gill net study to determine bull trout abundance in the lower Columbia at about $125,000 to $130,000 per year for two to three years.[139] Another possible study would be in the Snake River below Hells Canyon and include investigations in the Imnaha, Grande Ronde, Walla-Walla and Umatilla Rivers to radio tag fish and follow them through the dam system. Such a study would cost on the order of $400,000 to $500,000 over four to five years.[140]

374. A specific study currently underway from the 2000 BO project modifications is a study of fish passage at Albeni Falls. According to ACOE personnel, the cost of the first year of this study is $340,000, and a second year of study is possible.[141]

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[138] Personal communication, John Coyle, ACOE, Albeni Falls, December 3, 2003.

[139] Personal communication, Service Biologist, Vancouver , Washington, January 8, 2003.

[140] Personal communication, Service Biologist, Vancouver, Washington, January 8, 2003.

[141] Personal communication, Allan Coburn, ACOE, Seattle District office, January 16, 2003.

Exhibit 4.5 Summary of Project Impacts to Bull Trout in the Columbia River Distinct Population Segment							
Dam Name	**Excludes Migratory Use (no ladder)**	**Downstream Passage (screens/ juvenile bypass system)**	**Entrainment**	**Gas Super-saturation**	**Power Peaking**	**Temperature Impacts**	**Operation Isolates Spawning Habitat**
Hungry Horse	Yes	No	Yes	Yes	Yes	No	Yes
Libby	Yes	No	Yes	Yes	Yes	No	Yes
Albeni Falls	Yes	No	Yes	Yes	Yes	Yes	Yes
Grande Coulee	Yes	No	No	Yes	Yes	Yes	No
Banks Lake	Yes	No	No	Yes	Yes	Yes	No
Chief Joseph	Yes	No	No	Yes	Yes	Yes	No
McNary	No	Yes	Yes	Yes	Yes	Yes	No
John Day	No	Yes	No	Yes	Yes	Yes	No
The Dalles	No	No	Yes	Yes	Yes	Yes	No
Bonneville	No	Yes	Yes	Yes	Yes	Yes	No
Ice Harbor	No	Yes	No	Yes	Yes	Yes	No
Lower Monumental	No	Yes	Yes	Yes	Yes	Yes	No
Little Goose	No	Yes	Yes	Yes	Yes	Yes	No
Lower Granite	No	Yes	Yes	Yes	Yes	Yes	No
Dworshak	Yes	No	Yes	Yes	Yes	No	Yes
Source: BO on operation of the FCRPS. 2000.							

375. Several bull trout study proposals have been developed for the mid-Columbia and the upper Columbia. This includes a proposal for radio telemetry, snorkel surveys, and genetic monitoring through fin samples in the Entiat, Methow and Wenatchee River basins. The cost would be on the order of $400,000 per year for three years.[142] A similar study proposal has been developed for the mid-Columbia (including the mainstem Yakima River). This study would also use radio telemetry and examine juvenile bull trout abundance.

376. The Chelan, Douglas, and Grant PUDs are conducting a bull trout monitoring study (including telemetry) in the dam project areas including reservoirs at Wanapum, Rock Island, Rocky Reach and Wells projects. This study is from 2001 to 2004, with a total cost of $700,000.[143] Note that these expenditures are motivated by re-licensing rather than being

[142] Personal communication, Service Biologist, Mid-Columbia office, January 9, 2003.

[143] Personal communication, Scott Kreiter, Chelan PUD, November 20, 2003.

an element of the FCRPS BPA funding requirements. These expenditures are described here for their relationship to other Upper Columbia Recovery Unit fishery studies. However, the costs are not included in Exhibit 4.6 as this would result in double-counting (i.e., the total costs of bull-trout related re-licensing has been projected in the section on FERC). The Chelan PUD, which is currently seeking re-licensing at Rocky Reach and Rock Island, anticipates future bull trout mitigation costs at $20,000 per year for the first ten years of the new license, and $10,000 per year thereafter. This money will be allocated to priority projects based on a "fishery forum" decision group that will include the Service and the PUD. For example, one possibility would be to bank the money and conduct additional telemetry studies every five years or habitat enhancement efforts. Based on conversations with PUD staff, it is unlikely that this scale of study effort would have been undertaken in the absence of listing of bull trout. On the other hand, the PUD staff notes that the utility is committed, in the context of re-licensing, to looking at any species for which there is a legitimate concern. For example, the PUD is currently conducting studies of lamprey and sturgeon, neither of which are currently listed.

377. The Chelan PUD is also conducting an experiment this winter at Rock Island and Rocky Reach to monitor adult fishways (ladders) for presence of bull trout through the November 15 to April 15 period. Usually these ladders are not monitored during this period because it is outside the time when anadromous species are migrating, and ladders may also be closed for part of this period for maintenance. However, it is possible that bull trout use the ladders year round. The experiment entails taking video during the winter period, which will be reviewed in the spring by counting staff. This year the ladder at Rocky Reach will be closed for two months for maintenance, and the three ladders at Rock Island will each be closed for several weeks, but on a staggered schedule. Costs of the experiment are expected to be nominal, but if the ladders did need to be monitored year round, the additional cost for covering the winter season at the four ladders at these projects would be $12,800 per year.[144] There may also be ongoing costs to operate fish ladders at other mainstem Columbia River, Wenatchee-Tumwater, and Dryden Dams that have fish passage requirements that include a change to year round operation. These costs would be experienced at facilities that prior to bull trout listing did not operate and/or monitor during the winter season.

378. There is uncertainty associated with predicting likely costs associated with operational or facility changes that may eventually result from the adaptive management approach taken in the 2000 BO. These costs are, at present, unknown and hinge on the findings of studies not yet implemented or even funded. Nonetheless, some perspective on this issue is gained from examining the range of FCRPS project impacts generally identified to date.

[144] Personal communication, Scott Kreiter, Chelan PUD, November 20, 2003. These potential additional operational costs are related to possible re-licensing requirements and so are not incorporated in Exhibit 4.6.

Potential Changes to Facilities and Operations

379. Depending on the findings of bull trout-related studies in the area of the FCRPS, there may be a third category of costs: changes to facilities or other related operational changes. With regard to passage, many of the specific facilities already include passage, some with multiple fish ladders and increasingly sophisticated downstream collection facilities for juvenile salmon. However, some of the dam ladders are only operated seasonally and may prevent movements of bull trout that are in the Columbia River system year round, specifically Rock Island, Rocky Reach, and Wells dams. It is possible that there may need to be a test of when bull trout move through the ladders if they are operational year round. Depending on the findings, there could be a requirement for ladders to operate for longer periods. Of the facilities without passage, it seems doubtful that passage would ever be provided (and certainly not for bull trout alone) at Grand Coulee or Chief Joseph. Passage at Hungry Horse will likely never be provided because this dam is actually a barrier protecting a very strong bull trout population (the South Fork above Hungry Horse extends into the Bob Marshall Wilderness) from the invasive fish species in the Flathead River and lake system.

380. As noted previously, Albeni Falls is one dam where passage is being studied as a term and condition of the 2000 BO. The Service contact on this facility believes that the dam is an important barrier to bull trout wanting to migrate out of Lake Pend Oreille into downstream tributaries and vice-versa, and that Albeni Falls is a low head project in a setting where both downstream and upstream volitional passage would be feasible and relatively low cost.[145] As of early 2003, the ACOE contact suggested that the hypothesis that bull trout would like to move up and down through the Albeni Falls area is not finding much support in study findings to date.[146] However, findings of a recent study funded by the ACOE suggest that bull trout in tributaries to the Pend Oreille River exhibit a migratory life history. The migration of bull trout between tributaries and Lake Pend Oreille makes them susceptible to entrainment at Albeni Falls Dam. The dam then acts as an upstream migration barrier because it lacks passage facilities. At the present time, this appears to be the main effect of the dam because any migratory bull trout populations that formerly spawned in the tributaries below the dam are now functionally extirpated. However, if an attempt is made to restore migratory bull trout to tributaries of the Pend Oreille River below the dam, then upstream passage to Lake Pend Oreille will be necessary.[147]

381. Other potential "big ticket" items listed in Exhibit 4.5 include gas supersaturation and temperature. It is likely that bull trout are benefitting from actions already being taken in the mainstem Columbia for gas and temperature impacts to anadromous fish species. These

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[145] Personal communication, Service Biologist, Spokane, Washington, January 10, 2003.

[146] Personal communication, Allan Coburn, ACOE, Seattle District, January 16, 2003.

[147] David R. Geist, Richard S. Brown, Allan T. Scholz, and Bret Nine, "Movement and Survival of Radio-Tagged Bull Trout Near Albeni Falls Dam, DRAFT," January 2004, Department of the Army, Seattle District, Corps of Engineers, Seattle, Washington.

issues may continue to be driven by concerns for anadromous fish, since they are present in much larger numbers than bull trout. At sites where both salmon and bull trout are present, mitigation will likely continue to be driven by salmon. The facilities in the FCRPS where salmon or steelhead are not present are Albeni Falls, Libby and Hungry Horse.

Summary of Project Modification Costs for the FCRPS 2000 Biological Opinion

382. Exhibit 4.6 provides a summary of what is known about the project modification costs associated with the FCRPS 2000 BO. Minimum annual costs based on power operation costs and specific studies identified as funded to date are $2 to $4 million per year. There is considerable uncertainty about future bull trout-related studies, findings, and implications for FCRPS operations and facilities. An upper limit to FCRPS costs can be generated based on an assumption that the level of study funding might increase by two times current levels, and that future facility changes would equal the cost of two Albeni Falls-scale fish passage efforts. Construction of the facilities will begin in eight years and take ten years to complete. The construction cost of each facility is estimated at $25 million, and annual operating and maintenance costs will total several hundred thousand dollars. However, the latter will not begin until construction is complete and are outside the 10 year time frame estimated in this analysis. The annualized cost of each facility is approximately $0.56 to $0.67 million (at a discount rate of three to seven percent). The total of all estimated costs for the FCRPS 2000 BO are shown in Exhibit 4.6 at $3.37 to $5.71 million per year.

Exhibit 4.6 Forecast Bull Trout-Related Costs Associated with the Federal Columbia River Power System 2000 Biological Opinion Implementation, Ten Year Planning Period		
	Annual Costs (million $)	
Item	**Low Estimate**	**High Estimate**
1) Operational Changes		
BPA System Revenue - Shaping salmon flows to benefit bull trout at Libby and Hungry Horse Dams - Peaking and ramping constraints at Libby and Hungry Horse	$2.0 Unknown[b]	$4.0 Unknown[b]
2) Monitoring in the Lower Columbia River	minor	minor
3) Studies of Significance of Mainstem and Tributary Bull Trout Populations[c]		
Columbia River Unit Upper Columbia Unit Clark Fork River Unit Umatilla/Walla Walla Unit Grand Ronde Imnaha/Snake River Unit	$0.029 $0.141 $0.040 $0.023 $0.012 $0.012	$0.056 $0.141 $0.097 $0.036 $0.018 $0.018
Subtotal	$0.257	$0.366
4) Future Design and Operation Changes Based on 2 and 3		
Amortized Cost of Passage at Albeni Falls[a]	$0.56	$0.67
Annual Amortized Cost of Second Such Facility	$0.56	$0.67
TOTAL	**$3.37**	**$5.71**

[a] Assumes facility cost of $25 million. Construction begins in eight years. The cost estimate range is based on a 15 year amortization period and three percent and seven percent discount rates.
[b] Estimate pending from BPA.
[c] These estimates are for ongoing and proposed studies as discussed in text. Dollar amounts are present value estimates of total study costs. Possible bull trout studies in the Yakima Basin are included in the BOR estimates.
Source: Derived from personal communications as referenced in text.

Regulatory Baseline: Northwest Power Act

383. An important consideration in evaluating these costs is the extent to which these are costs over and above the regulatory baseline for the FCRPS. As noted previously, the 1980 Northwest Electric Power Planning and Conservation Act created the NWPCC with the primary task of developing a program to protect, mitigate and enhance fish and wildlife of the Columbia River basin that have been affected by hydroelectric power. This goal partially overlaps with the intent of the Service's biological opinions. The primary difference in these two conservation efforts is that the FCRPS BOs focus only on species listed under the Act, while the mandate of the NWPCC concentrates on all fish and wildlife populations impacted by the Columbia River hydroelectric system.

384. The Council has been an important player in the region in terms of fish and wildlife mitigation, and (as summarized in Exhibit 4.7) has spent a cumulative $6.0 billion (1978 to 2001) on programs to benefit fish and wildlife. These expenditures are primarily through BPA at the direction of the Council and include direct program expenditures as well as foregone revenues and purchase costs due to changes in operation of the FCRPS. The annual budget from the six-year memorandum of agreement signed by Federal agencies in 1996 anticipated an average of $435 million per year, of which $127 million was estimated for direct program expenses. The latter is allocated to anadromous fish, resident fish, and wildlife as shown in Exhibit 4.8. For example, in the year 2000, $83.7 million was actually spent on anadromous fish mitigation and enhancement and $19.6 million on resident fish. Historically, resident fish expenditures have been primarily to compensate for losses of salmon and steelhead in areas permanently blocked by hydroelectric power projects, particularly the vast areas lost due to construction of Chief Joseph and Grand Coulee dams. The program provides mitigation primarily through the construction of fish hatcheries, such as the ones for trout and kokanee in Lake Roosevelt.[148] However, the policy also calls for restoring native resident fish to near historic abundance throughout their historic ranges where habitat conditions are adequate or can be restored.

Exhibit 4.7

Columbia River Basin Fish and Wildlife Program Expenditures[a]
(millions of dollars)

Program / Statistic	**1999**	**2000**	**2001**	**Cumulative 1978-2000**
(A) Mitigation, Enhancement, Protection				
Direct program spending	$108.2	$108.2	$101.1	$1,020.2
Reimbursable spending	$38.9	$37.6	$42.4	$582.9
Capital investments	$76.1	$77.2	$77.1	$957.7
Subtotal	$223.2	$223.0	$220.6	$2,560.8
(B) River Operations				
Power Purchases	$47.6	$64.8	$1,389.6	$2,170.1
Foregone Revenue	$203.7	$272.2	$115.9	$1,279.9
Subtotal	$251.3	$337.0	$1,505.5	$3,450.0
Total	**$474.5**	**$560.0**	**$1,726.1**	**$6,010.8**

[a] Derived from NWPPC (2002).

[148] Northwest Power and Conservation Council. 2002. Second Annual Report of the Northwest Governors on Expenditures of the Bonneville Power Administration to Implement the Columbia River Basin Fish and Wildlife Program of the Northwest Power and Conservation Council. Council Document 2002-13.

Exhibit 4.8 Columbia River Basin Fish and Wildlife Program Expenditures Obligation by Species (million dollars)[a]			
Species group	**1999**	**2000**	**Cumulative 1978-2000**
Anadromous Fish	$82.4	$83.7	$817.0
Resident Fish	$14.9	$19.6	$131.6
Wildlife	$13.4	$11.5	$127.9
Total	**$110.7**	**$114.8**	**$1,076.5**
[a] Derived from NWPPC (2002).			

385. The cumulative expenditures specific to anadromous fish for the direct program are reported to be $817 million for 1978-2000 and $131.6 million for resident fish. However, a good share of the resident fish budget is also for salmon and steelhead mitigation. The cumulative expenditures to-date specific to bull trout are not reported in recent NWPCC publications. However, the share of bull trout expenditures for FY 2003 has been estimated. While the accounting exercise for FY 2003 is still being revised, it appears that Bonneville funded 94 projects in FY 2003 which anticipate some benefit to bull trout (among other species) at $35,303,844 (estimated FY 2003 expenditure). Ten of the above 94 projects deal primarily with bull trout, at a total cost of $1,892,858. This includes a proposal to examine the origin, movements, and relative abundance of bull trout in Bonneville Reservoir with an adjusted fiscal year 2003 budget of $293,000 for a five year program.[149]

386. Other major components of the Council's fish and wildlife expenditures (Exhibit 4.7) include $958 million for fixed expenses, primarily debt service on Federal bonds issued to pay for fishery-related capital improvements at dams. The reimbursement account total of $583 million is to reimburse the Federal Treasury for the power share of other Federal agency efforts, primarily those of ACOE, to improve fish and wildlife survival apart from the Council's program. This is primarily for fish passage improvements at Federal dams and hatcheries.[150]

387. It is noteworthy that the Council specifically includes in its total fish and wildlife program expenditures accounting for the foregone power revenues and power purchases due to the impacts of the agency BOs on FCRPS operations. The previously noted estimate from BPA based on a 50 year simulation of these costs implies a point estimate of $310 million for the year 2000 BOs. This estimate agrees fairly well with the actual 2000 expenditures (Exhibit 4.6) of $337 million. The uncertainty in these estimates is reflected in the actual costs for 2001 of $1.5 billion. This was due to the extremely high prices in West Coast

[149] Independent Scientific Review Panel. 2002. Final Review of Fiscal Year 2003 Mainstem and System wide Proposals. NWPPC: ISRP 2002-14.

[150] NWPPC. 2002. Second Annual Report at p. 4.

wholesale electric power markets coinciding with a low-water year in the Columbia Basin. The Council estimates that at normal prices ($26/mwhr rather than $260), the foregone revenue and power purchase costs would have been about $122.3 million in 2001.[151]

388. It is also apparent from the Council's reports that it attempts to budget for BOs. For example, in its Second Annual Report, the Council stated (with respect to the current BPA rate case period of 2002-2006): "Bonneville Administrator Steve Wright announced that the agency's target budget level for the Council's program, which integrates 2000 BO measures, would increase in the new rate period to a range that averages $186 million per year. The increase reflects: (1) the fact that the Council's base program is growing as projects are implemented over multiple years, and (2) that implementation of the Council's program is increasingly integrated with implementation of the reasonable and prudent alternatives of the 2000 BOs on operations of the FCRPS."[152] In December, 2002, Bonneville Administrator Steve Wright capped direct expenses for the Council's program at $139 million for FY 2003.

Conclusion

389. The Northwest Power Act of 1980 provides authority for fishery mitigation actions related to hydroelectric power that overlap with the actions that are being motivated by year 2000 BOs on the FCRPS. Importantly, the funding mechanism for the Act-based reasonable and prudent alternatives and project modifications actually appears to be in large part the NWPCC's program, implemented through BPA. This includes both direct program expenditures, foregone power revenues, capital expenditures for passage and other improvements, and reimbursement for passage and related mitigation on the part of the other Federal Action agencies, including ACOE and BOR.

390. In light of this information, one possible interpretation of the future section 7-bull trout related expenditures reported in Exhibit 4.6 is as follows. The foregone power revenues and/or power purchase element of the 2000 BO accounting ($2 to $4 million estimate) is an expense that has historically been included under Northwest Power Act obligations and is explicitly included in BPA and Council reported fish and wildlife program expenditures. Similarly, should capital investments be undertaken at Albeni Falls by the ACOE to provide fish passage, this appears to be the type of expenditure for which the BPA acknowledges its obligation under its "reimbursement" account. With regard to bull trout related studies, some share of these will likely eventually be funded through the Council's subbasin planning process for a share of the $139 million/year budget alluded to previously. It is not clear what share of these studies are attributable to section 7 and what share would occur in any case due to Northwest Power Act obligations.[153] It is possible that the bull trout listing, and a

[151] NWPPC. 2002. Second Annual Report.

[152] Ibid. at p. 7.

[153] ISRP, 2002, at 2.

reinitiated consultation, will result in more of such studies actually being implemented. Accordingly, this analysis estimates future annual project modification costs related to the FCRPS BO to be a share of projected future study costs - from zero percent to 100 percent (i.e., zero up to $400,000).

4.2.4 Bureau of Reclamation

391. This subsection provides a forecast of project modification costs expected to occur over the next ten years due to bull trout-related consultations involving the BOR. The BOR operates a number of impoundments and reservoirs within proposed critical habitat for the bull trout (see Exhibit 4.9). Also shown in the exhibit is the critical habitat unit containing the projects and whether the projects are currently operating under a BO on impacts to bull trout. A final column in Exhibit 4.9 notes the presence of other anadromous fish species. The BOR has completed two formal consultations since 1998. One of these is the FCRPS multi-agency consultation discussed in the previous subsection. The other is a consultation on dam and reservoir operations in the Upper Snake River Basin. The Upper Snake River consultations, which included five reservoirs on the Boise, Payette and Malheur Rivers, are examined in detail below, allowing for development of an estimate of typical costs associated with BOR reservoir consultations. The finding is that such consultations may result in annual fish passage costs (for example, trap and haul and monitoring costs of $70,000 to $250,000 per year) as well as study costs (on the order of $100,000 per year per consultation for these reservoirs). Since the number of BOR reservoirs is limited, estimates were developed for project modification costs at all reservoirs likely to be consulted on over the next ten years. An ongoing consultation for five BOR reservoirs in the Yakima Basin is likely to result in study as well as trap and haul operation and maintenance costs, in addition to major investments in fish passage facilities of about $26.5 million per dam. Additionally, irrigation withdrawal changes are likely in the Yakima system, impacting irrigated agriculture in this region. The combined annual costs at BOR reservoirs is estimated to be about $5.4 to $5.6 million over the next ten years, as detailed below.

392. BOR storage facilities in two critical habitat units are currently operating under the conditions of section 7 consultations involving the bull trout. Costs incurred in complying with these conditions provide examples of possible future costs for similar actions on at other BOR facilities. On the Boise River System the BOR currently spends approximately $250,000 per year for ongoing bull trout-related activities including trapping and hauling entrained bull trout from Lucky Peak Reservoir to the Boise River above Arrowrock Dam, and performing life cycle monitoring of bull trout within the Boise River system. The expenditures by the BOR related to operations of the two Boise River facilities represent BOR's 50 percent cost share with the USFS for these operations.[154] Within another southwest Idaho river system, the Payette River, the BOR currently spends about $60,000

[154] Information and cost estimates provided through personal communication with Richard Rieber, Fisheries Biologist, BOR, Boise, Idaho, and Tammy Salow, Fisheries Biologist, BOR, Boise, Idaho. January 7 and 8, 2003. The USFS's share of the cost is accounted for in the General Forest Management sub-section of section 4.2.7.

per year (again 50 percent of a total cost shared with the USFS) for monitoring of bull trout around Deadwood Reservoir.

Exhibit 4.9

Bureau of Reclamation Reservoirs Located Within Designated Critical Habitat for the Bull Trout

Reservoir	Critical Habitat Unit	Under Ongoing Bull Trout BO	Anadromous Fish Also Being Consulted On
Cle Elum Lake	Middle Columbia Basin	Biological opinion in development	Yes
Kachess Lake	Middle Columbia Basin	Biological opinion in development	Yes
Keechelus Lake	Middle Columbia Basin	Biological opinion in development	Yes
Tieton Dam (Rimrock Lake)	Middle Columbia Basin	Biological opinion in development[a]	Yes
Bumping Lake	Middle Columbia Basin	Biological opinion in development	Yes
Anderson Ranch Res.	Southwest Idaho River Basins	Yes	No
Arrowrock Res.	Southwest Idaho River Basins	Yes	No
Cascade Res.	Southwest Idaho River Basins	No	No
Deadwood Res.	Southwest Idaho River Basins	Yes	No
Beulah Res.	Malheur River Basin	Yes	No
Warm Springs Res.	Malheur River Basin	Yes	No
Phillips Res.	Hells Canyon Complex	No	No
Thief Valley Res.	Hells Canyon Complex	No	No
Crane Prairie Res.	Deschutes River Basin	No	No
Wickiup Res.	Deschutes River Basin	No	No

Sources: Information derived from BOR published data at http://mac1.pn.usbr.gov/hydromet/denver.html as well as the bull trout Recovery Plan and conversations with BOR and Service personnel.
[a] A formal BO was recently completed on a hydroelectric plant upgrade to Tieton Dam. Other functions of the dam are currently under consultation as part of the larger Yakima Project.

393. On the Malheur River System, the BOR currently operates two reservoirs within bull trout critical habitat, Beulah Reservoir and Warm Springs Reservoir. The operations of these two facilities are also currently under the conditions of section 7 BOs involving the bull trout. For 2002 the BOR spent approximately $35,000 for monitoring and trap and haul activities at Beulah Reservoir. These costs were again 50 percent of the total costs for the activities with the other half of the costs being supplied by the Burns-Paiute Tribe.[155] Although both Beulah and Warm Springs Reservoirs on the Malheur River are within

[155] Personal communication Richard Rieber, Fisheries Biologist, BOR, Boise, Idaho. January 7, 2003.

proposed bull trout critical habitat, the costs listed above are attributable only to operations at Beulah, as Warm Springs reservoir is currently unoccupied by bull trout. The record of current BOR (and partner) expenditures, therefore, indicate that trap and haul and monitoring costs for bull trout can range from $70,000 to $250,000 per year per reservoir.[156]

Impact of Anadromous Species on Costs

394. Another river system with BOR reservoirs is the Yakima. The presence of listed anadromous species (the threatened steelhead trout) within the Yakima river system provides a complicating aspect to estimating mitigation costs associated with the bull trout. The draft recovery plan for the bull trout lists establishing passage at the five BOR dams on the Yakima system as well as undertaking measures to reduce entrainment of bull trout in the dams as actions desirable for recovery of the species.[157] The Service is currently in consultation with BOR on operations of the projects. NOAA Fisheries is also currently in consultation on the project's impacts on the listed steelhead trout. A draft BO prepared by NOAA Fisheries currently calls for establishment of passage for steelhead trout around the five dams.[158] At this time, it is unknown what mitigation actions will be requested by the Service in the ongoing Yakima Project consultation or whether the actions requested by the Service will be impacted substantially by the results of the NOAA Fisheries section 7 consultation on impacts to steelhead trout.[159]

Costs of Fish Passage

395. Within the Yakima River System there are five major BOR irrigation impoundments currently under section 7 consultation for impacts to bull trout.[160] Conversations with BOR representatives indicate that passage adequate for bull trout around these dams could total an estimated $26.25 million per dam.[161] These improvements would likely be constructed

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[156] The specific conditions, size, and challenges associated with different BOR dams and reservoirs varies widely. As such, cost estimates for bull trout mitigation actions from one facility may not be appropriate for another facility in a different setting.

[157] Draft Bull Trout Recovery Plan, Chapter 21.

[158] Personal communication, Coordinator, Service Biologist, Division of Endangered Species, Portland, Oregon. January 8, 2003.

[159] Personal communication, Fisheries Biologist, BOR, Wenatchee, Washington. January 7, 2003.

[160] In addition to these five major impoundments, the BOR owned and operated Clear Lake Dam is also under bull trout consultation. This small dam consultation includes costs associated with fish passage. These possible costs are included within the uncertainty associated with the $26.25 million estimated cost for the entire Yakima system.

[161] The estimate of $26.25 million per dam is based on preliminary information from BOR on costs of modifications to Keechelus and Cle Elum dams for fisheries (Dave Kaumheimer, BOR). The most likely scenarios involve $15 million per dam construction costs for a trap and haul upward passage system and modified spillways for downstream passage. These simple construction costs are multiplied by 1.75 to allow for all design, engineering, and environmental compliance costs. While costs will likely vary substantially between the five Yakima dams, the average

over a 15 to 20 year period. The calculation of total annual amortized costs of the improvements to the dams assumes a 50 year productive life of the facilities,[162] a 15 year construction period beginning in 2006, and real discount rates of three and seven percent. The range of estimates of annualized costs associated with modifications to the Yakima Project Dams include allowances for annual operation costs attributable to the species.

396. In the case of the Yakima Project dam improvements, both NOAA Fisheries and the Service have indicated a desire to see passage at the five facilities for their species of concern. Therefore, in this analysis it is estimated that bull trout and steelhead are each responsible for 50 percent of the total costs of adding passage to the dams within the Yakima System.

397. As with the cost of potential facility modifications at the five Yakima Project dams, there is also a large degree of uncertainty associated with potential bull trout-related operation and maintenance and study costs associated with section 7 consultation on the project. As was estimated for Willamette River dams, it is assumed in this analysis that annual operating and study costs will average $100,000 per dam, or a total of $500,000 per year for the five dams in the project. Fish passage at each dam will also require an annual operating and maintenance budget, estimated at $100,000 per dam. However, the latter will not begin until fish passage construction is complete and are outside the 10 year time frame estimated in this analysis.

Potential Impacts on Agricultural Producers

398. Concern has been raised by BOR representatives and the public that potential project modifications associated with the consultations involving the Service (bull trout concerns) and NOAA Fisheries (steelhead concerns) may include modifications to reservoir operations within the Yakima Project that might result in reductions in availability of irrigation water for agricultural producers within the drainage.[163] A broad estimate of the potential costs associated with water reductions is developed below for this analysis. This estimate is based largely on similar analyses undertaken in conjunction with development of the Yakima River Basin Watershed Plan.[164]

399. The Yakima Project delivers approximately 2.5 million af of irrigation water per year to irrigation districts. The findings of R.C. Bain and Associates et al. (2002 at page 2) was

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estimate from BOR completed for two of the dams was extrapolated to the remaining three impoundments.

[162] Personal communication, Fisheries Biologist, BOR, Wenatchee, Washington. January 21, 2003.

[163] BOR Fisheries Biologist, Dave Kaumheimer (BOR, Wenatchee, Washington) expressed concern that the results of consultations could lead to significant reduction in irrigation flows in dry years.

[164] The studies examined were Montgomery Water Group, Inc. 2002. *Reliability of Surface Water Supply for Irrigation: Yakima Project Water Users*., and R.C. Bain and Associates and Montgomery Water Group, 2002. *Technical Memorandum: Yakima River Basin Watershed Plan. Water Supply Needs for Instream Flows.*

that based in several suggested levels of minimum instream flows for the Yakima River system the average additional amount of water needed to meet minimum flow recommendations was 48,000 af per year. The actual estimates varied between 1,200 af in a wet year and 110,000 af in a dry year. These estimated additional flows are associated with meeting instream flow standards largely established to protect anadromous species such as the listed steelhead. The Service has also conducted a hydrological analysis of the impact of potential changes in reservoir operations under a bull trout section 7 BO. This analysis examined the historical record of water deliveries within the basin and found that constraints on reservoir operations associated with bull trout protection would result in the BOR failing to meet its full contractual water delivery obligations in only one out of every 20 years, on average.[165] However, for the sake of this analysis, the average annual estimate of additional water needed to meet instream flow levels for all species, on an annual basis (48,000 af per year), is used as an estimate of the lost irrigation flow due to section 7 consultation.

Klamath River Basin (Unit 1) Agriculture

The issues surrounding bull trout are quite different than those leading to the high-profile conflicts seen in recent years within the Klamath River Drainage between salmon or sucker fish conservation and agricultural water withdrawals. The primary habitat for the bull trout is located higher in the drainage than for the other listed fish species. Thus most conflicts associated with water levels in Klamath Lake or agricultural water withdrawals are not the consequence of bull trout conservation. This economic analysis does estimate costs associated with USFS irrigation diversions related to bull trout conservation within the Klamath River Basin, but these costs are relatively small when compared to potential impacts associated with salmon or sucker fish conservation in the drainage.

400. Estimates were provided within the report by the Montgomery Water Group of the value per acre foot of water for irrigation within the Yakima Project for average water year conditions. This value is based on increased crop harvest. On average, the value per acre foot was estimated to be approximately $40.[166] This estimate falls in the midrange of actual lease prices cited by the Washington State Department of Ecology in 2000 which varied from $23 to $70 per acre foot[167]and somewhat below the 2002 Department of Ecology listing of four leases within the Upper Yakima Drainage for between $88 and $127 per acre foot.[168]

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[165] Personal communication, Fisheries Biologist, BOR, Wenatchee, Washington. January 22, 2003.

[166] Montgomery Water Group, Inc. 2002, at page 9.

[167] Washington State Department of Ecology, "2000 Report to the Legislature: Water Rights Purchasing Program," Olympia Washington. p. 5.

[168] Appendix V to 2002 report on the Washington Water Acquisition Program. Available at: http://www.ecy.wa.gov/programs/wr/instream-flows/wacqstra.html

401. Based on this information, the potential annual cost associated with flow restrictions in the drainage due to section 7 bull trout consultations is estimated to be approximately $960,000. This estimate assumes an annual loss of 48,000 af of water valued at $40 per acre foot. A final adjustment to the estimated annual loss is made by allocating 50 percent of the cost to consultations on steelhead within the drainage. Additional discussion of the impact of reductions in agricultural diversions is contained within the small business analysis.

Consumer and Producer Surplus

This rulemaking is not expected to result in higher prices or reduced supply of agricultural goods to consumers. As a result, consumer surplus is not expected to be significantly affected by this designation. However, the designation may effect farmer profits (i.e., producer surplus), as some farmers incur additional costs to obtain irrigation water. In the analysis of producer surplus impacts resulting from agricultural water diversions, it is assumed that farmers will purchase lost water from another source and that water will be available at its opportunity cost (i.e., market price). Thus, proxy for producer surplus losses (assuming, that the farmer does not change irrigation practices because of the higher water cost) is the additional cost of the purchased water.

402. Exhibit 4.10 lists the major BOR facilities that lie within proposed critical habitat for the bull trout and potential section 7 mitigation costs associated with bull trout protection. The range of estimates provided are based on actual costs incurred at existing BOR facilities, as well as on estimated costs from BOR facilities.

403. For BOR facilities where the installation of additional protection or passage structures to benefit bull trout is not reasonably foreseeable, an assumed annual cost of $100,000 per impoundment for species studies and reporting was used.[169]

[169] Personal communication, Fisheries Biologist, BOR, Boise, Idaho. January 7, 2003.

Exhibit 4.10

Bureau of Reclamation Reservoirs Located within Designated Critical Habitat for the Bull Trout: Forecast Annual Mitigation Costs, 10-Year Planning Period

Reservoir	Unit	Potential Bull Trout Mitigation Actions	Low Cost Estimate	High Cost Estimate	Annual Bull Trout Section 7 Share
Cle Elum Lake, Kachess Lake, Keechelus Lake, Tieton Dam, and Bumping Lake	20	Capital cost of trap and haul upstream passage and modified spillway downstream passage	$5,480,000[d]	$5,848,000	$2,740,000 – $2,924,000
		Cost associated with potential reductions in agricultural water use	$1,920,000	$1,920,000	$960,000[e]
		Annual study costs at five dams	$500,000	$500,000	$500,000
Anderson Ranch Res.	17	Life-cycle studies	$250,000[a]	$250,000	$250,000
Arrowrock Res.	17	Life-cycle studies; trap and haul around dam	$250,000[a]	$250,000	$250,000
Cascade Res.	17	Research	$70,000[b]	$70,000	$70,000
Deadwood Res.	17	Research and monitoring	$120,000[a]	$120,000	$120,000
Beulah Res.	13	Research; trap and haul around dam	$70,000[a]	$70,000	$70,000
Warm Springs Res.	13	Research	$100,000[c]	$100,000	$70,000
Phillips Res.	12	Research	$100,000	$100,000	$100,000
Thief Valley Res.	12	Research	$100,000	$100,000	$100,000
Crane Prairie Res.	6	Research; possible passage	$100,000	$100,000	$100,000
Wickiup Res.	6	Research	$100,000	$100,000	$100,000
Total Estimated Costs					**$5.43 - $5.61 million**

[a] Based on ongoing costs of section 7 consultations involving bull trout (source: Nancy Salow, Fisheries Biologist, BOR, Boise, Idaho).
[b] Based on costs incurred at Beulah Reservoir under ongoing bull trout BO.
[c] Source: Richard Rieber, Wildlife Biologist, BOR, Boise, Idaho. Mr. Rieber estimated that, in general, annual research costs for a facility operating under a bull trout BO would be $100,000.
[d] Source: Information on preliminary estimates of providing passage at the Yakima Project dams provided by Dave Kaumheimer, Fisheries Biologist, BOR, Wenatchee, Washington. Annual estimates based on an average total capital cost of $26.25 million per dam with a 15 year construction period beginning in 2006, annualized and discounted to 2003 at three percent and seven percent real rate.
[e] Calculated at 48,000 af loss of water, times $40/af, minus a 50 percent allocation of costs to steelhead protection.

