



ECONOMIC ANALYSIS OF PROPOSED
CRITICAL HABITAT DESIGNATION FOR
THE OREGON CHUB

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prepared for:

U.S. Fish and Wildlife Service

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EXECUTIVE SUMMARY

1. The purpose of this report is to identify and analyze the potential economic impacts associated with the proposed critical habitat designation for the Oregon chub (*Oregonichthys crameri*, hereafter, "chub"). This report was prepared by Industrial Economics, Incorporated (IEc), under contract to the U.S. Fish and Wildlife Service (Service).¹
2. A Final Rule to list the chub as endangered in the Willamette River Basin was published on October 18, 1993.² Subsequently, the Service published a rule on March 10, 2009 proposing critical habitat designation on 132 acres across three areas, comprising 25 distinct units.³ These units are water bodies ranging in size from 0.1 to 34.5 acres, and are distributed throughout tributaries of the Willamette River, generally located in off-channel areas protected from the mainstem flow. Proposed critical habitat is a mix of Federal (51 percent), private (25 percent), State (23 percent), and locally owned areas (two percent). Exhibit ES-1 presents an overview map of the proposed habitat.
3. This analysis describes the economic effects of chub conservation efforts associated with the following categories of activity: (1) water management, (2) agriculture, (3) forestry, (4) transportation, and (5) habitat management. Forecast impacts are organized into two categories according to "without critical habitat" and "with critical habitat" scenarios. The "without critical habitat" scenario represents the baseline for the analysis, considering protections already accorded the chub; for example, protections provided under the Federal and State listing and other Federal, State, and local regulations. The "with critical habitat" scenario describes the incremental impacts associated specifically with the designation of critical habitat for the species. The incremental conservation efforts and associated economic impacts would not occur but for the designation. This analysis also looks at indirect costs that are the result of the influence of critical habitat designation upon other, non-Federal decision-makers. Given data limitations, this analysis only quantifies benefits in one instance where chub-related water transfers potentially increase recreational activity in Lookout Point reservoir (in Section 3 of the analysis). For all other categories of benefits, a qualitative discussion is provided in Section 8 of the report.

¹ Dr. Richard Adams, Emeritus Professor at Oregon State University, served as Principal Investigator for this analysis. Dr. Lon Peters, President of Northwest Economic Research, Inc., provided technical oversight and peer review on issues related to hydropower and water management.

² 58 FR 53800.

³ 74 FR 10418.

4. This analysis estimates baseline impacts at \$3.33 million to \$13.2 million and incremental impacts at \$108,000 between 2010 and 2029 (assuming a seven percent discount rate). These impacts are low relative to the conservation costs for other threatened and endangered aquatic species in the Pacific Northwest for a few reasons: (1) unlike Pacific salmon or bull trout, the proposed critical habitat for the chub is predominantly made up of small, hydrologically disconnected habitat units and therefore related conservation efforts do not affect system flows; (2) the 25 units total only 132 acres and are typically isolated from economic activity; and (3) the long history of listing and other protections for the chub have afforded the species an established baseline of ongoing conservation efforts. The majority of estimated baseline costs arise from anticipated mitigation for future transportation projects, impacts to recreational activities and hydropower generation arising from changes in flows, and ongoing habitat management efforts,, which collectively account for over 95 percent of the high-end costs estimated in this analysis. Incremental impacts are forecast to be entirely administrative costs of section 7 consultations.
5. Key findings of this analysis are presented below. Throughout the report, impacts occurring prior to the finalization of this proposed rule (1993 to 2009) are referred to as “pre-designation” impacts. Likewise, impacts anticipated to occur after publication of the final rule (2010 to 2029) are referred to as “post-designation” impacts. Post-designation impacts may occur in the baseline or be attributed as incremental to the designation.
6. A summary of post-designation baseline impacts is presented in Exhibit ES-2, and a summary of incremental impacts is presented in Exhibit ES-3. The distribution across activities of post-designation baseline and incremental impacts is provides in Exhibits ES-4 and ES-5, respectively. Exhibits ES-6 and ES-7 present unit-by-unit post-designation baseline and incremental impacts, respectively. Exhibit ES-8 provides baseline and incremental impact rankings for the 25 units.
7. The present value of costs, by time period and activity, are presented throughout the report applying a discount rate of seven percent; the report tables are repeated in Appendix B applying a discount rate of three percent. Appendix C presents the undiscounted stream of impacts. Administrative costs of consultations under section 7 of the Endangered Species Act are incorporated into each Section corresponding to the activity for which the consultations are undertaken.

KEY FINDINGS

Post-designation Baseline Impacts: Baseline impacts associated with conservation of the chub and its habitat are estimated to be \$4.59 million to \$15.9 million (\$306,000 to \$1.05 million on an annualized basis), assuming a three percent discount rate, or \$3.33 million to \$13.2 million (\$309,000 to \$1.18 million on an annualized basis), assuming a seven percent discount rate, through the year 2029. In the high-end scenario, impacts to transportation activities represent approximately 59.3 percent of total impacts, followed by impacts arising from water management activities (18.4 percent), habitat management impacts (17.7 percent), agricultural impacts (4.3 percent), and impacts to forestry activities (0.3 percent).

- **Transportation:** Impacts to transportation activities are estimated to be \$223,000 to \$7.83 million, discounted at seven percent. The large majority of costs relate to potential land purchases from conservation banks to offset direct habitat loss due to planned transportation projects by the Oregon Department of Transportation. The large range of potential impacts reflects uncertainty in potential credit prices for the chub. In the absence of chub-specific information, the analysis assumes a price of between \$3,000 and \$125,000 per acre based on a survey of credit prices at conservation banks in ten states.
- **Water Management:** Impacts to water management-related activities are estimated to be \$731,000 to \$2.43 million, discounted at seven percent. The largest cost expected in the post-designation period results from periodic chub-related flow releases that affect recreational activities and hydropower generation at Detroit Lake; these impacts are estimated to be \$681,000 to \$2.38 million, assuming a seven percent discount rate.
- **Habitat Management:** Baseline impacts to habitat management activities are estimated to be \$2.34 million, assuming a seven percent discount rate. Activities associated with these impacts include chub surveying and monitoring, reintroduction efforts, research, and design, engineering, and implementation of habitat improvement projects.
- **Agriculture:** Agricultural conservation efforts are estimated to be \$0 to \$562,000, depending on the discount rate. Costs stem from lost agricultural production resulting from the implementation of pesticide free-buffers around Pacific salmon habitat that intersect with buffers around chub habitat.
- **Forestry:** Forestry-related impacts are estimated to be \$37,700, discounted at seven percent. Aside from small administrative costs arising from section 7 consultations, impacts stem from restrictions on timber harvesting activities around streams to preserve water quality in chub habitat.

Incremental Impacts: Incremental impacts associated with the designation of critical habitat for the chub are forecast to be entirely administrative costs associated with expected section 7 consultations. These costs are estimated to be \$146,000 (\$9,720 on an annualized basis), assuming a three percent discount rate, or \$108,000 (\$10,100 annualized) through 2029, assuming a seven percent discount rate. Impacts arising from habitat management consultations represent 66.6 percent of total impacts (\$66,300), followed by water management consultations at 20.5 percent (\$22,200), transportation consultations at 8.3 percent (\$9,000), and forestry consultations at 4.5 percent (\$4,910). No consultations are anticipated due to agricultural activities.

Units with the Highest Impacts

Baseline Impacts: Under the high-end scenario, Unit 2B(1) has the largest baseline impacts of the areas considered for designation of \$4.59 million, assuming a discount rate of seven percent. These arise predominantly from mitigation banking for anticipated transportation projects. Under the low-end scenario, Unit 1A is highest with impacts of \$738,000, stemming primarily from impacts to recreational activities and hydropower generation.

Incremental Impacts: Unit 3H has the largest incremental impacts of the areas considered for designation, \$7,680, assuming a discount rate of seven percent. These arise entirely from administrative costs of section 7 consultation.

EXHIBIT ES-1 PROPOSED CRITICAL HABITAT

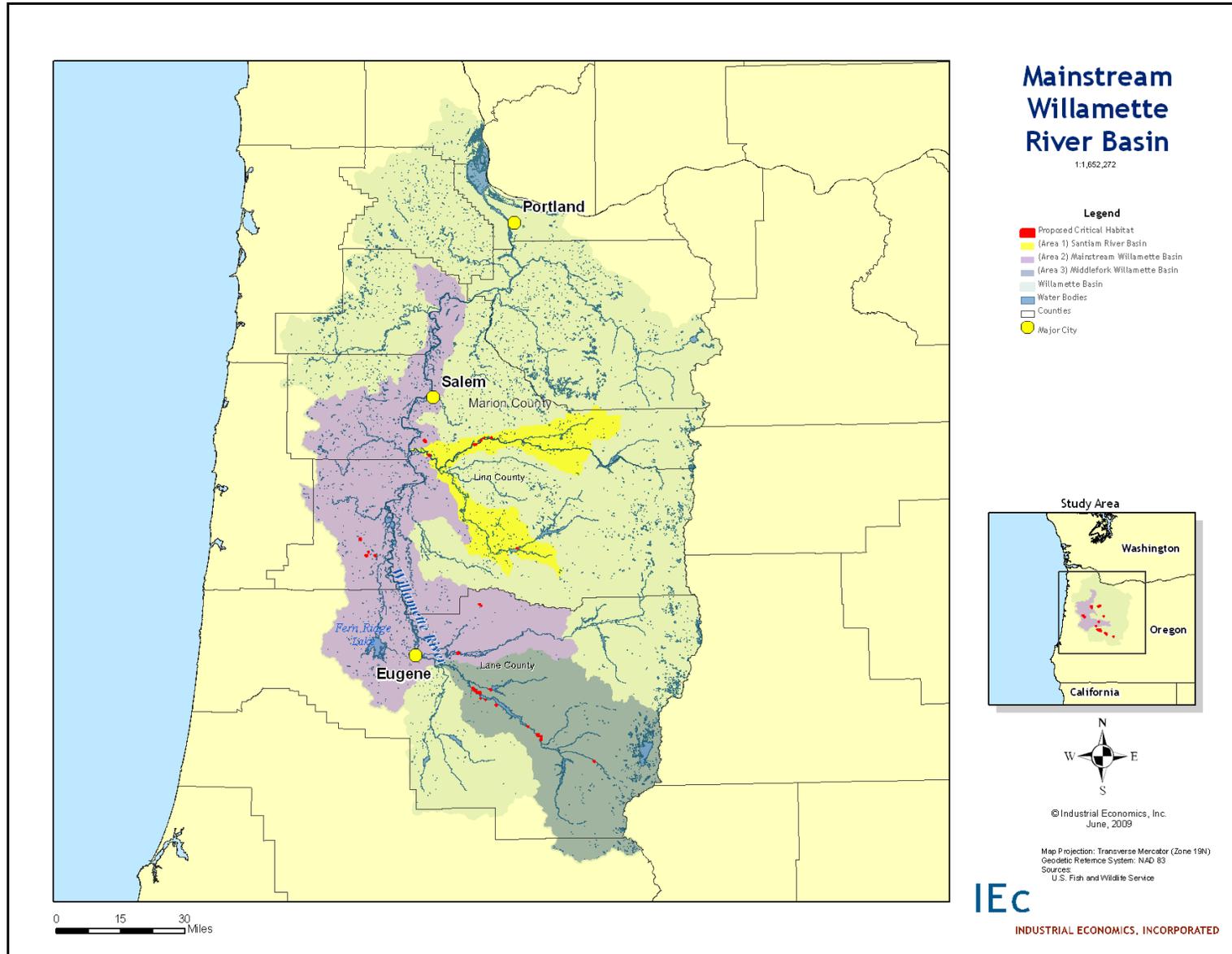


EXHIBIT ES-2 SUMMARY OF POST-DESIGNATION BASELINE IMPACTS BY ACTIVITY, 2010-2029

ACTIVITY	PRESENT VALUE IMPACTS				ANNUALIZED IMPACTS			
	3 PERCENT		7 PERCENT		3 PERCENT		7 PERCENT	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
Water Management	\$1,050,000	\$3,490,000	\$731,000	\$2,430,000	\$68,700	\$228,000	\$64,500	\$214,000
Agriculture	\$0	\$789,000	\$0	\$562,000	\$0	\$53,000	\$0	\$53,000
Forestry	\$53,000	\$53,000	\$37,700	\$37,700	\$3,470	\$3,470	\$3,360	\$3,360
Transportation	\$245,000	\$8,360,000	\$223,000	\$7,830,000	\$16,000	\$545,000	\$19,900	\$691,000
Habitat Management	\$3,240,000	\$3,240,000	\$2,340,000	\$2,340,000	\$218,000	\$218,000	\$221,000	\$221,000
Total	\$4,590,000	\$15,900,000	\$3,330,000	\$13,200,000	\$306,000	\$1,050,000	\$309,000	\$1,180,000

Note: Totals may not sum due to rounding.

EXHIBIT ES-3 SUMMARY OF INCREMENTAL IMPACTS BY ACTIVITY, 2010-2029

ACTIVITY	PRESENT VALUE IMPACTS		ANNUALIZED IMPACTS	
	3 PERCENT	7 PERCENT	3 PERCENT	7 PERCENT
Water Management	\$30,300	\$22,200	\$1,980	\$1,960
Agriculture	\$0	\$0	\$0	\$0
Forestry	\$5,610	\$4,910	\$377	\$463
Transportation	\$11,200	\$9,000	\$756	\$850
Habitat Management	\$98,400	\$72,200	\$6,610	\$6,810
Total	\$146,000	\$108,000	\$9,720	\$10,100

Note: Totals may not sum due to rounding.

EXHIBIT ES-4 DISTRIBUTION OF HIGH-END POST-DESIGNATION BASELINE IMPACTS BY ACTIVITY TYPE (DISCOUNTED AT 7 PERCENT)

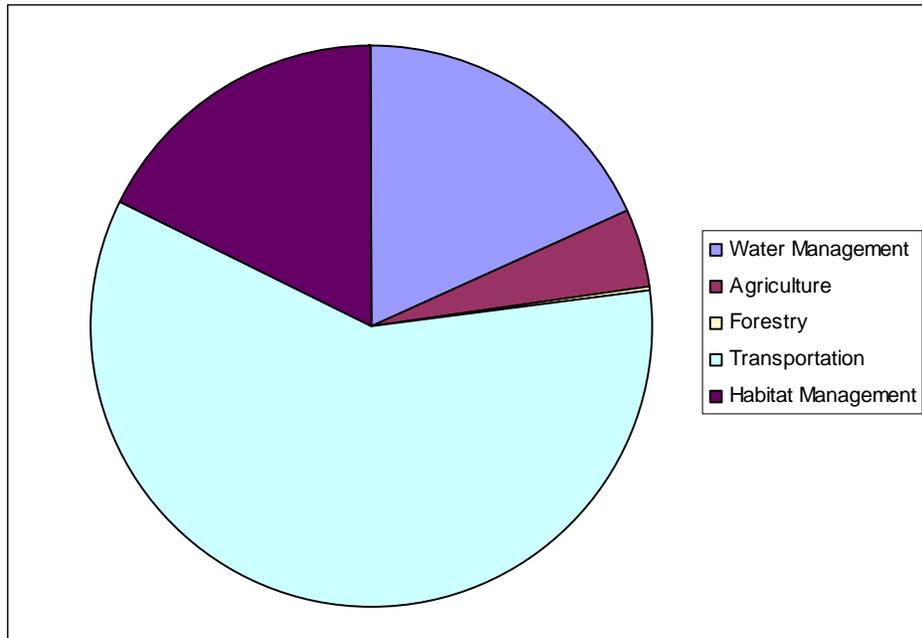


EXHIBIT ES-5 DISTRIBUTION OF INCREMENTAL IMPACTS BY ACTIVITY TYPE (DISCOUNTED AT 7 PERCENT)

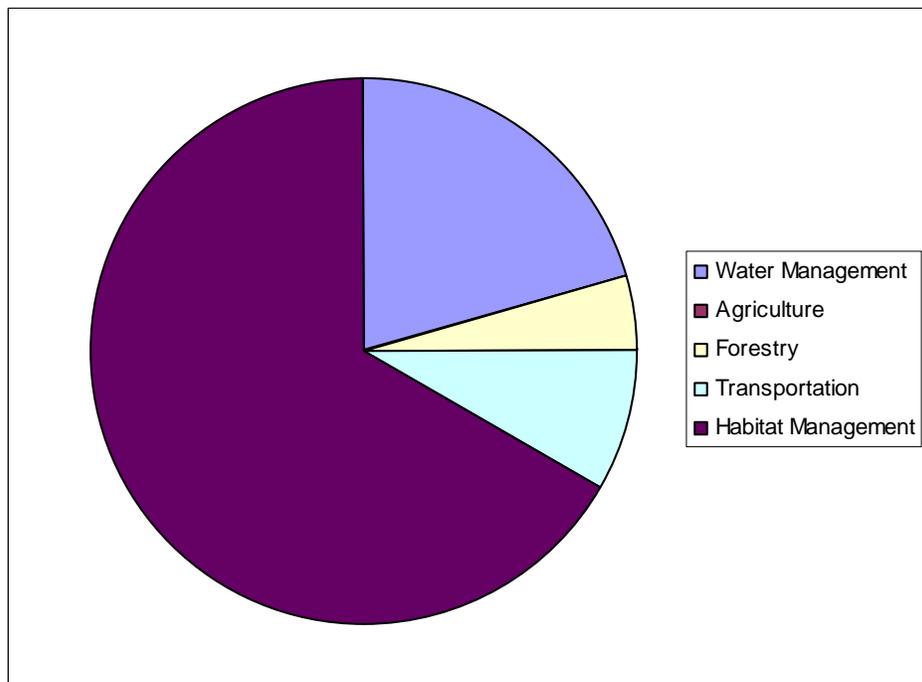


EXHIBIT ES-6 POST-DESIGNATION BASELINE IMPACTS BY UNIT, 2010-2029

UNIT	PRESENT VALUE IMPACTS				ANNUALIZED IMPACTS			
	3 PERCENT		7 PERCENT		3 PERCENT		7 PERCENT	
	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
1A	\$1,050,000	\$3,880,000	\$738,000	\$2,810,000	\$68,900	\$254,000	\$65,300	\$248,000
1B(1)	\$59,300	\$284,000	\$43,900	\$261,000	\$3,970	\$18,700	\$4,090	\$23,200
1B(2)	\$56,700	\$189,000	\$41,400	\$165,000	\$3,800	\$12,500	\$3,870	\$14,900
1B(3)	\$54,400	\$78,100	\$39,100	\$61,900	\$3,650	\$5,190	\$3,670	\$5,690
1B(4)	\$75,800	\$811,000	\$58,500	\$766,000	\$5,050	\$53,100	\$5,400	\$67,800
1C	\$52,400	\$52,400	\$37,200	\$37,200	\$3,520	\$3,520	\$3,500	\$3,500
2A(1)	\$52,400	\$52,400	\$37,200	\$37,200	\$3,520	\$3,520	\$3,500	\$3,500
2A(2)	\$55,900	\$90,400	\$40,500	\$72,400	\$3,750	\$6,000	\$3,800	\$6,620
2A(3)	\$52,400	\$83,500	\$37,200	\$59,400	\$3,520	\$5,610	\$3,500	\$5,590
2B(1)	\$164,000	\$4,970,000	\$142,000	\$4,590,000	\$10,800	\$326,000	\$12,800	\$408,000
2B(2)	\$96,900	\$1,770,000	\$74,600	\$1,510,000	\$6,430	\$115,000	\$6,810	\$133,000
2B(3)	\$52,400	\$52,400	\$37,200	\$37,200	\$3,520	\$3,520	\$3,500	\$3,500
2B(4)	\$52,400	\$52,400	\$37,200	\$37,200	\$3,520	\$3,520	\$3,500	\$3,500
2B(5)	\$123,000	\$974,000	\$92,000	\$881,000	\$8,110	\$63,600	\$8,370	\$77,900
3A	\$720,000	\$720,000	\$524,000	\$524,000	\$48,400	\$48,400	\$49,500	\$49,500
3B	\$52,400	\$52,400	\$37,200	\$37,200	\$3,520	\$3,520	\$3,500	\$3,500
3C	\$52,400	\$52,400	\$37,200	\$37,200	\$3,520	\$3,520	\$3,500	\$3,500
3D	\$52,400	\$52,400	\$37,200	\$37,200	\$3,520	\$3,520	\$3,500	\$3,500
3E	\$386,000	\$386,000	\$281,000	\$281,000	\$25,900	\$25,900	\$26,500	\$26,500
3F	\$389,000	\$389,000	\$283,000	\$283,000	\$26,100	\$26,100	\$26,700	\$26,700
3G	\$55,400	\$55,400	\$39,400	\$39,400	\$3,710	\$3,710	\$3,690	\$3,690
3H	\$721,000	\$721,000	\$525,000	\$525,000	\$48,500	\$48,500	\$49,600	\$49,600
3I	\$53,900	\$53,900	\$38,300	\$38,300	\$3,620	\$3,620	\$3,600	\$3,600
3J	\$53,900	\$53,900	\$38,300	\$38,300	\$3,620	\$3,620	\$3,600	\$3,600
3K	\$52,400	\$52,400	\$37,200	\$37,200	\$3,520	\$3,520	\$3,500	\$3,500
Total	\$4,590,000	\$15,900,000	\$3,330,000	\$13,200,000	\$306,000	\$1,050,000	\$309,000	\$1,180,000

Note: Totals may not sum due to rounding.

EXHIBIT ES-7 INCREMENTAL IMPACTS BY UNIT, 2010-2029

UNIT	PRESENT VALUE IMPACTS		ANNUALIZED IMPACTS	
	3 PERCENT	7 PERCENT	3 PERCENT	7 PERCENT
1A	\$7,810	\$6,050	\$523	\$565
1B(1)	\$5,150	\$3,780	\$343	\$351
1B(2)	\$5,150	\$3,780	\$343	\$351
1B(3)	\$5,150	\$3,780	\$343	\$351
1B(4)	\$6,130	\$4,430	\$410	\$412
1C	\$4,810	\$3,450	\$321	\$320
2A(1)	\$4,810	\$3,450	\$321	\$320
2A(2)	\$5,460	\$4,060	\$365	\$377
2A(3)	\$4,810	\$3,450	\$321	\$320
2B(1)	\$7,450	\$5,400	\$498	\$504
2B(2)	\$5,790	\$4,100	\$387	\$382
2B(3)	\$4,810	\$3,450	\$321	\$320
2B(4)	\$4,810	\$3,450	\$321	\$320
2B(5)	\$6,940	\$5,060	\$464	\$472
3A	\$7,620	\$6,160	\$510	\$576
3B	\$4,810	\$3,450	\$321	\$320
3C	\$4,810	\$3,450	\$321	\$320
3D	\$4,810	\$3,450	\$321	\$320
3E	\$6,220	\$4,810	\$415	\$448
3F	\$6,220	\$4,810	\$415	\$448
3G	\$4,810	\$3,450	\$321	\$320
3H	\$9,330	\$7,680	\$625	\$719
3I	\$6,510	\$4,970	\$436	\$464
3J	\$6,510	\$4,970	\$436	\$464
3K	\$4,810	\$3,450	\$321	\$320
Total	\$146,000	\$108,000	\$9,720	\$10,100
Note: Totals may not sum due to rounding.				

EXHIBIT ES-8 RANKING OF BASELINE AND INCREMENTAL IMPACTS BY UNIT, 2010-2029
(DISCOUNTED AT SEVEN PERCENT)

BASELINE IMPACTS (HIGH-END)				INCREMENTAL IMPACTS	
LOW		HIGH			
UNIT	IMPACT	UNIT	IMPACT	UNIT	IMPACT
1A	\$738,000	2B(1)	\$4,590,000	3H	\$7,680
3H	\$525,000	1A	\$2,810,000	3A	\$6,160
3A	\$524,000	2B(2)	\$1,510,000	1A	\$6,050
3F	\$283,000	2B(5)	\$881,000	2B(1)	\$5,400
3E	\$281,000	1B(4)	\$766,000	2B(5)	\$5,060
2B(1)	\$142,000	3H	\$525,000	3I	\$4,970
2B(5)	\$92,000	3A	\$524,000	3J	\$4,970
2B(2)	\$74,600	3F	\$283,000	3E	\$4,810
1B(4)	\$58,500	3E	\$281,000	3F	\$4,810
1B(1)	\$43,900	1B(1)	\$261,000	1B(4)	\$4,430
1B(2)	\$41,400	1B(2)	\$165,000	2B(2)	\$4,100
2A(2)	\$40,500	2A(2)	\$72,400	2A(2)	\$4,060
3G	\$39,400	1B(3)	\$61,900	1B(1)	\$3,780
1B(3)	\$39,100	2A(3)	\$59,400	1B(2)	\$3,780
3I	\$38,300	3G	\$39,400	1B(3)	\$3,780
3J	\$38,300	3I	\$38,300	1C	\$3,450
1C	\$37,200	3J	\$38,300	2A(1)	\$3,450
2A(1)	\$37,200	1C	\$37,200	2A(3)	\$3,450
2A(3)	\$37,200	2A(1)	\$37,200	2B(3)	\$3,450
2B(3)	\$37,200	2B(3)	\$37,200	2B(4)	\$3,450
2B(4)	\$37,200	2B(4)	\$37,200	3B	\$3,450
3B	\$37,200	3B	\$37,200	3C	\$3,450
3C	\$37,200	3C	\$37,200	3D	\$3,450
3D	\$37,200	3D	\$37,200	3G	\$3,450
3K	\$37,200	3K	\$37,200	3K	\$3,450

DISCUSSION OF RESULTS

WATER MANAGEMENT (SECTION 3)

8. Conservation measures required for water management-related activities to protect the chub are primarily designed to avoid exceedingly low flows in managed rivers that are hydrologically connected to chub ponds. This analysis quantifies the potential impacts of past and future water releases from U.S. Army Corps of Engineers (USACE) impoundments. These releases are part of the baseline and directly protect chub habitat. Historically, USACE released additional flows for the chub from Hills Creek Reservoir, Lookout Point Reservoir, and Detroit Lake. According to USACE and the Service, the flow releases from Hills Creek and Lookout Point are unlikely to recur, but the Detroit releases will likely be necessary during future low-flow years, when insufficient water is available to satisfy all water requests in the basin. The analysis quantifies costs and benefits to recreation (i.e., through changes in reservoir levels) and hydropower generation (i.e., through changes in timing and/or quantity of generation) arising from these releases. Impacts to other water management-related activities – including water diversions (e.g., irrigated agriculture or municipal use), flood control, navigation, lakefront property values, river-based recreation, and activities that affect water quality – are qualitatively discussed. The incremental impacts of critical habitat designation are forecast to be minor and administrative in nature.

AGRICULTURE (SECTION 4)

9. Chub populations adjacent to agricultural areas may be at risk due to poor water quality resulting from pesticides and nutrient runoff. Costs to agricultural activities are based on conservation measures for the Pacific salmon established by the Western Washington U.S. District Court in a January 2004 Stipulated Injunction. The Stipulated Injunction imposes buffer zones around upland and aquatic salmon habitat (20 yards to 100 yards for ground and aerial applications, respectively) and disallows the use of 55 active ingredients of pesticides within those buffer zones. In the absence of chub-specific guidance, the analysis assumes that in areas where 20- and 100-yard (i.e., low- and high-end scenarios) buffers around chub habitat overlap with Pacific salmon buffers, pesticide restrictions have resulted in the loss of agricultural production. These conservation measures indirectly protect chub habitat and are part of the baseline. No incremental impacts of critical habitat designation are quantified for agricultural activities.

FORESTRY (SECTION 5)

10. Conservation measures for forestry activities are primarily designed to preserve aquatic and riparian habitat and protect forested areas immediately adjacent to waterbodies. Accordingly, many of these conservation measures are expected to occur even in the absence of the chub and its habitat as a result of existing Federal and State regulations designed to protect water quality, aquatic and riparian areas, and streambed structure in forested areas where timber harvest occurs. Baseline impacts stem from preclusions and restrictions on timber harvesting around streams to preserve water quality in chub habitat. The incremental impacts of critical habitat designation are forecast to be minor and administrative in nature.

TRANSPORTATION (SECTION 6)

11. Conservation measures required for transportation-related activities to protect the chub are primarily designed to identify and isolate the chub prior to and during transportation projects. Where suitable chub habitat is present, ODOT will survey and monitor for the chub, and then designate restricted work areas where chub are known to be present. For larger transportation projects, ODOT may also designate or purchase land for conservation banks to offset direct habitat loss. To date, ODOT has not used a conservation bank to offset impacts to chub; therefore, the price of bank credits for chub is unknown. In the absence of chub-specific prices, the analysis assumes a price of between \$3,000 and \$125,000 per acre (causing the wide range of costs in the analysis) based on a survey of credit prices at conservation banks in ten states. Aside from these offset purchases and monitoring/survey efforts, other conservation measures are expected to occur even in the absence of the chub and its habitat as a result of existing best management practices (e.g., ODOT's Standard Specifications for Highway Construction). Based on the level of existing measures to protect chub habitat, the incremental impacts of critical habitat designation are forecast to be minor and associated with increased administrative effort.

HABITAT MANAGEMENT (SECTION 7)

12. Species management activities for the chub have consisted of surveys, research, and monitoring for the species, as well as species reintroduction efforts and implementation of habitat improvement projects. Habitat management activities stem from the 1993 species listing, the 1998 Oregon Chub Recovery Plan (recovery plan), and the 2008 Biological Opinion (BiOp) on the continued operation and maintenance of the Willamette Project. Costs associated with habitat management are anticipated to be borne primarily by public landowners such as USACE and the Service. Based on discussions with affected Federal and State agencies, surveying and monitoring efforts, as well as habitat management activities are not expected to change due to the designation of critical habitat. Accordingly, the only quantified incremental impacts related to habitat management activities are anticipated to be administrative in nature.

POTENTIAL BENEFITS OF CHUB CONSERVATION (SECTION 8)

13. Because the Service believes that the direct benefits of the proposed rule are best expressed in biological terms, this analysis does not quantify or monetize benefits. However, a qualitative discussion of potential categories of benefits is provided in Section 8. Other than nonuse values, the majority of potential benefits of chub conservation and critical habitat designation would be expected to arise due to changes in river flow or water quality arising from chub conservation efforts.⁴ Such benefits could include increased opportunities for recreation, increased hydropower production, and human health or ecosystem benefits of improved water quality, among others.

⁴Non-use values reflect the utility the public derives from knowledge that a species continues to exist (e.g., existence or bequest values), in the absence of any expected use values.

SECTION 1 | BACKGROUND

1. The purpose of this report is to estimate the economic impact of actions taken to protect the federally listed Oregon chub (*Oregonichthys crameri*, hereafter, "chub") and its habitat. This analysis examines the impacts of restricting or modifying specific land or resource uses, or activities, for the benefit of the species and its habitat within the areas considered for critical habitat designation. This analysis employs "without critical habitat" and "with critical habitat" scenarios. The "without critical habitat" scenario represents the baseline for the analysis, considering protections already accorded the chub (for example, under the Federal listing and other Federal, State, and local regulations). The "with critical habitat" scenario describes the incremental impacts associated specifically with the designation of critical habitat for the species. The incremental conservation efforts and associated impacts are those not expected to occur absent the designation of critical habitat for the chub. The analysis looks retrospectively at baseline impacts incurred since the species was listed, and forecasts both baseline and incremental impacts likely to occur after the proposed critical habitat is finalized.
2. This information is intended to assist the Secretary of the U.S. Department of the Interior (DOI) in determining whether the benefits of excluding particular areas from the designation outweigh the benefits of including those areas in the designation.¹ In addition, this information allows the U.S. Fish and Wildlife Service (the Service) to address the requirements of Executive Orders 12866 and 13211, and the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA).²
3. This section provides an introduction to the proposed critical habitat for Oregon chub. It includes a summary of the legal history of the chub's listing and habitat designation, an overview of the proposed critical habitat area, a description of threats to the species, and maps of proposed units. This information is intended to provide background information on the designation; official habitat boundaries are detailed in the Proposed Rule.³

¹ 16 U.S.C. §1533(b)(2).

² Executive Order 12866, Regulatory Planning and Review, September 30, 1993 (as amended by Executive Order 13258 (2002) and Executive Order 13422 (2007)); 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.

³ 74 FR 10418

1.1 LEGAL HISTORY OF THE OREGON CHUB

4. The Final Rule listing the Chub as endangered under the Act was published on October 18, 1993. The following list summarizes regulatory and legal actions relevant to chub conservation that have occurred since the listing. These include the following:
- **September 3, 1998:** The Service completed a recovery plan listing criteria for downlisting the species to threatened, as well as criteria for ultimately delisting the species.⁴
 - **June 7, 2001:** The Service established the first Safe Harbor Agreement (66 FR 30745) in Lane County.
 - **September 5, 2001:** The Service established the second Safe Harbor Agreement (72 FR 50976) in Lane County.
 - **March 9, 2007:** The Institute for Wildlife Protection filed suit in Federal district court, alleging that the Service and the Secretary of the Interior violated their statutory duties as mandated by the Act by failing to designate critical habitat for the chub and failing to perform a five-year status review (*Institute for Wildlife Protection v. U.S. Fish and Wildlife Service*).
 - **February 11, 2008:** The Service completed the chub five-year review.
 - **March 8, 2008:** The Service issued a notice to begin a status review of the chub (72 FR 10547).
 - **March 10, 2009:** The Proposed Rule designating critical habitat was published in the Federal Register (74 FR 10412).
 - **May 15, 2009:** A proposed rule to reclassify the Oregon chub from endangered to threatened was published in the Federal Register (74 FR 22870).
 - **March 1, 2010:** The final critical habitat determination is due to the Federal Register.

1.2 PROPOSED CRITICAL HABITAT DESIGNATION

5. The Service has proposed to designate 132 acres of critical habitat across three areas, comprising 25 distinct units, in the Willamette River Basin.⁵ These units are water bodies ranging in size from 0.1 to 34.5 acres, and are distributed throughout tributaries of the Willamette River, generally located in off-channel areas protected from the mainstem flow. Proposed critical habitat is characterized by aquatic vegetation cover of between 25 to 100 percent, summer subsurface water temperatures between 15 and 25 °C (59 and 78 °F), and negligible levels of nonnative aquatic predatory or competitive species.⁶
6. The majority of proposed critical habitat (51 percent) is federally-owned. Approximately 25 percent of proposed critical habitat is owned by private entities, and 23 percent is

⁴ U.S. Fish and Wildlife Service. Recovery Plan for the Oregon Chub (*oregonichthys crameri*). 1998.

⁵ 74 FR 10418.

⁶ 74 FR 10417.

State-owned (a majority of which is held by the Oregon Parks and Recreation Department). The remaining lands (approximately two percent) are owned by the cities of Salem and Stayton. Exhibit 1-2 provides information concerning land ownership by unit. Exhibits 1-3 through 1-5 display proposed critical habitat areas 1 through 3, respectively. To provide perspective on the landscape and physical characteristics of a typical proposed critical habitat unit, Exhibit 1-6 displays a satellite image of Unit 3D.

1.3 THREATS TO CRITICAL HABITAT

7. This report describes and quantifies potential economic impacts associated with the proposed critical habitat designation for the chub, focusing on economic activities and resource uses that have been identified as a potential threat by the Service. These include:
 - **Water management:** dam operations and related impacts on hydropower generation, flood control, the construction of water diversions, and reservoir- or river-based recreation (e.g., boating, fishing, camping, etc.);
 - **Agriculture:** farming operations adjacent to streams;
 - **Forestry:** timber activities, logging road construction; and
 - **Transportation:** infrastructure development and construction (e.g., roadways, bridges, power transmission corridors, public parks, and campground facilities).
8. In addition, the report describes costs related to habitat management activities and a discussion of the potential benefits of chub conservation efforts. Given that areas upstream of proposed critical habitat units contain activities that may affect chub habitat (e.g., impoundments that control river flow), and areas downstream may be affected by any changes in upstream water management for the chub, we define the “study area” for the economic analysis as including all watersheds in the Willamette Basin that contain proposed critical habitat (see Exhibit 1-1).

1.4 STRUCTURE OF THE REPORT

9. This remainder of this report is organized as follows:
 - Section 2: Framework for the analysis;
 - Section 3: Water management;
 - Section 4: Agriculture;
 - Section 5: Forestry;
 - Section 6: Transportation;
 - Section 7: Habitat management;
 - Section 8: Economic benefits;
 - Appendix A: Small Business Analysis and Energy Impacts Analysis;
 - Appendix B: Sensitivity Analysis Presenting Estimates Discounted at Three Percent;
 - Appendix C: Undiscounted Impacts by Year; and
 - Appendix D: Existing Federal and State Laws and Regulations that May Protect the Chub.