BOR Upper Deschutes Dam and Reservoir Operations

404. Concern has been expressed within the currently unoccupied Upper Deschutes Subunit that designation of critical habitat might lead to dam and reservoir modifications at Wickiup and Crane Prairie reservoirs. This analysis concludes that such actions in the Upper Deschutes Subunit are not reasonably foreseeable.[170] For this analysis, therefore, potential costs associated with section 7 bull trout consultations in the upper basin are estimated at $100,000 for studies and reporting at each of the two primary BOR impoundments in the subunit, Wickiup, and Crane Prairie.

Summary of Costs Associated with BOR Consultations

405. Exhibit 4.10 shows that overall the annualized cost associated with section 7 bull trout protection for BOR dams and reservoirs within critical habitat is estimated to range between $5.4 and $5.6 million. The estimated range is reflective of differing assumptions regarding discount rate as well as reductions in agricultural water availability.

4.2.5 Federal Highway Administration

406. This section provides a forecast of project modification costs expected to occur over the next ten years due to bull trout-related consultations for which the FHA is the lead Action agency. This analysis is summarized as follows. A total of 18 formal consultations since listing in 1998 have been completed with the FHA on bridge construction, maintenance, and removal projects in rivers proposed as critical habitat for bull trout. The typical project modification is date restrictions to protect spawning or migrating bull trout. Date restrictions have the potential to increase costs, but will not do so in every case. Larger projects are more likely to have date restriction costs. Based on a sample of ten projects, average project modification costs for FHA bridge projects are estimated to be $50,000. It is estimated that five such formal consultations involving the FHA will occur each year, for an annual estimated cost of $250,000.

Bridge Construction and Maintenance

407. Date restrictions have the potential to increase costs, but will not do so in every case. The imposition of date restrictions forces contractors to plan carefully and schedule the construction sequence with diligence. A large project coupled with a small window or unforeseen difficulties can lead to contractors being unable to finish their instream work during the allowed period. This is more likely with large projects than small projects. In some cases, after consultation with the Service and inspection by Service biologists, an extension can be granted.[171] Spawning streams are less likely to see extensions than migratory rivers while migratory rivers tend to have the larger projects. Late start dates,

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[170] Personal communication, Service Bull Trout Recovery Coordinator, Portland, Oregon. January 28, 2003.

[171] Personal communication, Service Biologist, Helena Office, Montana, December 6, 2002.

rather than early finish dates, have the greater potential for delays because the onset of cold weather. Since it is large projects over migratory rivers which tend to have late start dates, these are most likely to be impacted rather than small projects over spawning streams where bull trout spawn in the fall.[172]

408. There is a potential for increased costs if a project cannot be completed in a construction season. Delays could require re-mobilization of equipment for an additional construction season. For example, date restrictions on the Orange Street Bridge project.[173] added an estimated $40,000 to $60,000 in re-mobilization costs and $180,000 to $360,000 in rental costs for a large crane.[174] For a typical project, added cost estimates can run from minimal to ten percent of the total project cost.[175]

409. The FHWA undertook ten projects in Montana from 1997-2002 that involved formal consultations. Based upon this sample of projects, this analysis estimates the distribution of date restrictions and large projects and distributes the costs associated with a particular modification to the proper number of projects. Although some projects will have higher associated costs due to their larger size, while other projects will have lower costs due to their smaller size, this analysis assumes that the total cost will be based upon aggregating the predicted number of average projects.

410. The Montana sample of road construction projects is used in this analysis to determine how often particular modifications apply. Date restrictions applied to eight of the ten past formal consultations. However, because of the number of requested extensions, the Helena office of the Service projects that it will use fewer date restrictions on projects involving migratory rivers in the future.[176] Since the restrictions only impact large projects and since these projects can be identified by the requirements regarding coffer dams or drill casings or blasting, only four of the eight projects are considered in this analysis. These projects cost $6 million, $4 million, $1.5 million and $0.5 million.[177] Of these four projects,

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[172] Personal communication, Service Biologist, Boise Office, Idaho, March 17, 2003.

[173] U.S. Fish and Wildlife Service, " Endangered Species Act Section & Consultation Biological Opinion for the Effects to the threatened Columbia River basin population of Bull Trout (*Salvelinus confluentus*) from the Orange Street bridge replacement over the Clark Fork River in Missoula, Montana," Montana Field Office, Helena, Montana, December 30, 1999.

[174] Personal communication with the District Construction Engineer, Montana DOT, Missoula office, December 16, 2002.

[175] Personal communications with District Construction Engineers, Montana DOT Missoula and Kalispell offices, December 16, 2002.

[176] Personal communication, Service Biologist, Helena Office, Montana, December 6, 2002.

[177] The specific projects are Orange Street Bridge, Missoula ($6 million), Essex Bridge ($4 million), Sula Bridges ($1.5 million for 4 bridges), and the Condon Bridge ($0.5 million). Total costs for these projects is larger, and include construction activities taking place away from the bridge. For example the Orange Street project is a $7.5 million project but includes roads leading away from the bridge that do not impact the river. Personal communication with the

one was impacted by date restrictions (the $6 million Orange Street Bridge), two were not affected, and for one (the smallest) requirements have yet to be determined. Given this information, this analysis estimates that the typical large project will cost $5 million. Thus, a 10 percent added cost associated with date restrictions would represent a species protection cost of $500,000. Since only one of the ten Montana bridge projects was both large and delayed by date restrictions, this analysis multiplies the $500,000 increased cost estimate by one tenth (i.e., one out of ten projects) to generate a per project compliance cost of $50,000 to apply to all projects.

411. Based on the past consultation record for the bull trout, it is estimated that five formal consultations per year will occur involving the FHWA. At an estimated average cost of $50,000 per consultation for project modifications, it is forecast that total annual FHWA-related project modification costs will be $250,000 (Exhibit 4.11).

Exhibit 4.11

Forecast Annual Project Modification Costs Associated with FHWA Bridge Projects

Project	Primary Modification	Annual Projects	Per Effort Cost	Annual Cost Estimate	Party Bearing Cost
Bridge Replacement and Repair	Date restrictions	5	$50,000	$250,000	FHWA, state DOTs

Sources: See text, personal communications with District Construction Engineers, Montana DOT, Missoula and Kalispell offices, December 16, 2002.

4.2.6 Federal Energy Regulatory Commission

412. This section provides a forecast of bull trout-related project modification costs for hydroelectric projects licensed by FERC. Consultations on these projects are typically initiated during re-licensing. Because the schedule for re-licensing these projects is defined well into the future, this analysis considers impacts associated with FERC licensed facilities over the next 50 years.

413. This section is organized into two major parts. The first part focuses on estimating bull trout related project modification costs, and using these to estimate total annual FERC-related costs over the next 50 years. The main findings of this analysis are in Exhibits 4.17 and 4.18. The second part is a sensitivity analysis that shows the effects of assumptions that distinguish bull trout-related costs from those attributable to other species (such as salmon) and assumptions on what costs are co-extensive with the designation and what are due to other authorities. These findings are summarized in Exhibit 4.22.

District Construction Engineers, Montana DOT, Missoula and Kalispell offices, December 19, 2002 and "Orange Street Bridge" www.cl.missoula.us/msa/orange_street_bridge.htm

414. A brief summary of the approach and findings of this portion of the analysis is as follows. Since listing in 1998, a total of seven FERC consultations on bull trout have been completed. These are for dam re-licensing or removal and for dam and hydroelectric power upgrades. These seven consultations and several in progress or projected are examined in detail in this analysis to determine average bull trout-related project modification costs. Because of substantial differences between large and small hydroelectric projects and dam removals, average costs are estimated for each of these three project categories. Annual estimated costs per consultation for large projects is about $62,000 to $162,000, depending on the assumed discount rate and other factors. Small hydroelectric projects (less than one MW) had estimated project modification costs of $2,000, and project modifications for past dam removal actions were minimal. These estimates are applied to the 36 FERC-licensed hydroelectric projects located in the proposed designation. Depending on the assumed discount rate and other factors, annual project modification costs are estimated to range from $0.618 to $1.365 million per year over the next 50 years.

415. Forecasts are also developed for two other parameters: total annual costs of all fishery-related project modifications for relicensing actions and the share of these costs allocable to bull trout. Forecast bull trout-related costs that are co-extensive with the designation are a subset of this latter quantity. These additional parameters are estimated to provide a sensitivity analysis to assumptions regarding the share of total re-licensing project modification costs for fisheries due to bull trout (as opposed to other species, such as salmon or steelhead) and what share are likely to be co-extensive to the designation (as opposed to modifications motivated by other authorities). Estimated annual costs for all fishery-related project modifications are $14.9 to $36.1 million. All bull trout-related costs are estimated to be from $6.5 to $15.9 million, or about 45 percent of all fishery modification costs at these facilities. ESA-related costs are estimated to be about five percent of all fishery-related costs.

Hydroelectric Facility Re-licensing

Methodology

416. Section 3 provides a listing of all FERC-licensed hydroelectric projects in the proposed bull trout critical habitat. Of the 36 total projects, most are in Idaho and Washington. The total installed capacity of these projects is 9,000.7 MW, with most of this capacity (two-thirds) in Washington state. While there are a large number of projects, a handful of very large Columbia River and Snake River mainstem hydroelectric facilities account for most of the generating capacity.

417. The approach taken in this analysis of FERC projects was to collect sufficient information on each completed formal consultation to identify a sample of estimated project modification costs. Estimated average costs per consultation or per MW capacity were then used to project costs for the remaining future consultations.

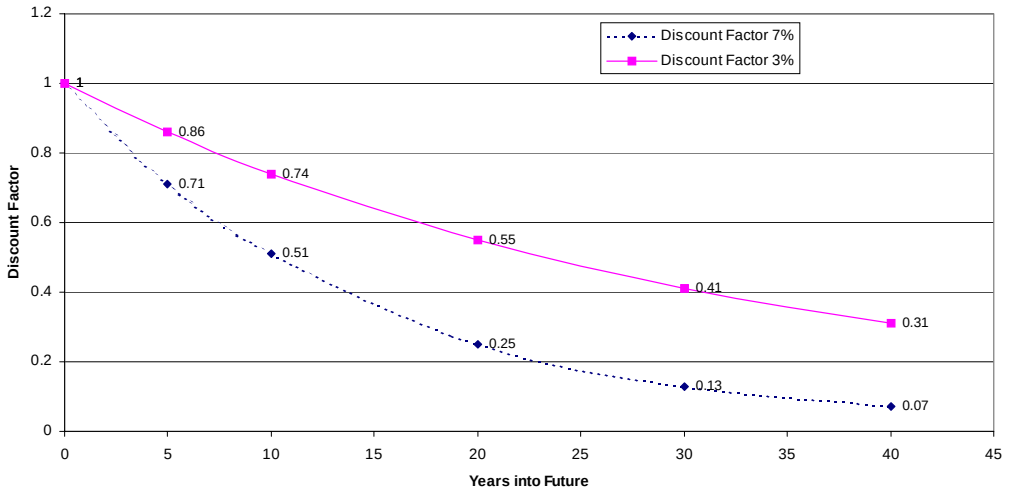
418. There are several sources of uncertainty in the results of this analysis. First, the sample of projects for which data are available is small, and accordingly, the estimated

average costs are not precise. First, the sample of projects for which data are available is small, and accordingly the estimated measures of central tendency necessarily have a large standard error. In addition, the agreements reached regarding species conservation measures are often complex and evolve over time. Thus, the characteristics of the sampled projects may differ systematically from those remaining in consultation. In recognition of these sources of uncertainty, where appropriate a range of estimates is presented (rather than a simple point estimate). Additionally, sensitivity analysis is presented to illustrate the importance of key assumptions. One sensitivity analysis includes the consistent presentation throughout of results based on both a three percent and seven percent real discount rate. Variations in the assumed discount rate is particularly important for dam project analysis given that many of the costs are large lump sum investments in facilities, such as fish passage, with very long expected useful lives (50 years is used here). Sensitivity of the results to the assumed allocation of project modification costs to section 7 bull trout consultations as opposed to the regulatory baseline, such as the FPA or other Act species, is also presented.

419. Discounting is required to present the costs of consultations in the near term and those in the more distant future in a consistent manner. In the absence of other information, it is generally assumed that bull trout consultations on these projects will be completed at the time of the re-licensing. The typical FERC license term is 50 years. Accordingly, while some projects are up for re-licensing at present or in the next year or two, others are scheduled out 30 or 40 years. Other things equal, project modification costs for near term projects will have a greater impact on estimated total annual project modification costs than those in the more distant future. Exhibit 4.12 provides a graphical illustration of this point and shows the effect of the three percent versus seven percent rate. For example, the costs of a consultation taking place 35 years hence will contribute only nine cents on the dollar in the present value cost estimate when using the seven percent rate.

420. A strategy used in this analysis for reducing uncertainty is to classify dam costs by project characteristics. Characteristics used include the presence of fish passage and the total MW capacity of the project. Precision is also improved by some stratification of the sample - distinguishing consultations on large hydroelectric facilities (greater than 10 MW) from those on small facilities, and separately categorizing FERC actions expected to result in dam removals rather than re-licensing. A final strategy to increase the precision of the estimates was to increase the sample size by including some consultations that are not completed but already well-underway, particularly where the utility contact and the Service appeared to be in agreement.

Exhibit 4.12. Implication of Consultation Date for Present Value of Relicensing Costs



Source: Derived from present net value worth formulas.

Estimation of Project Modification Costs from Case Studies

421. This lengthy subsection provides an analysis of bull trout-related project modification costs for a set of nine completed, ongoing, or projected formal consultations on FERC-licensed hydroelectric projects. The results (estimated average annual costs per consultation) are summarized below in Exhibit 4.17 and used to project future total annual costs at all 36 FERC-licensed projects over a 50 year period (Exhibit 4.18).

422. The first set of projects considered in this analysis are a sample of "large" facilities (greater than 10 MW capacity) including Noxon Rapids-Cabinet Gorge (697 MW) on the Clark Fork River, Leaburg-Walterville (23 MW) on the McKenzie, Pelton-Round Butte on the Deschutes (427 MW), Yale/Merwin/Swifts (580 MW) on the Lewis River, and Thompson Falls (93 MW) also on the Clark Fork (Exhibit 4.13). Even by Pacific Northwest standards, some of these are very large projects. To date, only the first two projects listed above have completed re-licensing consultations. Pelton-Round Butte and the Lewis River project have completed what might be called interim consultations - the first motivated by a turbine runner replacement, and the second by the desire to have existing take of bull trout at the facility permitted through a formal consultation. However, for both of these projects likely major cost items have been identified for the upcoming re-licensing consultation. Thompson Falls is included because the costs seem reasonably foreseeable and it provides an example of a project for which most of the costs are attributable section 7, rather than the regulatory baseline.

Exhibit 4.13 Examples of FERC-licensed Hydroelectric Facilities Within Bull Trout Habitat			
Project	**Consultation Date**	**MW Capacity**	**Other Aquatic Species/Regulations**
(A) Completed Consultations			
Noxon/Cabinet Gorge	1999	697	Cutthroat, Mtn. Whitefish, Kokanee, Kamloops
Leaburg-Walterville	2001	23.2	Chinook
(B) In-process or Projected			
Pelton/Round Butte	2000	427	Sockeye, Chinook, Steelhead, Water quality issues
Yale/Merwin/Swift	2001-2005	580	Salmon, Kokanee, Cutthroat
Thompson Falls	2006	92.6	Cutthroat, Whitefish
Source: FERC re-licensing schedules, communication with Service and state Service representatives.			

Noxon Rapids-Cabinet Gorge

423. The fisheries-related terms of the Avista (Noxon/Cabinet Gorge) re-licensing are shown in Exhibit 4.14, based on the detailed settlement agreement finalized in January, 1999. Avista chose to enter re-licensing as a collaborative process and included all stakeholders (such as the Montana and Idaho fish and game agencies, USFS, Trout Unlimited, Tribes, etc.) in the process. Essentially the utility wanted to retain most of its operation flexibility and in exchange funded some very substantial habitat mitigation, fish passage, gas supersaturation work, etc.

424. As a generalization, this project is one for which one would expect to see high project modification costs for bull trout. The dams sit in the heart of one of the major adfluvial bull trout systems in the Pacific Northwest: Lake Pend Oreille and the Clark Fork River, which historically supported at least 10,000 spawners (Pratt and Huston, 1993). Prior to the re-licensing, there was no provision at the dams for fish passage, yet the potential for recovery of the populations here seems good. According to the project biologist, five to 13 pound bull trout routinely are found at the base of the dams, moving up out of Lake Pend Oreille. Fish passage at these dams would provide access to many stream miles of historic adfluvial bull trout spawning and rearing habitat. A feature of the project is that no anadromous fish are present. The project is a major hydroelectric facility, with gross annual revenues on the order of $100 million.

Exhibit 4.14 Noxon/Cabinet Gorge Hydroelectric Facilities: Fisheries-Related Re-licensing Settlement Terms, 1999[a]				
Item	**Annual (2002 dollars)**	**One-time Lump Sum**	**Present Value (million 2002 $) at:**	
			3%	**7%**
ID Tributary Fish Restoration	$470,000	–	$12	$7
MT Tributary Fish Restoration	$513,000	–	$13	$7
Easement Thompson/Fisher Rivers	–	$540,000		
Fish Passage[b]	$1,027,000	$631,000	$26	$14
Bull trout Education and Protection	$135,000	–	$4	$2
Gas Supersaturation	$540,000	–	$14	$8
Project Operating Limits (minimum flows)	$531,000	–	$14	$7
Allocation of Admin. Costs[c]	$1,216,000	–	$31	$17
Total Costs	**$4,432,000**	**$1,171,000**	**$115**	**$63**

[a] Source: Avista Corp., Vol III. Application for New License, Settlement Agreement, Cabinet Gorge and Noxon Rapids. February, 1999. Term of settlement and payment period for annual costs is 47 years.
[b] $432,000/year for annual facilities contribution, $595,000/year annual operations.
[c] Administrative program at $1,501,000 per year; fishery share is 81 percent or $1,216,000/yr.

425. The cumulative undiscounted total cost of the mitigation package is a little over $200 million, running at about $5 million per year for 47 years.[178] The annual amounts shown in the table are indexed to the Consumer Price Index to be constant in real dollar terms over the duration of the license. Utility and Service personnel agree that bull trout weighed heavily in the design of the mitigation, for example including a $125,000/year item for bull trout education and enforcement (funding wardens to discourage poaching in spawning tributaries).[179] The other key species at the project is cutthroat trout. While perhaps half the expenditure on tributary restoration could be allocated to bull trout and the rest to the other species that would benefit from passage (cutthroat, mountain whitefish, kokanee, and kamloops rainbow), the Service stated that essentially the same mitigation package would likely have been obtained if only cutthroat were present. For example, both fish passage and the habitat restoration in Idaho and Montana would both have happened regardless of bull trout. For this analysis, total fishery mitigation costs (including an allocation of project administration) is estimated to be about $3.7 million per year, of which the bull trout share is estimated by this analysis to be $1,706,000 per year, derived by excluding gas

[178] Source: Avista Corp., Vol III. Application for New License, Settlement Agreement, Cabinet Gorge and Noxon Rapids. February, 1999.

[179] Personal communication, Tim Swant, Biologist, Avista, Noxon, Montana, December 2, 2002; personal communication, Service Biologist, Creston, Montana, December 20, 2002 and January 22, 2003.

supersaturation expenditures (benefitting resident species below the dam) and a 50 percent share of all other fishery-related expenditures.

426. The share of bull trout mitigation cost that can clearly be attributed to section 7 and the bull trout consultation in the Avista re-licensing is approximately zero. The Native Salmonid Restoration Plan, which was the cornerstone of the Avista settlement agreement, was developed in 1996-1997 and negotiated and finalized with all the stakeholders in July, 1998. The dollar costs for each of the 26 project mitigation and enhancement measures were agreed on at this time. This agreement preceded the bull trout consultation (dated August, 1999). The project modifications of the consultation are the measures in the restoration plan, with nothing added. The settlement agreement was signed by all parties in January, 1999, and incorporated the Native Salmonid Restoration Plan for project mitigation terms. The substantial bull trout mitigation at this project appears to be mainly driven by the fact that this is a biologically important species at the site. Throughout most of the negotiations, listing of bull trout was not a certainty, since the Service had previously denied listing several times. Accordingly, this re-licensing seems to provide an example, because of the timing of bull trout listing vis-a-vis the license renewal date, of a very extensive project mitigation package substantially motivated by bull trout, yet based on FPA re-licensing provisions rather than section 7 of the Act. The only specific cost clearly attributable to the section 7 consultation is the reporting requirements for the take report.

427. The estimated costs for the Avista project are summarized in Exhibits 4.15a and 4.15b (along with the estimates for the other of the five FERC large hydroelectric project consultations used as case studies in this analysis). These exhibits present a summary of three cost definitions: fishery-related project modification costs, bull trout-related costs, and section 7 bull trout costs. For example, at seven percent real discount rate, the present value of these costs for the Avista project are, respectively, $62.5 million, $25.6 million, and $0.04 million.

Leaburg-Walterville

428. The Leaburg-Walterville project is on the McKenzie River, Oregon, at the approximate lower boundary of the bull trout distribution in that river. According to the contact at Eugene Water and Electric Board, mitigation costs stemming from the Act at this project were also negligible because licensing had just been completed at time of the consultation and all that was required by the project modifications was to follow through on the licensing agreement. The total fishery project modifications amounted to about $20 million, primarily ladders, weirs and screens and minimum flows, all related to providing passage for Upper Willamette River chinook salmon. Salmon were the driving factor for mitigation in the licensing process (dating back to 1989).[180] The costs identified specific to bull trout are minimal monitoring and reporting costs (Exhibits 4.15a and 4.15b).

[180] Personal communication, Gale Banry, Eugene Water and Electric Board, December 17, 2002.

Exhibit 4.15a

FERC Hydroelectric Project Modifications Present Value Cost Allocation:
Seven Percent Discount Rate
(million 2002 dollars)

Project	**Fisheries Project Modification Costs**	**Bull Trout Share of Costs**	**Section 7 Bull Trout Share of Costs**
(A) Completed Consultations			
Noxon/Cabinet Gorge	$62.5[a]	$25.6[b]	$0.04[c]
Leaburg-Walterville	$20.0	< $0.138[d]	$0.04[c]
(B) In-process or Projected			
Pelton/Round Butte	$74.1	$4.14[e]	$0.69[f]
Yale/Merwin/Swift	$55.0 - $105.0	$35.0 - $75.0	$4.5
Thompson Falls	$5.0 - $10.0	$5.0 - $10.0	$2.95 - $5.90[g]

[a] See Exhibit 4.14.
[b] Share based on 50 percent of all fishery expenditures excluding gas supersaturation. Allocation of administrative costs is 67 percent or $931,000.
[c] Based on $3,000/yr estimate.
[d] Based on < $10,000/yr estimate.
[e] Annual of $100,000/yr for studies and $200,000/yr for trap and haul passage capitalized over 50 years.
[f] Annual of $50,000, or 50 percent of study costs, excludes trap and haul assumed re-licensing baseline.
[g] Section 7 cost is the difference in the present value of consultation in 2006 instead of the re-licensing date of 2025. Present value today of $5.0 million in 2006 is $4.08 million, but in 2025 is $1.13 million, or a difference of $2.95 million. Present value difference for $10 million is $8.16 million minus $2.26 million, or $5.90 million.

Source: Derived from data as referenced in exhibit notes and personal communications as referenced in text.

Exhibit 4.15b FERC Hydroelectric Project Modifications Present Value Cost Allocation: Three Percent Discount Rate (million 2002 dollars)[a]			
Project	**Fisheries Project Modification Costs**	**Bull Trout Share of Costs**	**Section 7 Bull Trout Share of Costs**
(A) Completed Consultations			
Noxon/Cabinet Gorge	$115.3	$48.8	$0.08
Leaburg-Walterville	$20.0	< $0.257	$0.08
(B) In-process or Projected			
Pelton/Round Butte	$77.2	$7.72	$1.29
Yale/Merwin/Swift	$55 – $105	$35 – $75	$4.5
Thompson Falls	$5 – $10	$5 – $10	$1.97 – $3.93[b]

[a] See notes to Exhibit 4.15a.
[b] At a three percent rate the present value cost of $5.0 million in three years instead of 22 years is $4.576 million minus $2.609 million, or $1.97 million. Cost of $10.0 million is $9.151 million minus $5.219 million, or $3.93 million.

Source: Derived from data as referenced in exhibit notes and personal communications as referenced in text.

Pelton-Round Butte

429. The Pelton-Round Butte Project on the Deschutes River had a consultation in 2000 triggered by a non-capacity license amendment action by FERC (turbine runner replacement). The discussion here and the cost estimates in Exhibits 4.15a and 4.15b for this facility are based on the combined project modifications of the 2000 consultation and a soon to be completed much more significant re-licensing consultation. One of the reservoirs formed by this project, Lake Billy Chinook and the tributaries that flow into it, including the very cold, clear spring-fed Metolius River support the strongest population of bull trout in Oregon. The utility contacts (PGE) and a contact at Oregon Department of Fish and Wildlife indicated that the utility, anticipating re-licensing, had actively sought to enhance the bull trout population in these waters, which were quite depressed as of the late 1980's (based on redd counts).[181] Primarily through a change in angler regulations, the fishery rebounded tremendously in the 1990's and now supports a healthy fishery directed at bull trout.

430. The primary project mitigation cost will be providing fish passage and water temperature control through a $70 million facility. The facility design was originally motivated by the need for a system to collect and guide juvenile fish for downstream transport. The facility can also, through a multi-level intake system, be used to mitigate

[181] Personal communication, Don Ratliff, Biologist, PGE, November 8, 2002; personal communication, Ted Wise, Biologist, Oregon Department of Fish and Wildlife, November 8, 2002.

temperatures downstream of the project, which are currently in violation of Oregon's water temperature standards (specific to bull trout waters).[182] The motivation for this scale in the fish passage facility is to be capable of transporting up to 100,000 of sockeye plus steelhead and chinook. The PGE re-licensing contact suggested that if bull trout were the only species requiring passage at the project, the fish passage modification costs would cost much less than the $70 million facility required to meet the passage needs of anadromous species. The passage costs for just bull trout would be a trap and haul operation at a level sufficient to exchange genetic material between the Metolius and Shitike/Warm Springs populations.[183]

431. The costs of the project specific to bull trout were estimated to have two components. About $100,000 per year will be spent for continuing biological studies directed at bull trout including creel census, spawning surveys and juvenile production monitoring.[184] However, these studies will not occur every year of the 40- or 50-year license. For example, PGE's December 2002 Biological Evaluation (at page 66) proposes to fund monitoring of annual bull trout harvest during March and April until the species is de-listed. This is a much more limited effort than in the past.[185] The estimated bull trout share of the passage facility would be about $200,000 per year - the cost of a trap and haul passage approach for bull trout. The selective water withdrawal/juvenile salmon passage facility was not bull trout or bull trout consultation related. Passage for all species would likely be pursued under Section 18 of the FPA, and accordingly the costs of passage are included in the baseline. Study costs were also likely related to re-licensing, not to consultation. Many unlisted species will typically be studied during re-licensing, such as kokanee, pike minnow, and smallmouth bass. Accordingly, studies for a fish as biologically significant (at this point) as the bull trout would possibly be warranted under re-licensing, even in the absence of listing. Reflecting uncertainty over this allocation of study costs between section 7 and re-licensing requirements, half of study costs for this project are allocated to section 7 (as shown in Exhibits 4.15a and 4.15b).

Yale, Merwin and Swift

432. Yale, Merwin, Swift #1 and Swift #2 are a linked set of dams and reservoirs covering 30 miles on the Lewis River. This is another kokanee-bull trout system and one that is interesting for the dramatic fluctuations in fishery populations in response to volcanic activity (Mount St. Helens) and floods. Bull trout are present throughout the reservoir/dam system, with some of the key spawning tributaries (such as Cougar Creek) located between dams. A consultation was completed in 2001 and the re-licensing consultation will likely be

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[182] Paul DeVito, Oregon DEQ, Bend, December 17, 2002.

[183] Personal communication, John Esler, PGE, Portland, Oregon, December 16, 2002.

[184] Personal communication, Don Ratliff, Biologist, PGE, January 22, 2003.

[185] Assuming study costs of only $50,000 per year has a small effect on the projections in Exhibits 4.17, 4.18, and 4.21. In the absence of more detailed information, the study cost is assumed to average $100,000 per year, which is likely an overestimate.

completed in 2005 or so. The 2001 consultation did not address operational or facility issues, and the main term and condition was the acquisition of conservation easements along key spawning tributaries including Cougar Creek, Panamaker Creek, and the Swift Creek Arm of Swift Reservoir. The habitat acquisition cost attributable to bull trout is about $4.5 million (another $450,000 was expended for salmon-related habitat acquisition).[186] The main cost likely to be associated with fisheries in the re-licensing will be fish passage, currently estimated at $50 to $100 million (present value). In this case, the cost share allocated to bull trout of $30 to $70 million is higher than the cost attributable to anadromous species. Bull trout need to have passage around and intra-basin movement within the project, while salmon only require passage around the entire project. These costs were provided by a Pacificorp contact. Fish passage costs have nothing to do with whether the species is listed, but can be required regardless in the context of FERC re-licensing when there are significant fish resources above a project. On the other hand, the Pacificorp contact stated that if bull trout were not listed, it was not certain that the utility would provide passage. Based on the interpretation of FPA section 18 found at other projects, the allocation in Exhibit 4.15 (a and b) to section 7 includes only the habitat acquisition costs. Fishways may be required under FPA section 18 if operating of the facility will impact the passage of fish species in the project area. Accordingly, the Service and NOAA Fisheries have the ability to mandate fish passage through FPA section 18, if warranted.[187]

Thompson Falls

433. The last project listed in Exhibits 4.15a and 4.15b is Thompson Falls. This dam on the Clark Fork River was built in 1913 and blocked passage by Lake Pend Oreille adfluvial bull trout to 90 percent of the historic spawning area in the Clark Fork basin. There is currently no passage at the dam, and bull trout are thought to collect at the base during normal migration periods. In July of 2002, a radio-tagged bull trout that spawned in the Vermillion River (which is about 30 miles downstream from Thompson Falls) in 2001 was caught in the Thompson Falls ladder/trap. It was a 12 pound female, and it died as a consequence of the trapping. Service personnel assume it was trying to pass upstream and may have had to settle on the Vermillion River for spawning the year before. Also in 2002, a radio-tagged bull trout (likely from below Noxon Rapids dam), spent weeks at the mouth of Prospect Creek, just below the Thompson Falls dam, and it eventually went up Prospect Creek to spawn. Montana Fish, Wildlife and Parks captured three bull trout (hook and line capture) below Thompson Falls in 2001 and transported them upstream. Several may have gone into the Thompson River drainage, which is about seven miles above the dam. Based on this information, there probably are concentration of bull trout below the Thompson Falls Dam.[188]

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[186] Personal communication, Frank Schrier, Pacificorp, December 18, 2002.

[187] See the discussion of the Federal Power Act (section 18) in section 2.2.3 and the interpretation of the Pelton-Round Butte case in this section.

[188] Personal communication, Service Biologist, Creston, Montana, March 2003.

434. While re-licensing is in 2025, this is a project where the Service is initiating a bull trout consultation over the next few years. The primary mitigation is likely to be fish passage and, based on the budgets at Noxon and Grand Coulee, could cost $5 to $10 million. In this case, while the passage costs would be motivated under Section 18 of the FPA, section 7 would move the costs forward in time by around 22 years. The cost of doing so is measured by the change in present value of passage costs incurred at these two points in time.

Conclusion

435. For the same set of five hydroelectric projects listed in the previous table, Exhibits 4.16a and 4.16b provide an overview of the percentage allocation of fishery related project modification costs to bull trout (all motives) and to bull trout costs incurred just due to section 7. The diversity among the projects results in a variety of patterns to the allocation. On average a little over 40 percent of total fishery-related costs are attributable to bull trout section 7 consultations. On average about five percent of total fishery-related costs are attributable to the bull trout. The information in these exhibits is used below in the sensitivity analysis section. The latter section investigates the importance of assumptions that determine the share of costs due to bull trout.

Exhibit 4.16a

Mitigation Costs Allocation for Large Hydroelectric Projects: Percent of Shares to Bull Trout
Seven Percent Discount Rate

Project	**Total Fisheries Project Modification Costs (percent)**	**Bull Trout Share of Costs (percent)[a]**	**Section 7 Bull Trout Share (percent)**
(A) Completed			
Noxon/Cabinet Gorge	100%	42.3%	<1.0%
Leaburg-Walterville	100%	0.7%	<1.0%
(B) In-process or Projected			
Pelton/Round Butte	100%	5.6%	<1.0%
Yale/Merwin/Swift	100%	63.6% to 71.4%	4.3% to 8.2%
Thompson Falls	100%	100%	59.0%

[a] Includes costs unrelated to consultation-related efforts including unrelated licensing costs.

Source: Based on allocation in Exhibit 4.15a.

Exhibit 4.16b Mitigation Cost Allocation for Large Hydroelectric Projects: Percent of Shares to Bull Trout Three Percent Discount Rate			
Project	**Total Fisheries Project Modification Costs (percent)**	**Bull Trout Share of Costs (percent)**	**Section 7 Bull Trout Share (percent)**
(A) Completed			
Noxon/Cabinet Gorge	100%	42.3%	<1.0%
Leaburg-Walterville	100%	1.2%	<1.0%
(B) In-process or Projected			
Pelton/Round Butte	100%	10.0%	<1.0%
Yale/Merwin/Swift	100%	63.6% to 71.4%	4.3% to 8.2%
Thompson Falls	100%	100%	39.4%
Source: Based on allocation in Exhibit 4.15b.			

436. Exhibit 4.17 provides estimates of the annual section 7 costs associated with each project. This table also contains some summary information for several other project classifications: small hydroelectric projects and dam removals. The small projects are the McKenzie (McKenzie River in Oregon) and the Atlanta Station (on the Middle Fork Boise River), at about 100 and 200 KW capacity respectively. Both of these are new licenses. The McKenzie will require some screening, primarily motivated by the presence of anadromous species. The only costs attributable to section 7 for bull trout due to the McKenzie consultation are annual reporting. The Atlanta station is the sole source of power for an isolated historic mining community, Atlanta, which is at the end of a 65 mile long dirt road that dead-ends on the edge of the Sawtooth Wilderness Area. The dam was nearly destroyed by flooding in the early 1990's, but was rebuilt by BOR to help retain toxic mine wastes in place behind the dam. The hydroelectric station was allowed to be operated on the new dam (now owned by the USFS) but as a condition of a special permit needed to have a FERC license. Fish passage at the site was provided by Idaho Fish and Game. This analysis assumes that the only costs attributable to section 7 are reporting costs. It is not clear how typical these two projects are of other small FERC projects in proposed bull trout critical habitat, particularly since both are original licenses, not re-licensing.

Exhibit 4.17 Estimated Annual FERC-licensed Hydroelectric Project Modification Costs Associated with Bull Trout Section 7 Consultations[a]					
Project	**MW**	**CH Unit**	**Consultation Year**	**Annual Section 7 Bull Trout Costs (2002 dollars)**	
				3% Discount Rate	**7% Discount Rate**
(A) Large Hydroelectric Dams					
Noxon/Cabinet Gorge	697	Clark Fork	1999	$3,000	$3,000
Pelton/Round Butte	427	Deschutes	2000	$50,000	$50,000
Swifts	580	Lower Columbia	2001	$175,000	$326,000
Leaburg-Walterville	23.2	Willamette	2001	$3,000	$3,000
Thompson Falls	92.6	Clark Fork	2006	$77,000-$153,000	$214,000-$428,000
Average Annual				$61,600-$76,800	$119,200-$162,000
(B) Small Hydroelectric Dams					
McKenzie	0.076	Willamette	1999	$2,000	$2,000
Atlanta	0.185	SW Idaho	2001	$2,000	$2,000
(C) Dam Removals					
Condit	15.8	Lower Columbia	1999	minimal	
Powerdale	6.0	Hood River	2000	minimal	
[a] See notes to Exhibit 4.15a.					