EXHIBIT 1-1 PROPOSED CRITICAL HABITAT FOR OREGON CHUB

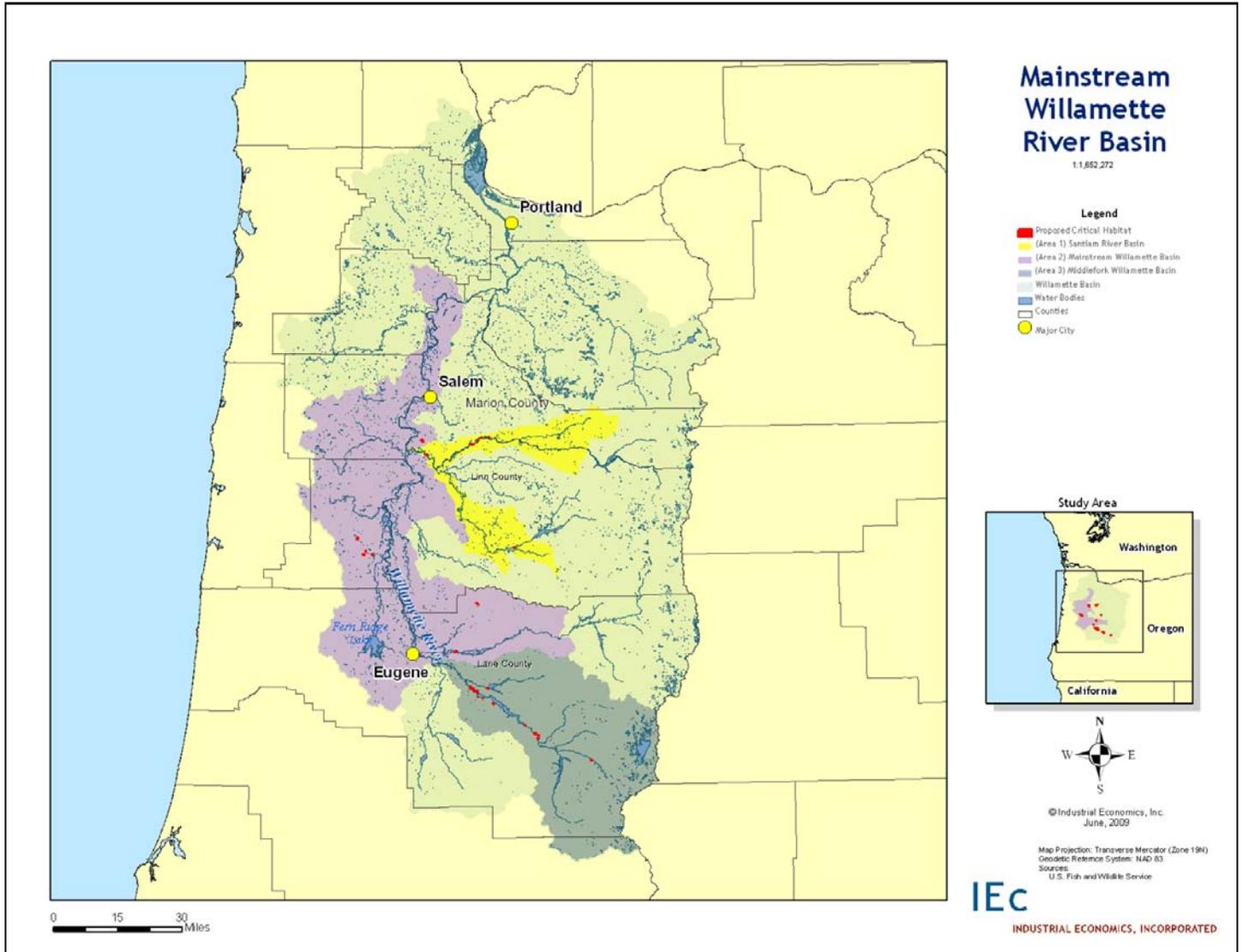


EXHIBIT 1-2 PROPOSED CRITICAL HABITAT UNITS BY LAND OWNERSHIP CATEGORY

	UNIT	LANDOWNER	TYPE	ACREAGE
AREA 1	SANTIAM RIVER BASIN - LINN AND MARION COUNTIES, OREGON			
LINN COUNTY				
1A	Mainstream - Santiam I-5 Side Channels	ODOT	State	3.3
1B(3)	North - South Stayton Pond	ODFW	State	0.2
1C	South - Foster Pullout Pond	USACE	Federal	1.0
MARION COUNTY				
1B(1)	North - Geren Island North Channel	City of Salem (Water treatment facility)	Local	1.9
1B(2)	North - Stayton Public Works Pond	City of Stayton	Local	1.0
1B(4)	North - Gray Slough	Private (Agricultural land)	Private	6.2
<i>Subtotal</i>				<i>13.6</i>
AREA 2	MAINSTREAM WILLAMETTE RIVER BASIN - BENTON, LANE AND MARION COUNTIES, OREGON			
LANE COUNTY				
2A(1)	McKenzie River - Russell Pond	Private	Private	0.1
2A(2)	McKenzie River - Shetzline Pond	Private	Private	0.3
2A(3)	McKenzie River - Big Island	McKenzie River Trust	Private	8.2
MARION COUNTY				
2B(1)	Willamette River Mainstream - Ankeny Willow Marsh	USFWS (Ankeny National Wildlife Refuge)	Federal	34.5
BENTON COUNTY				
2B(2)	Willamette River Mainstream - Dunn Wetland	Private	Private	15.2
2B(3)	Willamette River Mainstream - Finley Display Pond	USFWS (William L. Finley National Wildlife Refuge)	Federal	2.4
2B(4)	Willamette River Mainstream - Finley Cheadle Pond	USFWS (William L. Finley National Wildlife Refuge)	Federal	2.3
2B(5)	Willamette River Mainstream - Finley Gray Creek Swamp	USFWS (William L. Finley National Wildlife Refuge)	Federal	5.1
		Hull Oakes Lumber Co.	Private	2.3
<i>Subtotal</i>				<i>70.4</i>
AREA 3	MIDDLE FORK WILLAMETTE RIVER BASIN - LANE COUNTY, OREGON			
LANE COUNTY				
3A	Fall Creek Spillway Ponds	USACE	Federal	3.8
3B	Elijah Bristow State Park Berry Slough	OPRD	State	12.7
3C	Elijah Bristow State Park Northeast Slough	OPRD	State	5.4
3D	Elijah Bristow State Park Island Pond	OPRD	State	5.2
3E	Dexter Reservoir RV Alcove (DEX 3)	USACE	Federal	0.9
3F	Dexter Reservoir Alcove (PIT1)	USACE	Federal	0.3

UNIT		LANDOWNER	TYPE	ACREAGE
3G	East Fork Minnow Creek Pond	ODOT	State	3.3
3H	Hospital Pond	USACE	Federal	1.1
3I	Shady Dell Pond	USFS	Federal	2.8
3J	Buckhead Creek	USFS	Federal	9.3
3K	Wicopee Pond	USFS	Federal	3.3
			<i>Subtotal</i>	<i>21.0</i>
TOTAL PROPOSED FOR CRITICAL HABITAT DESIGNATION				132.1

EXHIBIT 1-3 AREA 1 OF PROPOSED CRITICAL HABITAT

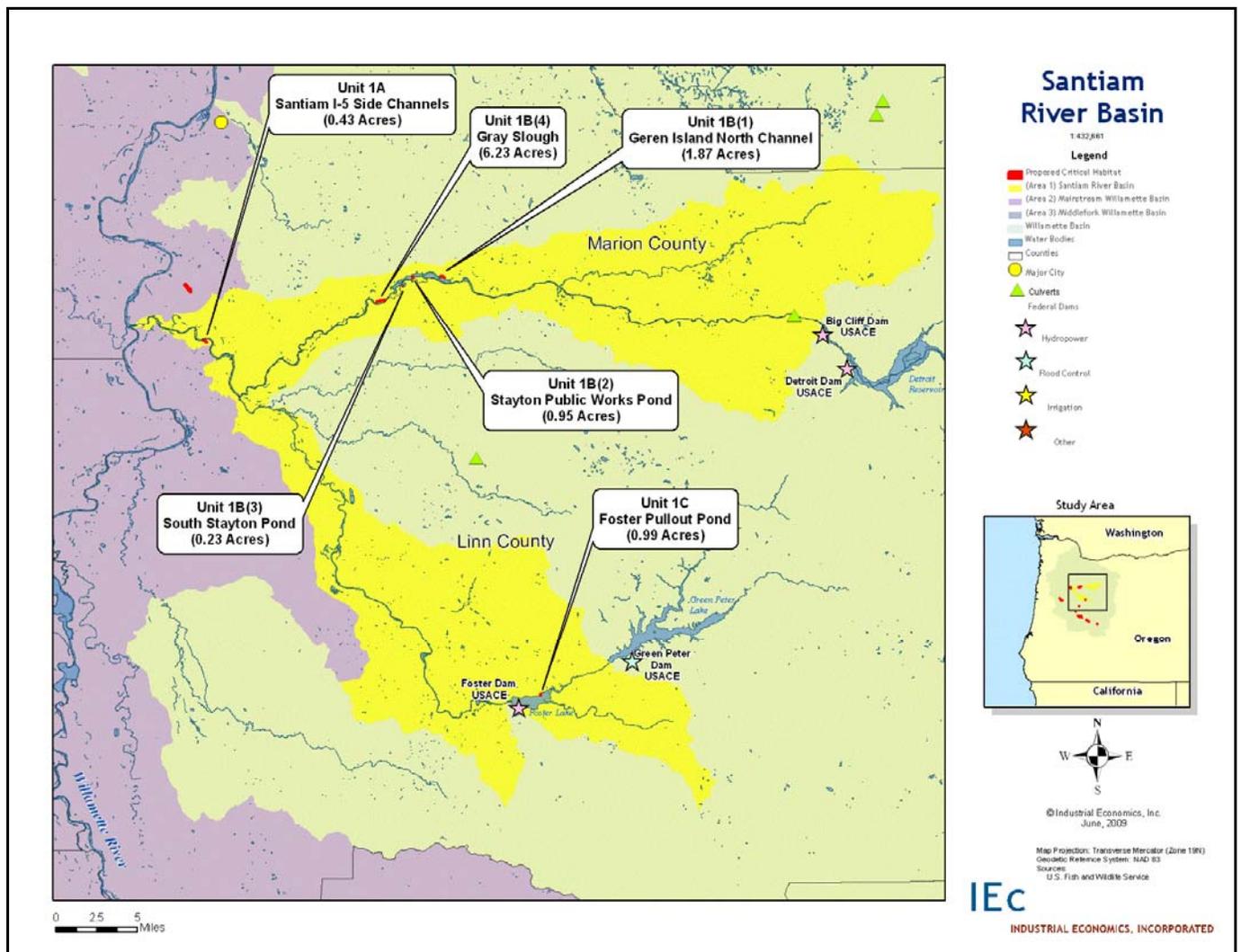


EXHIBIT 1-4 AREA 2 OF PROPOSED CRITICAL HABITAT

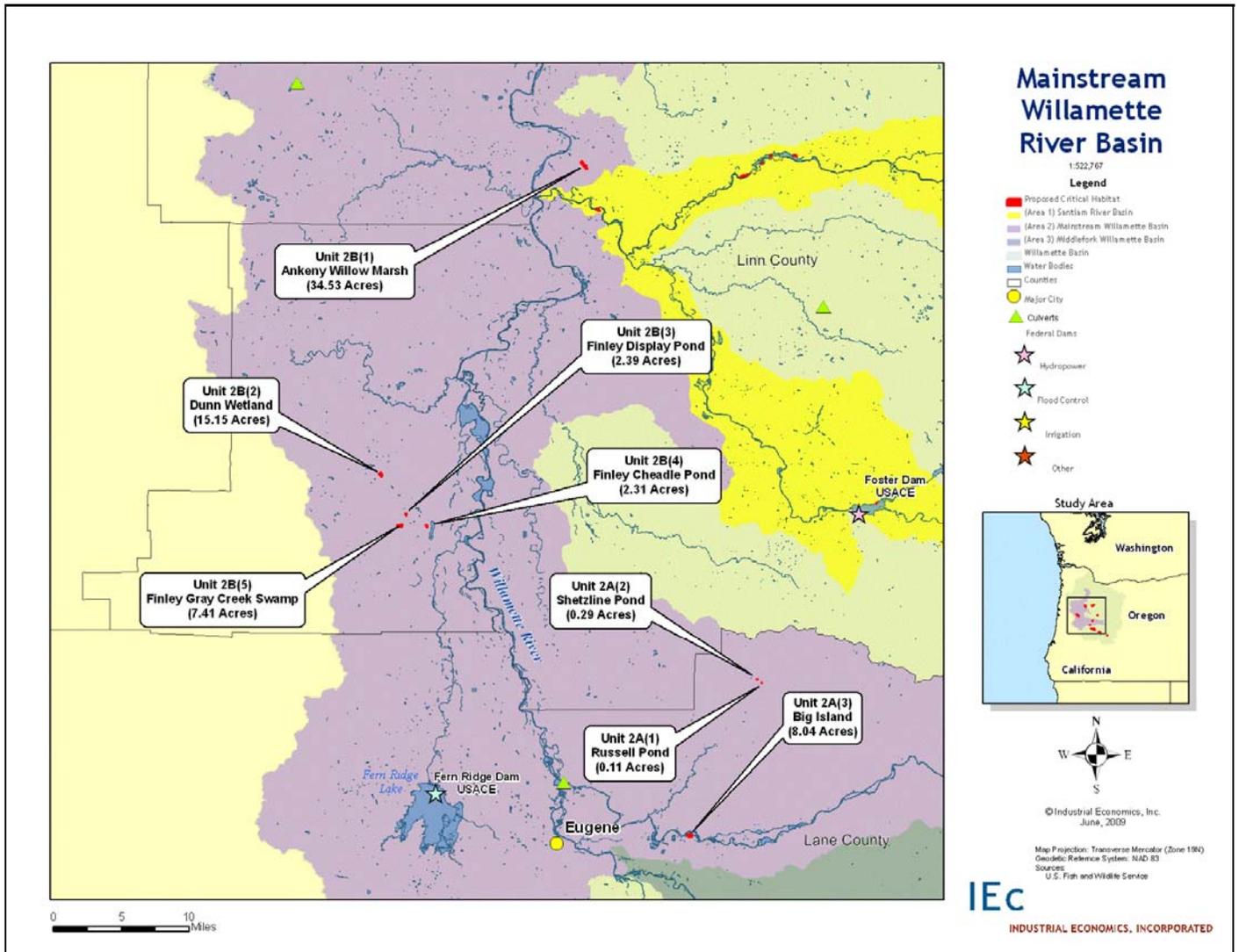


EXHIBIT 1-5 AREA 3 OF PROPOSED CRITICAL HABITAT

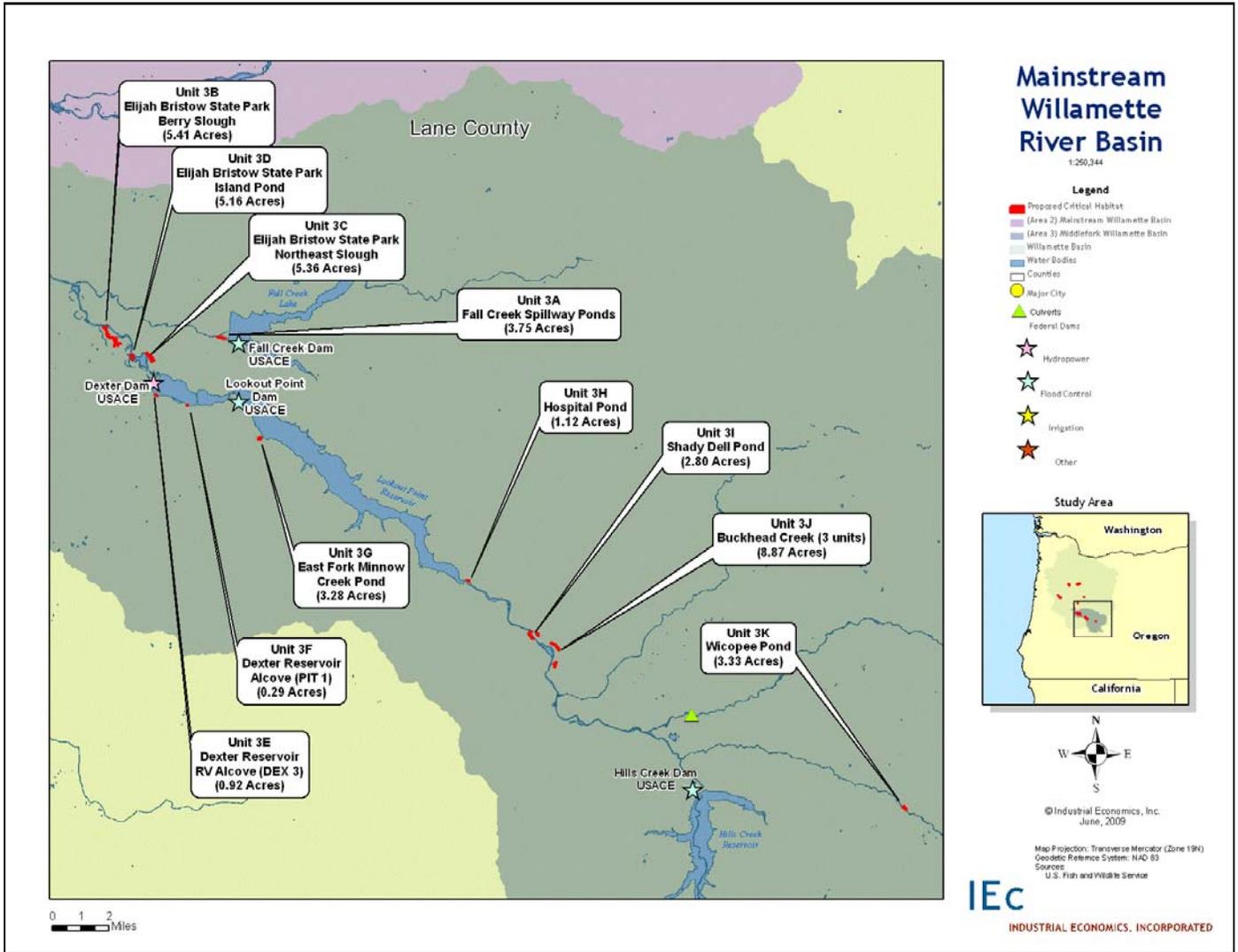
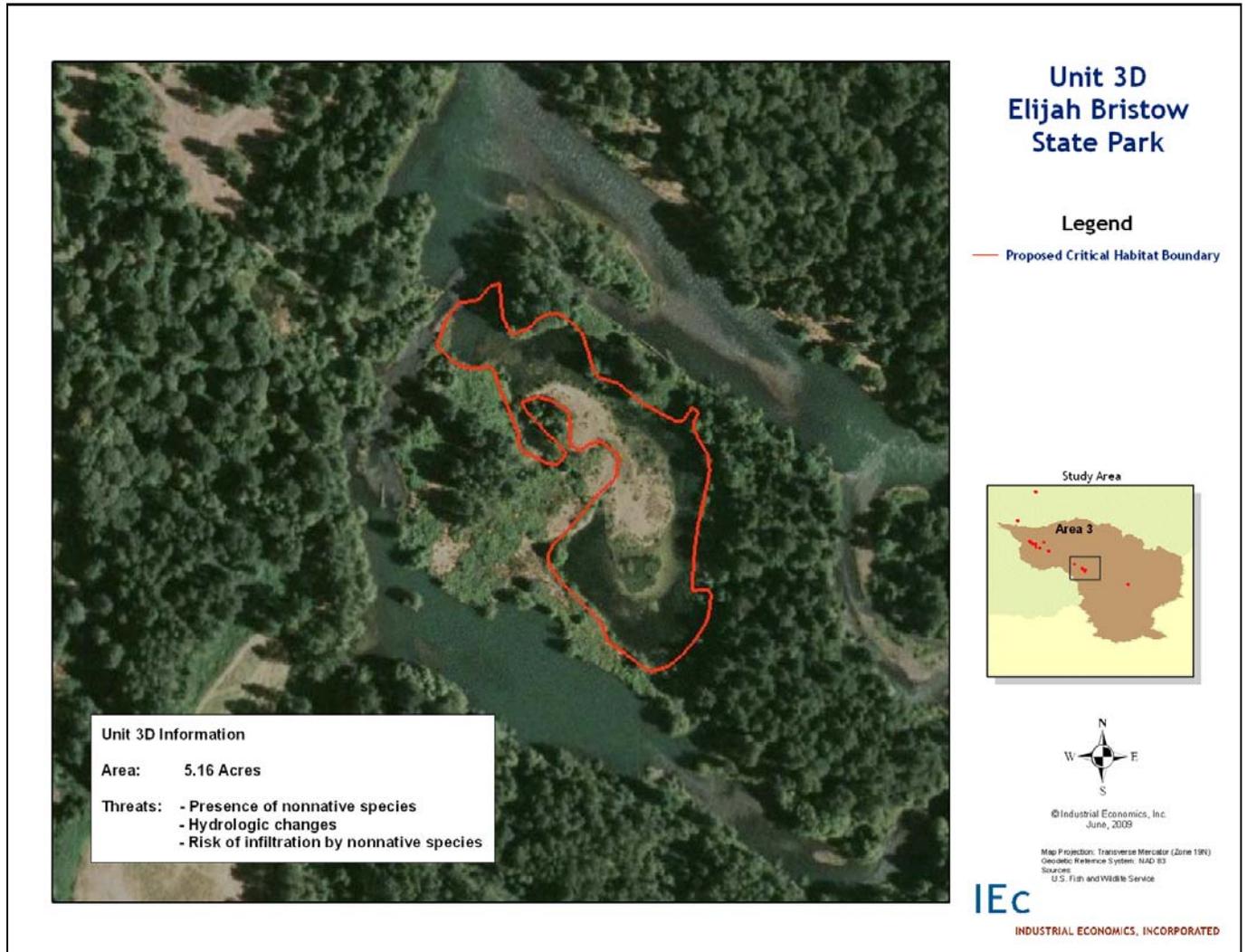