437. The last category of projects is dam removals. These are cases where for one reason or another (possibly including mitigation costs), the utility chooses not to go through re-licensing.

438. Condit dam blocks fish passage on the White Salmon River, which is anticipated to be good bull trout as well as anadromous fish spawning habitat. Powerdale dam is on the Hood River. Costs for either of these projects related to section 7 consultations appear to be minimal. Another likely future dam removal is Milltown Dam just upstream from Missoula, Montana. This dam is part of a major superfund site including the Clark Fork River between Missoula and Butte; the mining waste sediments that have collected above this dam over the last century contain metals including arsenic and copper that have contaminated the local groundwater resources. In April, the EPA released a draft proposed plan for this site that included dam removal and comments were closed in July. However, the Potentially Responsible Party at this site, ARCO, has also released a plan that differs in

several significant details from the EPA draft (hydraulic dredging versus in-the-dry; local sediment storage versus transport to the Opportunity Ponds near Anaconda). It is likely that an amended plan will be released in the first quarter of 2004 and that a ROD may be completed in mid-2004, almost certainly including dam removal. Bull trout will benefit from dam removal in several ways. A major migratory barrier will have been removed that reconnects significant spawning habitat in the Blackfoot drainage with bull trout habitat below Milltown dam. With the removal of the dam, northern pike will no longer spawn in the reservoir. Studies have shown that the pike eat juvenile bull trout at this site. It is likely that all actions taken at this site will be motivated by the superfund cleanup (CERCLA) rather than section 7.

Summary of Section 7 Costs

439. Exhibit 4.17 shows the estimated annual bull trout section 7-related project modification costs for the sample of large FERC hydroelectric projects. The range is from $3,000 per year to $428,000 per year with an average of about $60,000 to $75,000 per year at a three percent discount rate and about $120,000 to $160,000 per year at a seven percent discount rate. These average costs are used in Exhibit 4.18 to project total annual project modification costs due to all FERC facilities in the planning area. Consultation on two of the 36 facilities was completed prior to the proposed designation of bull trout critical habitat on November 29, 2002. The average annual total project modification cost for the 34 remaining projects is estimated to be $0.62 to $0.79 million at three percent and $0.94 to $1.32 million at seven percent discount rate. Since consultation for the 34 facilities occur at different points in time, a discount factor is included in the computation of total costs.[189] These cost estimates are the best estimate of the combined effect of listing and critical habitat designation on the 36 FERC facilities in proposed bull trout designated critical habitat in the Columbia River Basin population. There are no FERC hydroelectric facilities in the Klamath population proposed critical habitat.

[189] Based on the average annual costs shown in Exhibit 4.17, the present value of each project is computed from the date of re-licensing to the end of the 50 year analysis period. This future value is discounted back to the present and amortized over the 50 year analysis period.

Exhibit 4.18 Forecast Bull Trout-Related Project Modification Costs for FERC-Licensed Hydroelectric Facilities			
Consultation Status	**Number of Projects**	**Millions of 2002 $**	
		Average Annual Cost Per Project[a]	**Total Annual Section 7 Costs[b]**
(A) Three Percent Discount Rate			
Consultations Completed	2	$0	
Future Consultations -Large Hydro	24	$0.0616 to $0.0768	
Future Consultations -Small Hydro	10	$0.002	
Total	36		$0.62 to $0.79
(B) Seven Percent Discount Rate			
Consultations Completed	2	$0	
Future Consultations -Large Hydro	24	$0.1192 to $0.1620	
Future Consultations -Small Hydro	10	$0.002	
Total	36		$0.94 to $1.32

[a] These costs are estimated average annual costs derived from the last two columns of Exhibit 4.17 at three percent and seven percent discount rates. In the case of small projects (<5 MW), total annual section 7 bull trout costs are estimated to be $2,000 and no more than total estimated costs associated with bull trout fisheries. This includes both section 7 and non-section 7 costs, as shown in Exhibit 4.22.
[b] Total annual costs are based on the present net value of all 34 future consultations (discounted to the present from the projected year of re-licensing).

Source: Derived from Exhibits 4.15 and 4.17 and personal communications as referenced in text.

Sensitivity Analysis

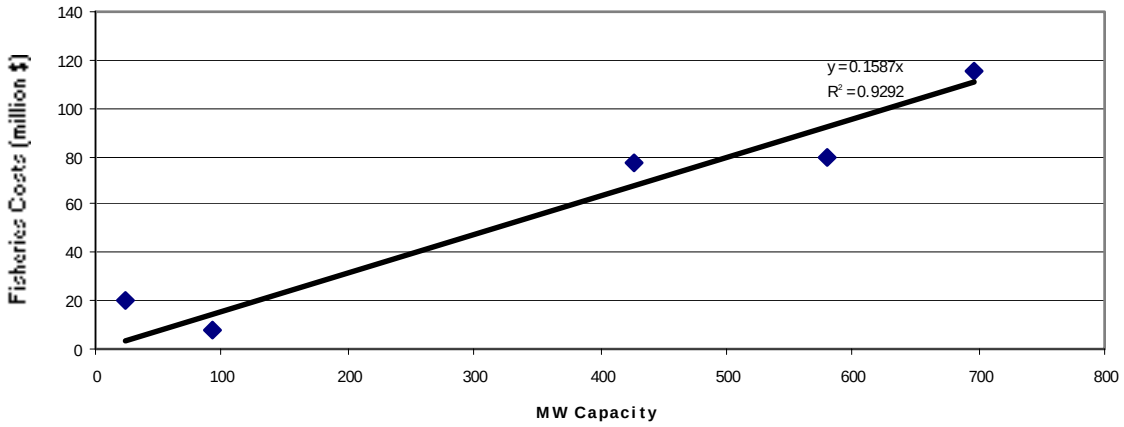
440. This subsection provides a sensitivity analysis of the assumptions used to: (1) distinguish bull trout-related FERC project modification costs from those costs associated with other species, and (2) distinguish costs co-extensive with the designation from costs motivated by other authorities. The importance of these assumptions is shown by estimating all fishery related project modification costs and by estimating the share of these costs due to bull trout. Co-extensive critical habitat related costs are a subset of the latter. All fishery related project modification costs were previously identified for the sample of completed (and ongoing) formal consultations. These estimated costs are found to be highly correlated with megawatt capacity (for the case study projects). A regression model is estimated and used to project all fishery related project modification costs for a subset of the 36 FERC facilities. The bull trout share of these costs is based on the average ratio of bull trout-related costs to all fishery-related costs in the sample of case studies. Findings for this subsection are summarized in Exhibit 4.22.

441. Because of uncertainty in allocation of total fishery-related project modification costs to bull trout and of bull trout project modification costs to section 7 consultations (for example, compare the first, second and third columns in Exhibits 4.16a and 4.16b), estimates are also developed here of total annual project modification costs for the set of 36 FERC facilities based on: (1) all estimated fishery-related project costs, and (2) all costs related to bull trout. With regard to all fishery-related project costs, the plot of our sample of project modification costs against MW capacity (Exhibit 4.19) shows what appears to be a strong positive linear relationship. In other words, the larger the generating capacity of the facility, the greater the project modification costs. This is intuitively reasonable since, other things equal, larger projects are likely to have greater impacts on fisheries and require greater expenditures to remedy these impacts. In the context of negotiations, larger facilities are also likely to have greater resources (e.g., power generation revenues) to address impacts. A simple linear regression model constrained to go through the zero intercept was estimated on this limited data set (five observations), using the midpoint of the range of projected costs for Pelton/Round Butte, Yale/Merwin/Swift and Thompson Falls. Despite the small data set, the estimated model fit the data well, especially for the three percent discount rate data (Exhibit 4.19). The estimated slope at three percent is $158,700/MW with a 95 percent confidence interval of about plus or minus $39,000. The estimated slope at seven percent is $121,100/MW with a 95 percent confidence interval of about plus or minus $55,000. These confidence intervals reflect not only the usual uncertainty due to sampling, but also the uncertainty due to using estimated costs for three of the dams.[190] Prediction intervals for the total present discounted cost for a subset (29) of the 36 FERC licensed dams were also computed; these prediction intervals also reflect the uncertainty due to the estimated costs for the three dams in the sample.[191] The width of the prediction interval depends on the size of the dam, with dams further from the mean having slightly larger standard errors. In addition, the width of the prediction interval is also affected by the re-license date, since predicted values are discounted present values. Because of the strong relationship of project modification costs to generating capacity, a more precise estimate of projected costs is obtained from the regression model, compared to simply using average project costs.

[190] This additional uncertainty was estimated by simulation, where the projected cost for each of these dams was a random draw from a normal distribution with standard deviation equal to one-quarter of the range of the projected costs. (For Pelton/Round Butte, the standard deviation was assumed to be half of that for Yale/Merwin/Swift.)

[191] This was also estimated by simulation.

Exhibit 4.19. Plot of Total Fisheries Project Modification Costs by MW Capacity of Hydroelectric Plant: 3% Discount Rate



Source: Derived through OLS regression estimate based on data in Exhibits 4.15b and 4.17.

442. Given that fish passage expenditures are a substantial share of total fishery-related project modification costs for the sample facilities, projected estimates may also be improved by distinguishing facilities with existing fish passage from others. Exhibit 4.20 provides a list of all 25 FERC projects greater than 10 MW with information on re-licensing date, presence or absence of fish passage, capacity, and whether a bull trout consultation has been completed or projected. There are five mainstem Columbia River and Snake River FERC-licensed projects either known to have passage or that are not expected to have ladder passage installed in the future (Hells Canyon, Priest Rapids, Rocky Reach, Wells and Rock Island). These five projects are all very large and combine for 5,556 MW of generating capacity or 62 percent of the generating capacity at the 36 total FERC projects in the planning area.

Exhibit 4.20

FERC-Licensed Dams Greater than 10 Megawatts Located within Bull Trout Critical Habitat

Consultation Completed or Projected[a]	Name of Project	MW	River	Re-license Date	Existing Fish Passage
IDAHO					
	Lucky Peak	101	Boise	2030	
	Arrowrock	60	Boise	2039	
	Cascade	12	N. Fk. Payette	2031	
Yes	Cabinet Gorge	231	Clark Fork	2046	No
	Hells Canyon Complex	1,167	Snake	2005	No
MONTANA					
Yes	Noxon Rapids	466	Clark Fork	2046	No
	Kerr	180	Flathead	2035	No
Yes	Thompson Falls	93	Clark Fork	2025	No
WASHINGTON					
	Box Canyon	60	Pend Oreille	2002	No
Yes	Merwin	136	Lewis	2006	No
Yes	Yale	134	Lewis	2001	No
Yes	Swift #1	240	Lewis	2006	No
Yes	Swift #2	70	Lewis	2006	No
	Priest Rapids	1,755	Columbia	2005	Yes
	Boundary	1,024	Pend Oreille	2011	
	Rocky Reach	1,237	Columbia	2006	Yes
	Wells	774	Columbia	2012	Yes
	Rock Island	623	Columbia	2028	Yes
	Tieton[b]	14	Tieton	2041	
OREGON					
Yes	Pelton/Round Butte	427	Deschutes	2001	No
	Trail Bridge-Carmen	125	McKenzie	2008	
Yes	Leaburg-Walterville	23	McKenzie	2037	No
	Blue River	15	Blue River	2039	

Source: FERC re-licensing schedule.
[a] As of June 2002
[b] Consultation completed December, 2002.

Summary of Total Fishery Related Costs

443. In projecting total annual fishery related project modification costs, the set of 36 FERC-licensed hydroelectric facilities is categorized into three groups: (1) two with completed consultations, (2) five mainstem projects with either existing fish passage or where fish passage is not expected in the future, and (3) all other (a total of 29) FERC projects. The cost parameters used are, respectively: (1) zero cost, (2) observed average costs excluding fish passage, and (3) regression model prediction (Exhibits 4.21a and 4.21b). The resulting estimates of projected total annual fishery-related project modifications are $14.9 to $26.3 million at three percent and $16.1 to $36.1 million at seven percent. These ranges are the 95 percent prediction intervals.

444. The second definition of costs includes only bull trout-specific costs. These are approximated by multiplying the average percentage share for this definition times the total fishery-related cost estimates in Exhibits 4.21a and 4.21b.

Exhibit 4.21a

Estimated Annual FERC Re-licencing Project Modification Costs Including all Fishery-Related Costs: Seven Percent Discount Rate

Dam Category	# of Dams	Annual Cost per MW (million $)	MW	Total Cost (million 2002 $)
Completed Consultations	2	NA	720[a]	NA[b]
Columbia and Snake River Mainstem Projects	5	$0.00117	5,556	$4.38
All other FERC Dams[c]	29	NA	2,725	$11.62-$31.64
Total	36		9,001	$16.10 - $36.12

[a] Completed MW total is 720 at Noxon/Cabinet Gorge and Leaburg-Walterville.
[b] Only includes costs for consultations completed after the publication of the proposed critical habitat designation for the bull trout, November 29, 2002.
[c] The total discounted cost for all 29 dams is obtained by totaling the predictions for the individual dams. The range of estimated total annual cost reported here is the 95 percent prediction interval for projected total discounted cost for all 29 dams amortized over 50 years.
Source: Derived using regression parameter from Exhibit 4.19, amortized over 50 years and known MW capacity and re-licensing data from FERC database.

Exhibit 4.21b

Estimated Annual FERC Re-licensing Project Modification Costs Including all Fishery-Related Costs: Three Percent Discount Rate

Dam Category	# of Dams	Annual Cost per MW (million $)	MW	Total Cost (million 2002 $)
Completed Consultations	2	NA	720[a]	NA[b]
Columbia and Snake River Mainstem Projects	5	$0.00102	5,556	$4.53
All other FERC Dams[c]	29	NA	2,725	$10.18 - $21.60
Total	36		9,001	$14.91 - $26.33

[a] Completed MW total is 720 at Noxon/Cabinet Gorge and Leaburg-Walterville.
[b] Only includes costs for consultations completed after the publication of the proposed critical habitat designation for the bull trout, November 29, 2002.
[c] The total discounted cost for all 29 dams is obtained by totaling the predictions for the individual dams. The range of estimated total annual cost reported here is the 95 percent prediction interval for projected total discounted cost for all 29 dams amortized over 50 years.
Source: Derived using regression parameter from Exhibit 4.19, amortized over 50 years and known MW capacity and re-licensing data from FERC database.

445. Estimates for all three cost definitions are reported in Exhibit 4.22. Forecast bull trout-related project modification costs are about five percent of all estimated fishery-related costs. These results highlight the importance of assumptions that identify the bull trout share of all fishery-related costs (assumptions relating to the share of project modification costs due to other species, including salmon and steelhead) and assumptions regarding which costs are co-extensive with the designation versus those due to other authorities (i.e., regulatory authorities other than section 7 of the ESA, including section 18 of the Federal Power Act).

Exhibit 4.22

Total Annual FERC Project Modification Cost Estimates: Sensitivity Analysis

Cost Category	Total Annual Costs (million 2002$)	
	3% Discount Rate	7% Discount Rate
(1) All Fishery Project Modification Costs[a]	$14.9 - $26.3	$16.1 - $36.1
(2) All Bull Trout Costs[b]	$6.5 - $11.8	$6.8 - $15.9
(3) All Section 7 Bull Trout Costs[c]	$0.62 - $0.79	$0.94 - $1.32

[a] See Exhibit 4.21a and 4.21b.
[b] Based on average ratio of method (2) costs to method (1) costs at Exhibits 4.16a and 4.16b for a ratio of 0.424 to 0.440 at seven percent and 0.434 to 0.450 at three percent discount rate.
[c] See Exhibit 4.18.
Source: Derived from Exhibits 4.16, 4.18 and 4.21.

Bias and Uncertainty

446. This section provides a discussion of sources of uncertainty and possible bias in the total estimated FERC-related project modification costs for bull trout.

447. Because of the effect of discounting on the cost contribution of consultations in the distant future (Exhibit 4.12), cost estimates for projects scheduled for re-licensing in the near future carry the most weight. The main sources of uncertainty in projected FERC hydroelectric project modification costs are the following project characteristics: (1) no completed or projected consultation cost, (2) large facilities in terms of generating capacity, (3) facilities with no existing fish passage, and (4) facilities with re-licensing dates in the near future. As is apparent from Exhibit 4.20, several key projects are Boundary (1,024 MW, re-license in 2011) and Box Canyon (60 MW, re-license in 2002). All other projects listed in Exhibit 4.20 are either: (1) less than 50 MW, (2) have a projected or completed consultation, (3) have fish passage, or (4) have a re-licensing date of 2030 or beyond. By contrast, considering the sample of five projects used to project costs: (1) three of five are greater than 400 MW, (2) none had a functioning fish passage system prior to the consultation, (3) all will result in substantial fish passage expenditures, and (4) the dams tend to be in areas with significant bull trout populations, relative to the remaining set of dams. A related set of points is made in Exhibit 4.23. This information suggests that the projected costs used in this analysis may be, on average, high compared to actual future project modification costs.

Exhibit 4.23 **Interpretation of Estimates from Sample of FERC-Re-licensing Section 7 Consultations on Bull Trout**	
–	Noxon / Cabinet Gorge is the largest FERC project in western Montana and is located in the heart of bull trout habitat. There are no salmon or steelhead present at this location.
–	Round Butte / Pelton is on the only harvested bull trout population in Oregon, and is one of the biggest dams in Oregon.
–	Yale / Merwin / Swift is a large project on a major river in one of the few well-populated bull trout waters in Washington.
–	This sample likely provides an upper bound to estimates of future impacts from FERC-licensed hydroelectric facilities remaining to be re-licensed.

448. Preliminary information regarding the Box Canyon re-licensing is available in a FERC draft EIS that details potential bull trout mitigation and enhancement at that project, including: (1) Box Canyon fish passage including capital costs of $16.8 million and about $600,000 per year in operation and maintenance and monitoring, (2) Calispell Creek Pumping Station fish passage (capital cost of $4.3 million and annual costs of $65,000), (3) total dissolved gas abatement (capital cost of $11 million, annual costs of $30,000 per year over 50 years, and present value of lost energy of $7.3 million), and (4) trout habitat

restoration of $20.5 million.[192] It is not clear at this point in time what the final terms of this draft re-licensing requirements will be and what share of these costs would be due to the bull trout section 7 consultation. Settlement discussions are underway regarding re-licensing provisions at the Box Canyon project, and the completion of BO has been delayed until February 2004. In any case, the projected total fishery-related project modification costs at this facility (Box Canyon, 60 MW) using the previously described regression model at 3 percent is $11.7 million and at 7 percent is $9.5 million. The 95 percent prediction interval for both these Box Canyon estimates is $0 to about $32 million. Boundary is a much larger dam (1,024 MW) and the predicted cost there is about $163 million at both discount rates and with a prediction interval of about $115 to $210 million. No information specific to Boundary has been obtained.

4.2.7 U.S. Forest Service

449. This section provides a forecast of project modification costs for bull trout-related consultations with the Forest Service. This section is organized into five main parts corresponding to the major types of Forest Service activities consulted on to date: (1) timber harvest, (2) grazing, (3) agricultural water diversions, (4) mining, and (5) general forest management. The general approach is to examine a subset of previously completed formal consultations, assess project modification costs, average these costs, and use the results (along with future projected number of consultations) to estimate total annual Forest Service-related project modification costs over a ten year period. The analysis of impacts to timber harvest projects is further organized to address three types of sales: fire salvage/restoration sales, green timber sales, and fuel reduction projects.

450. The findings of this section are summarized as follows.

- The Forest Service has completed more formal bull trout-related consultations since listing in 1998 than any other Action agency – a total of 86. Estimated costs per consultation for timber sales are summarized in Exhibit 4.31. A finding is that estimated costs per consultation are highest for major fire salvage sales ($4.3 to $11.7 million), much lower for green timber sales ($0.1 to $0.3 million), and very low for fuel reduction projects ($4,000 per consultation). It is projected that five green timber sales and one fuel reduction action will occur each year, and one major fire salvage action will occur every four years. Total annual project modification costs associated with bull trout for all timber sale actions are estimated to range from $1.6 to $4.1 million.

- Grazing project consultation are expected to have project modification costs of $40,000 (for projects where the modification is increased monitoring and reporting) and $10,000 (for elimination of conflicts through fencing and off-stream water). It

[192] FERC, Draft Environmental Impact Statement, August 2002, Pend Oreille County Public Utility District #1's Box Canyon Hydroelectric Project under P-2042. http://ferris.ferc.gov/

is projected that two consultations in each cost category will occur per year over the next ten years.

- With regard to agricultural water diversion, there are no examples in the formal consultation record of bull trout-related consultations involving the Forest Service resulting in reductions in irrigation withdrawals. However, there are several cases in the Methow drainage (Okanogan National Forest) where Forest Service consultations with NOAA Fisheries has resulted in reductions of irrigation water. Data on these reductions are used to project costs on the assumption that five such reductions (averaging about 2,700 acre feet) could occur in the coming ten years. This results in an estimated range for irrigation-related project modifications of zero to $1.7 million annually.

- Mining related project modifications are estimated for three types of mining activity: lode, recreational suction dredging, and placer. The first two types of mining activity are expected to occur in Idaho and Montana with costs per consultation estimated to be $100,000 annually both for watershed assessment requirements for large-scale hard rock mining and for date restrictions on streams for recreational suction dredging. A total of two mining-related consultations are projected to occur per year in Idaho and Montana. Placer mining is anticipated to generate 15 formal consultation per year in Eastern Oregon, with a total annual cost of about $330,000.

- Project modification costs associated with general forest management consultations (road maintenance, recreation management and facilities, and restoration activities) are expected to cost zero to $25,000 per consultation and about nine such consultations are projected to occur each year.

451. Forecast annual project modification costs for all bull trout-related activities for which the Forest Service is an Action agency are between $2.3 and $6.7 million.

<u>Timber Harvest</u>

452. This section examines future bull trout-related project modification costs arising from USFS timber sales. As noted previously, the USFS is the primary land manager of Federal lands (or of lands in all ownership categories, for that matter) adjacent to proposed designated bull trout critical habitat. Timber management is the primary revenue-generating activity of this agency.

Methodology

453. Exhibit 4.24 outlines a general method for estimating project modification costs for USFS projects. As noted previously, an important element in the analysis is identifying the existing regulatory baseline. With regard to timber, there are a number of significant regulations that guide timber management activities, particularly with regard to impacts on fisheries and aquatic health. These are listed in Exhibit 4.25, and were discussed earlier in

this document. In addition to these specific regulations, an important context for this analysis is the recognition that past management activities, including road construction, timber harvest, fire management, and grazing have affected water quality and watershed function. The primary water quality impacts are altered streamflow, erosion, and sedimentation regimes (e.g., turbidity, substrate composition, etc.). Specific to the planning area, a major ecosystem management project was undertaken in the 1990's, the ICBEMP.

Exhibit 4.24 **Methodology for Estimating U.S. Forest Service Timber Harvest Project Modification Costs**	
(1)	Examine a sample of formal timber sale BOs and develop a generalized case study addressing the following:
	– The scale of the project
	– The project modifications are likely to be contained within the BO
	– The degree to which any project modifications are attributable to section 7 consultation or to baseline regulations
	– The degree to which section 7 attributable project modification costs are attributable to bull trout (as opposed to another listed species)
(2)	Project the number of future timber sale consultations based on the past consultation rate and/or other project specific information
(3)	Apply estimated typical project modification costs per consultation to the number of future consultations predicted

Exhibit 4.25 **Timber Harvest Consultation Characteristics**	
(1) Action Agencies	– U.S. Forest Service – Bureau of Land Management
(2) Significant Baseline Regulations	– INFISH – PACFISH – Northwest Forest Plan – Wilderness Act – Clean Water Act – Other listed species (spotted owl, grizzly, lynx) – National Forest Management Act – Federal Land Policy and Management Act – Clean Air Act – National Wild and Scenic Rivers Act

454. One of the findings of that analysis is that riparian areas and wetlands on both USFS and BLM lands are in many cases quite degraded.[193] For example, in the Western United States, 66 percent of inventoried BLM-administered riparian areas are either "non-functioning" or "functioning at risk", and that 75 percent of riparian areas administered by the Forest Service in the Western United States are "not meeting or moving toward objectives." In recognition of these problems, there has been a changed emphasis in the goals of the USFS. For example, a recent publication characterizes the agency as "actively pursuing initiatives to restore watersheds, improve water quality, and protect aquatic habitats", and, with regard to goals, the agency is characterized as having made "watershed health and restoration, recreation, sustainable forestry, and roads management the agency's top priorities."[194]

455. This changed emphasis is in part an explanation (along with the baseline regulations such as the Northwest Forest Plan, PACFISH and INFISH) for the precipitous decline in annual timber harvests in the Pacific Northwest and Rocky Mountain regions from 1,502 mmbf in 1986 to 342 million in 1997 (as described previously in Exhibits 2.9 and 2.10). This changed emphasis also manifests itself in the characteristics of the sample of timber sales observed through the bull trout section 7 process. A good share of these timber sales are associated with restoration projects, or in some cases sales motivated primarily by the desire to fund restoration at a specific site through a timber sale. The latter are referred to as "stewardship sales," used on an experimental basis for several years in a number of USFS sites across the United States. A defining feature of such sales is that in principle all net revenues from timber harvest are used to mitigate the impacts of the current action, but more importantly to improve watershed and soil conditions through such actions as road upgrades, road obliteration, road closures, culvert replacement, fuel reduction, and other actions intended to improve watershed and forest health and compensate for past management activities. The nature of these sales has implications for interpreting project modification costs arising from the consultations.

Data

456. Exhibit 4.26 provides a list of formal bull trout consultations addressing USFS timber sales in the last four years. The total sample of sales that were investigated included nine different green timber sales in six consultations, two salvage timber sales, and one fuel reduction project (Exhibit 4.27) (i.e., it was not possible to obtain information adequate for estimating project modification costs for each of these sales). Note that, in the time since some of these consultations have been completed, some of the sales have been withdrawn or canceled for various reasons. For example, the Nevada-Dalton sale on the Helena National

[193] USDA USFS, USDOI BLM. 2000. Interior Columbia Basin Draft Supplemental Environmental Impact Statement, Volume 1 (for example, at pp. 2-132 to 2-133).

[194] USDA USFS. 2000. "Water and the Forest Service."

Forest was withdrawn because of the decision to first develop a forest-wide transportation plan, rather than doing it piecemeal through individual sales.[195]

Exhibit 4.26 U.S. Forest Service Timber Harvest Bull Trout Section 7 Consultations: 1998-2002[a]	
National Forest	**Sale Name**
Lolo NF	Clearwater sale
	Post-burn sale
	Knox-Brooks sale
	Northside Reset sale
	Boulder-Wyman, Mocassin sale
Kootenai NF	White Pine Creek sale
	Spar and lakes subunits sale
Flathead NF	Spotted Beetle sale
Bitterroot NF	Burned Area Recovery sale
Helena NF	Beaver Dry sale
	Poorman sale
	Navada Dalton sale
Idaho Panhandle NF	Bluegrass Bound sale
Fremont NF	White Rim sale
Willamette NF	Simco sale
	Staley sale
	Tumbler sale
	Upper Liz sale
Malheur NF	Merit Vegetation Project
[a] There were no BLM timber sales in the consultation sample, and only one BIA (Yakama Indian Nation) sale. There were a total of 15 formal consultations covering these 19 projects (all of the Willamette sales were under one consultation and Poorman and Beaver Dry were one consultation). Source: Derived from section 7 bull trout consultation documents.	

[195] Personal communication, Len Walsh, Forest Biologist, Helena National Forest, January 14, 2002.

Exhibit 4.27 Summary of U.S. Forest Service Timber Sales Examined in Analysis			
Sale	**Forest**	**State**	**Sale Type**
Beaver Dry	Helena	Montana	Green Timber
Bitterroot Burned Area	Bitterroot	Montana	Fire Salvage
Bluegrass Bound	Idaho Panhandle	Idaho	Green Timber
Clearwater	Lolo	Montana	Green Timber
Knox-Brooks	Lolo	Montana	Green Timber
Rock Creek	Lolo	Montana	Fuel Reduction
Simco	Willamette	Oregon	Green Timber
Staley	Willamette	Oregon	Green Timber
Tumbler	Willamette	Oregon	Green Timber
Upper Liz	Willamette	Oregon	Green Timber
White Pine	Kootenai	Montana	Green Timber
Winter Rim	Fremont	Oregon	Green Timber
Source: Derived from section 7 bull trout consultation documents.			

Salvage Timber Sale: Fire

457. The Bitterroot Burned Area project was a fire salvage sale. This is by far the most complex and the largest of the projects consulted on to date, and provides for an opportunity to identify the full gamut of likely project modification costs for USFS timber sales. The fires of 2000 were the largest in recorded history on the Bitterroot National Forest, and received national attention. In one three month period, wildland fires burned 356,000 acres in the Bitterroot Valley and surrounding areas of Western Montana and Central Idaho.[196] The fires were characterized as having destroyed about 30 years worth of timber harvest on the Bitterroot National Forest.[197] A fire salvage timber sale and restoration effort was developed in response to the fires that focused on only about 50,000 acres within the fire area, but was still projected to support a harvest of 176 mmbf.[198] This is a very large timber sale. For example this amounts to about 70 percent of the total annual harvest projected to come off all national forests in the entire states of Oregon and Washington and the Rocky Mountain region in 2010 and is over 50 percent of the actual harvest in these same areas in 1997 (Exhibits 2.9 and 2.10). The sale and restoration planning was very contentious and required

[196] USDA USFS. 2001. Bitterroot National Forest Burned Area Recovery Record of Decision.

[197] Personal communication, Spike Thompson, Deputy Forest Supervisor, Bitterroot National Forest, Hamilton, Montana, January 17, 2003.

[198] USDA USFS. 2001. Burned Area Recovery Final Environmental Impact Statement.

a full-scale NEPA analysis. After the ROD was issued in December 2001, the USFS was sued by citizen groups concerned that the project would do more damage than good. In February of 2002, current USFS Chief Dale Bosworth was summoned to Missoula by a Federal judge to negotiate a controversial post-fire logging and restoration settlement.[199] The settlement allowed for a total 56 mmbf harvest; however, because of the rapid deterioration of the standing fire-damaged trees, the lumber value has declined to the point (as of February 2003) that no more contracts other the ones in hand would likely be let.[200] While the initial value of the timber was about $5.50 per ton, by 2002 it averaged $2 per ton, and contracts in the winter of 2002-2003 were only at $0.33/ton.[201] It appears that the maximum harvest will be about 45 mmbf.

458. Project modification costs for the Burned Area Recovery are summarized in Exhibit 4.28. The consultation, which was completed November 19, 2001, was conducted on the full 176 mmbf harvest from the ROD. However, it appears that not all the initially identified project modifications will be implemented in a timely manner, in part because the actual sale is only one-quarter of the size originally envisioned. Accordingly, Exhibit 4.28 reports estimates both for the planned sale of 176 mmbf as well as the actual contracted sale of around 45 mmbf.

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[199] Devlin, Sherry. February 7, 2003. Bosworth hopes for "better way" in future. Daily Missoulian, pg 1.

[200] Personal communication, Jim McCormick, timber sale administrator, Bitterroot National Forest, Darby, Montana, January 23, 2003.

[201] For perspective, $2 a ton is equivalent to about $13.60 per mbf (typical green timber sale prices are in the $200 to $300/mbf range).

Exhibit 4.28

Analysis of Cost Components Associated with the Burned Area Recovery Plan: Bitterroot National Forest

Item	Original Planned Sale	Actual Sale
(1) Harvest (mmbf)	176.0	45.0
(2) Road Obliteration (million $)[a]		
Upper Rye Ck.	$0.140	
Gilbert-Lower Laird	$0.115	
Robins Gulch	$0.019	
Subtotal	$0.274	$0.274
(3) BMP Road Upgrade (million $)[b]		
Road 75-Rye Creek	$0.500	$0.500
Road 75-Skalkaho	$0.500	$0.500
N. Fork Rye Ck[c]	$1.000	
Laird-Warm Springs	$0.500	
Meadow Creek	$0.250	
Subtotal	$2.250	$1.000[f]
(4) Culverts[d] (million $)		
21 Large Culverts	$ 0.800	$ 0.800
(5) Expanded Riparian Habitat Conservation Areas[e]		
Foregone Harvest (mmbf)	34.6	11.0
Cost (million $)	$ 0.374	$ 0.119
(6) Deleted Rye Creek Units		
Foregone Harvest (mmbf)	5.0	–
Cost (million $)	$ 0.068[g]	–
(7) Yarding Systems (million $)		
Change from Ground to Helicopter (million $)	$0.55 - $7.40[h]	$0.240[i]
Change from Skyline to Helicopter	–	$0.312[j]
Subtotal	$0.55 - $7.40	$0.552
(8) Total (million $)	$4.32 - $11.166	$2.745
(9) Cost per mbf ($/mbf)	$24.54 - $63.47	$61.00

[a] Contracted, 18 miles, 14 miles, and 3.7 miles respectively.
[b] Contracted is only Rye Creek. Mileage: 8, 13, 8.5, 13, and 8 respectively. These would be done on a public works contract.
[c] This is uncertain as some want to relocate out of the drainage.
[d] Specifically for bull trout. Another 13 culverts ($350,000) are for cutthroat.
[e] Streamside buffer widths are increased for perennial non-fish streams from INFISH (150 feet) to 200 feet, for intermittent streams in PWS (100 to 200 feet), for intermittent non-priority streams (50 to 200 feet), otherwise buffers are the same as for INFISH (e.g., perennial, fish-bearing at 300 feet).
[f] Only Rye Creek is contracted. More contracting is expected in the Spring, with Skalkaho as a possibility. Others are uncertain and may be in the future, depending on the return of a $25 million funding allocation.
[g] Valued at $2.00 per ton.
[h] Based on a sale-wide change of 50 percent helicopter to 80 percent, for all aquatic health and soil purposes, at a cost per mbf $220/helicopter, $80/ground, $100 to $120/skyline.
[i] For Laural Creek. (397 acres), p. 6, Table 2, USDA USFS, 2001, assumes 4.3 mbf/acre based on sale average of 176 mmbf and 40,000 acres of harvest.
[j] For Rye Creek (602 acres) at $120/mbf cost difference for yarding system.
Sources: Personal communications, Jim McCormick, Spike Thompsom, Stuart Lovejoy, and Byron Williams, all USFS.

459. The sale had the potential to impact bull trout in that the Bitterroot critical habitat subunit epitomizes fragmented habitat. There are 26 local populations in this watershed, most in headwater streams originating in the Sapphire Mountains on the east side of Bitterroot Valley and in the Bitterroot Mountains on the west. Most are isolated from the mainstem river by agricultural diversions, instream flow limitations, and temperature barriers. The consultation estimated that eight of these 26 local populations are within the sale area. Additionally, a number of the areas within the fire were already "functioning at unacceptable risk" prior to the fires with regard to sediment, temperature, pool frequency and quality, road density and location, and streambank condition (consultation, at 23) due to previous roading and silvicultural prescriptions. The post-fire condition was greatly worsened both by the fire itself and the extreme thunderstorm events in mid-July of the following summer that triggered massive landslides in the barren soils.

460. Project modification costs were identified through discussions with Service and Action agency personnel and through planning documents. The Service contact on the project emphasized three areas of costs that could be attributed to the bull trout consultation.[202] These were: (1) improving the condition of the transportation system, including BMP upgrades on major log harvest corridors as well as culvert replacements, (2) expanding buffers along streamside corridors from INFISH standards to recognizing the increased vulnerability to sediment transport in burned areas, and (3) the more subtle issue of personnel costs of evaluating the buffer in place.

461. The first two of these cost items were significant.[203] Streamside buffers were expanded beyond INFISH standards, for example the buffer on intermittent streams went from 50 to 100 feet in INFISH to 200 feet for this project. The restrictions on use of several specific haul roads until BMP upgrades were completed was also identified as important, for example on road 75 in the Skalkaho and Rye Creek drainages. A third area mentioned as important by the agency biologist was the change in yarding systems from a mix of about 15 percent skyline, 35 percent tractor, and 50 percent helicopter, to a mix more like 15:5:80. This was done to protect soils and limit sediment transport to streams. Several other specific areas of costs were identified in further agency discussions. These included the deletion of all cutting units from upper Rye Creek due to bull trout concerns (a reduction of about five mmbf prior to the ROD[204]), and specific road obliterations in bull trout habitat funded in part through stewardship contracts.[205]

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[202] Personal communication, Service Biologist, Helena, Montana, January 16, 2003.

[203] Personal communication, Mike Jakober, forest biologist, Bitterroot National Forest, Sula, Montana, January 15, 2003.

[204] Personal communication, Stuart Lovejoy, Idaho team project leader, Bitterroot National Forest, Hamilton, Montana, January 25, 2003.

[205] Personal communication, Jim McCormick, sales administrator, Bitterroot National Forest, Darby, Montana, January 23, 2003.

462. Estimated costs for these elements are summarized in Exhibit 4.28. The estimated costs for the 176 mmbf plan are from $4.3 to $11.2 million and the costs for the actual 45 mmbf sale are estimated to be $2.7 million.[206] The difference between these two sale plans is largely in two areas, helicopter yarding costs and BMP road upgrades. The upper estimate for helicopter yarding costs is $7.4 million and assumes that all increases in helicopter use on the sale are actually due to bull trout. This is likely an overstatement, given that bull trout are only present in some drainages and that west slope cutthroat also received special planning consideration. The lower estimate uses the actual reported changes to Alternative F (to F-modified, the ROD alternative) in specific bull trout drainages as summarized in the notes to Exhibit 4.28. The true cost is likely to lie within the bounds of $0.6 to $7.4 million. The BMP upgrades specifically identified in the consultation have a total cost of $2.25 million. This full amount is included under the 176 mmbf sale. However, to date only one of these upgrades has been contracted, and the Action agency failed to meet the consultation project modifications that the upgrades be completed prior to harvest. The problem is that about $25.5 million allocated to the Bitterroot for recovery efforts was later taken away to meet shortfalls in the 2002 fire budget. The Service agreed to allow harvest and hauling but only under winter conditions (to limit sediment production), with the understanding that eventually the upgrades would be completed. There is some question as to whether the upgrades will be completed, and, if so, when.[207] It is reported that of a planned 500 miles of road upgrade, only 13 were accomplished last year, along with one-half mile of 45 miles of planned road obliteration, and one-third mile of 16 miles of stream restoration, and 4,000 acres of replanted forest out of 33,150 acres planned.[208]

463. From the standpoint of interpreting project modification costs, this sale presents some challenges in part due to uncertainty about what costs will actually be incurred. When the costs will be incurred has implications as well for present discounted value of total costs. Beyond this, there is uncertainty inherent in attributing $7 million in helicopter yarding costs to bull trout. These uncertainties are reflected in part in the wide range of estimates provided in Exhibit 4.28.

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[206] Ibid, and personal communication, Byron Williams, contract officer, Bitterroot National Forest, January 24, 2003.

[207] Devlin, Sherry. February 7, 2003. Betrayal of trust? Year after salvage decision, some complain restoration work lacking. Daily Missoulian. pp A1,A10.

[208] Ibid.

Salvage Timber Sale: Beetle-Killed

464. Costs for the full sample of USFS timber consultations are reported in Exhibit 4.29. The one example of a fire salvage sale has already been discussed. One of the other consultations reviewed in the course of this analysis is also a salvage timber sale (in this case beetle-killed timber), the Winter Rim Timber Salvage. The Winter Rim sale is in the Klamath Basin and covers approximately 1,500 acres. It involves the salvage of approximately eight mmbf of beetle killed timber in the Long and Choktoot sub-watersheds. The project design is noted in the consultation record to follow all INFISH standards, including no timber harvest that lies within 300 foot slope distance of Long Creek. There is no evidence that bull trout currently occur in these watersheds, but the project boundary does extend over into headwater streams of the Sycan River.[209] Despite the fact that no bull trout are in the project area, the Service may act to protect historical habitat that may be needed for recovery of the species.[210] The consultation concluded that because streams will be properly buffered and overall soil conditions are expected to improve, the project is unlikely to adversely affect bull trout. No project modification costs were identified. An agency contact noted that the sale was primarily wind-thrown salvage.[211] Due to a lightning strike, a good part of the salvage area burned and the consultation is being redone.

[209] Personal communication, Rich Pyzik, Silver Lake District, Fremont National Forest, January 8, 2003.

[210] Personal communication, Service Biologist, Klamath Falls, Oregon, January 9, 2003.

[211] Personal communication, Brent Fraser, Fremont National Forest, January 8, 2003.

Exhibit 4.29

Bull Trout-Related Project Modification Costs Per Consultation
U.S. Forest Service Projects
(costs in million $)

Sale Type / Project	Harvest Volume (MMBF)	Studies / Monitoring Cost	Road Costs	Harvest Reduction Costs	Yarding System Costs	Total Costs
(A) Green Timber Sales						
Clearwater (Lolo National Forest)	4.13		$0.0 – $0.116			$0.0 – $0.116
Knox-Brooks (Lolo National Forest)	3.72		$0.03			$0.030
Beaver-Dry (Helena)	8.39			$0.040[a]		$0.040
Bluegrass Bound (Idaho Pan)	30.0[d]	$0.024[b]	$0.470[c]			$0.142 – $0.494
Willamette Biop:						
Tumbler	2.5	Completed all but 15 acres				
Staley	4.9	Contracted				
Upper Liz	9.6	Contracted				
SIMCO	(12.9)	Sale dropped following lawsuit				
Subtotal	17.0	$0.050[e]				$0.050
Winter Rim (Fremont)	8.0					
White Pine Cr (Kootenai)	23.0	$0.010 – $0.017[h]	$0.052 – $0.175[g]	$0.350 – $0.70[f]		$0.412 – $0.892
(B) Fire Salvage Sales						
Bitterroot Burned Area	176		$3.324	$0.442	$0.55 – $7.4	$4.32 – $11.17
(C) Fuel Reduction Sales						
Rock Creek	NA	0.004	NA	NA	NA	0.004

[a] Harvest reduction of 158 mbf at cost of $252/mbf (Dan Mainwaring, Helena National Forest, personal communication).
[b] Monitor for three years at $8,000/yr included on range portion of BO.
[c] Road obliteration costs of $470,000 for multiple purposes, or bull trout share assumed at 25 percent.
[d] Group of four sales totaling about 30 mmbf on 2,464 acres. To date, one sold 8.4 mmbf at sale price of $2.29 million (Shanda DeKome, Idaho Panhandle National Forest, personal communication).
[e] Watershed assessment costs (David Bates, Willamette National Forest, personal communication).
[f] Harvest reduction of about 3.5 mmbf at $200/mbf allocated from 50 percent to 100 percent to bull trout.
[g] Road cost allocated at 30 percent to 100 percent bull trout.
[h] Monitor and assessment about $2,000/year for 10 years or present value of $9,700 at seven percent or $17,100 at three percent.

Source: Derived from section 7 bull trout consultation documents and personal communications as referenced here and in text.

Green Timber Sale: Stewardship Sales

465. The first two green timber sales listed, Clearwater and Knox Brooks, are stewardship sales, as was the Burned Area Recovery. On both these sales, the USFS's objective is to design a low impact timber sale that will fund restoration work. As such, it is not surprising to see that consultations associated with these actions do not add significant project modification costs.

466. In the case of the Clearwater, the Action agency earlier envisioned a much larger sale, on the order of 10 mmbf. This was modified by reducing the sale significantly by six mmbf, taking out units on the face of the Swan Mountains out of the Act concerns for grizzly bear. Additionally, there were no commercial thinning units in the sale because of lynx.[212] There were road obliteration costs associated with the sale that will benefit bull trout. However, the USFS contact indicated that the Clearwater is a TMDL limited stream for sediment and CWA requirements require that the actions improve or maintain the sediment budget. In addition to road obliteration, winter yarding was required to limit sediments. The extra costs associated with this system were not quantified, and, in any case would have the same allocation issue. The agency biologist concluded that the sediment reduction measures would be a part of the project even in the absence of bull trout. In Exhibit 4.29, the road obliteration costs are shown with a range of zero to the actual total cost ($116,000).

467. The Knox Brooks sale is similar in that it is also on a TMDL limited stream (Twelvemile Creek) and any actions to limit sedimentation will be required by the CWA. The entire BO is primarily focused on the analysis of sediment budgets, and there were no substantial project modifications. The USFS contact emphasized the importance of the INFISH guidelines on stream buffer widths, which were followed in both these sales. It is common, as in these consultations, to see reference to following INFISH guidelines. Both of these sales (as well as the Lolo forest-wide) benefitted from a culvert improvement effort that was mentioned in the consultation. Coincident funding was available for this effort from the regional office, and about 1,200 of a total of about 2,000 culverts on the forest have been surveyed to date.[213] INFISH requires that culverts be upgraded to handle 100 year flood (most now in place only have a 15 to 25 year flood design) and provide fish passage. One cost that the USFS contact suggested could be specifically attributed to bull trout was the replacement of several culverts in Rock Creek at the cost of $30,000. However, this could also be attributed to INFISH, which the USFS contact suggested was a strong driver of actions to secure fish passage.

468. Several timber sale consultations took place on the Helena Forest. The Beaver Dry sale involved a change in project requirements due to a bull trout consultation. In this case the consultation review identified what was essentially an error in applying INFISH

[212] Personal communication, Shane Hendrickson, Biologist, Lolo National Forest, Missoula, Montana, December 17, 2002.

[213] Ibid.

guidelines to a site with steep and seepy (wet) soils.[214] There was apparently some confusion over which buffer-widths applied on the site and this confusion was resolved in the consultation review. The overall Beaver Dry sale was about 8.4 mmbf and sold at $252 mbf for $2.1 million. Approximately 16 acres of 620 acre sale were excluded (158 mbf foregone harvest) due to the buffer changes with a foregone revenue of about $40,000.[215] This requirement would not have been identified except for the consultation, but the reduction is actually based on INFISH standards.

Green Timber: Combined Project

469. Bluegrass Bound is a combined project in the Idaho Panhandle National Forest that includes a timber sale, a range allotment and a road improvement project. The RPMs for the bull trout did not add any costs to the timber sale.[216] The BO's first RPM is to reduce the potential for fuel and/or hydraulic fluid spills from construction equipment, a precaution which, the agency contact noted, the forest management does already. The second RPM requires bringing the grazing allotment into consistency with INFISH standards as well as measures to keep cattle out of the streams. With respect to the road component, the agency contact noted that the motivation for the entire project is to close roads to increase security for grizzly bears in the Cabinet-Yaak ecosystem. The road obliteration effort (97 miles) was driven by a variety of motives including grizzly, watershed health (long range management plan), and the CWA. While bull trout would benefit from these actions, these activities were not motivated by conservation concerns for bull trout.[217] A cost that did arise from the consultation was monitoring the three projects to ensure the effectiveness of modifications in maintaining bull trout habitat. The cost would be about $8,000 per year for three years. In Exhibit 4.29, the monitoring costs and a share of from 25 percent to 100 percent of the road obliteration are shown as project modifications. This is to illustrate the sensitivity of costs to allocation assumptions among species.

470. A series of formal consultations beginning in 1999 examined a set of five timber sales on the Willamette National Forest's Middle Fork Ranger District. The first consultation led to no project modifications, as the BA was found by the Service to describe an acceptable course of action that met the aquatic conservation objectives in the Northwest Forest Plan and did not jeopardize bull trout. However, new information provided in 2002 resulted in reinitiation of the consultation.[218] On re-examination, one sale was found by the agency to

[214] Personal communication, Laura Burns, Helena National Forest, January 14, 2003.

[215] Personal communication, Dan Mainwaring, Helena National Forest, February 4, 2003.

[216] Shanda Dekome, Idaho Panhandle National Forest, Coeur d'Alene, Idaho, January 14, 2003.

[217] Ibid.

[218] Personal communication, Doug Larson, Willamette National Forest. January 15, 2003.

be inconsistent with the Northwest Forest Plan and was dropped (Simco[219], at 28.3 mmbf and a contract value of $2.3 million).[220] An updated watershed analysis and BO was prepared and submitted to the Service. A second BO was issued in May 2002. The Service in this case did not anticipate any incidental take of bull trout, but there were bull trout in the watershed near haul routes.[221] The agencies were sued over not meeting the Aquatic Conservation Strategy Objectives and potentially jeopardizing re-introduced bull trout. The issue was not the active harvest of timber but the use of roads and related sedimentation. At this point the consultation was withdrawn to answer the question of whether on a larger scale the project was consistent with the regulatory baseline. The USFS decided the analysis did not provide an adequate cumulative effects analysis.

471. A partial path for resolution of the issue would be to redo a watershed analysis to examine cumulative effects. The cost shown associated with these sales (Exhibit 4.29) is an estimate of the cost of conducting a watershed analysis, or about $50,000.

472. The status of the Willamette sales at this point is that the consultation is still ongoing. Simco was never awarded though it was put out to bid. Happy Bird was never laid out, cruised, or appraised. Tumbler was a sale that was in process prior to the consultations and is all but complete (15 acres). Staley and Upper Liz were under contract and harvest has not been initiated.

473. A final green timber sale is the White Pine Creek project in the Kootenai National Forest of Western Montana. This is project has two components: a timber harvest on 3,026 acres and watershed restoration. The total harvest is projected to be 23 mmbf in a mix of commercial thinning and regeneration harvest. The consultation did not result in significant modifications to the project. The primary project modification identified was monitoring to ensure compliance with INFISH standards and to require that a biologist be on site during some of the activity. The costs of monitoring and studies due to the bull trout consultation were estimated to add about $2,000 per year to costs that would be incurred, and would occur over a period of 10 years.[222] At a seven percent to three percent discount rate this implies a present value of such costs of about $9,800 to $17,060.

474. Prior to consultation, the agency had developed a draft alternative and had submitted a planning document for review.[223] The forest supervisor's office identified possible

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[219] Personal communication, Jan Burns, Willamette National Forest, Middle Fork District, January 15, 2003.

[220] Personal communication, Wade Sims, Willamette National Forest Biologist, January 15, 2003.

[221] Personal communication, Service Biologist, Portland, January 14, 2003.

[222] Personal communication, Doug Grupenhoff, Biologist, Cabinet Ranger District, Kootenai National Forest, Trout Creek, January 16, 2003.

[223] Personal communication, Doug Grupenhoff, Biologist, Cabinet Ranger District, Kootenai National Forest, Trout Creek, January 16, 2003.

problems related to peak inflow and channel stability that could cause the channel to come apart. About that same time (summer of 2000), a private consultant conducting research for the State of Montana discovered a single sub-adult bull trout within the immediate area of the proposed project. This led to dropping a significant number of cutting units on 300 acres from the preliminary plans. The reduction in harvest is estimated to be about 3.5 mmbf, at a value of $200/mbf, this implies a foregone harvest value of $700,000.[224] This harvest reduction would not strictly be due to the consultation, in that the change preceded consultation, but it would be in part due to the presence of bull trout. In addition, the change was motivated by watershed function concerns related to the channel stability issue, as well as sediment loads. A USFS contact indicated that, even in the absence of bull trout, there would have been a change to the project for watershed concerns and the change would likely have been similar in terms of dropping some cutting units higher in the watershed.

475. The project also has a watershed restoration component, including decommissioning 33 miles of road, and remove 12 stream crossings, as well as revegetation of disturbed areas. The cost of this package is about $175,000. The USFS believes that the proportion of these costs attributable to bull trout to be 30 percent.[225] Requirements under the CWA were the more significant cost driver.

476. A range of total project modification costs are summarized in Exhibit 4.29, including monitoring, restoration work, and foregone harvest. The latter two elements are allocated to bull trout conservation motives, assumed to be 30 percent to 100 percent for the restoration costs and from 50 percent to 100 percent for foregone harvest.

Timber Sale: Fuel Reduction

477. One example of a fuel reduction consultation (forthcoming) is also reported in Exhibit 4.29. Discussions with the Lolo Forest fisheries biologist indicate that with the increased concern for fires, this type of timber harvest is becoming the dominant type of sale on the Lolo.[226] For the near future, there are no conventional timber sales planned on the east zone of the Forest, while there are several fuel reduction projects in planning including the Missoula urban interface and the Frenchtown face, northwest of town. An example is the Rock Creek fuel reduction project. These types of sales are very different in that most of the work may actually be inside the streamside buffers. The motivation is to reduce fuels proximate to dwellings, but dwellings in the project area tend to be close to the creek. Of 30 some timber harvest units, about 90 percent are within 300 feet of Rock Creek (which is a major recreational fishery, with mid-summer flows in the 700 cfs range). The sale is designed to get six to 12 mmbf of barely commercial timber to pay for thinning and slash

[224] Personal communication, John Gubel, Cabinet Ranger District, Kootenai National Forest, Trout Creek, January 17, 2003.

[225] Personal communication, Doug Grupenhoff, Biologist, Cabinet Ranger District, Kootenai National Forest, Trout Creek, January 16, 2003.

[226] Personal communication, Shane Hendrickson, Biologist, Lolo National Forest, Missoula, December 17, 2002.

treatment, while leaving the larger more mature trees. This particular project also has an unrelated road treatment on the main (gravel and dirt surface) Rock Creek road. The motivation for the latter is safety. The primary mitigation cost with this type of sale is that the biologist must spend a lot of time on site, since the work is within the buffer zone. A USFS biologist estimated that the cost might be on the order of about $4,000 for extra monitoring work. Another element of the project that is related to INFISH aquatic habitat standards is the replacement of 15 culverts. Five of these are fish barriers with a total replacement cost of about $250,000.

478. No consultation is yet complete on this project, but the projected monitoring costs are a component of the actual fuel reduction activity that is, at least in part, attributable to bull trout conservation. These costs are summarized in Exhibit 4.29. At this point, prior to consultation, these preliminary costs are motivated by INFISH standards, not section 7.

Summary of Timber Costs

479. Exhibit 4.30 provides a summary and average total costs and average costs per mbf of harvest for three groups of sales: green timber, salvage, and fuel reduction. These parameters are used in Exhibit 4.31 to project future bull trout-related project modification costs for USFS timber sales. Information presented in Section 2 of this report suggest that, for the next 10 years or so, total timber harvests in the planning area may actually decline from levels in the late 1990's. Accordingly, the approximate frequency of formal timber sale consultations observed in the four years since listing (June 1998 through June 2002) provide an upper range estimate for future formal timber sale consultations. This analysis did not try to sample the programmatic and ongoing USFS consultations that occurred just after the time of listing. Accordingly, the forecast number of future sales is based on the last three years observed patterns rather than last four. There were 15 formal USFS timber consultations in total in the planning area, or five per year. The salvage sales occurred at the rate of 0.66 per year for the last three years (Bitterroot Burned Area and Winter Rim) or at the rate of one every three years for a very large sale and one every three years for a small salvage sale. Considering the very large size of the Bitterroot project, such a project occurring every three years would imply that fire salvage sales would be one quarter of all projected sales in the region by 2010. The average proportion of salvage sales to all projected sales would not be expected to be higher than 0.25 for the long term.

Exhibit 4.30 Summary of USFS Timber Consultation Total Project Modification Costs per Consultation and per MBF			
Sale Type / Project	**Total Mitigation Cost (million $)**	**Harvest (MBF)**	**Annual Cost ($) per MBF**
(A) Green Timber Sales			
Clearwater	$0.0 – $0.116	4.13	$0.00 – $28.09
Knox-Brooks	$0.03	3.72	$8.06
Beaver Dry	$0.04	8.39	$4.77
Bluegrass Bound	$0.142 – $0.494	30.0	$4.73 – $16.45
Willamette Sales	$0.050	17.0	$2.94
Winter Rim	$0.0	8.0	$0.00
White Pine	$0.412 – $0.892	23.0	$17.91 – $38.78
Average Cost	$0.112 – $0.270	14.4	$6.40 – $16.51
(B) Fire Salvage/ Restoration Sales			
Bitterroot Burned Area	$4.32 – $11.17	176.0	$24.54 – $63.47
(C) Fuel Reduction Projects			
Rock Creek	$0.004	6 – 12	$3.33 – $6.67
Source: Derived from Exhibit 4.29.			

Exhibit 4.31 Forecast Average Annual Project Modification Costs Associated with Formal Bull Trout Biological Opinions on U.S. Forest Service Timber Sales			
Sale Type	**Frequency / Year**	**Costs per Consultation (million $)**	**Total Costs (million $)**
Green Timber	5.0	$0.112 – $0.27	$0.560 – $1.35
Fire Salvage	0.25	$4.32 – $11.17	$1.08 – $2.79
Fuel Reduction	1.0	$0.004	$0.004
Total	6.25		$1.64 – $4.14
Source: Derived from Exhibit 4.30 and estimated future consultation rate (see Section 3).			

480. Based on the assumed consultation frequency (6.25 average per year) and distribution by sale type (Exhibit 4.31), the total cost of USFS bull trout consultations on USFS timber sales is projected to be from $1.6 to $4.1 million annually.

Consumer and Producer Surplus

This rulemaking is not expected to result in higher prices or a reduced supply of wood products to consumers. As a result, consumer surplus is not expected to be significantly affected. Producer surplus losses, from the timber contractor's perspective, are also expected to be negligible. Publically owned forests produce profit, or economic rent, which is the difference between the market prices of trees and the cost of harvesting them. The government obtains the rent through competitive bidding for cutting rights on public land, and the open bidding process assures that the price paid equals the present value of the future rents from the forest. This analysis expects that most of the projected project modification costs resulting from the designation will be incorporated into the timber bid and passed onto the Federal government. As logging costs and road restoration costs increase for the private contractor, or as timber sale volume decreases, the corresponding bid for the timber decreases. From the USFS's standpoint all costs are sunk (sale preparation, cruising, etc.) and the change in stumpage is a net revenue change for the agency. The only project modification costs not built into the bidding process are study and monitoring costs, and these costs are borne directly by the USFS.

Bias and Uncertainty.

481. The estimated additional effect of section 7 bull trout consultations are likely to lead to harvest reductions of less than one mmbf, at a cost of about $200,000 per year in foregone revenue, based on an examination of past formal timber harvest consultations with the USFS. The project modifications resulting from formal consultations, particularly with regard to possible reductions in timber harvest, are essentially consistent with the relevant Northwest Forest Plan, INFISH, or PACFISH standards with regard to the size of the RHCAs and standards with regard to road placement and maintenance. That is, there are so many protective standards for fisheries put in place for timber harvest management on the national forests in the Pacific Northwest at this time that the additional requirements of bull trout formal consultations are likely to be minor. This conclusion is consistent with the fact that the bull trout was an important species in the design of protective aquatic habitat standards for all three strategies, particularly for INFISH. The latter document notes that the focus on the planning effort was in large part on bull trout.[227]

482. As noted, there is uncertainty involved in identifying the share of aquatic restoration and project mitigation costs allocable to bull trout. Some of the cost components discussed above may be generated by other factors (e.g., actions taken for restoration motives where timber harvest is an incidental funding mechanism). The primary action being mitigated is past management practices, often related to excessive roading, poorly-designed roads, un-maintained roads, and undersized and poorly-designed culverts. In some cases, the extent to which these requirements would be imposed as a result of a section 7 consultation is unknown.

[227] For example, the main criteria for designating PWS was on providing "a network of priority bull trout watersheds within the proposed action area, based on metapopulation needs of bull trout." USDA USFS, 1995 at I-3.

Grazing

483. The majority of the grazing project modifications deal with monitoring the impacts of grazing and keeping grazing animals out of streams and off stream banks. The project modifications can be broken down into four categories: (1) monitoring, (2) elimination of conflicts, (3) implementing past commitments, and (4) review/reporting. Examination of the list of modifications shows that the major cost components come from the areas of monitoring and elimination of conflicts (e.g., fencing and providing off stream water). "Implementation of commitments" simply reiterates past commitments, so no additional cost is imposed with these project modifications. Review/reporting is part of standard practices and does not add additional costs except those added costs included in monitoring.

484. Date restrictions or the enforcement of stubble height restrictions can lead to a reduction in AUM on a particular allotment. As a result of such reductions, ranchers will generally move the cattle to a different allotment or private lands. If they move the cattle to private lands they may have to pay a higher grazing fee, reflecting the different responsibilities the rancher has on public land for monitoring livestock, fence repairs and moving livestock versus private rented land, for which these responsibilities are often taken over by the land owner. Thus, while costs may be shifted, this analysis does not predict significant additional costs to grazing permittees. In addition, when date restrictions are imposed, the USFS often can expand other allotments or increase AUMs on the restricted parcel to lessen any impact on the permittee.[228]

485. In cases where modifications in on-off dates and stocking levels result in reductions in total leased AUMs by a rancher, the total asset value of a permittee's privately held land may be impacted. Agricultural lending institutions often consider the number of historically leased Federal and state AUMs associated with a private ranching operation in determining the ranches market value. Significant reductions in Federally permitted AUMs could impact this market value. Reductions in total AUMs tend to be small and marginal in nature, and are often offset with available Federal, State, or private grazing elsewhere. The potential for this type of impact exists, but is not estimated due to the likely small magnitude and uncertain nature of the possible impact.

486. The major cost associated with bull trout comes from the increased monitoring and reporting the USFS must undertake.[229] This additional monitoring is significant, for example on the Helena National Forest, which hired an additional seasonal employee to help monitor bull trout allotments. Additional time is also required of existing employees. Estimates of cost depend upon the number of allotments impacted, how much bull trout habitat is

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[228] For example, for an allotment in the Fremont National Forest, when data restrictions were imposed, the number of cattle allowed was increased so there was no drop in AUM. Personal communication Range Program Manager, Fremont National Forest, December 19, 2002.

[229] This is additional monitoring; the USFS does monitor all allotments regardless of bull trout.

contained in the allotments and how many different National Forests are involved. For example, Fremont National Forest put the additional monitoring cost at $30,000 per year, while the Beaverhead- Deerlodge National Forest estimated monitoring costs at $50,000 year. Further complicating the estimation is that Beaverhead-Deerlodge cost is just one part of a larger consultation. The typical increase in monitoring costs is assumed to be $40,000.[230]

487. The other major cost component associated with grazing is fencing and off stream water sources. Fencing generally involves fencing off sensitive sections of streams to keep livestock out, while off stream water provides for alternate water sources for livestock. Total costs for these range from zero to $20,000 per consultation, for a sample of consultations the average of cost was $10,000.

488. The total estimated annual section 7 project modification costs associated with bull trout consultation involving USFS grazing leases is estimated to be $100,000 (Exhibit 4.32).

Exhibit 4.32

Forecast Annual Costs of Project Modifications Associated with Grazing On U.S. Forest Service Administered Lands

Activity	Modification	Annual Projects	Per Effort Cost	Annual Cost Estimate	Party Bearing Cost
Grazing	Increased monitoring and reporting	2	$40,000	$80,000	FS
	Elimination of conflicts (fencing, off-stream water)	2	$10,000	$20,000	FS
Total Estimated Annual Project Modifications				**$100,000**	

Source: Derived from personal communication as referenced in text.

489. The fact that grazing leases are long-term makes predicting the number of future consultations relatively straight forward. That is, past consultations are a good guide to future consultations. However, many of these costs will be reduced in the future since monitoring will become more efficient and fencing and off site water will be completed.

Agricultural Water Diversion

490. At present, uncertainty exists regarding the future impact of section 7 consultation on bull trout on agricultural water diversions on USFS land. As noted in Section 3 of this report, within the large central Idaho Salmon River Basin the direction from the USFS is to not recommend any changes in irrigation withdrawals until the issue of all water uses on

[230] These costs are the averages of four consultations involving the Sawtooth, Flathead, Fremont, Beaverhead-Deerlodge, Helena and Lolo National Forests, where the last three forests are in one consultation.

these drainages are considered by all governmental parties involved.[231] Therefore, in Idaho section 7 consultations involving bull trout and irrigation diversions on USFS lands are not expected to result in reductions in available water to irrigators.[232]

491. It should be noted that there have been isolated cases in the Methow River Drainage of Washington where consultations between the USFS and NOAA Fisheries have resulted in terms and conditions to formal consultations which include minimum instream flow levels. These consultations have been primarily driven by anadromous species concerns.[233] The current direction from the Service is to avoid situations such as have occurred in the Methow Drainage when consulting on the bull trout or its habitat. The Service believes it is unlikely that it would pursue limiting irrigation diversions in the context of bull trout consultation. In recent extreme cases involving section 9 take violations, the Service has opted for dialogue and negotiation to reduce take. Examples include several cases where the Service has applied a "Prosecutorial Discretion Agreement" where, although there was evidence to prosecute water users for take under section 9 of the Act because dead bull trout were discovered in a de-watered stream, the Service opted instead to work with agencies and irrigators to resolve the issue rather than confront them with a violation.[234]

492. The Service, USFS and BLM have stated that it is unlikely that limitations in irrigation flows would result from bull trout consultation. Thus, over the 10 year time frame of this analysis it is unlikely that costs associated with reduced irrigation deliveries will occur. However, because the historical record associated consultation activity in the Methow Drainage of Washington, and because of the widespread distribution of proposed bull trout critical habitat across the four-state region, a high-end estimate is also provided based on the costs associated with five diversion consultations over a 10-year period.[235]

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[231] This methodology of negotiating instream flow requirements through involvement of all parties within the watershed was successfully utilized in USFS consultations on the Okanagon National Forest. Personal communication, Lyle Powers, Staff Officer, Salmon/Challis National Forest. November 6, 2003.

[232] Personal communication, Lyle Powers, Staff Officer, Salmon Challis National Forest. November 3, 2003.

[233] Examples include the BOs for the Wolf Creek Irrigation Ditch (August 2, 2002), Early Winters and Willis Irrigation Ditches (August 2, 2002), and Skyline Irrigation Ditch (September 6, 2000). All NOAA Fisheries Pacific Northwest BOs can be found at http://www.nwr.noaa.gov/1publcat/allbiops.htm

[234] Examples of such "Prosecutorial Discretion Agreements" have been used in the Lemhi Drainage of Idaho with an example of such an agreement seen in "2002-2003 Conservation Agreement in the Lemhi Basin." Personal communication, Service Bull Trout Coordinator, Portland, Oregon. (Email communication November 12, 2003)

[235] Although the opinion of the Service (personal communication, Service Bull Trout Coordinator, Portland, Oregon. November 12, 2003) as well as that of Action agency personnel is that disruptions of irrigation water associated with bull trout consultation activity are very unlikely, an estimated range of zero to five consultations resulting in reduced irrigation withdrawals is assumed in this analysis given that such actions have resulted in recent years from consultation on anadromous species. This estimated range recognizes both that such consultation outcomes are unlikely, but that if a limited number were to occur, the impacts on individual operators could be substantial.

493. There is a large degree of uncertainty as to where these five consultations might occur, what volume of diverted water might be reallocated to instream flows, and what the primary use of the diverted water would be (e.g., crops or pasture irrigation). This analysis uses the three examples for the Okanogan National Forest where instream flows were specified to protect the primarily anadromous species. Exhibit 4.33 assumes that the diversions lost all intended withdrawals for the typical low flow late summer, early fall irrigation season. This exhibit details the calculation of the average annual expected loss in irrigation water per consultation, based on the three case studies. On average it is expected that a consultation resulting in recommended project modifications including specified instream minimum flow levels will result in the loss of 2,656 af of water to irrigation.

Exhibit 4.33
Forecast Annual Loss of Irrigation Water Due to Section 7 Consultation Based on NOAA Fisheries Okanogan National Forest Consultation Record

Consultation	Amount of Diversion	Critical Flow Period	Days in Critical Flow Period	Acre-Feet[1]
Skyline Irrigation Ditch	17 cfs	8/1 - 10/15	76	2,558
Wolf Creek Irrigation Ditch	13 cfs	7/1 - 9/30	92	2,368
Early Winters and Willis Irrigation Ditch	16.7 cfs	8/1 - 11/1	92	3,042
Average estimated annual loss in irrigation withdrawals				2,656

Source: Biological Opinions for the Wolf Creek Irrigation Ditch (August 2, 2002), Early Winters and Willis Irrigation Ditches (August 2, 2002), and Skyline Irrigation Ditch (September 6, 2000). All NOAA Fisheries Pacific Northwest BOs can be found at http://www.nwr.noaa.gov/1publcat/allbiops.htm
[1] One cfs per day is equivalent to 1.98 af per day.

494. Based on the estimated loss of 2,656 af of irrigation water per year per consultation, the high-end estimate of five such consultations over the 10-year analysis period results in an estimated maximum loss of irrigation flows of 13,280 af per year. Utilizing the upper-end example of the 2002 State of Washington Department of Ecology records of water leases within the Upper Yakima Drainage of $127 per acre foot[236] leads to an upper-bound estimate of $1,687,000 for the annual costs associated with reduced irrigation withdrawals. This estimate assumes that all five of the consultations occur in the first year, and every year has streamflow conditions necessitating the complete cessation of irrigation flows by the critical flow date.[237]

[236] Appendix V to 2002 report on the Washington Water Acquisition Program. Available at: http://www.ecy.wa.gov/programs/wr/instream-flows/wacqstra.html

[237] As noted previously, further discussion of the opportunity cost of lost diversions can be found in "Final Analysis of Critical Habitat Designation for the Rio Grande Silvery Minnow," U.S. Fish and Wildlife Service, Division of Economics, February 2003.

Mining

495. The three primary types of mining activities within proposed bull trout critical habitat are lode, placer, and recreational suction dredging. These activities occur in Northwestern Montana, Central Idaho, and the eastern portions of Oregon and Washington. Lode claims vary in size from large hard rock operations to small off-channel operations. Placer operations are found in various sizes, with varying degrees of ground disturbance ranging from 60 square feet up to an acre per year. These placer operations use various equipment ranging from large trackhoes and trommels on the larger mines to simple pick and shovel operations on the smallest mines.

496. The one example of a large hard-rock mine (the proposed Sterling Rock Creek Mine) had project modification costs resulting from a requirement for the mine developer to perform a watershed assessment at an estimated cost of approximately $100,000. The likelihood of a consultation such as this one occurring in any given year is quite low. Therefore, based on the consultation record for the bull trout assuming an annual cost of $100,000 associated with hard-rock mining project modifications provides an upper-bound estimate of these costs.

497. Examples of formal consultations involving recreational suction dredging impacts on bull trout have occurred in both Northwest Montana, and Central Idaho. In the case of Montana, the only estimated costs associated with project modifications involved minimal monitoring and reporting costs estimated at $200 per year.[238] In Idaho, the project modifications of the formal bull trout consultation on suction dredging on Moose Creek on the North Fork of the Clearwater River included only one term that was in addition to existing baseline requirement of the State of Idaho permit dredgers must hold. This term called for an end to the season on this stream on August 15th due to very low flows.[239] Because of the large number of substitute streams and rivers in the area available for recreational suction dredging activity, it is unlikely that this reduction in opportunity on one stream in the region will impose substantial actual or opportunity costs on recreational dredgers. In an effort not to underestimate potential opportunity costs to recreational dredgers from future potential access restrictions due to section 7 consultation on bull trout, it is estimated that these costs could potentially total $100,000 per year.[240]

498. Exhibit 4.34 details the predicted level of annual project modification costs associated with mining activities on USFS administered lands within proposed bull trout critical habitat. Overall, it is estimated that mining-related project modification costs on national forest lands in Montana and Idaho could total $200,000 per year, split equally

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[238] Personal communication, John McKay, Kooterai National Forest, November 25, 2002.