EXHIBIT 1-6 SATELLITE IMAGE OF SAMPLE UNIT



SECTION 2 | FRAMEWORK FOR THE ANALYSIS

10. This Section describes the framework for the analysis. First, it describes the case law that led to the selection of the framework applied in this report. It then describes in economic terms the general categories of economic effects that are the focus of regulatory impact analysis, including a discussion of both efficiency and distributional effects. Next, this Section defines the analytic framework used to measure these impacts in the context of critical habitat regulation, including the link between existing and critical habitat-related protection efforts and potential impacts, and the consideration of benefits. It concludes with a presentation of the information sources relied upon in the analysis.

2.1 BACKGROUND

11. The U.S. Office of Management and Budget's (OMB) guidelines for conducting economic analysis of regulations direct Federal agencies to measure the costs of a regulatory action against a baseline, which it defines as the "best assessment of the way the world would look absent the proposed action."⁷ In other words, the baseline includes the existing regulatory and socio-economic burden imposed on landowners, managers, or other resource users potentially affected by the designation of critical habitat. Impacts that are incremental to that baseline (i.e., occurring over and above existing constraints) are attributable to the proposed regulation. Significant debate has occurred regarding whether assessing the impacts of the Service's proposed regulations using this baseline approach is appropriate in the context of critical habitat designations.

12. In 2001, the U.S. Tenth Circuit Court of Appeals instructed the Service to conduct a full analysis of all of the economic impacts of proposed critical habitat, regardless of whether those impacts are attributable co-extensively to other causes.⁸ Specifically, the court stated,

“The statutory language is plain in requiring some kind of consideration of economic impact in the CHD [critical habitat designation] phase. Although 50 C.F.R. 402.02 is not at issue here, the regulation's definition of the jeopardy standard as fully encompassing the adverse modification standard renders any purported economic analysis done utilizing the baseline approach virtually meaningless. We are compelled by the

⁷ U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at <http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf>.

⁸ *New Mexico Cattle Growers Assn v. United States Fish and Wildlife Service*, 248 F.3d 1277 (10th Cir. 2001).

canons of statutory interpretation to give some effect to the congressional directive that economic impacts be considered at the time of critical habitat designation.... Because economic analysis done using the FWS's [Fish and Wildlife Service] baseline model is rendered essentially without meaning by 50 C.F.R. § 402.02, we conclude Congress intended that the FWS conduct a full analysis of all of the economic impacts of a critical habitat designation, regardless of whether those impacts are attributable co-extensively to other causes. Thus, we hold the baseline approach to economic analysis is not in accord with the language or intent of the ESA.”⁹

13. Since that decision, however, courts in other cases have held that an incremental analysis of impacts stemming solely from the critical habitat rulemaking is proper.¹⁰ For example, in the March 2006 court order ruling that the August 2004 critical habitat rule for the Peirson's milk-vetch was arbitrary and capricious, the United States District Court for the Northern District of California stated,

“The Court is not persuaded by the reasoning of *New Mexico Cattle Growers*, and instead agrees with the reasoning and holding of *Cape Hatteras Access Preservation Alliance v. U.S. Dep't of the Interior*, 344 F. Supp 2d 108 (D.D.C. 2004). That case also involved a challenge to the Service's baseline approach and the court held that the baseline approach was both consistent with the language and purpose of the ESA and that it was a reasonable method for assessing the actual costs of a particular critical habitat designation *Id* at 130. ‘To find the true cost of a designation, the world with the designation must be compared to the world without it.’”¹¹

14. In order to address the divergent opinions of the courts and provide the most complete information to decision-makers, this economic analysis reports both:
- a. The baseline impacts of chub conservation from protections afforded the species absent critical habitat designation; and
 - b. The estimated incremental impacts precipitated specifically by the designation of critical habitat for the species.

Summed, these two types of impacts comprise the fully co-extensive impacts of chub conservation in areas considered for critical habitat designation.

15. Incremental effects of critical habitat designation are determined using the Service's December 9, 2004, interim guidance on “Application of the ‘Destruction or Adverse

⁹ *Ibid.*

¹⁰ *Cape Hatteras Access Preservation Alliance v. Department of Interior*, 344 F. Supp. 2d 108 (D.D.C.); *Center for Biological Diversity v. Bureau of Land Management*, 422 F. Supp.2d 1115, 1131 n.31 (N.D. Cal. 2006).

¹¹ *Center for Biological Diversity v. Bureau of Land Management*, 422 F. Supp.2d 1115, 1131 n.31 (N.D. Cal. 2006).

Modification' Standard Under section 7(a)(2) of the Endangered Species Act" and information from the Service regarding what potential consultations and project modifications may be imposed as a result of critical habitat designation over and above those associated with the listing.¹² Specifically, in *Gifford Pinchot Task Force v. United States Fish and Wildlife Service*, the Ninth Circuit invalidated the Service's regulation defining destruction or adverse modification of critical habitat, and the Service no longer relies on this regulatory definition when analyzing whether an action is likely to destroy or adversely modify critical habitat.¹³ Under the statutory provisions of the Act, the Service determines destruction or adverse modification on the basis of whether, with implementation of the proposed Federal action, the affected critical habitat would remain functional to serve its intended conservation role for the species. A detailed description of the methodology used to define baseline and incremental impacts is provided later in this section.

2.2 CATEGORIES OF POTENTIAL ECONOMIC EFFECTS OF SPECIES CONSERVATION

16. This economic analysis considers both the economic efficiency and distributional effects that may result from efforts to protect the chub and its habitat (hereinafter referred to collectively as "chub conservation efforts"). Economic efficiency effects generally reflect "opportunity costs" associated with the commitment of resources required to accomplish species and habitat conservation. For example, if the set of activities that may take place on a parcel of land is limited as a result of the designation or the presence of the species, and thus the market value of the land is 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 opportunity costs of chub conservation efforts.
17. This analysis also addresses the distribution of impacts associated with the designation, including an assessment of any local or regional impacts of habitat conservation and the potential effects of conservation efforts on small entities and the energy industry. This information may be used by decision-makers to assess whether the effects of species conservation efforts unduly burden a particular group or economic sector. For example, while conservation efforts may have a relatively small impact relative to the national economy, individuals employed in a particular sector of the regional economy may experience relatively greater impacts. The differences between economic efficiency effects and distributional effects, as well as their application in this analysis, are discussed in greater detail below.

¹² Director, U.S. Fish and Wildlife Service, Memorandum to Regional Directors and Manager of the California-Nevada Operations Office, Subject: Application of the "Destruction or Adverse Modification" Standard under section 7(a)(2) of the Endangered Species Act, dated December 9, 2004.

¹³ *Gifford Pinchot Task Force v. United States Fish and Wildlife Service*, 378 F.3d 1059 (9th Cir. 2004).

2.2.1 EFFICIENCY EFFECTS

18. At the guidance of 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. In the context of regulations that protect chub habitat, these efficiency effects represent the opportunity cost of resources used or benefits foregone by society as a result of the regulations. Economists generally characterize opportunity costs in terms of changes in producer and consumer surpluses in affected markets.¹⁴
19. In some instances, compliance costs may provide a reasonable approximation for the efficiency effects associated with a regulatory action. For example, a Federal land manager, such as the U.S. Forest Service, may 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 is 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.
20. Where habitat protection measures are expected to significantly impact a market, it may be necessary to estimate changes in producer and consumer surpluses. For example, protection measures that reduce or preclude 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 (i.e., social welfare) can be measured by considering changes in producer and consumer surplus in the market.
21. This analysis begins by measuring economic impacts associated with efforts undertaken to protect chub and its habitat. As noted above, in some cases, compliance costs can provide a reasonable estimate of changes in economic efficiency. However, if the cost of conservation efforts is expected to significantly impact markets, the analysis will consider potential changes in consumer and/or producer surplus in affected markets. In the case of the chub, conservation efforts are not anticipated to significantly affect markets; therefore this report focuses on compliance costs.

2.2.2 DISTRIBUTIONAL AND REGIONAL ECONOMIC EFFECTS

22. Measurements of changes in economic efficiency focus on the net impact of conservation efforts, without consideration of how certain economic sectors or groups of people are affected. Thus, a discussion of efficiency effects alone may miss important distributional considerations. OMB encourages Federal agencies to consider distributional effects

¹⁴ 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. Environmental Protection Agency, 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>.

separately from efficiency effects.¹⁵ 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

23. This analysis considers how small entities, including small businesses, organizations, and governments, as defined by the RFA, might be affected by future species conservation efforts.¹⁶ In addition, in response to Executive Order 13211 “Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,” this analysis considers the future impacts of conservation efforts on the energy industry and its customers in Appendix A.¹⁷

Regional Economic Effects

24. Regional economic impact analysis can provide an assessment of the potential localized effects of conservation efforts. 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 represent the relationship between a change in one sector of the economy (e.g., expenditures by recreators) and the effect of that change on economic output, income, or employment in other local industries (e.g., suppliers of goods and services to recreators). These economic data provide a quantitative estimate of the magnitude of shifts of jobs and revenues in the local economy.
25. The use of regional input/output models in an analysis of the impacts of species and habitat conservation efforts can overstate the long-term impacts of a regulatory change. Most important, these models measure the initial impact of a regulatory change on an economy but do not consider long-term adjustments that the economy may 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 or other adaptive responses by affected businesses. In addition, the flow of goods and services across the regional boundaries defined in the model may change as a result of the regulation, compensating for a potential decrease in economic activity within the region.
26. Despite these and other limitations, in certain circumstances regional economic impact analysis may provide useful information about the scale and scope of localized impacts.

¹⁵ U.S. Office of Management and Budget, “Circular A-4,” September 17, 2003, available at <http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf>.

¹⁶ 5 U.S.C. § 601 et seq.

¹⁷ Executive Order 13211, Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use, May 18, 2001.

It is important to remember that measures of regional economic effects generally reflect shifts in resource use rather than efficiency losses, and should therefore be considered as distinct measures of impact.

27. Where relevant, this analysis qualitatively describes these potential regional economic impacts. In Section 3, for example, the analysis describes the potential regional impacts that may result from changes in recreational activity to Willamette Basin reservoirs.

2.3 ANALYTIC FRAMEWORK AND SCOPE OF THE ANALYSIS

28. This analysis identifies those economic activities most likely to threaten the listed species and its habitat and, where possible, quantifies the economic impact to avoid or minimize such threats within the boundaries of the study area (the boundaries of the study area are discussed later in this Section).
29. This section provides a description of the methodology used to separately identify baseline impacts and incremental impacts stemming from the proposed designation of critical habitat for the chub. This evaluation of impacts in a "with critical habitat designation" versus a "without critical habitat designation" framework effectively measures the net change in economic activity associated with the proposed rulemaking.

2.3.1 IDENTIFYING BASELINE IMPACTS

30. The baseline for this analysis is the existing state of regulation, prior to the designation of critical habitat, which provides protection to the species under the Act, as well as under other Federal, State and local laws and guidelines. The "without critical habitat designation" scenario, which represents the baseline for this analysis, considers a wide range of additional factors beyond the compliance costs of regulations that provide protection to the listed species. As recommended by OMB, the baseline incorporates, as appropriate, trends in market conditions, implementation of other regulations and policies by the Service and other government entities, and trends in other factors that have the potential to affect economic costs and benefits, such as the rate of regional economic growth in potentially affected industries.
31. Baseline impacts include sections 7, 9, and 10 of the Act, and economic impacts resulting from these protections to the extent that they are expected to occur absent the designation of critical habitat for the species.
- Section 7 of the Act, absent critical habitat designation, 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. The portion of the administrative costs of consultations under the jeopardy standard, along with the impacts of project modifications resulting from consideration of this standard, are considered baseline impacts. Baseline administrative costs of section 7 consultation are summarized later in Exhibit 2-2.
 - Section 9 defines the actions that are prohibited by the Act. In particular, it prohibits the "take" of endangered wildlife, where "take" means to "harass, harm,

pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."¹⁸ The economic impacts associated with this section manifest themselves in sections 7 and 10.

- Under section 10(a)(1)(B) of the Act, an entity (e.g., a landowner or local government) may develop a Habitat Conservation Plan (HCP) for a listed 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.¹⁹ The requirements posed by the HCP may have economic impacts associated with the goal of ensuring that the effects of incidental take are adequately avoided or minimized. The development and implementation of HCPs is considered a baseline protection for the species and habitat unless the HCP is determined to be precipitated by the designation of critical habitat, or the designation influences stipulated conservation efforts under HCPs.

Enforcement actions taken in response to violations of the Act are not included in this analysis.

32. The protection of listed species and habitat is not limited to the Act. Other Federal agencies, as well as State and local governments, may also seek to protect the natural resources under their jurisdiction. If compliance with the Clean Water Act or State environmental quality laws, for example, protects habitat for the species, such protective efforts are considered to be baseline protections and costs associated with these efforts are categorized accordingly. Of note, however, is that such efforts may not be considered baseline in the case that they would not have been triggered absent the designation of critical habitat. In these cases, they are considered incremental impacts and are discussed below.

2.3.2 IDENTIFYING INCREMENTAL IMPACTS

33. This analysis separately quantifies the incremental impacts of this rulemaking. The focus of the incremental analysis is to determine the impacts on land uses and activities from the designation of critical habitat that are above and beyond those impacts due to existing required or voluntary conservation efforts being undertaken due to other Federal, State, and local regulations or guidelines.
34. When critical habitat is designated, section 7 requires Federal agencies to ensure that their actions will not result in the destruction or adverse modification of critical habitat (in addition to considering whether the actions are likely to jeopardize the continued existence of the species). The added administrative costs of including consideration of critical habitat in section 7 consultations, and the additional impacts of implementing project modifications resulting from the protection of critical habitat are the direct

¹⁸ 16 U.S.C. 1532.

¹⁹ U.S. Fish and Wildlife Service, "Endangered Species and Habitat Conservation Planning," August 6, 2002, accessed at <http://endangered.fws.gov/hcp/>.

compliance costs of designating critical habitat. These costs are not in the baseline, and are considered incremental impacts of the rulemaking.

35. Exhibit 2-1 depicts the decision analysis regarding whether an impact should be considered incremental. The following sections describe this decision tree in detail.
36. Incremental impacts may include the direct compliance costs associated with additional effort required for consultations, reinitiated consultations, new consultations occurring specifically because of the designation, and additional project modifications that would not have been required under the jeopardy standard. Additionally, incremental impacts may include indirect impacts resulting from reaction to the potential designation of critical habitat (e.g., developing habitat conservation plans (HCPs) in an effort to avoid designation of critical habitat), triggering of additional requirements under State or local laws intended to protect sensitive habitat, and uncertainty and perceptual effects on markets.

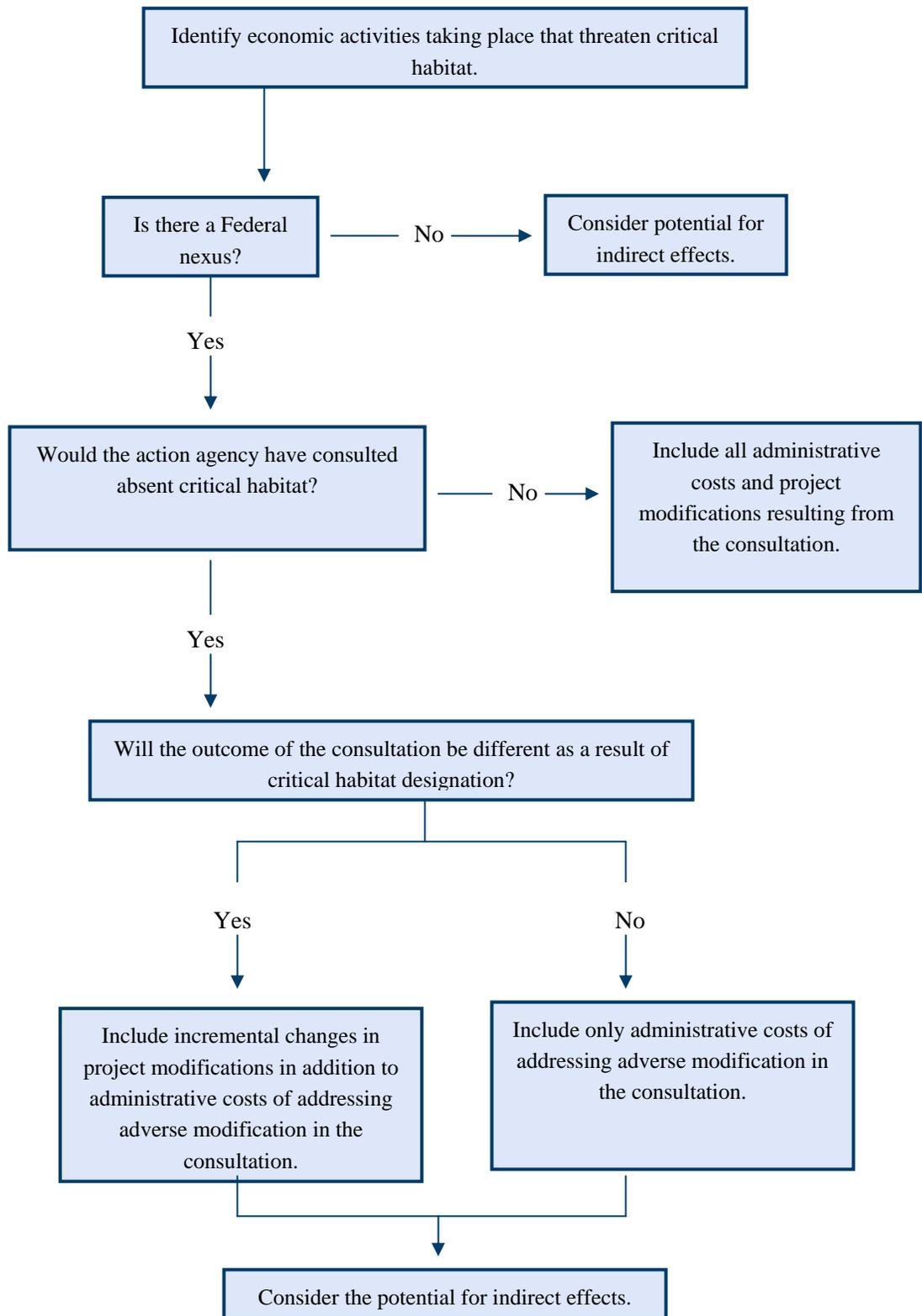
Direct Impacts

37. The direct, incremental impacts of critical habitat designation stem from the consideration of the potential for destruction or adverse modification of critical habitat during section 7 consultations. The two categories of direct, incremental impacts of critical habitat designation are: (1) the administrative costs of conducting section 7 consultation; and (2) implementation of any project modifications requested by the Service through section 7 consultation to avoid or minimize potential destruction or adverse modification of critical habitat.

Administrative Section 7 Consultation Costs

38. Parties involved in section 7 consultations include the Service, a Federal "action agency," and in some cases, a private entity involved in the project or land use activity. The action agency (i.e., the Federal nexus necessitating the consultation) serves as the liaison with the Service. While consultations are required for activities that involve a Federal nexus and may jeopardize the continued existence of the species regardless of whether critical habitat is designated, the designation may increase the effort for consultations in the case that the project or activity in question may adversely modify critical habitat. Administrative efforts for consultation may therefore result in both baseline and incremental impacts.

EXHIBIT 2-1 IDENTIFYING INCREMENTAL IMPACTS OF CRITICAL HABITAT DESIGNATION



39. In general, three different scenarios associated with the designation of critical habitat may trigger incremental administrative consultation costs:
1. **Additional effort to address adverse modification in a new consultation**
- New consultations taking place after critical habitat designation may require additional effort to address critical habitat issues above and beyond the listing issues. In this case, only the additional administrative effort required to consider critical habitat is considered an incremental impact of the designation.
 2. **Re-initiation of consultation to address adverse modification -**
Consultations that have already been completed on a project or activity may require re-initiation to address critical habitat. In this case, the costs of re-initiating the consultation, including all associated administrative and project modification costs are considered incremental impacts of the designation.
 3. **Incremental consultation resulting entirely from critical habitat designation -** Critical habitat designation may trigger additional consultations that may not occur absent the designation (e.g., for an activity for which adverse modification may be an issue, while jeopardy is not, or consultations resulting from the new information about the potential presence of the species provided by the designation). Such consultations may, for example, be triggered in critical habitat areas that are not occupied by the species. All associated administrative and project modification costs of incremental consultations are considered incremental impacts of the designation.
40. Section 7 consultations with the Service may be either informal or formal. An informal is “an optional process that includes all discussions, correspondence, etc., between the Service and the Federal agency or the designated non-Federal representative, designed to assist the Federal agency in determining whether formal consultation or a conference is required. If during informal consultation it is determined by the Federal agency, with the written concurrence of the Service, that the action is not likely to adversely affect the listed species or critical habitat, the consultation process is terminated and no further action is necessary. During informal consultation, the Service may suggest modifications to the action that the Federal agency and any applicant could implement to avoid the likelihood of adverse effects to listed species or critical habitat.”²⁰ In contrast, a formal consultation is generally required if the Service finds that the proposed action is likely to adversely affect the listed species or designated critical habitat in ways that cannot be resolved through informal consultation. Formal consultation is terminated with the issuance of the biological opinion or if, during any stage of consultation, the Federal

²⁰ 50 CFR 402.13

agency determines that either the proposed action is not likely to occur or, with the concurrence of the Director, that its proposed action is not likely to adversely affect any listed species or critical habitat.²¹ Programmatic consultations may occur to address a Federal agency's multiple actions on a program, regional, or other basis.²²

41. More minor efforts on the part of Federal agencies or private third parties regarding a proposed action in advance of consultation or for which no consultation is required are classified as technical assistance efforts. These may include, for example, a brief phone call with, or letter to, the Service.
42. The duration and complexity of all types of consultation depends on a number of variables, including: the species; the activity of concern; the region where critical habitat has been designated; the landowner; and level of complexity of any issues related to species conservation needs. As a result, the administrative costs are variable. One way to address this variability is to show a range of possible costs of consultation as it may not be possible to predict the outcome of each future consultation in terms of level of effort. Review of consultation records and discussions with Service field offices resulted in the estimated range of administrative costs of consultation employed in this analysis. For simplicity, the average of the range of costs in each category is applied in this analysis.
43. Exhibit 2-2 provides estimated consultation costs representing effort required for all types of consultation, including those consultations that considered both adverse modification and jeopardy. To estimate the fractions of the total administrative consultation costs that are baseline and incremental, the following assumptions were applied.
 - The greatest effort will be associated with consultations that consider both jeopardy and adverse modification. Depending on whether the consultation is precipitated by the listing or the critical habitat designation, part of the costs will be attributed to the proposed rule.
 - Efficiencies exist when considering both jeopardy and adverse modification at the same time (e.g., in staff time saved for project review and report writing), and therefore incremental administrative costs of considering adverse modification in consultations precipitated by the listing result in the least incremental effort, roughly on-quarter of the cost of the entire consultation. The remaining three-quarters of the costs are attributed to consideration of the jeopardy standard in the baseline scenario. This latter amount also represents the cost of a consultation that only considers adverse modification (e.g., an incremental consultation for activities in unoccupied critical habitat) and is attributed wholly to critical habitat.

²¹ 50 CFR 402.14

²² U.S. Fish and Wildlife Service. March 1998. Consultation Handbook: Procedures for Conducting Consultation and Conference Activities under Section 7 of the Endangered Species Act.

- Incremental costs of the re-initiation of a previously completed consultation because of the critical habitat designation are assumed to be approximately half the cost of a consultation considering both jeopardy and adverse modification. This assumes that re-initiations are less time-consuming as the groundwork for the project has already been considered in terms of its effect on the species. However, because the previously completed effort must be re-opened, they are more costly than simply adding consideration of critical habitat to a consultation already underway.

Section 7 Project Modification Impacts

44. Section 7 consultation considering critical habitat may also result in additional project modification recommendations specifically addressing potential destruction or adverse modification of critical habitat. For forecast consultations considering jeopardy and adverse modification, and for re-initiations of past consultations to consider critical habitat, the economic impacts of project modifications undertaken to avoid or minimize adverse modification are considered incremental impacts of critical habitat designation. For consultations that are forecast to occur specifically because of the designation (incremental consultations), impacts of all associated project modifications are assumed to be incremental impacts of the designation. This is summarized below.
1. **Additional effort to address adverse modification in a new consultation** - Only project modifications above and beyond what would be requested to avoid or minimize jeopardy are considered incremental.
 2. **Re-initiation of consultation to address adverse modification** - Only project modifications above and beyond what was requested to avoid or minimize jeopardy are considered incremental.
 3. **Incremental consultation resulting entirely from critical habitat designation** - Impacts of all project modifications are considered incremental.

EXHIBIT 2-2 RANGE OF ADMINISTRATIVE CONSULTATIONS COSTS (2009 DOLLARS)

BASELINE ADMINISTRATIVE COSTS OF CONSULTATION (\$2009)					
CONSULTATION TYPE	SERVICE	FEDERAL AGENCY	THIRD PARTY	BIOLOGICAL ASSESSMENT	TOTAL COSTS
CONSULTATION CONSIDERING JEOPARDY (DOES NOT INCLUDE CONSIDERATION OF ADVERSE MODIFICATION)					
Technical Assistance	\$420	n/a	\$788	n/a	\$1,130
Informal	\$1,840	\$2,330	\$1,540	\$1,500	\$7,130
Formal	\$4,090	\$4,610	\$2,630	\$3,600	\$15,000
Programmatic	\$12,300	\$10,200	n/a	\$4,200	\$26,700
INCREMENTAL ADMINISTRATIVE COSTS OF CONSULTATION (\$2009)					
CONSULTATION TYPE	SERVICE	FEDERAL AGENCY	THIRD PARTY	BIOLOGICAL ASSESSMENT	TOTAL COSTS
NEW CONSULTATION RESULTING ENTIRELY FROM CRITICAL HABITAT DESIGNATION (TOTAL COST OF A CONSULTATION CONSIDERING BOTH JEOPARDY AND ADVERSE MODIFICATION)					
Technical Assistance	\$560	n/a	\$1,050	n/a	\$1,500
Informal	\$2,450	\$3,100	\$2,050	\$2,000	\$9,500
Formal	\$5,450	\$6,150	\$3,500	\$4,800	\$20,000
Programmatic	\$16,400	\$13,700	n/a	\$5,600	\$35,700
NEW CONSULTATION CONSIDERING ONLY ADVERSE MODIFICATION					
Technical Assistance	\$420	n/a	\$788	n/a	\$1,130
Informal	\$1,840	\$2,330	\$1,540	\$1,500	\$7,130
Formal	\$4,090	\$4,610	\$2,630	\$3,600	\$15,000
Programmatic	\$12,300	\$10,200	n/a	\$4,200	\$26,700
RE-INITIATION OF CONSULTATION TO ADDRESS ADVERSE MODIFICATION					
Technical Assistance	\$280	n/a	\$525	n/a	\$750
Informal	\$1,230	\$1,550	\$1,030	\$1,000	\$4,750
Formal	\$2,730	\$3,080	\$1,750	\$2,400	\$10,000
Programmatic	\$8,200	\$6,830	n/a	\$2,800	\$17,800
ADDITIONAL EFFORT TO ADDRESS ADVERSE MODIFICATION IN A NEW CONSULTATION (ADDITIVE WITH BASELINE COSTS ABOVE OF CONSIDERING JEOPARDY)					
Technical Assistance	\$140	n/a	\$263	n/a	\$375
Informal	\$613	\$775	\$513	\$500	\$2,380
Formal	\$1,360	\$1,540	\$875	\$1,200	\$5,000
Programmatic	\$4,100	\$3,410	n/a	\$1,400	\$8,910
Source: IEC analysis of full administrative costs is based on data from the Federal Government Schedule Rates, Office of Personnel Management, 2009, and a review of consultation records from several Service field offices across the country conducted in 2002. Notes: 1. Totals may not sum due to rounding. 2. Estimates reflect average hourly time required by staff.					

Indirect Impacts

45. The designation of critical habitat may, under certain circumstances, affect actions that do not have a Federal nexus and thus are not subject to the provisions of section 7 under the Act. Indirect impacts are those unintended changes to economic behavior that may occur outside of the Act, through other Federal, State, or local actions, and that are caused by the designation of critical habitat. This section identifies common types of indirect impacts that may be associated with the designation of critical habitat. Importantly, these types of impacts are not always considered incremental. In the case that these types of conservation efforts and economic effects are expected to occur regardless of critical habitat designation, they are appropriately considered baseline impacts in this analysis.

Habitat Conservation Plans

46. Under section 10 of the Act, landowners seeking an incidental take permit must develop an HCP to counterbalance the potential harmful effects that an otherwise lawful activity may have on a species. As such, the purpose of the habitat conservation planning process is to ensure that the effects of incidental take are adequately avoided or minimized. Thus, HCPs are developed to ensure compliance with section 9 of the Act and to meet the requirements of section 10 of the Act.
47. Application for an incidental take permit and completion of an HCP are not required or necessarily recommended by a critical habitat designation. However, in certain situations the new information provided by the proposed critical habitat rule may prompt a landowner to apply for an incidental take permit. For example, a landowner may have been previously unaware of the potential presence of the species on his or her property, and expeditious completion of an HCP may offer the landowner regulatory relief in the form of exclusion from the final critical habitat designation. In this case, the effort involved in creating the HCP and undertaking associated conservation actions are considered an incremental effect of designation. No specific plans to prepare new HCPs in response to this proposed designation were identified.

Other State and Local Laws

48. Under certain circumstances, critical habitat designation 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 impacts would not have been triggered absent critical habitat designation, they are considered indirect, incremental impacts of the designation. No State or local laws that trigger additional economic impacts due to the critical habitat designation were identified.

Additional Indirect Impacts

49. In addition to the indirect effects of compliance with other laws or triggered by the designation, project proponents, land managers and landowners may face additional indirect impacts, including the following:
- **Time Delays** - Both public and private entities may experience incremental time delays for projects and other activities due to requirements associated with the need to reinitiate the section 7 consultation process and/or compliance with other

laws triggered by the designation. To the extent that delays result from the designation, they are considered indirect, incremental impacts of the designation. Based on a review of the consultation history and correspondence with stakeholders, no such impacts were identified or quantified in this analysis.

- **Regulatory Uncertainty** - The Service conducts each section 7 consultation on a case-by-case basis and issues a biological opinion on formal consultations based on species-specific and site-specific information. As a result, government agencies and affiliated private parties who consult with the Service under section 7 may face uncertainty concerning whether project modifications will be recommended by the Service and what the nature of these modifications will be. This uncertainty may diminish as consultations are completed and additional information becomes available on the effects of critical habitat on specific activities. Where information suggests that this type of regulatory uncertainty stemming from the designation may affect a project or economic behavior, associated impacts are considered indirect, incremental impacts of the designation. This analysis identifies no costs arising from regulatory uncertainty based on correspondence with stakeholders and a review of the consultation history.

2.3.3 BENEFITS

50. Under Executive Order 12866, OMB directs Federal agencies to provide an assessment of both the social costs and benefits of proposed regulatory actions.²³ OMB's Circular A-4 distinguishes two types of economic benefits: *direct benefits* and *ancillary benefits*. Ancillary benefits are defined as favorable impacts of a rulemaking that are typically unrelated, or secondary, to the statutory purpose of the rulemaking.²⁴
51. In the context of critical habitat, the primary purpose of the rulemaking (i.e., the direct benefit) is the potential to enhance conservation of the species. The published economics literature has documented that social welfare benefits can result from the conservation and recovery of endangered and threatened species. In its guidance for implementing Executive Order 12866, OMB acknowledges that it may not be feasible to monetize, or even quantify, the benefits of environmental regulations due to either an absence of defensible, relevant studies or a lack of resources on the implementing agency's part to conduct new research.²⁵ *Rather than rely on economic measures, the Service believes that the direct benefits of the proposed rule are best expressed in biological terms that can be weighed against the expected cost impacts of the rulemaking.*
52. Critical habitat designation may also generate ancillary benefits. Critical habitat aids in the conservation of species specifically by protecting the primary constituent elements on which the species depends. To this end, critical habitat designation can result in

²³ Executive Order 12866, Regulatory Planning and Review, September 30, 1993.

²⁴ U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at <http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf>.

²⁵ Ibid.

maintenance of particular environmental conditions that may generate other social benefits aside from the preservation of the species. That is, management actions undertaken to conserve a species or habitat may have coincident, positive social welfare implications, such as increased recreational opportunities in a region. While they are not the primary purpose of critical habitat, these ancillary benefits may result in gains in employment, output, or income that may offset the direct, negative impacts to a region's economy resulting from actions to conserve a species or its habitat.

53. It is often difficult to evaluate the ancillary benefits of critical habitat designation. To the extent that the ancillary benefits of the rulemaking may be captured by the market through an identifiable shift in resource allocation, they are factored into the overall economic impact assessment in this report. For example, if habitat preserves are created to protect a species, the value of existing residential property adjacent to those preserves may increase, resulting in a measurable positive impact. Where data are available, this analysis attempts to capture the *net* economic consequences (i.e., the increased regulatory burden less any discernable offsetting market gains), of species conservation efforts imposed on regulated entities and the regional economy. Economic benefits associated with the proposed rule are described in Section 8 of this analysis.

2.3.4 GEOGRAPHIC SCOPE OF THE ANALYSIS

54. The geographic scope of the analysis includes all areas currently identified as proposed critical habitat in the March 2009 proposed rule. These areas are referred to as the "study area" for the purposes of this analysis. Note that economic activities affecting critical habitat may be sited outside of the boundaries of the study area (e.g., upstream activities); these activities are considered relevant to this analysis. Specifically, the quantity and quality of water (both identified as primary constituent elements in the proposed rule) within proposed critical habitat is influenced by water management structures and operations located outside the proposed critical habitat. Hence, this analysis refers to several water management facilities located within the Willamette Basin that lie outside the areas proposed for designation.