[239] Personal communication, Service Biologist Supervisor, Boise Office, Idaho. February, 4, 2003.

[240] This estimate assumes a possible total loss of 1,000 dredging days valued at a net economic value of $100 per day.

between costs to hard-rock mines and costs to recreational suction dredgers or to placer mines.

Exhibit 4.34 Forecast Annual Costs of Project Modifications: Hard Rock Mining and Montana and Idaho Suction Dredging				
Activity	**Modification**	**Annual Projects**	**Annual Cost Estimate**	**Party Bearing Cost**
Large-scale Hard Rock Mining	Watershed assessment	1	$100,000	FS, permittee
Idaho and Montana Recreational Suction Dredging	Date restrictions on streams and reporting	1	$100,000	FS, permittees
Total Estimated Annual Project Modifications			**$200,000**	
Sources: Service personnel, Helena, Montana and Boise, Idaho.				

499. In Eastern Oregon, particularly within the John Day and Powder River drainages, there is a significant amount of placer mining activity that is expected to generate a substantial number of formal consultations involving the bull trout or its designated critical habitat.[241] The vast majority of the consultations are expected to occur within three specific drainages, the North Fork of the John Day river, the Middle Fork of the John Day River, and the Powder River. The operations consulted on are expected to be gold placer mines ranging in size from small recreational suction dredge operations to large "trackhoe" placer operations.[242] The primary Action agency associated with this expected consultation activity is the USFS.

500. As with other activities involved in section 7 bull trout consultation activity, it is expected that future placer mining formal consultations will result in requested project modifications that will limit the normal operation of the claims to a certain degree. Recently completed formal consultations on these types of placer operations within the eastern Oregon area reveal that the primary project modifications to normal placer operations will be (1) limitations in timing for instream work,[243] and (2) requirements for allowed stream crossing activity. The estimated costs associated with such project modifications as additional

[241] Personal communication, Service Biologist, Roseburg, Oregon Field Office. November 14, 2003.

[242] Oregon Service Office, Portland, Oregon. October 21, 2003.

[243] Within bull trout critical habitat instream work will be required to cease by either August 15th or 30th (depending on the location of the mine), thus effectively cutting four to six weeks of potential mining activity from the normal June to September season. Personal communication, Service Biologist, Roseburg, Oregon Field Office. November 14, 2003.

requirements for stream crossings are roughly estimated at an average of $500 per year per placer mine consulted on.[244]

501. The magnitude of costs associated with section 7-related reductions in the length of the placer mining season depend primarily upon the average profitability of the claims. That is, how much does the average Oregon placer claim make per year (or per day) after all costs associated with gold extraction are accounted for. Due to a lack of statistics on individual mines as to how much these small claims produce in a season, it would be extremely difficult to estimate profitability based on metal production and expense records. An alternative method of estimating productivity, however, is to look at evidence of value from outright sales of these mining claims. Again, however, such sale records are not readily available due to the nature of the small-scale mining industry. In estimating the value associated with these placer operations, anecdotal information on isolated mine sales is used to provide an upper-end estimate of the fully capitalized value of a typical eastern Oregon placer claim. Service personnel who have been closely involved with consultations within the John Day basins report that one particularly productive mine had sold at least twice in recent years for $30,000 to $40,000.

502. Exhibit 4.35 shows the estimation of average costs associated with bull trout section 7 consultation on Oregon placer mining activity. Assumptions used in this estimation include (1) the average value of a mining claim is $40,000, (2) the average reduction in mining season length is 37 percent,[245] and (3) mining activity is equally productive throughout the mining season. Additionally, it is estimated that future consultation activity will include five formal bull trout consultations per year in each of the North Fork and Middle Fork of the John Day and the Powder River Basins, for a total of 15 formal placer mining consultations per year. In addition to the estimated 37 percent reduction in the capitalized value of mining claims involved in formal bull trout consultation, it is estimated that the net present value of an average annual expenditure of $500 per claim to meet section 7 project modifications would be approximately $7,150 per consultation.[246]

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[244] Just as the sizes of placer mining operations vary significantly within the region, the out-of-pocket costs associated with specific project modifications are also likely to vary greatly. These costs likely range from zero or a few dollars per year up to several thousand dollars per year. This analysis assumes annual out-of-pocket costs of $500 per consultation.

[245] Typical mining activity begins in late May or early June and continues through September. A cutoff date of August 15th would eliminate 45 days from the typical 122 day mining season.

[246] This calculation is based on an annual cost of $500 discounted at seven percent.

Exhibit 4.35 Forecast Annual Project Modification Costs Associated with Placer Mining in Eastern Oregon				
Drainage	**Estimated Formal Consultations Per Year**	**Loss in Profitability due to Season Restrictions**	**Additional Costs Associated with RPMs**	**Total Estimated Costs per Consultation**
North Fork of John Day River	5	$74,000[a]	$35,750[b]	$109,750
Middle Fork of John Day River	5	$74,000	$35,750	$109,750
Powder River	5	$74,000	$35,750	$109,750
Total	**15**	**$222,000**	**$107,250**	**$329,250**

[a] Based on a $40,000 capitalized value and a loss of 37 percent of productive life (assumed into perpetuity), times five mines per year consulted on.
[b] Based on $500/mine out-of-pocket costs per year capitalized at a seven percent real discount rate (into perpetuity).

503. While mining related activities occur in other areas of the proposed bull trout critical habitat, it is unlikely that these activities will result in significant formal consultation activity. An example is found in the Northern Idaho gold, silver, and zinc mining areas. At present some mining related activities associated with CERCLA Natural Resource Damage Cleanup are generally not consulted on.[247] Additionally, the potential exists for some future consultation activity related to the extraction of gravel from streams and rivers within bull trout proposed critical habitat. While this potential activity is mentioned, no estimate of future section 7 related costs are provided as no specific information on the future potential scope of this activity was available either within the consultation record for the species or from Service personnel.

504. Considering the three primary types of mining within the proposed bull trout critical habitat, it is estimated that section 7 project modification costs will be $100,000 per year each large-scale hard rock mining and recreational suction dredging, and approximately $330,000 per year for eastern Oregon placer mining. Therefore, the total estimated mining-related project modification costs are $530,000 per year.

General Forest Management

505. This category includes all forest activities except timber sales, grazing and mining, and includes road maintenance, recreation management and facilities, and restoration activities. The modifications associated with bull trout consultations for these activities are generally actions the USFS would pursue regardless of the presence of bull trout. The section 7 consultations force the USFS to re-prioritize their projects, pushing bull trout-

[247] Personal communication, Service Biologist, Spokane Office, Washington. November 17, 2003. Service biologists note that in these cases the USFS believes that consultation is not required by the Act.

related projects to the top of the list and delaying other projects. A low estimate for this category is that aside from the consultation costs, there are no significant additional project modification costs to the USFS attributable to bull trout for general forest management.[248] An alternative assumption is that half of the projected consultations in this activity would have costs equal to other non-timber USFS consultations ($50,000) and the other half cost zero.

4.2.8 Other Action Agencies

506. Several other Federal agencies have been involved in formal section 7 consultations involving the bull trout since the species was listed as threatened. The NPS, APHIS, Farm Services Agency, and the Service itself have all consulted on actions potentially impacting the bull trout. Additionally, while there are a number of Native American Tribes with lands included within the proposed critical habitat for the bull trout, the consultation record for the species contains only one formal consultation involving the BIA which suggested no significant additional project modification costs. This analysis estimates that section 7 bull trout consultations with these agencies will lead to minimal project modification costs (estimated at $110,000 per year) in the foreseeable future.

4.3 Potential Impacts on Small Entities

507. Under the RFA (as amended by the SBREFA), whenever a Federal agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities (i.e., small businesses, small organizations, and small government jurisdictions).[249] However, no regulatory flexibility analysis is required if the head of an agency certifies that the rule will not have a significant economic impact on a substantial number of small entities.[250] SBREFA amended the RFA to require Federal agencies to provide a statement of the factual basis for certifying that a rule will not have a significant economic impact on a substantial number of small entities. Accordingly, the following represents a screening level analysis of the potential effects of critical habitat designation on small entities.

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[248] These observations were made at both the forest level (e.g., Colville, Sawtooth, and Lolo National Forests) and at the regional level (Region 1) in personal communication with USFS staff.

[249] Small businesses are defined by the U.S. Small Business Administration, most commonly in terms of the number of employees or annual receipts. A small organization is "any not-for-profit enterprise...which is independently owned and operated and is not dominant in its field." A small government is the government of a city, county, town, school district, or special district with a population of less than 50,000, not including tribal governments. Regulatory Flexibility Act, 5 U.S.C. 601 et. seq.

[250] Thus, for a regulatory flexibility analysis to be required, impacts must exceed a threshold for "significant impact" **and** a threshold for a "substantial number of small entities." See 5 U.S.C. 605 (b).

508. This analysis is intended to facilitate determination of whether this critical habitat designation potentially affects a "substantial number" of small entities in counties and/or supporting critical habitat areas. It also quantifies the probable number of small businesses and governments likely to experience a "significant effect." In both tests, this analysis examines the total estimated section 7 costs, which incorporate effects such as timing delays imposed on regulated entities, calculated in earlier sections of this report.

509. Federal courts have held that an RFA analysis should be limited to impacts on entities subject to the requirements of the regulation (i.e., participants in the section 7 consultation process).[251] These entities include participants in the section 7 consultation process, but not entities suffering the downstream effects of consultation outcomes. In spite of these rulings, in its guidance to Federal agencies on conducting screening analyses, the U.S. Small Business Administration recommends considering impacts to entities that may be indirectly affected by the proposed regulation.[252] In this analysis, small farming businesses may experience economic impacts due to reduction in contractual BOR water deliveries resulting from BOR's section 7 consultations with the Service. Due to uncertainty as to whether the Courts would consider these farmers to be directly regulated entities and given SBA's guidance, this screening analysis includes small farming businesses. Other indirectly regulated entities (e.g., road construction companies contracted by State DOTs) are not considered.

510. The following summarizes the potential effects of critical habitat designation on small entities:

- As discussed in detail in section 4.3.2, under one modeling scenario, section 7-related reductions in contractual BOR water deliveries in the Middle Columbia River Basin (Unit 20) could significantly impact on the order of 90 to 160 small farming operations.

- Out of 63 electric producers in Washington, Oregon, Idaho and Montana, 13 small hydroelectric producers could be affected by section 7-related project modification costs at the time of facility re-licensing. Specifically, the resulting project modifications could have a significant economic impact on the financial operations of Cowlitz County PUD (Unit 19 - Lower Columbia River) and Pend Oreille County PUD (Unit 22 - Northeast Washington River).

- Section 7-related reduction to the length of the placer mining season is expected to affect approximately 15 placer mines annually in the John Day River Basin (Unit 8)

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[251] Mid-Tex Elec. Coop. V. FERC, 773 F.2d 327 (D.C. Cir. 1985) and American Trucking Ass'ns v. EPA, 175 F.3d 1027, 1044 (D.C. Cir. 1999), *aff'd in part and rev'd in part on other grounds*, Whitman v. American Trucking Ass'ns, 531 I/S/ 457 (2001), as cited in U.S. Small Business Administration, Office of Advocacy, "A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act," May 2003.

[252] U.S. Small Business Administration. Office of Advocacy, "A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act," May 2003.

and Hells Canyon Complex (Unit 12). While the financial characteristics of these mining operations are unknown, this analysis assumes the economic effect will be significant for those operations that are impacted.

4.3.1 Identifying Activities That May Involve Small Entities

511. Section 3 of this report identifies activities that are forecast to be affected by section 7 consultation on the bull trout. Several of these activities are not expected to have third party involvement (i.e., only the Action agency and/or the Service are expected to incur costs). Of those activities that do not involve solely the Action agency and/or the Service, many do not involve directly-regulated small businesses or governments (e.g., FWHA-related consultations for road and bridge construction/maintenance with state DOTs).

512. Most of the project modification costs forecast in Section 4 of this report will either be borne directly by or passed onto the Federal government. Thus, in most instances, the additional costs associated with the forecast project modifications (e.g., fish ladder and fish studies for a bridge maintenance project) will not adversely impact small businesses.

- **Road and bridge construction and maintenance -** FHWA consultations on road and bridge construction and maintenance projects could lead to the imposition of date restrictions on in-stream work above and beyond those that may have been previously enforced by State agencies. This analysis anticipates that the costs associated with project modification compliance will be borne by the Federal government either directly or through their funding of State DOT projects.

- **Dam and reservoir operations -** ACOE and BOR consultations on dam and reservoir operations could lead to temperature control facilities, trap and haul passage, fish ladders, spillway modification and bull trout-related annual operation, maintenance, and study costs at various Federal dams. More than 98 percent of the ACOE related costs occur on the Upper Willamette River (Unit 4). Approximately 80 percent of the Federal BOR related costs occur on the Middle Columbia Basin (Unit 20), followed by the Southwest Idaho River Basins (Unit 17), the Deschutes River Basin (Unit 6), the Hells Canyon Complex (Unit 12) and the Malheur river Basin (Unit 13).

- **Federal Columbia River Power System operations -** BPA consultations on the FCRPS could lead to fishery studies to determine the impacts of the FCRPS and the significance of the bull trout population in the Lower and Upper Columbia River Basins (Units 19 and 21), the Northeast Washington River Basin (Unit 22) and the Snake River Basin in Washington (Unit 23).

- **Grazing leases** - BLM and USFS consultations on grazing leases could lead to additional monitoring, fencing and off-stream watering on Federal land. The cost of fencing and developing alternative water sources on Federal land

is paid for by the government. The lessor (Federal government) is also responsible for additional livestock monitoring. Approximately 50 percent of the annual project modification costs associated with BLM grazing leases are expected to occur in the Salmon River Basin (Unit 16). Most of the costs associated with USFS grazing leases are also expected to occur in the Salmon River Basin (more than 25 percent) followed by the Clark Fork River Basin (Unit 2), the Southwest Idaho river Basins (Unit 17) and the Clearwater River Basin (Unit 15). While date restrictions or the enforcement of stubble height restrictions can lead to a reduction in AUMs on a particular allotment, these reductions are expected to be small and will likely be offset with available Federal, State or private grazing elsewhere. AUM reductions could also be offset with modifications to the timing of stock densities, such as offsetting a decrease in the AUMs on a particular allotment during the summer an increase in the AUMs on that same allotment, or a different allotment, during the winter.

- **Forest management and road maintenance -** Future USFS consultations could lead to additional efforts to prevent erosion and protect wildlife during road maintenance and culvert and stream crossing replacement activities. Similar to USFS grazing leases, most of the costs associated with forest management and road maintenance are expected to occur in the Salmon River Basin (more than 25 percent) followed by the Clark Fork River Basin (Unit 2), the Southwest Idaho river Basins (Unit 17) and the Clearwater River Basin (Unit 15).

- **Federal timber sales -** Future USFS consultations could lead to additional efforts to protect soils and limit sediment transport to streams. These efforts include improving the condition of the transportation system through BMP upgrades as well as culvert replacements, expanding buffers along streamside corridors from INFISH standards, modifying logging and yarding methods and providing monitoring to evaluate the buffer zone in place. Additional monitoring costs by an agency biologist and the cost of some of the additional road work will be borne directly by the USFS while costs related to remaining road work and changes in logging and yarding methods will be passed on to the USFS through lower stumpage prices. Businesses will not pay the USFS for timber not included in the sale, so, by expanding the buffers along streamside corridors the USFS will forego timber revenue. While this could impact the flow of raw material into the forest products industry, the annual cost of the foregone timber harvest over USFS lands in the proposed critical habitat designation is only expected to range from $450,000 to $725,000.[253] Most of the costs associated with USFS timber sales

[253] The average cost of harvest reductions for green timber sales is expected to range from $65,000 to $123,000 per consultation. Harvest reductions are not anticipated for fuel reduction sale consultations, and are expected to approximate $442,000 for fire salvage sale consultations (see Exhibit 4.29). Based on the forecasted level of timber sale

are expected to occur in the Salmon River Basin (more than 25 percent) followed by the Clark Fork River Basin (Unit 2), the Southwest Idaho river Basins (Unit 17) and the Clearwater River Basin (Unit 15).

- **Hydroelectric Facility Re-licensing**[254] **-** ACOE and BOR consultations on hydroelectric facility re-licensing could lead to fish studies, stream and wetland restoration, education and enforcement activities and capital projects such as fish passage at various Federal dams. Approximately 95 percent of the ACOE and BOR-related FERC re-licensing costs occur in the Southwest Idaho River Basin (Unit 17). These re-licensing costs are associated with ACOE's Lucky Peak project and BOR's Arrowrock project. BOR's Tieton project in the Middle Columbia River Basin (Unit 20) accounts for another five percent of the re-licensing costs, and ACOE's Dworshak project in the Clearwater River Basin (Unit 15) accounts for less than one percent of the costs.

- **Consultations with other Federal agencies -** Consultations with various Federal agencies, including the NPS, BIA, USDA, USFS, the Service and NOAA Fisheries, could lead to fisheries and stream and wetland restoration.

513. After excluding the consultations on activities above from the total universe of potential impacts identified in the body of the analysis, the following consultations and Action agencies remain. This subset represents the group of consultations and Action agencies that *may* produce significant impacts on small entities:

- Agriculture water diversions (BOR and USFS);
- Hydroelectric facility re-licensing (FERC); and
- Mining (USFS).

4.3.2 Costs Associated with Agriculture Water Diversions

514. Future BOR and USFS consultations on water diversions could result in reductions in contractual water deliveries in the Middle Columbia River Basin (Unit 20). As described in section 4.2, 1,200 to 110,000 acre-feet of additional water may be needed to meet annual instream flow recommendations for all fish species in the Yakima River system, or 48,000

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consultation activity (five green timber sales, one fuel reduction sale and 0.25 fire salvage sale consultations annually), the estimated annual cost of harvest reduction attributable to section 7 consultation for bull trout is $435,500 to $727,167.

[254] Because the re-licensing consultation occurs one year in 50, the annualized bull trout-related section seven costs for ACOE and BOR facilities (Lucky Peak, Arrowrock, Dworshak and Tieton) are converted to capitalized dollars to better represent the anticipated project modification costs at the time of consultation.

acre-feet on average.[255] When combined with regional irrigation water application rates and average farm size, the additional water needed to meet average annual instream flow recommendations provides an estimate of the potential range of annual small agribusiness impacts associated with lost irrigation water attributable to bull trout.[256]

515. The first step of the analysis translates acre-feet of irrigation diversions lost to instream flow into acres of irrigated land using water application rates for crops grown in the region. Water requirements within the Yakima River Basin vary by crop, ranging from a low of 2.7 acre-feet of water per irrigated acre of grapes to a high of 4.7 acre-feet per irrigated acre of mint.[257] Based on this range of application rates, the additional water needed to maintain average annual instream flow recommendations would irrigate approximately 10,200 to 17,800 acres of crops.

516. The next step determines the number of irrigated acres in an average sized farm in the three counties (Yakima, Kittitas, and Benton counties) that encompass the Yakima River Basin as the farmers in these counties depend on the BOR's Yakima River Project for a portion of their irrigation requirements. Within the three counties, 5,200 individuals farm almost 2.5 million acres, and 25 percent of these acres (500,000 acres) are under irrigation.[258] The irrigated land is owned by 4,565 farming operations, or 111 acres of irrigated land per farm.

517. The SBA sets the small business size standard for "crop production" and "animal production" at $0.75 million in annual receipts. Of the 5,200 farms within the three counties included in Unit 20, 3,873 of the farms (74 percent) had annual sales below $100,000.[259]

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[255] The studies examined were Montgomery Water Group, Inc. 2002. *Reliability of Surface Water Supply for Irrigation: Yakima Project Water Users*., and R.C. Bain and Associates and Montgomery Water Group, 2002. *Technical Memorandum: Yakima River Basin Watershed Plan. Water Supply Needs for Instream Flows.*

[256] There are examples of cases where water historically used for irrigation has been converted to species conservation uses (e.g., maintenance of "conservation pools" in BOR reservoirs to protect aquatic species). BOR impoundments such as Beulah, Deadwood, and Cascade Reservoirs have various conservation pool programs. The policy of the Service in consulting with BOR on their reservoir operations and water delivery programs has been to encourage BOR to lease water from agricultural users to fulfill pool needs. While the costs associated with leasing agricultural water for species protection are real costs, these accrue to the agency (BOR) rather than to the willing sellers who lease their water to BOR. To date, minimum conservation pool requirements at BOR reservoirs have been fulfilled using willing-buyer-willing-seller transactions with agricultural producers. While changes to these policies are not anticipated in the future, there is no guarantee that farmers will receive compensation for water diversions that take place in the future.

[257] Northwest Economic Associates, April 8, 1997, *"The Economic Benefits of Enhanced Water Supplies in the Yakima River Basin."*

[258] http://www.nass.usda.gov/census/census97/highlights/wa/wac003.txt, http://www.nass.usda.gov/census/census97/highlights/wa/wac019.txt, and http://www.nass.usda.gov/census/census97/highlights/wa/wac039.txt

[259] Ibid.

Based on this information, it is clear that contracted water delivery reductions to maintain instream flow recommendations could impact small farming operations practicing irrigated agriculture in the region.

518. Forecasts of the likely impact of changes in irrigation water deliveries on small farming businesses requires consideration of complex hydrologic and climatic conditions, government policies and water law and regulations. For example, how much water will need to be diverted, how often, and where? Will farmers holding contracts be compensated for lost water deliveries and will the required water be purchased in arms length transactions? What is the priority of various water rights held by small farming businesses?

519. This analysis applies a simplified approach reflecting the availability of data and uncertainty in these factors. Specifically, it considers a scenario in which the water reductions are borne by a small group of farmers rather than prorated across all junior water right holders in the Yakima River Basin. If this small group of farmers lost 100 percent of their contracted water rights, 90 to 160 farmers would lose all of the economic benefits of irrigated agriculture on 10,200 to 17,800 acres in an average water year (under drought conditions, impacts could be greater; in wet years, impacts might be lessened). Some farmers could also lose variable operating expenses (i.e., seed, fertilizer, labor, fuel, etc.) if unexpected water reductions occur following the start of annual farming activities. Either one of these outcomes could result in significant impacts on small farming businesses in the region. Should water be unavailable to farmers with permanent plantings, even if only periodic, the impact to these farmers could be more substantial.[260]

520. This scenario presents the maximum impact to any one farmer, and is one of a number of possible regulatory outcomes. Given the water rights structure in this basin, it is likely that water shortages created by the need to conserve instream flow would be shared equally by all, or by some larger subset of junior water right holders. There are approximately 1.4 million acre-feet of proratable (i.e., junior) BOR water entitlements in the Yakima River Basin. Assuming the contracted water delivery reductions to maintain instream flow recommendations during an average hydrologic year (48,000 acre-feet) are allocated among all junior water right holders equally, then each will loose about 3.5 percent of their contracted deliveries. That is, if the expected impacts are prorated across a larger group of junior water right holders, the impact on any given farmer would be lessened.

521. The USFS may also curtail irrigation diversions during dry years. Based on past NOAA Fisheries consultations, this analysis anticipates that 13,280 acre-feet of water per year will be permanently lost to instream flows, impact five ranchers/farmers, or 2,656 acre-feet per individual operation. Assuming the same irrigation application rate range as the Yakima River Basin, the water reduction would remove approximately 3,000 to 5,000 acres from irrigation. While the location of the reduction in water deliveries within the critical habitat designation is uncertain, the estimated costs (zero to $1,690,000) can be allocated to

[260] Orchards and vineyards are important commodities in the basin, accounting for approximately 30 percent of irrigable acres, and more than 40 percent of farms have capital invested in some type of permanent crop.

the proposed units based on the share of all USFS controlled stream miles found within each unit, adjusted for stream miles within designated wilderness areas. The units that receive the largest portion of USFS irrigation-related costs are the Salmon River Basin (Unit 16), followed by the Clark Fork River Basin (Unit 2), the Southwest Idaho river Basin (Unit 17) and the Clearwater River Basin (Unit 15). Considering the thousands of small agriculture businesses operating withing the proposed critical habitat area (more than four thousand within the Middle Columbia River Basin alone, Unit 20), irrigation reductions associated with USFS consultations are not expected to have a significant effect on a substantial number of small agricultural businesses.

4.3.3 Hydroelectric Facility Re-licensing

522. Future FERC consultations on hydroelectric facility re-licensing could lead to fish studies, stream and wetland restoration, education and enforcement activities and capital projects, such as fish studies. While the Idaho Power Company, Avista Corporation, PPL Corporation, Northwestern Power, PacifiCorp, PGE, Chelan County PUD, Grant County PUD and Seattle City Light are involved in FERC re-licensing consultations, these companies reported annual MW hour sales in excess of the SBA threshold of four million MW hours and therefore are not considered in the SBREFA analysis.[261] While the owners of the remaining 14 hydroelectric facilities fall below the MW hour threshold for small, only six are utility districts that also meet the requirement "primarily engaged in the generation, transmission, and/or distribution of electric energy for sale." The remaining eight owners are individuals or partnerships. Because it is uncertain whether these owners meet the latter requirement, they are also discussed below.

523. According to the 1997 U.S. Economic Census, 63 establishments are engaged in operating electric power generation facilities in Washington, Idaho, Montana and Oregon. Section 7 consultation for bull trout could therefore have a significant impact on the small electric power generators, considering that 13 small electric power generators in the proposed critical habitat designation are impacted by section 7 consultation for bull trout (Eugene Water & Electric Board owns two of the 14 identified facilities). However, each owner is expected to consult once for re-licensing activities during the next fifty years, and most of the re-licensing activity occurs after the year 2030.

524. Considering the expected re-licensing consultation for nine of the 14 hydroelectric facilities occurs after the year 2030, the annualized bull trout-related section seven costs are converted to capitalized dollars to better represent the facility owner's anticipated project modification costs at the time of consultation. This is summarized in Exhibit 4.36. This exhibit also provides the name of the owner of the facility and the expected project

[261] "Electric power generation" is identified by NAICS code #22111. U.S. Small Business Administration, "Small Business Size Standards matched to North American Industry Classification System (NAICS)," accessed at http://www.sba.gov/size/sizetable2002.html on March 14, 2003. A firm is small if, including its affiliates, it is primarily engaged in the generation, transmission, and/or distribution of electric energy for sale and its total electric output for the preceding fiscal year did not exceed four million MW hours.

modification cost range associated with FERC re-licensing for each unit. The Eugene Water and Electric Board, Douglas County PUD, Cowlitz County PUD and Pend Oreille County PUD operate the largest facilities and are expected to incur ninety-nine percent of the estimated project modification associated with FERC re-licensing. These costs are expected to occur in the Willamette River Basin (Unit 4), the Columbia River Basin (Unit 24), the Lower Columba River Basin (Unit 19) and the Northeast Washington River Basin (Unit 22). Nine individuals and smaller utility/water districts are expected to incur the remaining cost ($50,000 to $600,000).

525. On an annualized basis, the project modification cost per MW hour of electricity produced is greatest for Cowlitz County PUD ($1.05 to $1.28), followed by Pend Oreille County PUD ($0.35 to $0.53). Project modification costs for Douglas County PUD and the Eugene Water Electric Board and average $0.09 to $0.13 per MW hour of electricity produced (annualized), and $0.03 to $0.16 per MW hour for electrical production from the Northern Wasco County PUD.[262] This could have a significant economic impact on the financial operations of Cowlitz County and Pend Orielle County PUDs.

526. At an average annual wholesale price of $20 to $40 per MW hour of electricity,[263] the estimated annualized project modification cost for Douglas County PUD (Swift Number 2 in the Lower Columbia River Basin, Unit 19) is equal to three to six percent of the average annual wholesale price. For Pend Orielle County PUD (Box Canyon in the Northeast Washington River Basin, Unit 22), the annualized project modification cost is equal to one to three percent of the average annual wholesale price. Annualized project modification costs are equal to less than one percent of the average annual wholesale price per MW of electricity for Douglas County PUD (Wells), Northern Wasco County PUD (Dalles Dam North Fishway) and the Eugene Water and Electric Board (Trail Bridge & Carmen and Blue River Dams).The total annual power production is not known for the eight remaining owners. Therefore annualized project modification costs per MW hour of production and annualized project modification costs as a percentage of the average annual wholesale price per MW hour of electricity cannot be quantified. However, these remaining facilities account for less than one percent of the project modification costs associated with FERC re-licensing.

[262] The total power production is not known for the eight remaining owners. Therefore annualized project modification costs per MW hour of production and annualized project modification costs as a percentage of the average annual wholesale price per MW hour of electricity cannot be quantified.

[263] http://www.eia.doe.gov/cneaf/electricity/epav1/wholesale.html

Exhibit 4.36
Small Business Hydropower Re-Licensing, Total Bull Trout-Related Project Modification Costs, Capitalized Dollars

Project Name	CH Unit	Owner	Total Company Power Production MWh[1]	Project Capacity MW	Re-license Date	Total Cost Range[2]		Total Cost Range By Unit	
						Low $	High $	Low $	High $
Shingle Creek	Clearwater	Deveny, Willis & Betty	Unknown	0.2	2031	$973	$10,622	$5,632	$73,695
Ford		Ford Hydro Ltd. Partnership	Unknown	1.5	2035	$4,959	$63,073		
Wells	Columbia River	Douglas County PUD	2,059,000	774.3	2012	$2,789,312	$8,814,555	$2,803,490	$9,009,154
Dalles Dam North fishway		Northern Wasco Co. PUD	35,486	4.9	2037	$14,178	$194,599		
Opal Springs	Deschutes	Deschutes Valley Water District	Unknown	4.3	2032	$17,450	$197,970	$17,450	$197,970
North Fork Sprague River	Klamath	HDI Associates & Fred Ehlers	Unknown	1.2	2035	$4,075	$51,823	$4,075	$51,823
Swift No. 2	Lower Columbia	Cowlitz County PUD	159,000	70.0	2006	$2,377,867	$6,766,533	$2,377,867	$6,766,533
Box Canyon	NE Washington	Pend Oreille County PUD	376,000	60.0	2002	$1,853,486	$6,705,000	$1,853,486	$6,705,000
Sunshine	Salmon	Jerry Lee & Christinee McMillan	Unknown	0.1	2037	$318	$4,369	$318	$4,369
Big Creek	SW Idaho	Big Creek Lodge & Outfitters	Unknown	0.0	2022	$176	$1,361	$176	$1,361
Jim Boyd	Umatilla	Boyd, James B & Janet A	Unknown	1.2	2034	$4,253	$52,076	$4,253	$52,076
Trail Bridge & Carmen	Willamette	Eugene Water & Electric Board	590,151	124.5	2008	$2,562,741	$11,651,814	$2,599,855	$12,202,282
Blue River Dam		Eugene Water & Electric Board	590,151	14.7	2039	$37,023	$548,413		
McKenzie		Bigelow, John H. II	Unknown	0.1	2050	$91	$2,055		
Total						$9,666,602	$35,064,263		

[1] The SBA sets the small business size standard for "electric power generation" at four million MW-hours of total output for the prior fiscal year if, including its affiliates, it is primarily engaged in the generation, transmission, and/or distribution of electric energy for sale.
[2] These costs are costs that will occur at the time of consultation. See re-license date column.

4.3.4 Mining

527. Future USFS consultations on mining activities could lead to watershed assessment requirements, a reduction in the length of the mining season, buffer strips, restrictions as to type of equipment allowed, timing of equipment use and additional requirements for stream crossings. The project modifications for load claims (hard-rock) may also include restrictions on how or where the ore is processed. There is a significant amount of placer mining activity on USFS lands in Eastern Oregon and Washington, particularly within the drainages of the North and Middle Forks of the John Day River (Unit 8 - John Day River Drainage) and the Powder River (Unit 12 - Hells Canyon Complex).[264] Formal consultations are expected to occur at a rate of 15 per annum, or 150 over ten years, and will occur evenly within the three basins. The placer mines are expected to range in size from small recreational suction dredge operations to large "trackhoe" placer operations. Mining also occurs on USFS lands in Montana and Idaho (Unit 2 - Clark Fork River Basin and Unit 15 - Clearwater River Basin). Mining-related formal consultations in these states are expected to occur at a rate of two per annum, or 20 over ten years, and will occur evenly within the two basins. It is anticipated that one of the annual consultations will involve a hard-rock mine and the other a recreational mine. The annual project modification costs associated with recreational mining are not included in this SBREFA analysis ($100,000 annually).

528. The SBA sets the size standards for "mining (except oil and gas)" at 500 employees.[265] Evaluating the significance of the potential economic impact on small mining businesses presents unique challenges, and an accurate estimate is difficult to achieve given a lack of information on the number and characteristics of small mining businesses by county and state within the proposed critical habitat designation. There are approximately 97 mining companies operating within 27 counties that encompass these four units, of which 70 are identified as small.[266] Furthermore, of the 97 mining companies, 15 are classified as gold

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[264] Within the North Fork of the John Day River and Granite Creek (Unit 8, John Day River Basin), there are 24 mining operations currently in formal consultation. There are an additional 106 operations in informal consultation. A similar situation exists in the Upper Powder River watershed (Unit 12, Hells Canyon Complex) where about 40 mines exist, at least eight of which are under formal consultation. There are also approximately 400 active mining claims on the Middle fork of the John Day River, although there is no available information on the status of consultation on these, as is also true of the mining situation in Eastern Washington. Personal communication, Service personnel, Portland, October 21, 2003.

[265] U.S. Small Business Administration, "Table of Small Business Size Standards," accessed at http://www.sba.gov/size/indextableofsize.html

[266] Dun and Bradstreet (D&B) provide national, state and county data on existing facilities by SIC code. Dun's Market Identifiers (File 516) file is a subset of D&B's global database of over 52,000,000 records. It includes all organization sizes (ranging from single employee level to thousands) and types, including public and private companies, government agencies, and contractors, schools and universities. Data are collected through a variety of means including yellow pages, trade associations and journals, Secretary of State filings, Federal bankruptcy filings, daily newspaper publications and electronic news services, telephone directories, and other sources. The file also contains those records that have been updated. Data are collected and maintained by a staff of over 1,200 business analysts through daily in-person and telephone interviews; county, state, and Federal government sources; third party sources; business trade tape exchange programs; and large-volume mailings. This analysis uses SIC#10 "metal mining," SIC#12 "coal mining," and

operations, and ten of these are identified as small. While the current level of section 7 consultation activity suggests a larger number of placer mines operate within the proposed designation, the available data does not accurately characterize the placer mining industry.[267]

529. According to BLM statistics, there are approximately 500,000 mining claims in Oregon, Washington, Idaho and Montana.[268] However, only 25,000 of these claims are active and in good standing under the recording, maintenance and assessment work statutes. Individuals maintain active mining claims in anticipation that one day the claim will prove valuable. The vast majority of the claimants that could potentially be affected by the proposed designation do not currently receive any income from their claims. In this sense, it is impossible to quantify from claim numbers the extent to which the likely economic impact can be considered significant.

530. A comparison of the cost of the potential project modifications to the economic value of the mining industry in the 27 counties is not possible as the U.S. Census does not disaggregate annual state mining revenues to the county level. Given the small size of the mining sector, in both number of establishments and receipts, relative to the state and county economy, data are either withheld at the county level to avoid disclosure or are not available. While an accurate estimate of the potential economic impact is uncertain, it should be recognized that some number of small mining businesses could be significantly impacted by section 7. For these individuals, the likely economic impact may approach $20,000 given timing restrictions and reporting requirements.