2.3.5 ANALYTIC TIME FRAME

55. The analysis estimates impacts based on activities that are "reasonably foreseeable," including activities that are currently authorized, permitted, or funded, or for which proposed plans are currently available to the public. Forecasted impacts are based on the reasonable planning periods for potentially affected activities. In general, we endeavor to forecast impacts to 2029 (twenty years from the year of final critical habitat designation, 2010). Where information is available to reliably forecast economic activity beyond the 20-year future time frame, this analysis incorporates that information. For example, in the case of forestry activities, impacts are estimated assuming the services provided by timberlands are lost or diminished in perpetuity (i.e., decreased net timber revenues). However, the resulting estimates reflect impacts on land values that occurred during the pre-designation period. We also assess retrospective impacts beginning in 1993 (year of the species' final listing), to provide context for the assessment of prospective costs. Results of the retrospective portion of the analysis (i.e., costs occurring from the time of

listing to the designation of critical habitat) are reported separately from the results of the prospective portion of the analysis (i.e., costs likely to occur after the designation of critical habitat), and are not identified as baseline or incremental impacts.

2.4 INFORMATION SOURCES

56. The primary sources of information for this report are communications with, and data provided by, personnel from the Service, Federal, State, and local governments and other stakeholders. In addition, this analysis relies upon the Service's section 7 consultation records and the 1998 Recovery Plan for the chub. Due to the large number of entities contacted, the complete list of contacted stakeholders is presented in the reference section at the end of this document.

SECTION 3 | WATER MANAGEMENT

57. This section estimates the potential opportunity costs of changes in water management associated with conservation efforts for the chub.²⁶ Given that low flows in the Willamette River and its tributaries threaten certain chub populations, periodic changes to how water is managed in the Willamette Basin (the basin) have occurred, and may continue to occur, to protect the species.²⁷
58. Exhibit 3-1 provides an overall summary of impacts to water management as described in the remainder of the section and presented by unit in Sections 3.3 and 3.4. Conservation measures required for water management-related activities to protect the chub are primarily designed to avoid exceedingly low flows in managed rivers that are hydrologically connected to chub ponds. Historically, periodic increases in flow have occurred for Units 1A, 3B, 3C, and 3D; in future years, these releases are only anticipated to occur for Unit 1A. This analysis quantifies the potential impacts of these increases in flow on reservoir-based recreational activities and hydropower generation.
59. Impacts to other water management-related activities – including water diversions (e.g., irrigated agriculture or municipal use), flood control, navigation, lakefront property values, river-based recreation, and activities that affect water quality – are qualitatively discussed. Based on the level of existing measures to protect chub habitat, the incremental impacts of critical habitat designation are forecast to be minor and administrative in nature.
60. The section proceeds as follows: (1) background on water management in the Willamette basin and past chub conservation measures for water management-related activities; (2) description of the economic effects of changes in water management; (3) presentation of pre-designation impacts; (4) presentation of post-designation impacts; and (5) a final section highlighting major assumptions and uncertainties of the analysis.

²⁶ *Opportunity cost* in this context refers to the economic costs of decreasing water deliveries to these activities, defined as the increase in cost to consumers via substitution to other activities or supplies (e.g., recreational sites or electricity supplies). Decreases in the provision of water can have opportunity costs, including: reductions in agricultural production (and therefore profits) from lower crop yields or lost economic welfare resulting from fewer recreational trips to reservoirs due to reduced water levels.

²⁷ 74 FR 10416

EXHIBIT 3-1 SUMMARY OF IMPACTS TO WATER MANAGEMENT-RELATED ACTIVITIES (2009 DOLLARS, ASSUMING A SEVEN PERCENT DISCOUNT RATE)

VALUES	LOW	HIGH
Pre-Designation Impacts (1993 - 2009)		
Present Value of Impacts	\$427,000	\$893,000
Post-Designation Baseline Impacts (2010 - 2029)		
Present Value of Impacts	\$731,000	\$2,430,000
Annualized Impact Value	\$64,500	\$214,000
Incremental Impacts (2010 - 2029)		
Present Value of Impacts	\$22,200	\$22,200
Annualized Impact Value	\$1,960	\$1,960

3.1 BACKGROUND

3.1.1 WATER MANAGEMENT IN THE STUDY AREA

61. The Willamette Basin is a complex hydrological system. Multiple management structures and numerous withdrawals currently exist on the mainstem Willamette and its tributaries, which are managed through a series of dams and hydroelectric plants that provide water for hydropower production, municipal uses, recreation, flood control, and other uses.
62. Water in the basin has historically been managed to balance a wide variety of competing uses, but has emphasized flood control, hydropower generation and recreation. Passage of the 1936 Flood Control Act initiated construction of the 13 Federal facilities managed by USACE on the Willamette River, the first of which was constructed by 1941 (see Exhibit 3-2). These facilities have since contributed significantly to the region's hydropower production and recreational resources, and USACE has estimated that the dams have provided over \$20 billion in flood protection benefits since their construction.²⁸ Among other uses of the basin, navigation was once a more significant use of the Willamette River. However, it has since declined for several reasons, including that the Federal navigation channel between the Columbia River and the Broadway Bridge in Portland has not been maintained since 1997.
63. In future years, expanding use of this water resource (e.g., population growth, increased irrigation) are anticipated to further constrain water availability, which will affect reservoir operations and aquatic habitat.²⁹ The "Trajectories of Change" chapter of the

²⁸ USACE. 2008. U.S. Army Corps of Engineers' Willamette Project: Oregon Water Round Table. Accessed on May 21, 2009 from <http://water.oregonstate.edu/roundtables/download/SalemUSACE.pdf>.

²⁹ Oregon Water Resources Department. 2009. The Willamette Reservoir Study. Accessed on May 18, 2009 from http://www.oregon.gov/OWRD/mgmt_res_study.shtml

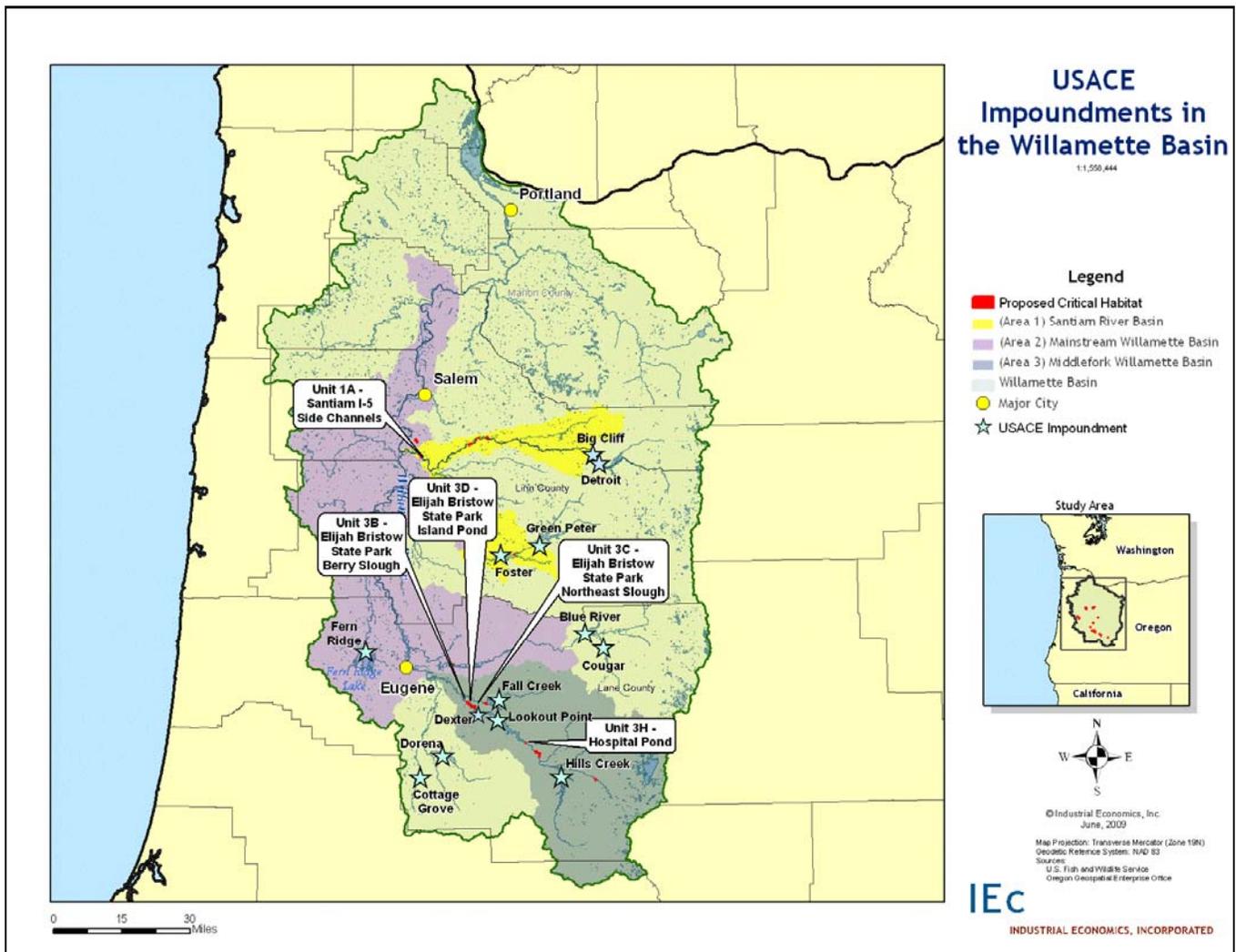
Willamette River Basin Atlas forecasts future water availability in various Willamette sub-basins, and concludes that increases in irrigated agriculture in the northern parts of the basin will significantly affect streamflow by 2050.³⁰ In an ongoing study, USACE and the Oregon Water Resources Department (OWRD) seek to determine if operational changes or modifications in the allocation of stored water in the Willamette Basin would better serve present and future water needs.³¹

64. Exhibit 3-2 displays USACE impoundments within the Willamette Basin. Because flows within proposed critical habitat areas depend upon water management upriver, the analysis considers the potential for impacts to economic activities in areas immediately upriver of proposed critical habitat (see Section 2). Although state and private entities manage several facilities in the basin, all chub habitat is situated downstream of USACE impoundments (some are upstream of USACE impoundments as well), making them the primary mechanism by which flows on the Willamette River and its tributaries are managed for the chub. These facilities, therefore, are the focus of the analysis of how chub protection may affect water management-related activities.

³⁰ Niemi, E., D. Dole, E. Whitelaw. 2002. Water Availability. In *Willamette River Basin Atlas*. Accessed on May 21, 2009 from http://www.fsl.orst.edu/pnwerc/wrb/Atlas_web_compressed/PDFtoc.html.

³¹ Oregon Water Resources Department and U.S. Army Corps of Engineers. 2001. *Willamette Basin Reservoir Study: 2001 Update*. Accessed on May 18, 2009 from http://www1.wrd.state.or.us/pdfs/Res_Study_Update_2001.pdf.

EXHIBIT 3-2 USACE IMPOUNDMENTS IN THE WILLAMETTE BASIN



65. Exhibit 3-3 provides characteristics of the 13 USACE impoundments, including the year construction was completed, total and summer pool storage, reservoir surface area, and installed hydropower-generating capacity. For an example year (2006), the exhibit provides total hydropower generation, estimated market value of hydropower generation, total recreational trips, and total recreational expenditures. As described below, outflows from the Detroit, Lookout Point, and Hills Creek facilities have been affected by chub conservation efforts in the past. Detroit and Lookout Point are responsible for over half of the total hydropower generation capacity in the basin. Although these facilities are not the top recreational reservoirs in the basin (based on the 2006 USACE visitation data below), they were still collectively responsible for over 300,000 annual trips and nearly \$8 million in recreational expenditures.

EXHIBIT 3-3 CHARACTERISTICS OF USACE IMPOUNDMENTS

IMPOUNDMENT	YEAR COMPLETED	STORAGE (ACRE- FEET)		SURFACE AREA (ACRES)	INSTALLED HYDRO- POWER CAPACITY (MW)	2006 HYDROPOWER GENERATION		2006 RECREATION	
		TOTAL	SUMMER POOL			TOTAL	MARKET VALUE	VISITATION (TRIPS)	EXPENDITURES
Big Cliff	1953	NA	NA	148	21	91,277	\$4,127,742	NA	NA
Blue River	1969	89,500	78,800	1,240	None	None	None	134,072	\$2,840,000
Cottage Grove	1942	32,900	28,700	1,152	None	None	None	366,572	\$8,750,000
Cougar	1964	219,000	143,900	1,280	28	101,593	\$4,623,829	87,831	\$1,950,000
Detroit	1953	455,100	281,600	3,600	115	316,727	\$14,006,583	202,035	\$5,610,000
Dexter	1954	NA	NA	1,024	17	67,145	\$2,879,594	654,694	\$18,070,000
Dorena	1949	77,600	65,000	1,840	None	None	None	425,876	\$9,860,000
Fall Creek	1966	125,000	108,200	1,856	None	None	None	224,971	\$6,300,000
Fern Ridge	1941	116,800	93,900	9,360	None	None	None	675,652	\$13,800,000
Foster	1968	60,700	24,800	1,200	23	87,690	\$3,600,428	536,164	\$11,820,000
Green Peter	1968	312,500	249,900	3,720	92	268,175	\$11,965,782	203,488	\$4,980,000
Hills Creek	1961	355,500	194,600	2,735	34	161,706	\$6,892,374	6,283	\$120,000
Lookout Point	1954	455,800	324,200	4,255	138	415,812	\$18,892,647	93,378	\$2,240,000

Sources:

1. OWRD and USACE. 1999. Willamette Basin Reservoirs. Accessed on May 20, 2009 from <http://www1.wrd.state.or.us/pdfs/WillametteReservoirs.pdf>.
2. Annual generation from USACE. 2008. Monthly Power Production Summaries, Corps of Engineers. Accessed on May 21, 2009 from <http://www.nwd-wc.usace.army.mil/report/pwrsum.htm>.
3. Prices used to generate market 2006 market values provided by the Northwest Power and Conservation Council (NPCC).

3.1.2 CHUB CONSERVATION NEEDS

66. Human alteration of the hydrological landscape in the Willamette Basin has been largely responsible for chub population declines. According to the Proposed Rule, the most severe population decline occurred between 1950 and 1960 when eight of the USACE impoundments were constructed.³² Channelization, revetment and dike construction, and other modifications to the natural hydrological environment have caused further declines. This water management infrastructure has both positive and negative effects on the chub. On one hand, it suppresses floodplain function and therefore limits development of new channel habitat and expansion of the species into these areas through flooding. On the other, non-native species represent a significant threat to the chub; by suppressing floods,

³² 74 FR 10416.

these non-natives are kept out of existing chub ponds, keeping them isolated from competition and predation.³³

67. Water management within the Willamette Basin has already changed significantly to accommodate threatened and endangered species, but the vast majority of these changes have been for species other than the chub. Formal consultation on operation and maintenance of the Willamette Project began in 2000 with a USACE Biological Assessment (BA) that indicated their operations would be likely to adversely affect several aquatic species in the basin. Changes in water management subsequent to this BA and the more recent 2007 supplemental BA (jointly written by USACE, Bonneville Power Administration (BPA), and the Bureau of Reclamation) have increased spring releases for salmon spawning, mandated minimum in-stream flows, and required a variety of other conservation efforts. Although establishment of minimum flows and certain other conservation efforts for other species have benefitted the chub, other existing and planned efforts may not be beneficial. For example, significant flood pulses to benefit salmonids may carry non-native species into otherwise isolated chub ponds.³⁴ The 2008 Biological Opinion (BiOp) on the proposed Willamette Project operations concludes that planned operations would “adversely affect some Oregon chub populations some years” but would not jeopardize the species.³⁵
68. Given these issues, how water should be managed for chub conservation is still uncertain; however, it is certain that exceedingly low flows in the Willamette River and its tributaries during the late spring and early summer months (when breeding occurs) threaten some chub populations adjacent to those waterways by lowering chub pond levels below those that are optimal for the species.³⁶ USACE and the Service have identified three events in which USACE has and will release additional flows specifically for the chub, as described in the following section.³⁷ Given that these events would occur regardless of critical habitat, we consider all related costs as part of the baseline.

3.2 POTENTIAL ECONOMIC EFFECTS OF CHANGES IN WATER MANAGEMENT

69. Periodic changes to the timing of releases from impoundments for the chub may adversely or positively affect water management-related economic activities in the basin. Such changes for Willamette species have affected economic activity in the past; for

³³ U.S. Fish and Wildlife Service. 2008. Biological Opinion on the Continued Operation and Maintenance of the Willamette River Basin Project and Effects to Oregon Chub, Bull Trout, and Bull Trout Critical Habitat Designated Under the Endangered Species Act. Tails Number: 13420-2007-F-0024.

³⁴ Personal communication with Paul Scheerer, ODFW; May 1, 2009.

³⁵ U.S. Fish and Wildlife Service. 2008. Biological Opinion on the Continued Operation and Maintenance of the Willamette River Basin Project and Effects to Oregon Chub, Bull Trout, and Bull Trout Critical Habitat Designated Under the Endangered Species Act. Tails Number: 13420-2007-F-0024.

³⁶ 74 FR 10416, Personal communication with Paul Scheerer, ODFW; May 27, 2009.

³⁷ How increasing flows for chub conservation in the early spring may conflict with the habitat needs of other species is uncertain. There is a risk that increasing flows for chub in the spring and early summer will interfere with the ability to meet minimum flow requirements for anadromous species in the fall.

example, the BPA has estimated that switching from the flow regime identified in the Northwest Power Plan to the flow schedule for salmon and other species increased net hydropower costs to consumers by roughly \$5 million in 2006.³⁸

70. This analysis quantifies the potential costs and benefits to recreation (i.e., through changes in reservoir levels) and hydropower generation (i.e., through changes in timing and/or quantity of generation) arising from the three chub-specific conservation events described below. All of these costs and benefits are part of the baseline. Potential impacts to other activities – including flood control, water diversions for agricultural and municipal purposes, property values around reservoirs, and activities that affect water quality – are discussed qualitatively.

3.2.1 CHUB-SPECIFIC FLOW RELEASES

71. Historically, USACE released additional flows for the chub out of Hills Creek Reservoir in 2002 and 2005 (for Unit 3H), Lookout Point Reservoir in 2002 (for Units 3B, 3C, and 3D), and Detroit Lake in 2005 (for Unit 1A). According to USACE and the Service, the flow releases from Hills Creek and Lookout Point are unlikely to recur, but the Detroit releases will likely be necessary during future low-flow years, when insufficient water is available to satisfy all water requests in the basin. Table 5.1 of the 2008 BiOp on the Willamette Project provides a table of runoff conditions in the Willamette Basin observed between 1936 and 1999, included below as Exhibit 3-4. Note that years are designated as having deficit, insufficient, adequate, or abundant flows. According to USACE and BPA, future flow releases are most likely to occur during years with deficit or insufficient flows, collectively representing about 25 percent of historically experienced water conditions.³⁹

³⁸ BPA. 2006. WillametteGenComparisonNov06HYSSR. Received from Daniel Spear, BPA; May 5, 2009. Note that changes to hydropower generation to protect the salmon are scales of magnitude more extensive than are necessary for chub protection.