4.4 Potential Impacts on the Energy Industry

531. Pursuant to Executive Order No. 13211, "Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use," issued May 18, 2001, Federal agencies must prepare and submit a "Statement of Energy Effects" for all "significant energy actions." The purpose of this requirement is to ensure that all Federal agencies "appropriately weigh and consider the effects of the Federal Government's regulations on the supply, distribution, and use of energy."[269] The OMB has provided guidance for implementing this executive order that outlines nine outcomes that may constitute "a

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SIC#14 "nonmetallic minerals, except fuels." Market Identifiers, File 516: D&B, January 2004.

[267] Gold mining consists of many recreational and small mining operations. The recreational miners operate dredges, sluices or pan on public land while the small operations mine their own claims. Some of the latter even make a living from their mining activities. These types of operations may be missing from the available industry statistics. Personal communication with Mike Heywood, Northwest Mining Association, January 5, 2004.

[268] Bureau of Land Management Department of the Interior Public Land Statistics 2002. http://www.blm.gov/natacq/pls02/

[269] Memorandum For Heads of Executive Department Agencies, and Independent Regulatory Agencies, Guidance For Implementing E.O. 13211, M-01-27, OMB, July 13, 2001, http://www.whitehouse.gov/omb/memoranda/m01-27.html.

significant adverse effect" when compared without the regulatory action under consideration:

- Reductions in crude oil supply in excess of 10,000 barrels per day;
- Reductions in fuel production in excess of 4,000 barrels per day;
- Reductions in coal production in excess of five million tons per year;
- Reductions in natural gas production in excess of 25 million mcf;
- Reductions in electricity production in excess of 1 billion kilowatts-hours per year or in excess of 500 MWs of installed capacity;
- Increases in energy use required by the regulatory action that exceed the thresholds above;
- Increases in the cost of energy production in excess of one percent;
- Increases in the cost of energy distribution in excess of one percent; or
- Other similarly adverse outcomes.[270]

532. Two of these criteria are relevant to this analysis: (1) reductions in electricity production in excess of one billion kilowatt-hours per year or in excess of 500 MWs of installed capacity and (2) increases in the cost of energy production in excess of one percent. Below, the analysis determines whether the electricity industry is likely to experience "a significant adverse effect" as a result of section 7 implementation for the bull trout.

4.4.1 Evaluation of Whether the Designation will Result in a Reduction in Electricity Production in Excess of One Billion Kilowatt-Hours Per Year or in Excess of 500 Megawatts of Installed Capacity

533. Installed capacity is "the total manufacturer-rated capacity for equipment such as turbines, generators, condensers, transformers, and other system components" and represents the maximum rate of flow of energy from the plant or the maximum output of the plant. The two potential activities that might lead to reduced energy generation due to section 7 consultation involving the bull trout are operation of the FCRPS and operation of FERC-licensed hydroelectric dams.

534. As noted in Section 4 of this report, providing water (increased flows and spills) for salmon and steelhead migration, particularly for juveniles migrating downstream to the ocean, is the most significant operational change experienced by FCRPS as a result of section 7 consultation. Water releases at Libby and Hungry Horse dams are being shifted from the winter to increase instream flows during spring runoff and August, and the water spilled over the dams is lost to use for power generation. However, this is a power production issue as installed capacity remains unchanged. Therefore, the analysis focuses on changes in energy production.

535. Shifting water releases from the winter, when electric power prices are generally higher, to increase instream flows during spring runoff and August results in reduced

[270] Ibid.

revenues. BPA personnel provided estimates of the combined cost (in terms of foregone power revenues) of the 2000 NOAA and Service BOs.[271] Based on HYDSIM, a model that simulates flow/reservoir management and fish spill operations on a monthly basis at FCRPS and other Columbia Basin projects,[272] and using a simulation of the 1929 to 1978 water years,[273] the annual cost of changes to power operations (in terms of foregone power revenues) resulting from compliance with the NOAA and Service BOs is expected to range of $180 to $440 million, depending on the water year and energy markets.

536. The foregone power revenues are based on a reduction of approximately 1,100 average MWs of hydroelectric energy-production,[274] and is due primarily to project modifications in the NOAA Fisheries 2000 BO for anadromous fish. While model runs specific to the bull trout portion of the Service 2000 BO have not been completed, it is estimated that bull trout-related changes to hydroelectric power operations would cost two orders of magnitude less than the NOAA-related changes.[275] In other words, a loss of approximately $2 million to $4 million of energy revenues and a reduction of approximately 11 average MWs of hydroelectric production.

537. A review of the bull trout section 7 consultation record for FERC-licensed hydroelectric facilities since species listing in 1998 found no instances of prescribed changes in average hydroelectric energy production. The only energy-related impacts were relatively minor movements of peak energy production during the year. This practice does not reduce average energy production, but rather changes the temporal distribution of that power.

538. The reduction in electricity production of 11 average MWs, or 96,000,000 kilowatt-hours (11 MWs of continuous energy production multiplied by 8,760 MW-hours per average MW multiplied by 1,000 kilowatt-hours per MW-hour), is less than 10 percent of the one billion kilowatt-hour threshold suggested by OMB.

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[271]Personal communication, Scott Bettin, BPA, Portland, December 16, 2002; personal communication, Roger Schiewe, BPA, Portland, December 30, 2002.

[272] Management objectives include flood control, anadromous and resident fish protection, projected energy loads, Columbia Basin Treaty obligations, and other project-specific non-power requirements. http://www.nwr.noaa.gov/1hydrop/hydroweb/docs/2000/chap02.pdf

[273] The years 1929-1978 are used only as a basis for a typical 50 year hydrological cycle in the Pacific Northwest. This period has been judged by hydrologists to be a representative period (including both extended drought and substantial floods, etc.) for purposes of hydropower modeling by both the Northwest Power and Conservation Council and the Bonneville Power Administration. All other (economic) parameters in the simulation were based on current data.

[274]An average measure of the total electricity produced in one year. In this case, 11 average MWs is the equivalent of producing 11 MW-hours of electricity for a year. It does not necessarily mean that 11 MW-hours of electricity is continually produced for a year. Over the course of a year, an average MW is equal to 8,760 MW-hours (24 hours multiplied by 365 days multiplied by one MW).

[275]Personal communication, Scott Bettin, BPA, Portland, December 16, 2002; personal communication, Roger Schiewe, BPA, Portland, December 30, 2002.

4.4.2 Evaluation of Whether the Designation will Result in an Increase in the Cost of Energy Production in Excess of One Percent

539. The following analysis considers the probability that a reduction of 11 average MWs (96,360,000 kilowatt-hours) of hydroelectric production will lead to an increase in the cost of energy production of one percent or more. Because 11 average MWs represents a small amount of the regional generating capacity, this screening level analysis assumes the BPA will purchase the lost power from an alternative source. The most likely source of replace energy for Libby and Hungry Horse dams, both "peaking" hydroelectric power facilities, is electricity from a gas turbine peaking facility.

540. First, total annual net electricity generation is estimated,[276] by fuel type, for the four state region. As shown in Exhibit 4.37, the region produced 201 billion kilowatt-hours of electricity in 2000.

Exhibit 4.37
Net Generation For Four State Region By Fuel Type, 2000 (million Kwhr)

Fuel Type	WA	OR	ID	MT	Total
Hydro	80,534	38,187	11,000	12,131	141,852
Gas	8,183	8,793	186	30	17,192
Petroleum	413	57	3	442	915
Coal	9,534	3,810	59	16,149	29,552
Nuclear	8,605	0	0	0	8,605
Other	1,542	567	719	51	2,879
Total	108,811	51,414	11,967	28,803	200,995

Source: http://www.eia.doe.gov/cneaf/electricity/epav1/epav1.pdf

541. Next, the average operating expense is calculated for each fuel type. In this screening level analysis, the average, in mills per kilowatt-hour, is determined for the years 1996 to 2000, and then converted into dollars per kilowatt-hour (Exhibit 4.38).

542. The total cost of energy production for the region is then calculated assuming (1) no change in power operations at Libby and Hungry Horse dams and (2) the replacement of 96,360,000 kilowatt-hours of power from Libby and Hungry Horse dams with power from a gas turbine facility (Exhibit 4.39). This small reduction in hydroelectric output is not expected to reduce the total cost of hydroelectric power production since hydroelectric production costs are largely fixed. Therefore, the estimated cost of annual hydroelectric energy production in the alternative scenario remains the same as annual production costs under baseline operations.

[276]Net generation is gross generation less plant use. The energy required for pumping at a pumped storage plant is regarded as "plant use" and is deducted from the gross generation.

543. Last, the additional cost of producing 96,360,000 kilowatt-hours of energy from the gas turbine facility is compared to the total regional energy production costs assuming no change in power operations at Libby and Hungry Horse dams to determine impact. As illustrated in Exhibit 4.39, the additional cost of producing 96,000,000 kilowatt-hours of energy from a gas turbine facility is 0.15 percent of the estimated annual baseline cost of regional energy production, well below the one percent threshold suggested by OMB.

544. It is therefore estimated that constraints placed on energy production within the region from compliance with section 7 bull trout consultation project modifications will not result in significant decreases in production or increases in energy costs within the region.

Exhibit 4.38
Average Operating Expenses for Major U.S. Investor-Owned Electric Utilities
(Mills per Kilowatt-hour)

Expense	2000	1999	1998	1997	1996	Average
Operating						
Nuclear	8.41	8.93	9.98	11.02	9.47	9.56
Fossil Steam	2.31	2.21	2.17	2.22	2.25	2.23
Hydroelectric	4.74	4.17	3.85	3.29	3.87	3.98
Gas Turbine and Small Scale	4.57	5.16	3.85	4.43	5.08	4.62
Maintenance						
Nuclear	4.93	5.13	5.79	6.90	5.68	5.69
Fossil Steam	2.45	2.38	2.41	2.43	2.49	2.43
Hydroelectric	2.99	2.60	2.00	2.49	2.08	2.43
Gas Turbine and Small Scale	3.50	4.80	3.43	3.43	4.98	4.03
Fuel						
Nuclear	4.95	5.17	5.39	5.42	5.50	5.29
Fossil Steam	17.69	15.62	15.94	16.80	16.51	16.51
Hydroelectric	0.00	0.00	0.00	0.00	0.00	0.00
Gas Turbine and Small Scale	39.19	28.72	23.02	24.94	30.58	29.29
Total, mills/KWhr						
Nuclear	18.29	19.23	21.16	23.34	20.65	20.53
Fossil Steam	22.45	20.21	20.52	21.45	21.25	21.18
Hydroelectric	7.73	6.77	5.85	5.78	5.95	6.42
Gas Turbine and Small Scale	47.26	38.68	30.30	32.80	40.64	37.94
Total, $/KWhr						
Nuclear	0.0183	0.0192	0.0212	0.0233	0.0207	0.0205
Fossil Steam	0.0225	0.0202	0.0205	0.0215	0.0213	0.0212
Hydroelectric	0.0077	0.0068	0.0059	0.0058	0.0060	0.0064
Gas Turbine and Small Scale	0.0473	0.0387	0.0303	0.0328	0.0406	0.0379

Note: Operating expenses do not include capital or transmission costs.
Source: http://www.eia.doe.gov/cneaf/electricity/epav2/html_tables/epav2t13p.html

Exhibit 4.39
Increase in Regional Cost of Energy Production

Fuel Type	Actual Regional Energy Production in 2000, million KWhr (Baseline)	Regional Energy Production in 2000 Moving 96,360,000 KWhr from Hydro-electric to Gas, million KWhr (Alternative)	Average Operating Cost 1996 to 2000, $/KWhr	Estimated Cost of Annual Energy Production in Baseline, $/KWhr	Estimated Cost of Annual Energy Production in Alternative, $/KWhr
Hydro	141,852	141,756	$0.00642	$910,122,432	$910,122,432
Gas	17,192	17,288	$0.03794	$652,195,712	$655,851,225
Petroleum	915	915	$0.02118	$19,376,040	$19,376,040
Coal	29,552	29,552	$0.02118	$625,793,152	$625,793,152
Nuclear	8,605	8,605	$0.02053	$176,695,070	$176,695,070
Other	2,879	2,879	$0.03794	$109,217,744	$109,217,744
Total	200,995	200,995	-	$2,493,400,150	$2,497,055,663
Incremental cost of moving 96,360 KWhr from hydroelectric to gas				$3,655,513	
Percent change				0.15%	

APPENDIX A

Detailed Description of Critical Habitat Units

Unit 1: Klamath River Basin

The Klamath River Basin is located in south-central Oregon and includes three critical habitat subunits (CHSUs): (1) Upper Klamath Lake CHSU in Klamath County; (2) Sycan Marsh CHSU in Klamath County; and (3) Upper Sprague River CHSU in Klamath and Lake counties. Total proposed critical habitat includes 475 km (295 mi) of streams representing 9.4 percent of the total stream lengths in the unit. Proposed critical habitat includes: 224.6 km (139.6 mi) of stream in 13 reaches, and 3,775 ha (9,327 ac) of lake in the Upper Klamath CHSU; 103.8 km (64.5 mi) of stream in 6 reaches, and 9,965 ha (24,625 ac) of marsh in the Sycan Marsh CHSU; and 146 km (91 mi) of stream in 10 reaches in the Upper Sprague CHSU.

Unit 2: Clark Fork River Basin

The Clark Fork River Basin unit includes 12 CHSUs, organized primarily on the basis of major watersheds. It includes most of western Montana and the Idaho panhandle.

The Lake Pend Oreille CHSU incorporates all waters in the Clark Fork River drainage downstream from Cabinet Gorge Dam (near the Montana/Idaho border), including the lower portion of the Priest River drainage, and the Pend Oreille River (the impounded downstream arm of Lake Pend Oreille).

The Lower Clark Fork River CHSU includes the three mainstem Clark Fork River impoundments (Cabinet Gorge, Noxon Rapids, and Thompson Falls reservoirs), the Clark Fork River between reservoirs and upstream to the confluence of the Flathead River, the lower Flathead River drainage downstream from Kerr Dam, and all tributaries to these waters.

The Middle Clark Fork River CHSU includes the mainstem of the Clark Fork River in western Montana and all tributary watersheds, from the confluence of the Flathead River upstream to the base of Milltown Dam, except for the Bitterroot River drainage.

The Upper Clark Fork River CHSU includes the entire Clark Fork River in western Montana upstream from Milltown Dam, with the exception of the Blackfoot River, Clearwater River, and Rock Creek drainages. The Priest Lakes and River CHSU includes the entire drainage of the Priest River upstream from Priest Lake Dam.

The Flathead Lake CHSU includes the entire Flathead River basin upstream from Kerr Dam, and the South Fork Flathead River drainage upstream from Hungry Horse Dam. Flathead Lake is the largest natural freshwater lake west of the Mississippi River in the United States. Twenty other natural glaciated lakes up to 2,800 ha (6,919 ac) in size are occupied by bull trout in this CHSU.

The Swan CHSU includes the entire Swan River drainage upstream from Bigfork Dam. The Hungry Horse Reservoir CHSU includes the entire South Fork Flathead River drainage upstream from Hungry Horse Dam. The Bitterroot CHSU includes the entire Bitterroot River drainage. The Blackfoot River CHSU includes the entire Blackfoot River drainage, with the exception of its tributaries in the Clearwater River CHSU. The Clearwater River and Lake Chain CHSU includes the Clearwater River drainage. The Rock Creek CHSU includes the entire watershed of Rock Creek.

Unit 3: Kootenai River Basin

Just a short stretch of the Kootenai River lies in the U.S. where it loops down out of British Columbia. The Kootenai Unit thus comprises only the northwestern corner of Montana, including Libby Dam, and the northeastern tip of the Idaho panhandle. This unit includes two CHSUs: the Kootenai River and Bull Lake CHSU in Boundary County, Idaho and Lincoln County, Montana, and the Lake Koocanusa and Sophie Lake CHSU in Lincoln County, Montana.

The Service is proposing to designate critical habitat for bull trout in portions of 27 streams, 2 lakes, and 1 reservoir in this unit. The total stream distance is about 528 km (328 mi) in Montana, and 95 km (59 mi) in Idaho, for a total of 623 km (387 mi). The lakes and reservoir have a surface coverage of about 19,418 ha (47,982 ac), about 97 percent of which is the Lake Koocanusa reservoir. The Draft Recovery Plan (Service 2002) identified 10 local populations of bull trout in this unit as essential to recovery.

Unit 4: Willamette River Basin

The Willamette River Basin Unit includes 337 km (209 mi) of stream and 1,600 ha (3,954 ac) of lake habitat in the McKenzie River and Middle Fork Willamette River subbasins of western Oregon. The unit is located primarily within Lane County, but also extends into Linn County. Currently, there are three known bull trout local populations in the McKenzie River subbasin, and one potential bull trout local population in the Middle Fork Willamette River subbasin. All four of these populations are identified as essential for bull trout recovery in the Draft Recovery Plan (Service 2002). With the exception of the mainstem Willamette River, the lower Middle Fork Willamette River, and Lost Creek, all segments proposed as critical habitat are currently occupied by bull trout, and all segments are essential to recovery as indicated in the recovery criteria in the Draft Recovery Plan (Service 2002).

Unit 5: Hood River Basin

The Hood River Unit lies entirely within Hood River County, Oregon. The Unit includes the mainstem Hood River and three major tributaries: the Clear Branch Hood River, West Fork Hood River, and East Fork Hood River. A total of 178.0 km (110.3 mi) of stream, representing 21 percent of the total stream lengths in this unit, is proposed for critical habitat. Currently, there are two local populations (Clear Branch Hood River above Clear Branch Dam, and Hood River and tributaries below Clear Branch Dam) identified as essential to recovery (Service 2002). Two additional areas (West Fork Hood River and East Fork Hood River), where additional local populations necessary for bull trout recovery may be established, have also been identified. Presently, bull trout in the Hood River basin are believed to number less than 300 adult fish, emphasizing the need to establish additional local populations (Service 2002).

Unit 6: Deschutes River Basin

The Deschutes River Basin Unit in central Oregon contains two CHSUs: the lower Deschutes and the upper Deschutes, separated by Big Falls, an impassible barrier on the Deschutes River at rkm 211.4 (rmi 131.4) (Stuart et al. 1997).

The Lower Deschutes CHSU is in Wasco, Sherman, Jefferson, Deschutes, and Crook Counties. Approximately 576 km (358 mi) of stream in the lower Deschutes River basin is proposed for critical habitat designation.

The Upper Deschutes River CHSU is located in Deschutes, Crook, and Klamath counties. Approximately 225.4 km (140.1 mi) of stream in the upper Deschutes River basin is proposed for critical habitat designation.

Unit 7: Odell Lake

The Odell Lake Unit in central Oregon lies entirely within the Deschutes National Forest in Deschutes and Klamath counties. Total proposed critical habitat includes approximately 2,675 ha (6,611 ac) of lakes and 18.1 km (11.3 mi) of streams.

Unit 8: John Day River Basin

The John Day River Basin Unit in eastern Oregon includes the North Fork, the Middle Fork, and mainstem portions of the John Day River and their tributary streams in Wheeler, Grant, and Umatilla counties. A total of 1,080 km (671 mi) of stream is proposed for critical habitat.

Unit 9: Umatilla-Walla Walla River Basins

The Umatilla and Walla Walla Rivers Unit is located in northeastern Oregon and southeastern Washington. The unit includes 636 km (395 mi) of stream extending across portions of Umatilla, Union, and Wallowa counties in Oregon, and Walla Walla and Columbia counties in Washington. Currently, there are four known bull trout local populations in this unit, three in the Walla Walla River Basin, and one in the Umatilla River Basin. The Draft Recovery Plan (Service 2002) indicates the need to maintain these four local populations to provide for the recovered distribution of bull trout.

Unit 10: Grande Ronde River Basin

The Grande Ronde Unit extends across Union, Wallowa, and Umatilla counties in northeastern Oregon, and Asotin, Columbia, and Garfield counties in southeastern Washington. The unit includes the Grande Ronde River from its headwaters to the confluence with the Snake River and a number of its tributaries, the largest being the Wallowa River. Approximately 1,030 km (640 mi) of stream in the Grande Ronde River basin is proposed for critical habitat designation. Five bull trout populations are associated with streams that branch directly off the Grande Ronde River, and three populations are associated with streams flowing into the Wallowa River. One population in the upper Little Minam River is isolated by a barrier falls and is not connected to either of the main rivers. The Draft Recovery Plan (Service 2002) identifies all nine existing local populations as necessary for recovery.

Unit 11: Imnaha/Snake River Basins

The Imnaha/Snake Unit extends across Wallowa, Baker, and Union counties in northeastern Oregon and Adams and Idaho counties in western Idaho. The unit contains approximately 306 km (190 mi) of proposed critical habitat, and consists of two CHSUs: the Imnaha River basin and the Snake River basin from the Imnaha confluence upstream to Hells Canyon Dam. Seven bull trout local populations are identified in this unit, two in the Snake River CHSU, and five in the Imnaha River CHSU. The Draft Recovery Plan (Service 2002) identifies all seven existing local populations as necessary for recovery.

Unit 12: Hells Canyon Complex

The Hells Canyon Complex Unit encompasses basins in Idaho and Oregon draining into the Snake River and its associated reservoirs, from Hells Canyon Dam upstream to the confluence of the Weiser River. The Hells Canyon Complex unit includes a total of approximately 1,000 km (621 mi) of stream proposed as critical habitat.

The Unit contains two CHSUs: the Pine-Indian-Wildhorse CHSU and the Powder River CHSU. The Pine-Indian-Wildhorse CHSU is located within Adams and Washington counties in western Idaho, and Baker and Wallowa counties in northeastern Oregon. A total of 390 km (242 mi) of streams within this CHSU are proposed for critical habitat designation. This CHSU contains seven known local populations of bull trout and two potential local populations. The Powder River CHSU is located within Baker, Union, and Wallowa counties in northeastern Oregon. A total of approximately 610 km (379 mi) of streams within the Powder River CHSU are proposed for critical habitat designation. This CHSU contains 10 known local populations of bull trout and one potential local population.

Unit 13: Malheur River Basin

The Malheur Unit is in the Malheur River Basin in eastern Oregon in Grant, Baker, Harney, and Malheur counties. A total of 389 km (241 mi) of streams and two reservoirs are proposed for critical habitat. There are two local bull trout populations and four potential local populations that are identified as essential to recovery in the Draft Recovery Plan (Service 2002).

Unit 14: Coeur d'Alene Lake Basin

The Coeur d'Alene Lake Basin Unit in Idaho is broken into two subunits.

The Coeur d'Alene Lake CHSU lies within Kootenai, Shoshone, Benewah and Bonner counties. In total, there are approximately 6,903 km (4,290 mi) of streams comprising 502 named streams in the Coeur d'Alene Lake basin. Of this, 30 stream reaches or tributaries comprising 677 km (421 mi) are proposed as critical habitat. This equals approximately 6 percent of all streams and less than 10 percent of total stream length in the basin. Lakes comprising 12,727 ha (31,450 ac) of surface area are also being proposed as critical habitat.

The St. Joe River CHSU includes an estimated 3,574 km (2,221 mi) of streams encompassing over 254 named tributaries (Streamnet 2002) in Shoshone, Benewah, and Latah counties, Idaho.

Unit 15: Clearwater River Basin

The Clearwater River Unit includes 3,063 km (1,904 mi) of streams and 6,722 ha (16,611 ac) of lakes proposed as critical habitat for bull trout in north-central Idaho. This large unit covers an area of approximately 2,423,691 ha (5,989,052 ac) and extends from the Snake River confluence at Lewiston on the west to headwaters in the Bitterroot Mountains along the Idaho/Montana border on the east. This unit is divided into seven CHSUs. These CHSUs include: Lower/Middle Fork Clearwater River, North Fork Clearwater River, Fish Lake (North Fork), South Fork Clearwater River, Lochsa River, Fish Lake (Lochsa), and Selway River. All local populations within this unit are essential to the recovery of bull trout (Service 2002).

Unit 16: Salmon River Basin

The Salmon River basin extends across central Idaho from the Snake River to the Montana border. The critical habitat unit includes 7,688 km (4,777 mi) of stream extending across portions of Adams, Blaine, Custer, Idaho, Lemhi, Nez Perce, and Valley counties in Idaho. There are 10 CHSUs: Little-Lower Salmon River, Middle Salmon River Chamberlain, South Fork Salmon River, Middle Fork Salmon River, Middle Salmon River-Panther Creek, Opal Lake, Lemhi River, Lake Creek, Pahsimeroi River, and Upper Salmon River. Currently, there are 125 known bull trout local populations in this unit. The Draft Recovery Plan (Service 2002) indicates the need to maintain all known local populations and identifies nine additional potential populations.

Unit 17: Southwest Idaho River Basins

The Southwest Idaho Unit includes a total of approximately 2,792 km (1,735 mi) of stream and 9 CHSUs in the Boise, Payette, and Weiser River basins (Ada, Adams, Boise, Camas, Canyon, Elmore, Gem, Payette, Valley, and Washington counties). The Boise River basin contains the Arrowrock, Anderson Ranch, and Lucky Peak critical habitat CHSUs. The Payette River Basin contains the upper South Fork Payette River, Deadwood River, Middle Fork Payette River, North Fork Payette River and Squaw Creek CHSUs; and the Weiser River basin contains the Weiser River CHSU. All proposed critical habitat designations are associated with populations of bull trout identified as essential to recovery in the Draft Recovery Plan (Service 2002).

Unit 18: Little Lost River Basin

The Little Lost River Unit is within Butte, Custer, and Lemhi counties in east-central Idaho. Approximately 184.6 km (115.4 mi) of stream in the Little Lost River Basin is proposed for critical habitat designation. There are 10 known local populations in the Little Lost River Basin and the Draft Recovery Plan (Service 2002) states that the persistence of all 10 populations is needed for species' recovery.

Unit 19: Lower Columbia River Basin

The Lower Columbia Unit consists of portions of the Lewis, White Salmon, and Klickitat Rivers, and associated tributaries in southwestern and south-central Washington. The unit extends across Clark, Cowlitz, Kilickitat, Skamania, and Yakima counties. Approximately 340 km (210 mi) of stream and 3 reservoirs covering 5,054 ha (12,488 ac) are proposed for critical habitat designation. Currently, there are three bull trout local populations in the Lewis River watershed and one in the Klickitat River. The Draft Recovery Plan (Service 2002) indicates the need to maintain those four local populations and establish four additional populations within the Lewis River watershed, and one in the White Salmon.

Unit 20: Middle Columbia River Basin

The Middle Columbia River unit encompasses the entire Yakima River basin located in south central Washington, draining approximately 15,900 square km (6,155 square mi). The basin occupies most of Yakima and Kittitas counties, about half of Benton County, and a small portion of Klickitat County. Thirteen local populations of bull trout occur in this unit, all of which are essential to recovery. The Draft Recovery Plan (Service 2002) recommends the establishment of three other local populations. Approximately 846 km (529 mi) of stream habitat and 6,066 ha (14986 ac) of lake and reservoir surface area are proposed as critical habitat within this unit.

Unit 21: Upper Columbia River Basin

The Upper Columbia River Basin includes three CHSUs in central and northern Washington: (1) Wenatchee River CHSU in Chelan County; (2) Entiat River CHSU in Chelan County; and (3) Methow River CHSU in Okanogan County. A total of 909.7 km (565.4 mi) of streams and 1,010 ha (2,497 ac) of lake surface area are proposed for critical habitat.

Proposed critical habitat includes 364 km (226.1 mi) of stream in 21 stream reaches and one lake (990 ha; 2,445 ac) in the Wenatchee River CHSU, 78.5 km (48.8 mi) of stream in three stream reaches in the Entiat River CHSU, and 486.3 km (302.2 mi) of stream in 26 stream reaches and three lakes that total 22.6 ha (55.9 ac) in the Methow River CHSU.

Unit 22: Northeast Washington River Basins

The Northeast Washington unit includes bull trout above Chief Joseph Dam on the Columbia River. A total of 373.1 km (231.9 mi) of streams and 1,166 ha (2,880 ac) of lake surface area are proposed as critical habitat within this unit.

Unit 23: Snake River Basin in Washington

The Snake River Washington Unit includes two critical habitat subunits (CHSU) located in southeast Washington: (1) the Tucannon River CHSU located in Columbia and Garfield counties, and (2) the Asotin Creek CHSU within Garfield and Asotin counties. A total of 326 km (203 mi) of stream reaches are proposed as critical habitat within this unit.

Unit 24: Columbia River

This unit is located in Clatsop, Columbia, Multnomah, Hood River, Wasco, Sherman, Gilliam, Morrow, and Umatilla counties in Oregon and Pacific, Wahkiakum, Cowlitz, Clark, Skamania, Klickitat, Benton, Walla Walla, Franklin, Yakima, Grant, Kittitas, Chelan, Douglas, and Okanogan counties in Washington.

Unit 25: Snake River

The lower Snake River is located in Washington (Franklin, Walla Walla, Columbia, Whitman, and Asotin counties) from its mouth to the confluence with the Clearwater River at the cities of Clarkston, Washington and Lewiston, Idaho. The Snake River is the border between Washington and Idaho from Clarkston/Lewiston upstream to the Oregon border at rkm 223.7 (rm 139.0). The Snake River forms the boundary between Idaho and Oregon from that point upstream to the limit of this critical habitat unit. This portion of the Snake River is within Nez Perce, Idaho, Adams, and Washington counties in Idaho, and Wallowa, Baker, and Malheur counties in Oregon.

APPENDIX B

Ownership of Lands Adjacent to Proposed Critical Habitat by Unit and Subunit

Exhibit B.1

Approximate Distribution of Proposed Critical Habitat by Adjacent Land Ownership by Unit and Subunit

Unit and Subunit #	Unit and Subunit	Federal (%)	State and Local (%)	Private (%)	Tribal (%)
1	**Klamath River Basin**	**69%**	**3%**	**28%**	**0%**
1.01	Upper Klamath Lake CHSU	84%	6%	10%	0%
1.02	Sycan Marsh CHSU	56%	0%	44%	0%
1.03	Upper Sprague River CHSU	56%	0%	44%	0%
2	**Clark Fork River Basin**	**54%**	**6%**	**39%**	**1%**
2.01	Lake Pend Oreille CHSU	36%	14%	50%	0%
2.02	Lower Clark Fork River CHSU - streams	31%	1%	55%	13%
2.03	Middle Clark Fork River CHSU	51%	3%	46%	0%
2.04	Upper Clark Fork River CHSU	25%	3%	72%	0%
2.05	Priest Lake and River CHSU	58%	33%	9%	0%
2.06	Flathead Lake, Flathead River, and 20 Headwater Lakes CHSU	68%	10%	22%	0%
2.07	Swan CHSU	36%	17%	47%	0%
2.08	Hungry Horse Reservoir CHSU	100%	0%	0%	0%
2.09	Bitterroot CHSU	64%	1%	35%	0%
2.10	Blackfoot River CHSU	34%	8%	58%	0%
2.11	Clearwater River and Lake Chain CHSU	51%	5%	44%	0%
2.12	Rock Creek CHSU	73%	1%	26%	0%
3	**Kootenai River Basin**	**53%**	**3%**	**44%**	**0%**
3.01	Kootenai River and Bull Lake CHSU	53%	3%	44%	0%
3.02	Lake Koocanusa and Sophi Lake CHSU	53%	3%	44%	0%
4	**Willamette River Basin**	**46%**	**0%**	**54%**	**0%**
5	**Hood River Basin**	**48%**	**1%**	**51%**	**0%**
6	**Deschutes River Basin**	**35%**	**1%**	**41%**	**23%**
6.01	Lower Deschutes CHSU	23%	1%	44%	32%
6.02	Upper Deschutes CHSU	64%	1%	35%	0%
7	**Odell Lake**	**100%**	**0%**	**0%**	**0%**
8	**John Day River Basin**	**54%**	**0%**	**46%**	**0%**
9	**Umatilla-Walla Walla River Basins**	**32%**	**2%**	**58%**	**8%**

Exhibit B.1 Approximate Distribution of Proposed Critical Habitat by Adjacent Land Ownership by Unit and Subunit					
Unit and Subunit #	**Unit and Subunit**	**Federal (%)**	**State and Local (%)**	**Private (%)**	**Tribal (%)**
9.01	Umatilla CHSU	37%	0%	44%	19%
9.02	Walla Walla CHSU	28%	3%	69%	0%
10	**Grande Ronde River Basin**	**52%**	**0%**	**48%**	**0%**
11	**Imnaha/Snake River Basins**	**51%**	**0%**	**49%**	**0%**
11.01	Snake River CHSU	0%	0%	0%	0%
11.02	Imnaha River CHSU	0%	0%	0%	0%
12	**Hells Canyon Complex**	**47%**	**0%**	**53%**	**0%**
12.01	Pine-Indian-Wildhorse CHSU	65%	0%	35%	0%
12.02	Powder River CHSU	36%	0%	64%	0%
13	**Malheur River Basin**	**63%**	**3%**	**34%**	**0%**
14	**Couer d'Alene Lake Basin**	**58%**	**6%**	**35%**	**0%**
14.01	Couer d'Alene Lake CHSU	64%	6%	30%	0%
14.02	St Joe River CHSU	52%	7%	41%	0%
15	**Clearwater River Basin**	**78%**	**4%**	**17%**	**0%**
15.01	Lower/Middle Fork Clearwater River CHSU	14%	8%	76%	2%
15.02	North Fork Clearwater River CHSU	67%	12%	21%	0%
15.04	South Fork Clearwater River CHSU	85%	0%	15%	0%
15.05	Lochsa River CHSU	95%	0%	5%	0%
15.06	Fish Lake (Lochsa) CHSU	100%	0%	0%	0%
15.07	Selway River CHSU	100%	0%	0%	0%
16	**Salmon River Basin**	**86%**	**1%**	**13%**	**0%**
16.01	Little-Lower Salmon CHSU	78%	1%	21%	0%
16.02	Middle Salmon-Chamberlain CHSU	99%	0%	1%	0%
16.03	South Fork Salmon River CHSU	96%	1%	3%	0%
16.04	Middle Fork Salmon River CHSU	98%	0%	2%	0%
16.05	Middle Salmon-Panther CHSU	89%	0%	11%	0%
16.06	Lemhi River CHSU	65%	3%	32%	0%
16.07	Opal Lake CHSU	100%	0%	0%	0%
16.08	Lake Creek CHSU	86%	1%	13%	0%
16.09	Pahsimeroi River CHSU	66%	3%	31%	0%
16.10	Upper Salmon River CHSU	85%	0%	15%	0%

Exhibit B.1

Approximate Distribution of Proposed Critical Habitat by Adjacent Land Ownership by Unit and Subunit

Unit and Subunit #	Unit and Subunit	Federal (%)	State and Local (%)	Private (%)	Tribal (%)
17	**Southwest Idaho River Basins**	**78%**	**4%**	**17%**	**0%**
17.01	Anderson Ranch CHSU	87%	2%	11%	0%
17.02	Arrowrock CHSU	91%	3%	6%	0%
17.03	Lucky Peak CHSU	57%	18%	25%	0%
17.04	Deadwood River CHSU	95%	0%	5%	0%
17.05	Middle Fork Payette River CHSU	90%	3%	7%	0%
17.06	Weiser River CHSU	53%	8%	39%	0%
17.07	Upper South Fork Payette River CHSU	100%	0%	0%	0%
17.08	North Fork Payette River CHSU	47%	10%	43%	0%
17.09	Squaw Creek CHSU	48%	5%	47%	0%
18	**Little Lost River Basin**	**76%**	**2%**	**22%**	**0%**
19	**Lower Columbia River Basin**	**18%**	**10%**	**55%**	**17%**
19.01	Lewis River CHSU	29%	7%	64%	0%
19.02	White Salmon River CHSU	2%	0%	98%	0%
19.03	Klickitat River CHSU	6%	17%	35%	42%
20	**Middle Columbia Basin**	**44%**	**9%**	**40%**	**7%**
21	**Upper Columbia Basin**	**58%**	**0%**	**42%**	**0%**
21.01	Wenatchee River CHSU	59%	0%	41%	0%
21.02	Entiat River CHSU	47%	0%	53%	0%
21.03	Methow River CHSU	59%	0%	41%	0%
22	**Northeast Washington River Basins**	**58%**	**4%**	**37%**	**1%**
22.01	Pend Oreille River CHSU	58%	4%	37%	1%
23	**Snake River Basin in Washington**	**52%**	**16%**	**33%**	**0%**
23.01	Tucannon River CHSU	71%	23%	6%	0%
23.02	Asotin Creek CHSU	31%	8%	61%	0%
24	**Columbia River**	**39%**	**0%**	**61%**	**0%**
25	**Snake River**	**50%**	**0%**	**50%**	**0%**
Total		**65%**	**3%**	**31%**	**1%**

Notes: Figures taken or calculated from Fish and Wildlife Service, "Endangered and Threatened Wildlife and Plants; Proposed Designation of Critical Habitat for the Klamath River and Columbia River Distinct Population Segments of Bull Trout", 50 CFR part 17 (Proposed Rule). Subunit totals may not sum to unit totals because of rounding errors.

Exhibit B.2

Approximate Surface Area of Critical Habitat in Lakes and Reservoirs in Hectares and Adjacent Land Ownership by Unit and Subunit

Unit and Subunit #	Unit and Subunit	Federal* (%)	State and Local* (%)	Private* (%)	Tribal* (%)
1	**Klamath River Basin**	**64%**	**2%**	**35%**	**0%**
1.01	Upper Klamath Lake CHSU	84%	6%	10%	0%
1.02	Sycan Marsh CHSU	56%	0%	44%	0%
1.03	Upper Sprague River CHSU				
2	**Clark Fork River Basin**	**33%**	**16%**	**41%**	**10%**
2.01	Lake Pend Oreille CHSU	50%	50%	0%	0%
2.02	Lower Clark Fork River CHSU	23%	0%	70%	7%
2.03	Middle Clark Fork River CHSU				
2.04	Upper Clark Fork River CHSU				
2.05	Priest Lake and River CHSU	30%	0%	70%	0%
2.06	Flathead Lake, Flathead River, and 20 Headwater Lakes CHSU	10%	0%	68%	22%
2.07	Swan CHSU	63%	0%	37%	0%
2.08	Hungry Horse Reservoir CHSU	100%	0%	0%	0%
2.09	Bitterroot CHSU	75%	0%	25%	0%
2.1	Blackfoot River CHSU				
2.11	Clearwater River and Lake Chain CHSU	51%	5%	44%	0%
2.12	Rock Creek CHSU	73%	1%	26%	0%
3	**Kootenai River Basin**	**53%**	**3%**	**44%**	**0%**
3.01	Kootenai River and Bull Lake CHSU	53%	3%	44%	0%
3.02	Lake Koocanusa and Sophi Lake CHSU	53%	3%	44%	0%
4	**Willamette River Basin**	**46%**	**0%**	**54%**	**0%**
5	**Hood River Basin**				
6	**Deschutes River Basin**				
6.01	Lower Deschutes CHSU				
6.02	Upper Deschutes CHSU				
7	**Odell Lake**	**100%**	**0%**	**0%**	**0%**
8	**John Day River Basin**				
9	**Umatilla-Walla Walla River Basins**				
9.01	Umatilla CHSU				
9.02	Walla Walla CHSU				
10	**Grande Ronde River Basin**				

Exhibit B.2

Approximate Surface Area of Critical Habitat in Lakes and Reservoirs in Hectares and Adjacent Land Ownership by Unit and Subunit

Unit and Subunit #	Unit and Subunit	Federal* (%)	State and Local* (%)	Private* (%)	Tribal* (%)
11	**Imnaha/Snake River Basins**				
11.01	Snake River CHSU				
11.02	Imnaha River CHSU				
12	**Hells Canyon Complex**				
12.01	Pine-Indian-Wildhorse CHSU				
12.02	Powder River CHSU				
13	**Malheur River Basin**				
14	**Couer d'Alene Lake Basin**	**0%**	**0%**	**100%**	**0%**
14.01	Couer d'Alene Lake CHSU	0%	0%	100%	0%
14.02	St Joe River CHSU				
15	**Clearwater River Basin**	**67%**	**12%**	**21%**	**0%**
15.01	Lower/Middle Fork Clearwater River CHSU				
15.02	North Fork Clearwater River CHSU	67%	12%	21%	0%
15.03	Fish Lake (North Fork) CHSU	100%	0%	0%	0%
15.04	South Fork Clearwater River CHSU				
15.05	Lochsa River CHSU				
15.06	Fish Lake (Lochsa) CHSU	100%	0%	0%	0%
15.07	Selway River CHSU				
16	**Salmon River Basin**	**87%**	**1%**	**12%**	**0%**
16.01	Little-Lower Salmon CHSU				
16.02	Middle Salmon-Chamberlain CHSU				
16.03	South Fork Salmon River CHSU				
16.04	Middle Fork Salmon River CHSU				
16.05	Middle Salmon-Panther CHSU				
16.06	Lemhi River CHSU				
16.07	Opal Lake CHSU	100%	0%	0%	0%
16.08	Lake Creek CHSU	86%	1%	13%	0%
16.09	Pahsimeroi River CHSU				
16.1	Upper Salmon River CHSU				
17	**Southwest Idaho River Basins**	**66%**	**8%**	**26%**	**0%**
17.01	Anderson Ranch CHSU	87%	2%	11%	0%
17.02	Arrowrock CHSU	91%	3%	6%	0%

Exhibit B.2

Approximate Surface Area of Critical Habitat in Lakes and Reservoirs in Hectares and Adjacent Land Ownership by Unit and Subunit

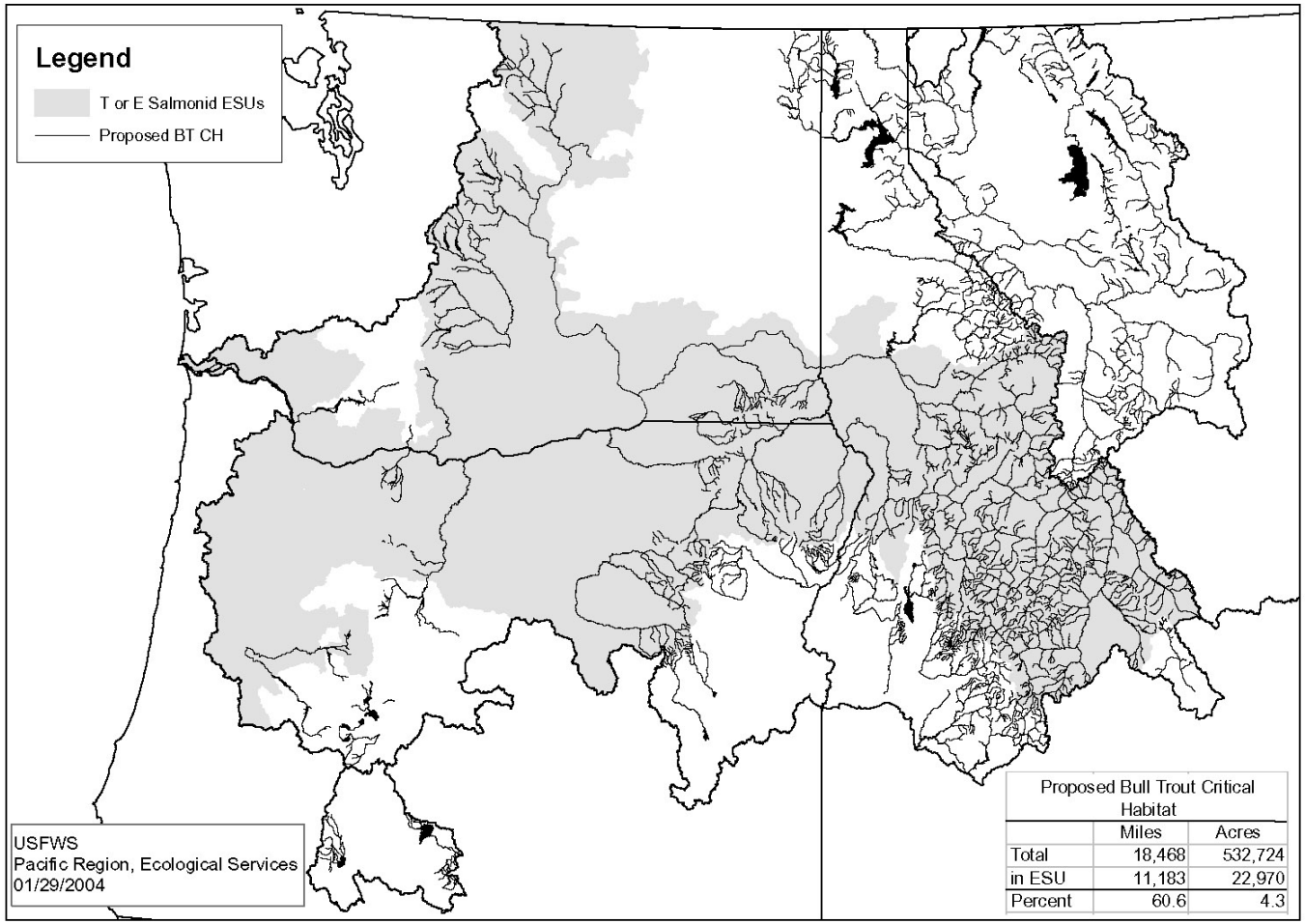
Unit and Subunit #	Unit and Subunit	Federal* (%)	State and Local* (%)	Private* (%)	Tribal* (%)
17.03	Lucky Peak CHSU	57%	18%	25%	0%
17.04	Deadwood River CHSU	95%	0%	5%	0%
17.05	Middle Fork Payette River CHSU				
17.06	Weiser River CHSU	53%	8%	39%	0%
17.07	Upper South Fork Payette River CHSU				
17.08	North Fork Payette River CHSU	47%	10%	43%	0%
17.09	Squaw Creek CHSU				
18	**Little Lost River Basin**				
19	**Lower Columbia River Basin**	**29%**	**7%**	**64%**	**0%**
19.01	Lewis River CHSU	29%	7%	64%	0%
19.02	White Salmon River CHSU				
19.03	Klickitat River CHSU				
20	**Middle Columbia Basin**	**44%**	**9%**	**40%**	**7%**
21	**Upper Columbia Basin**	**41%**	**0%**	**59%**	**0%**
21.01	Wenatchee River CHSU	40%	0%	60%	0%
21.02	Entiat River CHSU				
21.03	Methow River CHSU -lakes	100%	0%	0%	0%
22	**Northeast Washington River Basins**	**58%**	**4%**	**37%**	**1%**
22.01	Pend Oreille River CHSU	58%	4%	37%	1%
23	**Snake River Basin in Washington**				
23.01	Tucannon River CHSU				
23.02	Asotin Creek CHSU				
24	**Columbia River**				
25	**Snake River**				
Total		**40%**	**11%**	**43%**	**6%**

Notes:
* Blank cells indicate units or subunits with no lakes or reservoirs proposed for critical habitat designation. Figures taken or calculated from Fish and Wildlife Service, "Endangered and Threatened Wildlife and Plants; Proposed Designation of Critical Habitat for the Klamath River and Columbia River Distinct Population Segments of Bull Trout", 50 CFR part 17 (Proposed Rule). The Proposed Rule describes approximately 4,400 lake acre of proposed critical habitat in the Deschutes River basin and 5,900 lake acres in the Malheur River basin, however, the Proposed Rule does not describe the adjacent land ownership. Subunit totals may not sum to unit totals because of rounding errors.

APPENDIX C

Overlap of Proposed Bull Trout Critical Habitat and Salmon and Steelhead Habitat

Bull Trout Proposed Critical Habitat Compared to Listed (Threatened or Endangered) Salmonid ESUs in the Columbia River and Klamath River DPSs



Proposed Bull Trout Critical Habitat		
	Miles	Acres
Total	18,468	532,724
in ESU	11,183	22,970
Percent	60.6	4.3

APPENDIX D

Listing of All Suggested Project Modifications Found in Formal Biological Opinions: By Activity Type

HIGHWAY PROJECT MODIFICATIONS

Bridge Replacement

- Seasonal limitation on in-water work.
- Construction activities can occur within dewater coffer dams or drilling casings provided that all water from inside these structures is pumped to contained settling ponds on the river bank, and that equipment access to these structures is made via the work bridges.
- To the maximum extent possible, the existing bridge will be disassembled and removed without pieces being allowed to fall into the river.
- If portions of the old bridge do fall into the river, they will be removed from the river by lifting them onto the work bridge as opposed to dragging them through the water to the river bank.
- Blasting required will be contained to the maximum extent possible using 'blankets' to attenuate the blast's pressure wave in the water and to prevent debris from entering the river.
- Work bridge shall be constructed to withstand winter icing and spring runoff to prevent collapse into the river, or removed prior to winter icing conditions.
- Construction of access road under new bridge and the attendant wall and riprap placement shall be conducted at low river flows and 'in the dry'.
- BMPs for erosion control:
    - constructing silt fencing.
    - using straw bales in borrow ditches.
    - quickly reseeding and revegetating all disturbed areas.
    - using bank stabilization measures for disturbed channel banks.
    - daily visual monitoring of sediment minimization structures.
- Construction zones within coffer dams will be checked for trapped bull trout, any found bull trout will immediately be returned to the river.
- Notification on finding dead, injured or sick bull trout.
- Sediment mitigation control until revegetation goals are reached.
- Conservation and reuse of topsoil and organic duff layers during construction and revegetation.
- Hydroseed of all cut and fill slopes resulting from road reconstruction and alignment.
- Ensure post-construction success rate of vegetation (i.e., 95 percent cover within 6 years).
- All habitat protection and conservation measures will be incorporated into contracts relating to the project.
- Monitor the levels of soils and habitat disturbances and the revegetative efforts and successes.
- All waste fuels, lubricating fluids, herbicides, and other chemicals will be collected and disposed of in a manner that ensures that no adverse environmental impact will occur.

Repair

- Passage shall provide for both adult and juvenile forms of all salmonid species.
- Seasonal limitation on in-water work.
- All in-water work will be done within a coffer dam.
- Minimize alteration or disturbance of stream banks and existing riparian vegetation.
- Minimize amount of riprap used, when it is necessary, only clean, non-erodible, upland angular rock of sufficient size for long-term armoring will be used.
- Native streambed materials will be stockpiled out of the 2-year floodplain for later reuse in the project - place on top of riprap.
- An erosion control plan will be prepared and implemented by ODOT or its contractor.
- effective erosion control measures shall be in-place at all times, construction will not begin until controls are in place.
- All exposed areas will be replanted with native vegetation.
- All erosion control devices will be inspected during construction.

- Where feasible, sediment laden water created by construction activity shall be filtered before it leaves the right-of-way or enters an aquatic resource area.
- A supply of erosion control measures will be kept on site.
- All equipment used in-stream will be cleaned at a location that is outside of the 5-year floodplain prior to entering the 2-year floodplain.
- Material removed during excavation shall only be placed in locations where it cannot enter sensitive aquatic habitat.
- Develop a site-specific spill prevention and countermeasure or pollution control plan.
- Fuel storage, refueling and servicing of construction equipment and vehicles will be located at least 300 feet from the 2-year floodplain.
- Hazmat booms will be installed on all aquatic systems where:
    - significant in-water work will occur or where significant work occurs within the 5-year floodplain or where sediment/toxicant spills are possible
    - the aquatic system can support a boom setup
- Hazmat booms will be maintained on-site in locations where there is potential for a toxic spill, diapering of vehicles to catch any toxicants will be maintained when the vehicles have any potential to contribute toxic materials into aquatic systems.
- No surface application of nitrogen fertilizer will be used within 50 feet of any aquatic resource.
- Boundaries of the vegetation clearing limits will be flagged, ground will not be disturbed beyond the flagged boundary.
- Alteration of native vegetation will be minimized.
- Riparian understory and overstory vegetation removed will be replaced.
- Erosion control measures will be monitored.
- Failed plantings and structures will be replaced.
- A plant establishment period will be required.
- Monitoring reports required.

<u>Maintenance</u>
- Seasonal limitations on in-water work.
- Development of contingency plan in the event of adverse weather conditions or other foreseeable undesirable conditions.
- Survey by biologists prior to in-channel work to detect the presence of migrating adult fish, paired fish or redd construction.
- Minimize all clearing of woody vegetation, salvage vegetation for replanting where possible, revegetate newly created slopes and impacted riverbanks.
- Follow stringent erosion control measures including frequent inspections.
- Report of take.
- All plantings shall be watered and maintained and replaced as needed for a period of 3 years.

FISHERIES PROJECT MODIFICATIONS

<u>Coho reintroduction terms and conditions</u>
- Implement project to minimize risk of adverse effects to bull trout; involve Service.

<u>Bull trout reintroduction terms and conditions</u>
- Monitor macroinvertebrate densities prior to application of antimycin.
- Keep creek closed to sport fishing.
- Create neutralization stations using potassium permanganate to reduce downstream impacts of antimycin.
- Collect dead bull trout.

Ecological survey terms and conditions

- Follow State of Montana's electrofishing guidelines and make sure all electrofishing equipment works properly.
- Schedule sampling at each site when bull trout are least likely to be present.

Fish bypass terms and conditions

- Conduct channel work in the dry when possible.
- Implement spill prevention and control plan.
- Replace hydraulic fluid in heavy equipment with biodegradable, non-toxic hydraulic fluid.
- Clean heavy equipment of pollutants.
- Use sediment control devices.
- Snorkel the project reach to determine bull trout presence.
- Capture stranded fish by nets and electrofishing and transport to main creek.
- Monitor channel during dry out period.
- Replant riparian areas using native species.
- Revegetate disturbed area during fall or spring.
- Monitor plants for at least 5 years to ensure 80 percent survival.
- Construction will take place within stipulated time period and not exceed 365 days.
- Develop wetland mitigation and monitoring plan.
- Conservation recommendation: increase riparian planting.

Squawfish removal terms and conditions

- Instruct anglers on proper handling and release of caught salmonids.
- Consider using barbless hooks.

Salmon study terms and conditions

- Instream work contingent on not finding spawning bull trout.
- Survey for bull trout and train field crews in bull trout identification.
- Follow electrofishing guidelines.
- Minimize vegetation degradation to avoid exposing bare soils.

FOREST MANAGEMENT PROJECT MODIFICATIONS

RESTORATION

- Develop an environmental education program to inform the public about structures and woody debris, aquatic habitat, and riparian dependent species.
- Steam clean heavy equipment before it enters the stream channel.
- Minimize the amount of time that heavy equipment is in the stream.
- Follow WDFW Hydraulic Permit guidelines.
- Subsoil, close or otherwise limit sediment input.
- Require 0.25-inch mesh fish screens on suction inserts at pump chances.

Trail Bridge Repair:

- Work during low stream flow.
- Minimize use of mechanized equipment within the ordinary high-water mark.
- Prepare and approve spill containment plan.
- Store and disperse any excavated material away from the channel.
- Install sediment fences.
- Access only via existing trail.
- Silt fences.
- Minimize disturbance to immediate riparian vegetation.
- Log placement, as needed.

Log Placement:

- Helicopter fueling and landing areas will be located least 150 to 200 feet from open water.
- Fuel trucks and landing sites within the riparian reserve.

Horse Camp:

- Limit excavator work and road decommissioning to driest time of the year (August or September).
- Place and secure LWD along the stream side.
- Minimize disturbance to existing riparian vegetation.
- All mechanized material will be cleaned of all foreign plant materials and soil prior to moving into project area.

ROAD CONSTRUCTION

- Minimize sediment introduction resulting from cattle grazing in riparian areas.
- Implement riparian management areas on each side of affected streams.
- Limit use of ground-based equipment within X feet of channel migration zone.
- Design and implement water temperature monitoring plan.
- Monitor road use and maintenance. Ensure no public use occurs on gated or barriered roads.
- Design and implement a sediment monitoring plan.
- Monitor compliance with required terms and conditions.
- Design and implement a plan to monitor cattle use in harvested riparian areas and at stream crossings resulting from the project.
- Limit in-stream construction impacts to actions providing fish passage, bank and sediment stability, improve or create fish habitat above or below project area.
- Monitoring of fisheries and sediment delivery by fishery biologist during in-water work period.
- Provide passage around the site during in-water construction period.
- Education of contractors.
- Minimize disturbance to native riparian vegetation.
- Monitor success of any riparian replanting.
- Monitor stability of finished grade slopes and elevations.
- Survey by hydrologist and fisheries biologist to help determine most effective design for restoring channel stability and integrity.
- Seasonal restrictions on construction activities.
- Maintain all straw bales and filter fences where road maintenance could deliver sediment to streams.

TIMBER ACTIVITIES

- For culvert installation and/or replacement, follow the fish passage criteria developed by the Washington Department of Fish and Wildlife.
- Monitor the condition of streams for sedimentation.
- Road-related and in-stream activities which may affect bull trout habitat will be conducted during recommended in-water work periods.
- Initiate an interdisciplinary and integrated functional road-shed analysis.
- Provide information summary tables to the Service describing implementation and effectiveness monitoring of timber sale.
- Install and maintain sediment barriers to prevent/minimize the amount of sediment entering the river.
- Install erosion control matting.
- Seed areas denuded of vegetation.
- Mulch newly seeded areas and other areas subject to erosional processes.

OTHER - RECREATION

- Inventory dispersed sites, single purpose roads to trail heads, and riparian trails and provide an annual report recommendation for sites, roads, and/or trails that require management actions.
- Implement a dispersed recreation public education program to increase public knowledge of importance of healthy riparian habitat.
- Where possible pull dispersed recreation sites back from the edge of stream and block off erosive streambank.

DAM AND HYDROPOWER PROJECT MODIFICATIONS

Modifications Associated with Hydropower Dams and Related Reservoirs

Fish passage terms and conditions

- Net and haul species over dam.
- Study fish passage options.
- Maintain conditions that allow for unimpeded passage of fish past construction sites during remediation/replacement of pipeline and bridge construction.
- Ensure upstream and downstream passage is not impeded at dams.
- Modify, operate, and maintain fish screen cleaning system, fish return bypass conduit, bank fish ladder.
- Design and implement upstream and downstream long-term fish passage facilities.
- Capture, tag, and monitor movement and migration of juvenile bull trout (install traps).
- Tag and transfer adult bull trout.
- Investigate methods to provide safe fish passage around dams.
- Adaptive refinement of mitigation measures for fish ladder and fish screen based on monitoring.
- Provide fish passage for juvenile and adult bull trout traveling upstream and downstream.
- Monitor prey species and provide safe fish passage for prey species.

Entrainment reduction terms and conditions

- Study use of strobe light system to prevent entrainment of bull trout.
- Install fish screens on water intake to prevent entrainment.
- Develop plan to handle and relocate bull trout that are trapped and collected during fish salvage efforts.
- Evaluate fish screen impacts and eliminate sources of increased injury associated with increased water levels.
- Construct, operate, maintain adult barrier at terminus.
- Reduce entrainment due to reservoir operations - install entrainment barrier, develop bypass tubes, study long-term solutions to entrainment problem.
- Adaptive refinement of mitigation measures for fish ladder and fish screen based on monitoring.
- Feasibility study of fish screen to reduce take during dewatering.

Adequate flow terms and conditions

- Implement operational constraints to minimize severe fluctuations in flow levels.
- Monitor to provide information on distribution, timing, and usage of dams and reservoir system.
- Store and release sufficient water to provide base flow prior to salmon flows and associated ramping volumes (12/20/2000).
- Re-design WTC tower based on overlapping/telescoping weir gates instead of ports, allowing flow to be taken from the surface at any pool elevation.
- Construct, operate, maintain rock drop water diversion structures.
- Conduct hydraulic and biological evaluation of tailrace barrier one year after operation.
- maintain instantaneous minimum flows downstream at 1,000 cfs.
- Operate project in continuous run-of-river mode.
- Ensure that reservoir operations to not result in significant de-watering of reservoirs.
- Increase minimum dam discharge to reduce effect of power peaking operations.

Total dissolved gases/temperature terms and conditions

- Evaluate and potentially modify equipment to reduce total dissolved gases (TDG) and temperature effects.
- Develop and implement a dissolved gas supersaturation control, mitigation, and monitoring program.

Habitat protection terms and conditions

- Protect riparian corridor habitat.
- Minimize downslope sedimentation from abandoned and active logging roads.
- Comply with state water quality standards.
- Limit extent of woody debris removal.
- Relocate and use woody debris for habitat restoration within former lake bed and downstream reach.
- Construct containment berm to control erosion.
- Re-establish appropriate vegetation in the 20 foot drawdown zone.
- Control erosion, slope instability to minimize sedimentation and control spills of chemical/petroleum products.
- Placement of large woody debris complexes in pond area of power canal to provide escape cover from predators, structural diversity, and predation refuge.
- Planting native conifer trees on south bank to maintain shade and temperatures.

Other terms and conditions

- Monitor and control exotic fishes.
- Develop a plan to preserve genetic variability of Lake Pend Oreille bull trout.

Conservation recommendations

- Educate anglers that use associated reservoirs and rivers.
- Study and report annually observations of bull trout captured in field activities
- Fund and implement Lake Billy Chinook sport harvest/angler survey.
- Fund and carry out disease studies.
- Engage landowners and water users in watersheds surround projects in cooperative resource management.
- Participate in life history investigations.
- Cooperate with National Forest to better describe bull trout.
- Incorporate articles related to bull trout recovery into FERC license agreements.
- Cooperation with Idaho Fish and Game Department and Montana Department of Fish, Wildlife, and Parks to promote bull trout recovery, and survey and monitor populations.

GRAZING PROJECT MODIFICATIONS

- Route sheep so as to avoid fish-bearing portions of streams at watering locations.
- Locate camping and sanitation facilities outside riparian reserves.
- No sheep grazing or bedding allowed in conifer plantations with trees <=3 feet tall.
- Disperse grazing away from riparian areas.
- Avoid stream use for longer than what is needed to water the flock.
- Herd cattle our of riparian reserves whenever they are found to be bedded down in these areas.
- Implement the 4 to 5 inch stubble height utilization standard.
- Review all recently planted regeneration stands with the permittees and identify all appropriate measures and provisions to ensure adequate resource protection against cattle grazing damage to seedlings.
- Avoid salting and bedding of stock in riparian areas.
- When crossing fish-bearing streams after August 1, do so in areas dominated by sand or streambed substrate greater than 4 inches in diameter.
- Limit grazing period (early season = May 15 to July 31).
- Restrict number of cattle.
- Set maximum allowed forage/browse utilization levels.
- Turn-on away from creek.
- Provide rider to remove cattle from creek when found.
- Remove 90 percent by pasture close date, remove remaining 10 percent within 5 days.

- Establish photo monitoring prior to turn-out and immediately following grazing period.
- Monitor forage/browse utilization.
- Monitor willows.
- Monitor for unauthorized and excess livestock as often as necessary.
- Establish effectiveness monitoring sites to monitor changes in riparian vegetation, water quality, and channel morphology.
- Assure consistent implementation of grazing-related measures and standards specified in INFISH and PACFISH.
- Monitor cattle access to river after completion of fence.
- Ensure all BLM authorities are used to preclude unauthorized livestock use of the new road system, including development and implementation of specific measures to ensure functionality of existing and new management features (gates, barriers, etc.).
- Install fences or other barriers (slach, cattle guards, etc.) where forest or other activities have removed or reduced the effectiveness of natural barriers.
- Identify the needs and responsibilities for fence repair and maintenance, and pipeline and water trough repair and maintenance.
- Provide necessary training for all permittees and range riders to monitor livestock use and to understand objectives and standards stated in the AOP.
- Ensure allotment use guidelines and management objectives (utilization levels, stubble height, prescribed grazing systems) are strictly adhered to and successfully met.
- Provide off-channel watering facilities and salt for livestock away from the streams to pull use away from riparian areas.
- Report to the Service annually, following the grazing season, the results of monitoring.

AGRICULTURE PROJECT MODIFICATIONS

<u>Irrigation channel project terms and conditions</u>

- Complete in-water work between July 15 and August 31.
- Place all in-water structures to ensure that they do no inhibit passage of bull trout.
- Minimize the potential for sedimentation associated with project construction and operation.
- Minimize the potential for chemical pollution associated with project construction and operation.
- Minimize potential for take associated with installation and operation of new fish screen (designed to keep fish out of irrigation channels).
- Ensure that fish screen meets NMFS acceptance standards for mortality or injury of juvenile salmonids.
- Conservation recommendation: study newly created habitat and minimize use of non-native plants for revegetation.

<u>Oregon CREP terms and conditions</u>

- Develop comprehensive monitoring program to assess effectiveness of the CREP.
- Avoid take of listed fish in wetland restoration activities.
- Manage herbicides and pesticides to ensure that no degradation of water quality occurs.
- Location, design, and maintain livestock crossings as necessary to minimize degradation of riparian and aquatic habitats.
- Minimize take associated with instream work by applying appropriate timing restrictions.

MINING PROJECT MODIFICATIONS

- Investigate an alternative crossing.
- Insure that mine operator does not use the ford between August 31 and April 1.
- Provide an annual activity report.
- Provide educational materials to the miner that describe the bull trout life history, including redd formation and timing of spawning, and an identification key.

"OTHER" PROJECT MODIFICATIONS

Channel improvements (Columbia River dredging) terms and conditions

- Minimize entrainment by: implementing dredging Impact Minimization Measures, monitoring dredge draghead and/or cutterhead to minimize the time they are removed from the substrate, monitor blasting to check for fish take, provide contractor compliance plan prior to construction.
- Institute monitoring program.
- Develop contaminant testing protocols.
- Develop plan to reduce fish stranding by vessel traffic (give plan to Coast Guard).
- Use in-water construction windows for construction (including excavation and dredge material placement) and ecosystem restoration.
- Minimize contaminant resuspension from temporary storage of dredge material.
- Record daily operations when dredging and submit monitoring reports to the Service, including Integrated Annual Report.

Stream restoration terms and conditions

- Limit duration and extent of in-water construction activities, and time projects to avoid effects.
- Provide passage for adult and juvenile forms of all salmonid species.
- All in-water work will be completed between July 1 and July 31.
- Minimize disturbance of streambank and riparian vegetation.
- Minimize amount of riprap.
- Water withdrawals comply with all state and Federal laws.
- Erosion control measures include: erosion control blankets, straw for temporary erosion control, replanting with native shrubs, inspect erosion control devices regularly.
- Pollution control measures include: filter sediment-laden water, conserve topsoil, clean equipment used for instream work prior to use, prevent construction debris from falling into stream, develop pollution control plan, locate fuel storage, refueling, and servicing areas above 10 year floodplain of any waterbody, no surface application of nitrogen fertilizer.
- Protect riparian habitat by clearly marking boundaries, minimizing alteration of native vegetation (clip by hand to leave roots intact), replace riparian understory and overstory vegetation.
- Make sure fish are not stranded in old channel by using diversion structures and sequenced dewatering; physically move fish into the new channel.
- Monitor all measures and provide report.

Integrated noxious weed management terms and conditions

- No adjuvant will be added to any aquatic-approved herbicide without the adjuvant also being labeled as approved for aquatic use by the EPA.
- Educate herbicide applicators regarding BMPs.
- Determine level of concern of herbicide prior to use if there is insufficient data to complete a risk assessment.
- Provide new information on herbicide and adjuvant toxicity to the Service annually.
- Provide report of proposed weed control activities and monitoring report yearly.

Resource management terms and conditions

- None.
- Conservation recommendations: cooperate with BOR and tribes to evaluate losses of bull trout at Agency Dams and develop remedies to preclude/offset those losses; review and implement Service's draft Recovery Plan for bull trout.

Intra-service consultation terms and conditions

- Ensure that only qualified individuals conduct bull trout restoration.
- Require permit applicants to provide a clear description of requested activities.
- Require permittees to provide an annual report of activities.

APPENDIX E

Length (streams) and area (lakes) of proposed designated bull trout critical habitat that is within U.S. Forest Service Land and Forest Service Wilderness Areas

Length of Proposed Bull Trout Critical Habitat Streams that are within U.S. Forest Service Lands*		
Critical Habitat Unit	Kilometers	Miles
Clark Fork River Basin	2,707.6	1,682.4
Clearwater River Basin	2,516.7	1,563.8
Coeur d'Alene Lake Basin	425.7	264.5
Deschutes River Basin	236.0	146.6
Grande Ronde River Basin	506.2	314.5
Hells Canyon Complex	422.0	262.2
Hood River Basin	76.5	47.6
Imnaha-Snake River Basins	156.6	97.3
John Day River Basin	507.7	315.5
Klamath River Basin	213.1	132.4
Kootenai River Basin	226.0	140.4
Little Lost River Basin	71.8	44.6
Lower Columbia River Basin	52.9	32.9
Malheur River Basin	227.4	141.3
Middle Columbia River Basin	354.3	220.2
Northeast Washington River Basins	170.3	105.8
Odell Lake	23.8	14.8
Salmon River Basin	5,445.7	3,383.8
Snake River	80.4	49.9
Snake River Basin in Washington	152.9	95.0
Southwest Idaho River Basins	2,068.7	1,285.4
Umatilla-Walla Walla River Basins	199.0	123.6
Upper Columbia River Basin	567.2	352.5
Willamette River Basin	143.8	89.3
TOTAL	17,552.1	10,906.3

Note: Some reaches of the Columbia River mainstem within Columbia River Basin unit may border national forest lands. However, the Proposed Rule does not describe adjacent land managed by the USFS in this unit.

Area of Proposed Bull Trout Critical Habitat Lakes/Reservoirs that are within U.S. Forest Service Lands*		
Critical Habitat Unit	Hectares	Acres
Clark Fork River Basin	10,510.0	25,970.9
Clearwater River Basin	24.3	60.1
Deschutes River Basin	3,471.5	8,578.3
Hood River Basin	36.9	91.1
Klamath River Basin	37.5	92.7
Kootenai River Basin	18.1	44.8
Lower Columbia River Basin	10.6	26.2
Middle Columbia River Basin	1,706.9	4,218.0
Northeast Washington River Basins	517.4	1,278.6
Odell Lake	2,605.9	6,439.3
Salmon River Basin	1,395.3	3,448.0
Southwest Idaho River Basins	360.0	889.5
Upper Columbia River Basin	67.8	167.4
Willamette River Basin	23.9	59.1
TOTAL	20,786.3	51,364.0

Note: Some reaches of the Columbia River mainstem within Columbia River Basin unit may border national forest lands. However, the Proposed Rule does not describe adjacent land managed by the USFS in this unit.

Length of Proposed Bull Trout Critical Habitat Streams that are within Designated Wilderness Areas*		
Critical Habitat Unit	Kilometers	Miles
Clark Fork River Basin	511.9	318.1
Clearwater River Basin	737.5	458.3
Deschutes River Basin	22.2	13.8
Grande Ronde River Basin	245.7	152.7
Hells Canyon Complex	31.8	19.8
Hood River Basin	4.0	2.5
Imnaha-Snake River Basins	71.4	44.4
John Day River Basin	134.9	83.8
Klamath River Basin	42.1	26.2
Kootenai River Basin	3.9	2.5
Malheur River Basin	27.9	17.4
Middle Columbia River Basin	98.2	61.0
Northeast Washington River Basins	3.4	2.1
Odell Lake	9.8	6.1
Salmon River Basin	1,890.5	1,174.7
Snake River	31.7	19.7
Snake River Basin in Washington	21.2	13.2
Southwest Idaho River Basins	158.1	98.2
Umatilla-Walla Walla River Basins	25.9	16.1
Upper Columbia River Basin	145.8	90.6
Willamette River Basin	6.6	4.1
TOTAL	4,224.5	2,625.