³⁹ Personal communication with Daniel Spear, Bonneville Power Administration; May 1, 2009; and personal communication with Greg Taylor, U.S. Army Corps of Engineers; May 19, 2009. According to the Biological Assessment (emphasis in original text): "During an **insufficient** runoff season, it will likely be necessary to reduce flow targets at Salem and Albany to levels below the biological and Congressional minimum flow objectives. The flow targets would be less than the minimum flow objectives, proportional to the expected mid-May system-wide storage capability, down to a minimum of the deficit flow thresholds shown in Table B-4. For deficit runoff years, it is unlikely that even the weekly average deficit flow thresholds (Table B-4) would be attainable. Extensive coordination, cooperation, and adaptive management will be required in such years to balance storage use between flows needed to protect ESA-listed fish species and other uses." (Willamette Supplemental BA 2007, Appendix B, Page B-4).

EXHIBIT 3-4 EVALUATION OF SPRING RUNOFF AND CONSERVATION OPERATION (PERIOD OF RECORD 1936-1999)

VOLUME IN STORAGE BY 10-20 MAY (MAF) ¹	DESIGNATION	OCCURRENCES (YEARS)	PERCENT OF YEARS
<0.9	<i>Deficit</i>	10	16
0.9-1.19	<i>Insufficient</i>	6	9
1.20-1.48	Adequate	11	17
>1.48	Abundant	37	58

Note: 1. MAF = Millions of Acre-Feet
Source: Table 5-1. U.S. Fish and Wildlife Service. 2008. Biological Opinion on the Continued Operation and Maintenance of the Willamette River Basin Project and Effects to Oregon Chub, Bull Trout, and Bull Trout Critical Habitat Designated Under the Endangered Species Act. Tails Number: 13420-2007-F-0024.

72. The three flow release events are described below. Given that there is a lack of information on some specific characteristics of these releases, low- and high-end scenarios are identified to facilitate developing cost estimates arising from each release.

Flow release 1: Additional releases from Hills Creek Reservoir to support the chub population in Hospital Pond (Unit 3H).

73. In order to supply Hospital Pond (Unit 3H) with warm water necessary for chub breeding in the summer months, water levels in the adjacent Lookout Point Reservoir must be sufficiently high that water spills from the reservoir into the pond. On two occasions in 2002 and 2005, USACE spilled additional water from the upstream Hills Creek Reservoir to maintain sufficient water levels in Lookout Point for the chub in Hospital Pond. These events each required continuous additional releases from Hills Creek Reservoir of 100 to 200 cubic feet per second (cfs), and lasted between six and eight weeks, ending in mid-July.⁴⁰
74. According to USACE, a study is currently underway evaluating alternative ways to provide warm water to Hospital Pond without the need to spill water from Lookout Point Reservoir. When this study is complete in 2010, USACE will implement the selected alternative, which will eliminate these events in future years. Given that Lookout Point Reservoir completely filled in 2008 and is expected to fill completely in 2009, USACE does not expect that this flow release will occur in 2010.⁴¹
75. Assumptions for flow release 1
- Low- to high-end flow release: **100 cfs to 200 cfs**
 - Low- to high-end flow duration: **six to eight weeks ending July 15**

⁴⁰ Personal communication with Greg Taylor, USACE; May 19, 2009.

⁴¹ Personal communications with Greg Taylor, USACE; May 28, 2009.

- Period of impacts: **2002 and 2005 only**

Flow release 2: Additional releases from Lookout Point Reservoir to support Elijah Bristow chub populations (Units 3B, 3C, and 3D).

76. USACE increased the minimum drought year flows out of Dexter Dam from 1,000 cfs to 1,100 cfs during a single event in 2002 to support chub populations in the Elijah Bristow gravel pit ponds on the Middle Fork Willamette.⁴² Although these flows were not intended to support particular populations within proposed critical habitat, ODFW has indicated that the flows provide ancillary benefits to three populations within the proposed designation (Units 3B, 3C, and 3D).⁴³ Rather than deplete storage in Dexter Dam, which is a major recreational reservoir in the basin, the additional 100 cfs came from Lookout Point Reservoir upstream, and could occur for six to ten weeks starting June 1. USACE does not anticipate these flow releases in future years because the populations at the Elijah Bristow gravel pits are no longer present.⁴⁴
77. To estimate the potential economic impact due to these increased flows, the analysis assumes that the flows will lower Lookout Point reservoir levels but do not increase reservoir levels on Dexter Lake. Specifically, upstream releases do not affect downstream reservoir recreation. Under this assumption, this conservation event causes a loss of recreational benefits at Lookout Point and a transfer of hydropower generation to earlier in the year.
78. Assumptions for flow release 2
- Flow release: **100 cfs**
 - Low- to high-end flow: **six to ten weeks starting on June 1**
 - Period of impacts: **2002 only**

Flow release 3: Additional releases from Detroit Lake to support the chub population in the Santiam I-5 Side Channels (Unit 1A).

79. In March of 2005, an extreme drought prompted USACE to lower releases from Detroit Lake to support reservoir recreation and to preserve water for late summer. In response, the Service requested that USACE increase releases to the Santiam River from 750 cfs to 900 cfs to support a chub population in the Santiam I-5 Side Channels (Unit 1A).⁴⁵ These releases affected and will affect the timing (and perhaps the quantity) of hydropower generation, and potentially affect recreational resources on Detroit Lake. USACE and the Service have agreed that such requests are likely to continue during future drought years, defined as insufficient and deficit water years (see Exhibit 3-4).⁴⁶ Although the 2005

⁴² Personal communication with Greg Taylor, USACE; May 19, 2009.

⁴³ Written communication with Paul Scheerer, ODFW; May 21, 2009.

⁴⁴ Personal communication with Greg Taylor, USACE; May 28, 2009.

⁴⁵ Written communication from Richard Hobernicht, USACE, to Kemper McMaster, USFWS regarding 8330.03132(05); May 26, 2005.

⁴⁶ Personal communication with Greg Taylor, USACE, and Chris Allen, Service; May 1, 2009.

releases occurred in March, USACE and BPA have indicated that future release requests from Detroit Lake will more likely occur during the late spring and early summer, when flows are most constrained during low water conditions. Hence, this analysis models future releases as occurring during those later spring and early summer months.

80. Assumptions for flow release 3

- Flow release: **100 to 200 cfs**
- Low- to high-end flow duration: **six weeks starting June 1 to ten weeks starting May 1**
- Expected frequency: **1 release in 2005, 0.25 releases for all other years**
- Period of impacts: **2005, 2010 to 2029**

3.2.2 RESERVOIR-BASED RECREATION

81. Recreational activity on USACE reservoirs is a significant economic activity in the Willamette Basin. As indicated in Exhibit 3-3 above, USACE estimated that 2006 expenditures by recreationists within 30 miles of reservoirs in the Willamette basin totaled \$86.3 million. Changes in lake levels affect boating, fishing, camping, picnicking, and a variety of other recreational activities on or near USACE reservoirs. For instance, the Oregon State University Extension Service found that if Detroit Lake levels fall enough to keep moorages from opening in the summer season, the direct, indirect, and induced impacts would total \$6.5 million (2006 dollars).⁴⁷ Periodic increases in releases for the chub from Detroit Lake, Hill Creek Reservoir, and Lookout Point Reservoir during drought years further diminishes reservoir levels, adding to any economic impacts during drought years. This analysis estimates the economic impacts of these chub-specific alterations to reservoir levels only; it does not estimate the total impact caused by the underlying drought.

82. Several studies have been conducted on the relationship between reservoir water levels and recreational value. For example, Connelly et al. (2007) developed a model that relates reservoir water levels to recreational boating in New York, and estimate the changes in the net economic value of boating associated with such water levels.⁴⁸ Similarly, McMahon et al. (2004) estimate the elasticity of recreation trips with respect to the water level of Georgia's Lake Lanier using historical visitation and lake elevation data.⁴⁹ Most applicable to this context, however, is work by Seedang et al., who evaluate changes in recreation value resulting from changes in Cougar Reservoir volume in the Willamette

⁴⁷ Sorte, B., C. Buerger. 2006. Economic Impact Study for Detroit Lake and the Upper North Santiam Canyon. Accessed on May 18, 2009 from <http://ruralstudies.oregonstate.edu/Publications/DetroitLake-SR1071.pdf>

⁴⁸ Connelly, Nancy A., Tommy L. Brown, and Jonathan W. Brown. 2007. Measuring the Net Economic Value of Recreational Boating as Water Levels Fluctuate. *Journal of the American Water Resources Association*. Vol. 43, No. 4. Pages 1016-23.

⁴⁹ McMahon, et al. 2004. Lake Lanier National Economic Development Update: Evaluation of Water Supply, Hydropower, and Recreation Benefits. Prepared for the Atlanta Regional Commission. February.

Basin.⁵⁰ Given the geographic appropriateness of the Seedang et al. study, and the fact that it has been published in the peer-reviewed literature, this economic analysis uses this study to evaluate the impacts to recreation of chub conservation efforts.

83. Using data from USACE, Seedang et al. calculate recreation benefits using three steps: (1) calculate reservoir water levels under various flow scenarios using regression analysis linking reservoir elevation, area capacity (acres) and flow release; (2) estimate the effect of reservoir water levels on recreation visitations using a coefficient on the water level variable in a USACE visitation model; and (3) estimate the reservoir recreation benefits by multiplying the change in visitations (estimated from step 2) with the marginal visitation recreation benefit. Seedang et al. find that for the 2001 water year, the average value of reservoir recreation losses associated with increased flow releases during summer (June–September) was \$3.23 (in 2009 dollars) per acre-foot of water released from Cougar Reservoir downstream.⁵¹
84. Based on these findings, this analysis assumes that during other drought years, if a single acre-foot of water is released from Cougar Reservoir, the resulting decline in lake level causes \$3.23 in recreational losses. Given the severity of drought conditions in 2001, and therefore the high marginal value of additional water for recreation, this assumption may overestimate the value of water to recreation.
85. In the absence of specific information on the recreational value of releases from Detroit Lake, Hills Creek Reservoir, and Lookout Point Reservoir, this analysis scales the \$3.23 per acre-foot value from Cougar Reservoir to these other impoundments based on two characteristics: relative visitation (i.e., recreational trips) and relative summer pool volume. If visitation at a reservoir were higher than at Cougar, the recreational value of an acre-foot of water would likely also be higher. If, on the other hand, the summer pool volume of the reservoir is higher than at Cougar, an acre-foot of releases would likely have less relative effect on lake levels and would therefore drive down the recreational value of that acre-foot of water. Based on these assumptions, a reservoir with low volume and high visitation would have the highest recreational value relative to Cougar Lake. For a hypothetical reservoir “A” in the Willamette Basin, the formula to describe this relationship is as follows:

$$Value(A) = Value(Cougar) * \frac{Visitation(A)}{Visitation(Cougar)} * \frac{Volume(Cougar)}{Volume(A)},$$

⁵⁰ Seedang, S., A.G. Fernald, R.M. Adams. D.H. Landers. 2008. Economic Analysis of Water Temperature Reduction Practices in a Large River Floodplain: An Exploratory Study Of The Willamette River, Oregon. *River Research and Applications*. 24 (7), 941-959.

⁵¹ Note that this number is low compared to values developed by Ward et al. (1996) ranging from \$6 to more than \$600 per acre-foot in California reservoirs. [Ward F.A., Roach B.A., Henderson J.E. 1996. The economic value of water in recreation: evidence from the California drought. *Water Resource Research* 32: 1075-1081. Cited in Seedang et al. 2008 (see citation above).]

where Value(Cougar) is \$3.23 per acre-foot. The other parameters in the above equation (2006 visitation and summer pool volume), as well as the resulting recreational values per acre-foot for Detroit, Hills Creek, and Lookout Point, are provided in Exhibit 3-5.

EXHIBIT 3-5 RECREATIONAL VALUE PER ACRE-FOOT FOR AFFECTED RESERVOIR

IMPOUNDMENT	SUMMER VOLUME (ACRE- FEET)	2006 VISITATION	VOLUME & VISITATION COEFFICIENT RELATIVE TO COUGAR	TRANSFERRED SEEDANG ET AL. VALUE (PER ACRE- FOOT)
Cougar	143,900	87,831	1.000	\$3.23
Detroit	281,600	202,035	1.175	\$3.80
Hills Creek	194,600	6,283	0.053	\$0.17
Lookout Point	324,200	93,378	0.472	\$1.53

86. Multiplying these values per acre-foot by the expected changes in annual lake volume (in acre-feet) caused by each of the three flow releases described above results in the drought year impacts presented in Exhibit 3-6. For each flow release, this exhibit also provides the proposed critical habitat units affected, period of potential impacts, average value per acre-foot (from values in Exhibit 3-5), and low- and high-end change in reservoir volume. Based on assumptions described above, note that because Lookout Point has a higher recreational value per acre-foot than Hills Creek, transferring water from Hills Creek to Lookout Point actually increases recreational values. Hence, the recreational “impact” per acre-foot for this periodic event (i.e., Hills Creek value minus Lookout Point value) is presented as a negative number. Total pre- and post-designation impacts arising from these events are included in the total costs to water management-related activities presented in Sections 3.3 and 3.4.

EXHIBIT 3-6 RECREATIONAL IMPACTS DURING DROUGHT YEARS FOR THE THREE CHUB CONSERVATION EVENTS

EVENT	UNIT(S) AFFECTED	PERIOD OF POTENTIAL IMPACTS	IMPACT PER ACRE- FOOT	ADDITIONAL RELEASE (ACRE FEET)		DROUGHT YEAR IMPACT (NOMINAL)	
				LOW	HIGH	LOW	HIGH
1. Hills Creek to Lookout Transfer for Hospital Pond	3H	2002, 2005	(\$1.35)	8,320	22,200	-\$11,300	-\$30,100
2. Lookout Point Releases for Elijah Bristow	3B, 3C, 3D	2002	\$1.53	8,320	13,900	\$12,700	\$21,200
3. Detroit Releases for Santiam I-5 Side Channels	1A	2005, 2010-2029	\$3.80	8,320	27,700	\$31,600	\$105,000

87. These direct welfare impacts due to reduced lake elevations would also have resulting impact on the surrounding region. If fewer recreational trips are taken to USACE reservoirs, a reduction in regional economic activity related to this sector may result, which may affect the regional economy in a number of ways. Changes would manifest themselves primarily through decreased spending on fuel, food, equipment, sporting goods, and lodging. Decreased expenditures in these industries would also result in secondary effects on related sectors. Some of these related sectors may be closely associated with the recreation industry, such as the boating industry; however, some sectors may be less closely associated, such as the food service industry.

3.2.3 HYDROPOWER

88. USACE operates 13 dams on the Willamette River, of which 11 generate hydropower.⁵² Hydropower is responsible for nearly 65 percent of Oregon's overall electricity supply, although the majority of this supply is generated at Columbia River facilities. Exhibit 3-7 presents the relative contribution of hydropower in Oregon's electricity sector.

EXHIBIT 3-7 OREGON'S NET ELECTRICITY GENERATION, JANUARY 2009

POWER SOURCE/TYPE	MEGAWATT HOURS	PERCENTAGE
Petroleum-Fired	1,000	<0.1%
Natural-Gas Fired	1,353,000	23.6%
Coal-Fired	397,000	6.9%
Hydroelectric*	3,715,000	64.8%
Other Renewables	267,000	4.7%
Total	5,736,000	100%
Source: Energy Information Administration, State Profiles, Oregon. Accessed at: http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=OR#Pr on May 12, 2009.		

89. As described above, chub conservation efforts have required changes in the timing of releases from Hill Creek Reservoir, Lookout Point Reservoir, and Detroit Lake, and may continue to do so in the future at Detroit Lake. Increasing flows from May through July (i.e., the low- and high-end impact scenarios for each flow release) may transfer power production from the late summer, when power prices are high, to the late spring and early summer months, when power prices are normally lower. In a more extreme case, water that would otherwise be used to generate electricity in peak months may be spilled earlier in the season to provide flows for the chub, thus generating no electricity (i.e., water would not pass through the turbines). However, according to BPA staff, the affected Willamette facilities are normally operating at minimum flow levels in the spring, and given that the chub releases are expected during low water years, no additional spill due to flows for chub are expected.⁵³ These changes may result in diminished revenues or higher costs to BPA, the Federal agency responsible for collecting power revenues from

⁵² Willamette Riverkeeper. Accessed on March 10, 2009 from <http://www.willamette-riverkeeper.org/river1.htm>.

⁵³ Personal communication with Robert Diffely, BPA, May 29, 2009.

the Willamette reservoirs, and thus higher charges by BPA for wholesale power to consumers in the Northwest.

90. As noted in the introduction, the analysis of how flow releases may affect hydropower potential relies on modeling conducted by BPA. Staff at BPA modeled changes in monthly system generation as a result of each chub flow release scenario (described above) using the Hydro System Simulator (HydSim). According to BPA, HydSim “estimate[s] the Federal system energy production that can be expected from specific hydroelectric power projects in the PNW Columbia River Basin when operating in a coordinated fashion and meeting power and non-power requirements for the 70 water years of record (October 1928 through September 1998). The hydro regulation study uses individual project operating characteristics and conditions to determine energy production expected from each specific project.”⁵⁴ Based on the estimated frequency of “deficit” and “insufficient” water conditions, the results of HydSim runs on only the 18 lowest water years were used for this analysis. Monthly generation levels from each scenario described above were compared with a “baseline” without the specified releases for chub. As would be expected, generation increased in some months and decreased in others, in most cases by modest amounts.
91. Exhibit 3-8 presents hydropower production modeling results from HydSim under the base case scenario and two scenarios for each of the three flow release events (i.e., seven scenarios in total). The exhibit also presents the monthly differences in production between the base case and each scenario. Note that chub flow releases decrease the total annual production under the Lookout Point and Detroit Lake events, but increase production under the Hills Creek event (by 647 to 1,750 megawatt-hours (MWH) over the year). BPA has indicated that production increases under the Hills Creek event occur because reservoir elevations (and therefore hydroelectric potential) are higher during the late spring and early summer releases than when water would otherwise be released (e.g., late summer and fall).⁵⁵ Flows during these spring and early summer months therefore are likely to generate more hydropower than is displaced during other months. Note also that the largest annual change in hydropower generation resulting from chub flow releases is 1,830 MWH (under the high-end Detroit release), which is only 0.2 percent of the 846,000 MWH generated yearly in the Willamette Project under low water conditions.