Area of Proposed Bull Trout Critical Habitat Lakes/Reservoirs that are within Designated Wilderness Areas*		
Critical Habitat Unit	Hectares	Acres
Clark Fork River Basin	415.8	1,027.3
Clearwater River Basin	22.2	54.9
Upper Columbus River Basin	46.4	114.7
TOTAL	484.4	1,196.9

Source: Provided by U.S. Fish and Wildlife Service, Portland.

* The figures in the above tables were derived from overlaying proposed Bull Trout Critical Habitat streams and lakes/reservoirs data with the following data layers:

- 1:100,000 scale land "Ownership" layers created in support of the Interior Columbia Basin Ecosystem Monitoring Program (ICBEMP) were used to define boundaries of public lands administered by the U.S. Forest Service in Washington, Oregon and Idaho.

- 1:100,000/1:500,000 scale "Wilderness" layer created in support of the ICBEMP was used to define boundaries of public lands designated as Wilderness Areas in Washington, Oregon and Idaho.

- 1:100,000 scale "Public Land Ownership and Managed Lands of Montana" layer created by the Montana Natural Heritage Program was used to define boundaries of public lands administered by the U.S. Forest Service as well as those designated as Wilderness Areas.

These figures should be used with the following caveats:

- The process of overlaying digital data from various sources can generate measurement error, mainly along edges of physical features. For example, a stream channel may be designated as the boundary of a particular land use designation, such as a Wilderness Area. When overlaying the digital representation of the stream channel and the Wilderness Area boundary, however, these may not be identical features. This source of error is also inherent in area calculations for lakes and reservoirs that border USFS lands and Wilderness Areas.

- In some cases, stream channels (especially for larger rivers), where delineated as polygon features, separate from the land ownership designation on either side of the channel. In cases where land ownership on <u>both</u> sides of such streams was "USFS" or "Wilderness Area", these streams (or portions of streams) were included in the appropriate length figures in the above tables.

- Likewise, lakes and reservoirs were often identified as "Water" polygons in the land ownership layers. If these polygons were <u>entirely</u> contained within USFS lands or Wilderness Areas, these features were included in the appropriate area figures in the above tables.

- The ICBEMP data sets (used for Washington, Oregon and Idaho) identified Federally owned wilderness areas, and of these areas that intersected proposed bull trout critical habitat, all were administered by the USFS. The Montana data set, on the other hand, also identified Wilderness Areas on Tribal lands. One such area exists west of the Mission Mountains Wilderness on lands of the Salish and Kootenai tribes. This area was considered in the final figures presented in the above tables, however, it accounts for only 3.7 km (2.3 miles) and 1.0 hectares (2.5 acres) of proposed bull trout critical habitat on wilderness area lands. The remainder of the wilderness areas identified in the Montana data set were administered by USFS.

APPENDIX F

Breakdown of the Co-Extensive Costs of the Designation by Proposed Critical Habitat Unit

F.1 Introduction

1. As noted in Section 1 of this report, Section 4(b)(2) of the Endangered Species Act (the Act) requires the Service to designate critical habitat on the basis of the best scientific data available, after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat. The Service may exclude areas from critical habitat designation when the benefits of exclusion outweigh the benefits of including the areas within critical habitat, provided the exclusion will not result in extinction of the species. The purpose of this appendix is to provide an allocation of the aggregate costs estimated in this report among the 25 proposed bull trout critical habitat units.

2. As is detailed below, there is uncertainty associated with both the magnitude and the location of some estimated future bull trout consultation-related costs. Certain estimated costs are easily assigned to specific proposed critical habitat units (such as dam-related consultations where the location of the dams in question are known). For other categories of costs, however, there is less certainty as to where within the range of the bull trout designation the costs will occur. Despite these uncertainties, the following analysis provides an allocation of estimated costs across proposed critical habitat units. Where no allocation can be made, or where an allocation has a significant degree of uncertainty associated with it, such limitations are noted.

F.2 Allocation of Consultation Costs by Unit

3. Section 4 of this report details the estimation of total annual costs associated with the preparation of section 7 bull trout consultations. Exhibit 4.1 presents the aggregate estimate of anticipated annual section 7 consultation related costs (exclusive of any additional forecast project modification costs). In order to allocate these costs to specific proposed units, the incidence of future formal consultations was assumed to follow the pattern of past formal consultation activity for the species.[1] Exhibit F.1 shows the percentage distribution of future formal consultations across critical habitat units and allocates the total estimated formal consultation-related costs to the Service, Action agencies and private applicants.

[1] The past consultation record includes consultations throughout the proposed designation for the species from listing in 1998 through November, 2002. This consultation record was augmented with information on ongoing consultation activities that might not be represented by the consultation record examined.

4. Additionally, Exhibit F.1 shows estimated informal consultation costs by unit. Estimates of future informal consultations were derived from the unit's share of field office formal consultations. For example, 40 formal bull trout consultations took place within the Portland office during the period examined. Ten of these formal consultations, or 25 percent, took place on projects located in the Hood River Basin. Given 15 informal bull trout consultations per year projected for the Portland office, the Hood River Basin is expected to see (0.25)*15, or 3.75 informal consultations annually. The unit informal consultation costs were then converted to a percentage of all informal consultations. The Hood River Basin represents 3.75 of 619 projected informal consultations across all units, or approximately 0.61 percent. Multiplying the unit share of all informal consultations (0.0061) by the estimated total annual cost of all informal consultations within the designation ($5,881,000) yields an estimated annual informal consultation cost estimate for the Hood River Unit of $36,000, after rounding to the nearest thousand.

5. The methodology used for allocating informal consultation activity reported by a field office among the critical habitat units within that office's jurisdiction has the potential for bias. Specifically, some offices have a large number of informal consultations and a relatively small number of formal consultations. In these cases, a large number of informal consultations (and associated consultation-related costs) may be allocated to a unit based on a relatively small sample of formal consultations. In cases where a significant share of total estimated costs associated with a specific unit are accounted for by predicted informal consultation costs, care should be taken in interpreting those estimates.

Exhibit F.1

Estimated Annual Formal and Informal Section 7 Consultation Costs by Proposed Critical Habitat Unit (Thousands $)

Unit	Unit Name	Percent of Formal Consultations	Formal Consultation Costs	Informal Consultation Costs	Total Consultation Costs
1	Klamath River Basin	4.0%	$100	$19	$119
2	Clark Fork River Basin	19.3%	$488	$321	$809
3	Kootenai River Basin	6.9%	$175	$115	$290
4	Willamette River Basin	3.0%	$75	$21	$96
5	Hood River Basin	5.0%	$125	$36	$161
6	Deschutes River Basin	2.0%	$50	$14	$64
7	Odell Lake	1.5%	$38	$11	$49
8	John Day River Basin	6.9%	$175	$50	$225
9	Umatilla-Walla Walla River Basins	1.5%	$38	$11	$49
10	Grande Ronde River Basin	2.5%	$63	$325	$388
11	Imnaha/Snake River Basins	3.5%	$88	$456	$544
12	Hells Canyon Complex	3.0%	$75	$672	$747
13	Malheur River Basin	5.5%	$138	$1,232	$1,370
14	Couer d'Alene Lake Basin	1.0%	$25	$130	$155
15	Clearwater River Basin	2.0%	$50	$448	$498
16	Salmon River Basin	5.0%	$125	$1,121	$1,246
17	Southwest Idaho River Basins	1.0%	$25	$224	$249
18	Little Lost River Basin	0.5%	$13	$112	$125
19	Lower Columbia River Basin	5.5%	$138	$105	$243
20	Middle Columbia Basin	1.0%	$25	$19	$44
21	Upper Columbia Basin	2.5%	$63	$48	$111
22	Northeast Washington River Basins	2.0%	$50	$261	$311
23	Snake River Basin in Washington	1.0%	$25	$130	$155
24	Columbia River	2.0%	$50	--	$50
25	Snake River	4.0%	$100	--	$100
Multiple Unit or Unknown Area		8.4%	$213	--	$213
	Total	100.0%	$2,526	$5,881	$8,407

F.3 Allocation of Unit-by-Unit Project Modification Costs

6. The second major component of anticipated costs associated with future section 7 consultations involving the bull trout are costs associated with project modifications resulting from the formal consultation process. In this analysis aggregate predicted annual project modification costs are examined and presented by associated Action agency and activity. These estimates are then allocated to each proposed critical habitat unit.

7. In the case of a number of relatively large classes of predicted project modification costs, unit allocation is a straightforward process. For example, there are significant annual project modification cost estimates associated with ACOE and BOR dam consultations in the Yakima and Willamette River Basins. These estimated costs are clearly assignable to the Middle Columbia and Willamette River Units, respectively. Other costs that were estimated across the designation are not as clearly assigned on a unit level. In these cases (such as FHWA costs and BLM grazing costs) additional information is utilized to allocate estimated costs.

8. In the following discussion, project modification costs are addressed for each Action agency and activity, and estimates of these costs are presented on a critical habitat unit level. Where significant uncertainty exists as to the distribution of estimated costs across units, this uncertainty is noted and implications of associated errors discussed.

F.3.1 U.S. Army Corps of Engineers

9. Two specific classes of project modification costs associated with ACOE section 7 bull trout consultations were identified: (1) dam and reservoir operations, and (2) bank stabilization, bridge replacement and stream restoration projects. In the case of forecast annual costs associated with dam and reservoir operations, these costs are specific to the Willamette River Drainage critical habitat unit (as discussed in Section 4). All of these costs ($3,290,000 to $3,490,000 annually) result from expected modifications and ongoing costs associated with section 7 bull trout consultations on 13 ACOE impoundments on the Upper Willamette River.

10. The estimated costs associated with bank stabilization, bridge replacement and stream restoration (estimated at $40,000/year) have been allocated across all critical habitat units based on the number of stream miles within each unit. One adjustment was made to this allocation. The number miles of streams within designated wilderness areas was subtracted from the total number of river and stream miles within a unit. This adjustment was made because project modifications within wilderness areas are not expected.

11. On a unit basis, project modification costs for bank stabilization, bridge replacement and stream restoration rarely exceed $2,000 per year. The Clark Fork Unit ($7,000 annually) and Salmon River Basin Unit ($9,000 annually) are the critical habitat units with the highest levels of these predicted costs.

Exhibit F.2

Estimated Annual Project Modification Costs Associated With Army Corps of Engineers (Thousands $)

Unit #	Unit Name	Project Modification Costs		
		Dam Modifications		Bank stabilization. Bridge Replacement and Stream Restoration
		Low	High	
1	Klamath River Basin	-		< $1
2	Clark Fork River Basin	-		$7
3	Kootenai River Basin	-		< $1
4	Willamette River Basin	$3,290	$3,490	< $1
5	Hood River Basin	-		< $1
6	Deschutes River Basin	-		$1
7	Odell Lake	-		< $1
8	John Day River Basin	-		$1
9	Umatilla-Walla Walla River Basins	-		< $1
10	Grande Ronde River Basin	-		$1
11	Imnaha/Snake River Basins	-		< $1
12	Hells Canyon Complex	-		$1
13	Malheur River Basin	-		< $1
14	Couer d'Alene Lake Basin	-		$2
15	Clearwater River Basin	-		$3
16	Salmon River Basin	-		$9
17	Southwest Idaho River Basins	-		$4
18	Little Lost River Basin	-		< $1
19	Lower Columbia River Basin	-		< $1
20	Middle Columbia Basin	-		$1
21	Upper Columbia Basin	-		$1
22	Northeast Washington River Basins	-		< $1
23	Snake River Basin in Washington	-		< $1
24	Columbia River	-		$1
25	Snake River	-		< $1
	Total	$3,290	$3,490	$40*

*Note: Total reflects sum of non-rounded project modification cost estimates.

F.3.2 Bureau of Land Management

12. The primary project modification costs resulting from BLM consultations with the Service are associated with conditions and requirements for grazing leases on BLM lands. These costs, estimated at $30,000 per year, have been allocated across the proposed critical habitat units based on the estimated share of total BLM land within each proposed unit.

13. BLM grazing costs for the bull trout are fairly minimal at the critical habitat unit level. Of the 25 proposed critical habitat units for the bull trout, only five units have project modification costs expected to exceed $1,000 annually. By far, the largest project modification cost estimate associated with BLM consultations occurs in the Salmon River Basin ($14,000 annually).

Exhibit F.3 Estimated Annual Project Modification Costs Associated with Bureau of Land Management (Thousand $)		
Unit #	**Unit Name**	**Project Modification Costs Grazing Leases**
1	Klamath River Basin	< $1
2	Clark Fork River Basin	< $1
3	Kootenai River Basin	< $1
4	Willamette River Basin	< $1
5	Hood River Basin	< $1
6	Deschutes River Basin	< $1
7	Odell Lake	$0
8	John Day River Basin	$2
9	Umatilla-Walla Walla River Basins	< $1
10	Grande Ronde River Basin	< $1
11	Imnaha/Snake River Basins	< $1
12	Hells Canyon Complex	$2
13	Malheur River Basin	$3
14	Couer d'Alene Lake Basin	< $1
15	Clearwater River Basin	< $1
16	Salmon River Basin	$14
17	Southwest Idaho River Basins	$4
18	Little Lost River Basin	$1
19	Lower Columbia River Basin	< $1
20	Middle Columbia Basin	< $1
21	Upper Columbia Basin	< $1
22	Northeast Washington River Basins	< $1
23	Snake River Basin in Washington	< $1
24	Columbia River	$0
25	Snake River	$0
	Total	$30*
*Note: Total reflects sum of non-rounded project modification cost estimates.		

F.3.3 Bonneville Power Administration

14. The primary project modification costs results from Bonneville Power Administration consultations with the Service are associated with conditions and requirements for the Federal Columbia River Power System (FCRPS). Other BPA project modification costs are associated with fisheries and habitat restoration. These costs are expected to range between $10,000 and $40,000 per year. The estimated annual BPA-related costs are allocated across the proposed critical habitat units based on the share of stream kilometers found within each proposed unit. One adjustment was made to this allocation. The kilometers of streams within designated wilderness areas were subtracted from the total number of river and stream miles within a unit. This adjustment was made because project modifications within wilderness areas are not expected.

15. It is estimated that annual BPA costs associated with section 7 consultation with the FCRPS involving the bull trout and its proposed critical habitat will cost between zero and $1.9 million. These estimated costs have been allocated among units based on actual past years' allocation of bull trout-related costs incurred by BPA. This allocation places roughly 10 percent of predicted costs within the Columbia River Unit, 29 percent within the Upper Columbia Unit, 25 percent within the Clark Fork Unit, and 36 percent within the Imnaha, Grand Ronde, and Walla Walla/Umatilla Units.

16. At the unit level, high-end annual estimated project modification cost estimates for BPA fisheries and habitat restoration are typically less than $1,500. The highest forecast project modification costs occur in the Clark Fork Unit ($7,000) and Salmon River Basin Unit ($9,000).

Exhibit F.4

Estimated Annual Project Modification Costs Associated With Bonneville Power Administration (Thousands $)

Unit #	Unit Name	Project Modification Costs		
		FCRPS	Fisheries, Restoration	
			Low End	High End
1	Klamath River Basin	$0	< $1	< $1
2	Clark Fork River Basin	$0 - $97	$2	$7
3	Kootenai River Basin	$0	< $1	< $1
4	Willamette River Basin	$0	< $1	< $1
5	Hood River Basin	$0	< $1	< $1
6	Deschutes River Basin	$0	< $1	$1
7	Odell Lake	$0	< $1	<$1
8	John Day River Basin	$0	< $1	$1
9	Umatilla-Walla Walla River Basins	$0 - $36	< $1	< $1
10	Grande Ronde River Basin	$0 - $18	< $1	$1
11	Imnaha/Snake River Basins	$0 - $18	< $1	< $1
12	Hells Canyon Complex	$0	< $1	$1
13	Malheur River Basin	$0	< $1	< $1
14	Couer d'Alene Lake Basin	$0	< $1	$2
15	Clearwater River Basin	$0	< $1	$3
16	Salmon River Basin	$0	$2	$9
17	Southwest Idaho River Basins	$0	< $1	$4
18	Little Lost River Basin	$0	< $1	< $1
19	Lower Columbia River Basin	$0	< $1	< $1
20	Middle Columbia Basin	$0	< $1	$1
21	Upper Columbia Basin	$0 - $141	< $1	$1
22	Northeast Washington River Basins	$0	< $1	< $1
23	Snake River Basin in Washington	$0	< $1	< $1
24	Columbia River	$0 - $56	< $1	$1
25	Snake River	$0	< $1	< $1
	Total	$0 - $366	$10*	$40*

*Note: Totals reflect sum of non-rounded project modification cost estimates.

F.3.4 Bureau of Reclamation

17. As presented in Section 4, cost estimates associated with project modifications resulting from section 7 bull trout consultations between the Service and BOR are specific to individual BOR facilities. Exhibit F.5 shows the allocation of total estimated annual bull trout-related project modification costs on a unit-by-unit basis.

18. The largest share of these project modification costs ($4,230,000 to $4,380,000 annually) are associated with the Middle Columbia River Basin critical habitat unit. These are estimated annual project modification costs to BOR impoundments on the Yakima River System. Other units with significant forecast costs are the Southwest Idaho River Basins Unit ($690,000 annually), the Deschutes River Basin and the Hells Canyon Complex Units ($200,000 annually apiece) and the Malheur River Basin Unit ($140,000 annually).

Exhibit F.5

Estimated Annual Project Modification Costs Associated With Bureau of Reclamation (Thousands $)

Unit #	Unit Name	Project Modification Costs Irrigation, Dam, and Reservoir Operations	
		Low End	High End
1	Klamath River Basin	-	-
2	Clark Fork River Basin	-	-
3	Kootenai River Basin	-	-
4	Willamette River Basin	-	-
5	Hood River Basin	-	-
6	Deschutes River Basin	$200	$200
7	Odell Lake	-	-
8	John Day River Basin	-	-
9	Umatilla-Walla Walla River Basins	-	-
10	Grande Ronde River Basin	-	-
11	Imnaha/Snake River Basins	-	-
12	Hells Canyon Complex	$200	$200
13	Malheur River Basin	$140	$140
14	Couer d'Alene Lake Basin	-	-
15	Clearwater River Basin	-	-
16	Salmon River Basin	-	-
17	Southwest Idaho River Basins	$690	$690
18	Little Lost River Basin	-	-
19	Lower Columbia River Basin	-	-
20	Middle Columbia Basin	$4,230	$4,380
21	Upper Columbia Basin	-	-
22	Northeast Washington River Basins	-	-
23	Snake River Basin in Washington	-	-
24	Columbia River	-	-
25	Snake River	-	-
	Total	$5,430	$5,610

F.3.5 Federal Highway Administration

19. The primary project modification costs resulting from Federal Highway Administration consultations with the Service are associated with bridge construction and maintenance. These costs, estimated at $250,000 per year, are allocated across the proposed critical habitat units based on the share of stream kilometers found within each proposed unit. One adjustment was made to this allocation. The kilometers of streams within designated wilderness areas were subtracted from the total number of river and stream miles within a unit. This adjustment was made because project modifications within wilderness areas are not expected.

20. Although project modification cost estimates for the FHWA are fairly low when distributed by unit, several critical habitat units stand out; specifically, the Clark Fork River Basin ($45,000), the Couer d'Alene Lake Basin ($12,000), the Clearwater River Basin ($21,000), the Salmon River Basin ($53,000) and the Southwest Idaho River Basins ($23,000).

Exhibit F.6 Estimated Annual Project Modification Costs Associated With Federal Highway Administration (Thousands $)		
Unit #	**Unit Name**	**Project Modification Costs**
1	Klamath River Basin	$4
2	Clark Fork River Basin	$45
3	Kootenai River Basin	$5
4	Willamette River Basin	$3
5	Hood River Basin	$2
6	Deschutes River Basin	$7
7	Odell Lake	< $1
8	John Day River Basin	$9
9	Umatilla-Walla Walla River Basins	$6
10	Grande Ronde River Basin	$7
11	Imnaha/Snake River Basins	$2
12	Hells Canyon Complex	$9
13	Malheur River Basin	$3
14	Couer d'Alene Lake Basin	$12
15	Clearwater River Basin	$21
16	Salmon River Basin	$53
17	Southwest Idaho River Basins	$24
18	Little Lost River Basin	$2
19	Lower Columbia River Basin	$3
20	Middle Columbia Basin	$7
21	Upper Columbia Basin	$7
22	Northeast Washington River Basins	$3
23	Snake River Basin in Washington	$3
24	Columbia River	$8
25	Snake River	$5
	Total	$250*
*Note: Total represents sum of non-rounded project modification estimates.		

F.3.6 Federal Energy Regulatory Commission

21. For project modifications resulting from FERC consultations, this analysis uses information from specific dams where future section 7 consultations will take place. Bull trout consultations generally coincide with the dam re-licensing process. To estimate project modification costs, the actual re-license date was used in discounting future costs to present. Table F.7a provides estimates based on a seven percent rate, and Table F.7b presents estimates based on a three percent rate. The highest cost estimates are associated with critical habitat units with significant damming, such as the Columbia River (with high end annual cost estimates of $362,000 and $218,000, using rates of seven and three percent, respectively).

Exhibit F.7a

Estimated Annual Project Modification Costs Associated With Federal Energy Regulation Commission Seven Percent Discount Rate (Thousands $)

Unit	Unit Name	Section 7 Bull Trout-Related Costs	
		Low	High
1	Klamath River Basin	< $1	< $1
2	Clark Fork River Basin	$50	$91
3	Kootenai River Basin	$0	$0
4	Willamette River Basin	$80	$111
5	Hood River Basin	$14	$38
6	Deschutes River Basin	$129	$177
7	Odell Lake	$0	$0
8	John Day River Basin	$0	$0
9	Umatilla-Walla Walla Rivers	< $1	< $1
10	Grande Ronde River Basin	$0	$0
11	Imnaha/Snake River	$0	$0
12	Hells Canyon Complex	$99	$135
13	Malheur River Basin	$0	$0
14	Couer d'Alene Lake Basin	$0	$0
15	Clearwater River Basin	< $1	<$1
16	Salmon River Basin	< $1	< $1
17	Southwest Idaho Rivers	$24	$36
18	Little Lost River Basin	$0	$0
19	Lower Columbia River Basin	$90	$123
20	Middle Columbia Basin	$1	$3
21	Upper Columbia Basin	$0	$0
22	N.E. Wash. River Basins	$183	$248
23	Snake River Basin in Wash.	$0	$0
24	Columbia River	$265	$362
25	Snake River	$0	$0
	Total	$939	$1,328

Exhibit F.7b

Estimated Annual Project Modification Costs Associated With Federal Energy Regulation Commission Three Percent Discount Rate (Thousands $)

Unit	Unit Name	Section 7 Bull Trout-Related Costs	
		Low	High
1	Klamath River Basin	< $1	<$1
2	Clark Fork River Basin	$56	$77
3	Kootenai River Basin	$0	$0
4	Willamette River Basin	$54	$69
5	Hood River Basin	$14	$22
6	Deschutes River Basin	$67	$84
7	Odell Lake	$0	$0
8	John Day River Basin	$0	$0
9	Umatilla-Walla Walla Rivers	< $1	<$1
10	Grande Ronde River Basin	$0	$0
11	Imnaha/Snake River	$0	$0
12	Hells Canyon Complex	$57	$72
13	Malheur River Basin	$0	$0
14	Couer d'Alene Lake Basin	$0	$0
15	Clearwater River Basin	<$1	<$1
16	Salmon River Basin	< $1	< $1
17	Southwest Idaho Rivers	$33	$44
18	Little Lost River Basin	$0	$0
19	Lower Columbia River Basin	$53	$66
20	Middle Columbia Basin	$4	$6
21	Upper Columbia Basin	$0	$0
22	N.E. Wash. River Basins	$106	$132
23	Snake River Basin in Wash.	$0	$0
24	Columbia River	$174	$218
25	Snake River	$0	$0
	Total	$622	$794

F.3.7 U. S. Forest Service

22. Project modification costs forecast to result from U.S. Forest Service consultations with the Service fall under five categories: (1) timber harvest, (2) grazing, (3) mining, (4) forest and road management and (5) irrigation diversions. For all proposed critical habitat units, timber harvest costs range between $1,640,000 and $4,140,000 per year, grazing costs are estimated as $100,000 per year, mining costs are expected to be $530,000 per year, forest and road maintenance is expected to cost between $0 and $230,000 per year, and irrigation diversions are expected to cost between $0 and $1,687,000. These costs are all allocated across the proposed critical habitat units based on the share of all Forest Service controlled stream kilometers found within each proposed unit. One adjustment was made to this allocation. The kilometers of streams within designated wilderness areas were subtracted from the total number of river and stream miles within a unit. This adjustment was made because project modifications within wilderness areas are not expected.

23. High end project modification cost forecasts associated with timber harvest exceed $500,000 in several units: the Clark Fork River Basin ($682,000), the Clearwater River Basin ($553,000), the Salmon River Basin ($1,104,000), and the Southwest Idaho River Basin ($593,000) critical habitat units.

24. The majority (17) of unit project modification cost estimates for grazing are less than $2,000. The Clark Fork River Basin ($16,000), the Clearwater River Basin ($13,000), the Salmon River Basin ($27,000), and the Southwest Idaho River Basins ($14,000) are forecast to experience relatively high project modification costs associated with grazing on Forest Service land.

25. The analysis identifies four specific critical habitat units where section 7 compliance affects mining activity on Forest Service land. Project modification cost estimates come to $100,000 for the Clark Fork River Basin, $220,000 for the John Day River Basin, $110,000 for the Hells Canyon Complex, and $100,000 for the Clearwater River Basin.

26. Project modification cost estimates for road maintenance and forest management are less than $5,000 in 17 of the 25 critical habitat units. The Clark Fork River Basin ($38,000), the Clearwater River Basin ($31,000), the Salmon River Basin ($61,000), and the Southwest Idaho River Basins ($33,000) are forecast to experience relatively high project modification costs associated with road maintenance and forest management.

27. The same four critical habitat units are forecast to experience high project modification costs associated with irrigation diversions. The high end annual irrigation diversion cost estimates reach $278,000 for the Clark Fork River Basin, $225,000 for the Clearwater River Basin, $450,000 for the Salmon River Basin, and $242,000 for the Southwest Idaho River Basins.

Exhibit F.8

Estimated Annual Project Modification Costs Associated With U.S. Forest Service (Thousands $)

#	Unit Name	Project Modification Costs							
		Timber		Grazing	Mining	Road and Forest Management		Irrigation Diversions	
		Low	High			Low	High	Low	High
1	Klamath River	$21	$53	$1	-	$0	$3	$0	$22
2	Clark Fork River	$270	$682	$16	$100	$0	$38	$0	$278
3	Kootenai River	$27	$69	$2	-	$0	$4	$0	$28
4	Willamette River	$17	$43	$1	-	$0	$2	$0	$17
5	Hood River	$9	$23	< $1	-	$0	$1	$0	$9
6	Deschutes River	$26	$66	$2	-	$0	$4	$0	$27
7	Odell Lake	$2	$4	< $1	-	$0	< $1	$0	$2
8	John Day River	$46	$116	$3	$220	$0	$6	$0	$47
9	Umatilla-Walla River	$21	$54	$1	-	$0	$3	$0	$22
10	Grande Ronde River	$32	$81	$2	-	$0	$4	$0	$33
11	Imnaha/Snake River	$10	$26	< $1	-	$0	$1	$0	$11
12	Hells Canyon	$48	$121	$3	$110	$0	$7	$0	$49
13	Malheur River	$25	$62	$1	-	$0	$3	$0	$25
14	CDA Lake	$52	$132	$3	-	$0	$7	$0	$54
15	Clearwater River	$219	$553	$13	$100	$0	$31	$0	$225
16	Salmon River	$437	$1,104	$27	-	$0	$61	$0	$450
17	Southwest Idaho River	$235	$593	$14	-	$0	$33	$0	$242
18	Little Lost River	$9	$22	< $1	-	$0	$1	$0	$9
19	Lower Columbia	$7	$16	< $1	-	$0	< $1	$0	$7
20	Middle Columbia	$32	$80	$2	-	$0	$4	$0	$32
21	Upper Columbia	$52	$131	$3	-	$0	$7	$0	$53
22	Northeast Washington	$21	$52	$1	-	$0	$3	$0	$21
23	Snake River Washington	$16	$41	< $1	-	$0	$2	$0	$17
24	Columbia River	$6	$15	< $1	-	$0	< $1	$0	$6
25	Snake River	$0	$0	$0	-	$0	$0	$0	$0
	Total	$1,640	$4,139	100*	$530	$0	$230*	$0	$1,686

*Note: Totals reflect non-rounded sums of project modification estimates.

F.3.8 Other Agencies

28. Additional project modification costs are forecast to be associated with consultations between Bureau of Indian Affairs, National Park Service, Fish and Wildlife Service, U.S. Geological Survey, U.S. Department of Agriculture and National Oceanic and Atmospheric Administration and the Service. These are forecast to be, in total, $110,000 per year. These costs are allocated across the proposed critical habitat units based on the share of stream kilometers found within each proposed unit. One adjustment was made to this allocation. The kilometers of streams within designated wilderness areas were subtracted from the total number of river and stream miles within a unit. This adjustment was made project modifications within wilderness areas are not expected. Once again the unit cost allocation forecasts the highest costs to occur in the Clark Fork ($20,000) and Salmon ($24,000) River Basins.

Exhibit F.9 Estimated Annual Project Modification Costs Associated with Other Action Agencies (BIA, NPS, FWS, USGS, USDA, NOAA) (Thousands $)		
Unit #	**Unit Name**	**Project Modification Costs**
1	Klamath River Basin	$2
2	Clark Fork River Basin	$20
3	Kootenai River Basin	$2
4	Willamette River Basin	$1
5	Hood River Basin	< $1
6	Deschutes River Basin	$3
7	Odell Lake	< $1
8	John Day River Basin	$4
9	Umatilla-Walla Walla River Basins	$2
10	Grande Ronde River Basin	$3
11	Imnaha/Snake River Basins	< $1
12	Hells Canyon Complex	$4
13	Malheur River Basin	$1
14	Couer d'Alene Lake Basin	$5
15	Clearwater River Basin	$9
16	Salmon River Basin	$24
17	Southwest Idaho River Basins	$10
18	Little Lost River Basin	< $1
19	Lower Columbia River Basin	$1
20	Middle Columbia Basin	$3
21	Upper Columbia Basin	$3
22	Northeast Washington River Basins	$1
23	Snake River Basin in Washington	$1
24	Columbia River	$3
25	Snake River	$2
	Total	$110*
*Note: Total reflects non-rounded sum of project modification cost estimates.		

F.3.9 Summary of Unit-by-Unit Annual Cost Estimates

29. Exhibits F.10 and F.11 present estimates of total annual section 7 consultation related costs for occupied and all proposed bull trout critical habitat respectively. Exhibit F.11 inflates the estimates from Exhibit F.10 to account for the percentage of the unit's proposed critical habitat that is either not currently occupied by the bull trout, or is of unknown occupancy.

30. The two proposed critical habitat units with the largest estimated annual costs are the Middle Columbia Basin ($4.9 to $5.2 million) and the Willamette River Basin ($4.3 to $4.6 million). Both of these units have large dam consultations currently ongoing that are expected to result in substantial costs associated with future bull trout protection. It is important to note, however, that both units are also currently in consultation with NOAA Fisheries on other listed species which will likely require very nearly the same level of expenditures to protect those species. Therefore, it is possible that some of the forecast costs for these units would be incurred regardless of the status of the bull trout and its consultation process.

31. Other units with significant estimated annual costs include the large Salmon and Southwest Idaho River Basins in Idaho, and the Clark Fork River Basin in Montana. This is not surprising as these are generally spatially very large units.

Exhibit F.10

Total Annual Estimated Project Modification and Consultation Costs for Occupied Bull Trout Habitat (Thousands $)

Unit #	Unit Name	Project Modification Costs		Section 7 Consultation Costs	Total Costs	
		Low End	High End		Low End	High End
1	Klamath River Basin	$36	$93	$119	$155	$212
2	Clark Fork River Basin	$499	$1,307	$809	$1,308	$2,116
3	Kootenai River Basin	$47	$121	$290	$337	$411
4	Willamette River Basin	$3,372	$3,675	$96	$3,468	$3,771
5	Hood River Basin	$29	$77	$161	$190	$238
6	Deschutes River Basin	$316	$497	$64	$380	$561
7	Odell Lake	$3	$7	$49	$52	$56
8	John Day River Basin	$285	$409	$225	$510	$634
9	Umatilla-Walla River Basins	$39	$133	$49	$88	$182
10	Grande Ronde River Basin	$56	$162	$388	$444	$550
11	Imnaha/Snake River Basins	$18	$65	$544	$562	$609
12	Hells Canyon Complex	$341	$549	$747	$1,088	$1,296
13	Malheur River Basin	$182	$249	$1,370	$1,552	$1,619
14	Couer d'Alene Lake Basin	$93	$236	$155	$248	$391
15	Clearwater River Basin	$339	$931	$498	$837	$1,429
16	Salmon River Basin	$707	$1,892	$1,246	$1,953	$3,138
17	Southwest Idaho River Basins	$1,080	$1,736	$249	$1,329	$1,985
18	Little Lost River Basin	$16	$40	$125	$141	$165
19	Lower Columbia River Basin	$67	$155	$243	$310	$398
20	Middle Columbia Basin	$4,286	$4,526	$44	$4,330	$4,570
21	Upper Columbia Basin	$84	$365	$111	$195	$476
22	Northeast Washington River Basins	$139	$338	$311	$450	$649
23	Snake River Basin in Washington	$27	$71	$155	$182	$226
24	Columbia River	$194	$455	$50	$244	$505
25	Snake River	$8	$8	$100	$108	$108

Exhibit F.11

Total Estimated Annual Project Modification and Consultation Costs for All Proposed Bull Trout Critical Habitat (Thousands $)

Unit #	Unit Name	Total Costs - Occupied Habitat		% Unknown Occupancy	Total Costs - All Proposed Habitat	
		Low End	High End		Low End	High End
1	Klamath River Basin	$155	$212	72	$267	$365
2	Clark Fork River Basin	$1,308	$2,116	0	$1,308	$2,116
3	Kootenai River Basin	$337	$411	0	$337	$411
4	Willamette River Basin	$3,468	$3,771	23	$4,266	$4,638
5	Hood River Basin	$190	$238	43	$272	$340
6	Deschutes River Basin	$380	$561	37	$521	$769
7	Odell Lake	$52	$56	0	$52	$56
8	John Day River Basin	$510	$634	19	$607	$754
9	Umatilla-Walla Walla River Basins	$88	$182	17	$103	$213
10	Grande Ronde River Basin	$444	$550	7	$475	$589
11	Imnaha/Snake River Basins	$562	$609	0	$562	$609
12	Hells Canyon Complex	$1,088	$1,296	48	$1,610	$1,918
13	Malheur River Basin	$1,552	$1,619	25	$1,940	$2,024
14	Couer d'Alene Lake Basin	$248	$391	46	$362	$571
15	Clearwater River Basin	$837	$1,429	13	$946	$1,615
16	Salmon River Basin	$1,953	$3,138	6	$2,070	$3,326
17	Southwest Idaho River Basins	$1,329	$1,985	24	$1,648	$2,461
18	Little Lost River Basin	$141	$165	8	$152	$178
19	Lower Columbia River Basin	$310	$398	20	$372	$478
20	Middle Columbia Basin	$4,330	$4,570	13	$4,893	$5,164
21	Upper Columbia Basin	$195	$476	9	$213	$519
22	Northeast Washington River Basins	$450	$649	54	$693	$999
23	Snake River Basin in Washington	$182	$226	23	$224	$278
24	Columbia River	$244	$505	0	$244	$505
25	Snake River	$108	$108	20	$130	$130

Note: Total costs for this table will differ slightly from total costs in row E of Exhibit 4.2 due to the differential effects of inflating costs by percent of unoccupied habitat at the unit level (as in this exhibit) and at the aggregate level (as in Exhibit 4.2).