⁵⁴ BPA. 2009. Loads and Resources Study, February. p. 15. Inputs and outputs of HydSim are as follows: “Inputs include: system electric loads or firm load carrying capability, secondary markets, historic unregulated stream flows or forecasted unregulated streams flows, flood control curves, project data, and a variety of constraints to meet specific fishery and other nonpower objectives. Outputs include: average and peak generating capability, spill, streamflows, reservoir elevations, and system power surplus or deficit. The model includes ancillary programs to optimize critical rule curves, determine refill curves, analyze model results, and can be run in a batch or interactive mode.” Based on written communication with Robert Diffely, BPA, June 1, 2009.

⁵⁵ Based on personal communication with BPA, June 3, 2009.

EXHIBIT 3-8 LOW- AND HIGH-END DISPLACED ELECTRICITY GENERATION FOR EACH FLOW RELEASE EVENT

FLOW RELEASE EVENT	SCENARIO	GENERATION AND CHANGE FROM BASE CASE (MWH)												TOTAL (MWH)
		MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	
GENERATION														
Base case	NA	94,300	60,800	51,200	54,500	51,300	64,300	121,000	106,000	84,900	40,100	50,900	66,500	846,000
1. Hills Creek Release	Low-end	94,300	61,500	52,100	54,500	51,100	64,300	121,000	105,000	84,900	40,100	50,900	66,500	847,000
	High-end	94,100	62,400	53,000	54,600	51,000	64,300	121,000	105,000	84,800	40,100	50,900	66,500	848,000
2. Lookout Point Release	Low-end	94,300	61,400	51,400	53,900	51,200	64,200	121,000	106,000	84,900	40,100	50,900	66,500	846,000
	High-end	94,300	61,400	51,700	53,800	51,000	64,100	120,000	106,000	84,900	40,100	50,900	66,500	845,000
3. Detroit Lake Release	Low-end	94,300	62,200	52,200	54,300	50,700	63,800	119,000	106,000	84,900	40,100	50,900	66,500	845,000
	High-end	97,300	63,400	53,000	53,800	49,700	62,000	116,000	106,000	84,900	40,100	50,900	66,500	844,000
DIFFERENCE FROM BASE CASE														
1. Hills Creek Release	Low-end	0	696	913	21	-172	-46	24	-789	0	0	0	0	647
	High-end	-157	1,640	1,830	169	-344	-58	280	-1,590	-8	0	0	0	1,750
2. Lookout Point Release	Low-end	0	592	153	-583	-128	-83	-304	0	0	0	0	0	-353
	High-end	0	592	446	-641	-300	-190	-460	0	0	0	0	0	-552
3. Detroit Lake Release	Low-end	0	1,370	1,000	-149	-612	-546	-1,450	-99	0	0	0	0	-482
	High-end	3,040	2,650	1,780	-654	-1,560	-2,360	-4,620	-112	0	0	0	0	-1,830

Source: BPA and IEC analysis of modeling results. Note that totals may not sum due to rounding.

Costs of historical flow release events

92. For the historical cost analysis, changes in generation presented above were valued at the Mid-Columbia (Mid-C) hub wholesale prices for 2002 and 2005, which were provided by the Northwest Power and Conservation Council (NPCC). Monthly prices vary considerably between these years; in 2002, prices ranged from \$7 to \$36 per MWH, whereas in 2005 they ranged from \$30 to \$100 per MWH. Exhibit 3-9 presents low- and high-end hydropower cost effects for the flow releases in 2002 and 2005. Note that the effects of the flow releases vary from \$19,600 in the 2002 Hills Creek low-end release to \$399,000 in the high-end Detroit 2005 release. This wide range is attributable to differences in magnitude, duration, and timing of flows, as well as to the significant differences in electricity prices between 2002 and 2005. Also, observe that the costs related to the Hills Creek releases are all positive, even though power production *increases* under both Hills Creek scenarios. This is because increases in production occur during June and July when power prices are lower, and decreases occur in the fall months, which have higher prices. The net effect of these changes is decreased revenues. The net present value totals related to changes in the timing or quantity of hydroelectricity generation are rolled into the total pre-designation costs presented in Sections 3.3 and 3.4 below.

EXHIBIT 3-9 HYDROPOWER COSTS DURING DROUGHT YEARS FOR THE THREE CHUB FLOW RELEASE EVENTS

FLOW RELEASE EVENT	UNIT(S) AFFECTED	EVENT YEAR	ECONOMIC COST (NOMINAL)	
			LOW	HIGH
1. Hills Creek to Lookout Transfer for Hospital Pond	3H	2002	\$19,600	\$30,900
		2005	\$26,400	\$25,300
2. Lookout Point Releases for Elijah Bristow	3B, 3C, 3D	2002	\$19,500	\$29,600
3. Detroit Releases for Santiam I-5 Side Channels	1A	2005	\$111,000	\$399,000

Costs of future flow release events from Detroit Dam

93. The displaced future electricity generation estimates resulting from the Detroit Lake releases in Exhibit 3-8 are assumed to occur only during “deficit” or “insufficient” flow years. Given that these flows have historically occurred during 25 percent of years (see Exhibit 3-4), this analysis assumes that there is a one in four chance of such an event occurring each year in the future and therefore assigns 25 percent of the monthly generation changes in Exhibit 3-8 to each year between 2010 and 2029. For example, under the high-end Detroit scenario, the analysis assumes that generation in May of each year increases by 760 MWH (i.e., 25 percent of 3,040 MWH), and that overall generation each year decreases by 458 MWH (i.e., 25 percent of 1,830 MWH).
94. Projected wholesale prices for 2010 and 2011 were taken at the Mid-Columbia (Mid-C) hub from studies in the current BPA wholesale power rate case.⁵⁶ These near-term prices were then extended through 2029 using a forecast of real (i.e., inflation-adjusted) natural gas prices delivered to electric utilities, prepared by the federal Department of Energy.⁵⁷ On average, this real price increase translates to 2.29 percent per year.⁵⁸ Natural gas prices were used for the long-term escalation because in the Western Energy Coordinating Council (WECC), natural gas is normally the “marginal fuel”. Furthermore, under low water conditions, the AC/DC Interties connecting the Northwest and California would normally be operating below capacity, ensuring that California market conditions, based on natural gas at the margin, would be reflected in Mid-C prices.
95. Post-designation hydropower costs associated with Detroit Lake releases through 2029 total between \$632,000 and \$2.22 million in the low- and high-scenarios, respectively

⁵⁶ BPA, Market Price Forecast Study, WP-10-E-BPA-03, February 2009, p. 15.

⁵⁷ DOE, “Report: An Updated Annual Energy Outlook 2009 Reference Case Reflecting Provisions of the American Recovery and Reinvestment Act and Recent Changes in the Economic Outlook, SR/OIAF/2009-03.

⁵⁸ Note that once this real price increase is applied, the resulting annual values are then discounted at three and seven percent according to Office of Management and Budget (OMB) guidance.

(discounted at seven percent). Because these costs have occurred historically and would have occurred absent critical habitat, they are included in the baseline of this analysis.

96. These economic effects are “energy only”; no capacity value, or loss thereof, is assigned to the USACE facilities. Hydropower production in the Willamette is concentrated on the peak period, and no dams are currently capable of providing regulating or operating reserves to the BPA control area. Although this is an accurate description of the current configuration and use of the Willamette system, USACE and BPA are undertaking studies to assess the potential for the Willamette dams to be modified, by the addition of hardware and telemetry, to provide reserves, in large part because of the integration of a rapidly increasing “wind generation fleet” into BPA’s system. Future flows for chub may require BPA to turn to substitute and more expensive sources of reserves.

3.2.4 POTENTIAL IMPACTS TO OTHER ACTIVITIES

97. Several other water management-related activities may be affected by changes in the timing and magnitude of Willamette Basin flows during drought years. These include water diversions, activities that affect water quality, flood control, navigation, lake-front property values, and river-based recreation. Potential impacts to each of these activities are qualitatively described below.

Water diversions

98. Due to abundant supplies of water in the Willamette Basin, small changes in the timing of flows in the basin are unlikely to affect the availability of water for diversions to agriculture or municipalities. The Bureau of Reclamation holds permits from the Oregon Water Resources Department (OWRD) to use 1.64 million acre-feet of stored water for irrigation, but current withdrawals for irrigation are less than five percent of the allocated amount.⁵⁹ In the future, however, expanding irrigated agriculture in some areas of the designation, coupled with changes in runoff due to climate change, may constrain water supplies during drought years. During such years, periodic increases in spring flows out of Detroit reservoir may affect water availability for diversions in the late summer months. Because Oregon’s water rights are regulated under the Prior Appropriation doctrine (i.e., users with earlier priority dates receive water before those with later ones), junior rights holders may lose access to water if water availability becomes sufficiently restricted.
99. An analysis of the impacts to agriculture or other economic activities that depend on water diversions requires forecasts of when and where small changes in Santiam River flows would affect diversions. Such forecasts are currently unavailable.

Activities that affect water quality

100. Lower late summer flows due to chub conservation efforts in drought years may adversely affect water quality, causing wastewater quality targets for Federal- and State-permitted entities (e.g., power plants or municipalities) to be more costly to reach. For

⁵⁹ OWRD and USACE. “Willamette Basin Reservoir Study, 2001 Update,” accessed on May 22, 2009 from http://www1.wrd.state.or.us/pdfs/Res_Study_Update_2001.pdf.

example, if temperatures in the Willamette River reach the Total Maximum Daily Load (TMDL) of 17.8 degrees Celsius, additional discharge restrictions apply for any entities permitted under the National Pollution Discharge Elimination System (NPDES).⁶⁰ In such an instance, chub conservations efforts would be responsible for the fraction of mitigation costs attributable to the marginal increase in temperature caused by periodic decreases in river flows.

101. Estimating these costs would require a basin-wide water quality model capable of assessing how decreases in Santiam River flows of 100 to 200 cfs would affect changes in water quality, and the frequency that such changes would cause Federal and State requirements to be exceeded. Further, an economic model would be needed that was capable of determining the added costs relating to these periodic events. Given that neither model is currently available, this analysis does not quantify impacts related to changes in water quality. Based on the low magnitude of these flow releases, as well as their sporadic nature, it is unlikely that these impacts would be significant, however.

Flood control

102. One of the primary purposes of the USACE impoundments in the Willamette Basin is flood control. The costs of flooding in the Willamette Basin can be dramatic, as experienced during the 1996 Willamette River floods which caused over \$400 million in total damages.⁶¹ Changes to the timing of flows may increase reservoir levels during flood prone periods, potentially increasing the risk that a heavy rainfall event will cause flooding. In the case of the changes to benefit chub, however, increases in flood risk are unlikely for two reasons: (1) during drought years, the buffering capacity of impoundments is especially high, making flood events less likely in general; and (2) the additional releases requested for the chub are more likely to increase, rather than decrease, this buffering capacity. Hence, flood control is more likely to be enhanced than adversely affected by chub conservation efforts, and is therefore described in the benefits section of this analysis.

Navigation

103. By the 1850s, the Willamette River was used regularly as a way to transport agriculture and timber products to Portland. However, Willamette Falls, located 26 miles from Portland presented a major barrier until 1873 when a series of locks was created. The locks, which are maintained by the US Army Corps of Engineers, continue to operate; however, due to low use, the government has limited operation to the summer months.⁶² Currently, the majority of commercial navigation in the area occurs on the Columbia

⁶⁰ Seedang, S., A.G. Fernald, R.M. Adams. D.H. Landers. 2008. Economic Analysis of Water Temperature Reduction Practices in a Large River Floodplain: An Exploratory Study Of The Willamette River, Oregon. River Research and Applications. 24 (7), 941-959.

⁶¹ Clackamas County Flood Overview. From http://www.co.clackamas.or.us/docs/dtd/flood_overview.pdf

⁶² Willamette Falls Heritage Foundation. "Conquering the Falls, the Willamette Falls Locks" accessed at <http://www.willamettefalls.org/HisLocks> on May 21, 2009.

River, beginning at the Columbia River bar and continuing 105 miles upriver to the Portland Harbor where the Willamette River feeds into Columbia River.

104. The Federal navigation channel on the Willamette stretches from the Broadway Bridge in Portland downstream to the Columbia River. The Willamette's navigation channel was last maintained by the Corps in 1997. Historically, the Corps dredged between 500,000 to 750,000 cubic yards of sediment from the channel every three to five years. However, navigation has been impaired due to the lack of maintenance dredging over the last ten years.⁶³ Accordingly, although changes in the timing and magnitude of flows from Detroit Lake during drought years may affect the flows in the mainstem Willamette, these changes will have a negligible effect on navigation activities in the Columbia.

Waterfront property values

105. Waterfront home prices reflect the amenities of being near water; any changes in the value of these amenities would result in a change in the value of the waterfront home and would therefore represent a loss in consumer surplus to homeowners. Declining reservoir water levels as a result of chub conservation efforts may adversely impact waterfront amenities by diminishing recreational access (e.g., to docks or beaches) or view quality. Property values would be affected to the extent that view quality was lessened, recreational access was diminished, or some other impact occurred as a result of this additional decline in water elevations.
106. Although there are few lakefront properties on Detroit Lake, property values may be affected by chub conservation efforts. To evaluate these effects, a hedonic price model would be needed to separate lake levels from other factors that cause variations property values, such as market fluctuations and other property characteristics (e.g., number of rooms, acreage, quality of house, etc.). Such a study would require sufficient property transaction data to statistically identify the relationship between lake levels and property values. However, for this statistical separation to be feasible, the study must also have sufficient data to control for all other explanations for why property values vary. Such datasets were not identified in the course of this study. To avoid this issue, lakefront property owners can be surveyed about how changes in lake elevation may affect their property values (i.e., using the contingent valuation method). In the absence of either data source, this analysis does not quantify impacts to property values; however, it is likely these effects would be small given their small magnitude and infrequent nature.

River-based recreation

107. According to the Willamette River Recreation Guide (1998), nearly the entire Willamette River offers good fishing opportunities.⁶⁴ The fish species vary depending on fishing location; however, the river is best known for its cold water fish including the spring and

⁶³ Port of Portland. 2005. Columbia River Navigation. Accessed on May 20, 2009 from http://www.portofportland.com/Nvgt_Home.aspx; Port of Portland. 2009. Willamette River Dredged Material Management Plan. Accessed on May 20, 2009 from http://www.portofportland.com/Prj_Mar_DMMP_Home.aspx.

⁶⁴ Oregon State Marine Board and Oregon State Parks. Willamette River Recreation Guide. 1998.

fall chinook salmon, summer and winter steelhead, and trout.^{65,66} Given that the increases in flows during the spring and early summer months would more than likely benefit, rather than harm, river-based recreational opportunities, the effects to this activity are qualitatively discussed in the benefits section of this economic analysis.

3.3 PRE-DESIGNATION IMPACTS

108. Estimated economic impacts related to chub conservation efforts that have occurred prior to the designation of critical habitat include impacts to recreation and hydropower activities arising from the three events described above, as well as administrative costs of section 7 consultations. There have been 38 consultations on water management-related activities between 1993 and 2009. Of these, 10 are known to have occurred within the study area, 20 occurred outside of the study area, and the locations of eight are unknown. Assuming that the frequency of known consultations within the study area applies to these eight, approximately three additional consultations are assumed to occur within the study area, bringing the total to 13. One of these consultations was a technical assistance effort, seven were informal, four were formal, and one was programmatic (on USACE's Willamette Project operations).
109. USACE has been the primary action agency consulting with the Service, although the U.S. Environmental Protection Agency (EPA) and the Federal Energy Regulatory Commission (FERC) have also consulted. Habitat management-related conservation activities resulting from the Willamette Project consultation are discussed in Section 7 of this analysis. Total pre-designation administrative costs associated with section 7 consultations are \$154,000, discounted at seven percent.
110. Pre designation baseline costs are displayed in Exhibit 3-10. Total pre-designation costs to water management-related activities range from \$427,000 to \$893,000, discounted at seven percent (\$154,000 of which is administrative costs of section 7 consultation). The largest fraction of pre-designation costs is impacts to recreation and hydropower activities at Detroit Reservoir in 2005 caused by releases to support Unit 1A. Note that the impacts to Hospital Pond (Unit 3H) in the high-end scenario are negative, reflecting a net gain in recreational benefits caused by transferring water from Hills Creek Reservoir to Lookout Point Reservoir.

⁶⁵ Oregon Fishing Guides. "Willamette River Fishing," accessed at http://www.tgfusa.com/Willamette_River.asp on May 21, 2009.

⁶⁶ Oregon Department of Fish and Wildlife. "2005 Oregon Native Fish Status Report" Accessed at <http://www.dfw.state.or.us/fish/ONFSR/final/Vol%20II%20Introduction.pdf> on May 21, 2009.

**EXHIBIT 3-10 PRE-DESIGNATION IMPACTS TO WATER MANAGEMENT-RELATED ACTIVITIES BY UNIT
(2009 DOLLARS, ASSUMING A SEVEN PERCENT DISCOUNT RATE)**

UNIT	PRESENT VALUE IMPACTS	
	LOW	HIGH
1A	\$204,000	\$678,000
1B(1)	\$27,300	\$27,300
1B(2)	\$3,120	\$3,120
1B(3)	\$3,120	\$3,120
1B(4)	\$3,120	\$3,120
1C	\$3,120	\$3,120
2A(1)	\$3,120	\$3,120
2A(2)	\$3,120	\$3,120
2A(3)	\$32,700	\$32,700
2B(1)	\$12,700	\$12,700
2B(2)	\$3,120	\$3,120
2B(3)	\$3,120	\$3,120
2B(4)	\$3,120	\$3,120
2B(5)	\$3,120	\$3,120
3A	\$3,120	\$3,120
3B	\$20,300	\$30,300
3C	\$20,300	\$30,300
3D	\$20,300	\$30,300
3E	\$3,120	\$3,120
3F	\$3,120	\$3,120
3G	\$3,120	\$3,120
3H	\$36,400	-\$1,880
3I	\$3,120	\$3,120
3J	\$3,120	\$3,120
3K	\$3,120	\$3,120
Total	\$427,000	\$893,000
<p>Note: Totals may not sum due to rounding. Also, the negative value for Unit 3H implies that the costs are negative, or alternatively, that conservation actions in that unit provide benefits.</p>		

3.4 POST-DESIGNATION IMPACTS

111. Similarly, post-designation impacts arise from both impacts to recreation and hydropower activities, as well as forecast administrative costs of section 7 consultations. The analysis assumes that in future years a consultation on the USACE Willamette Project will be reinitiated to address chub critical habitat, and that another consultation on this project will occur in 2023 when the 15-year term of the 2008 BiOp has expired. For other water management-related actions, the analysis assumes that consultations will occur at the same frequency as observed between 1993 and 2009. Based on this assumption, approximately one technical assistance effort, eight informal consultations, and five formal consultations occur between 2010 and 2029.

3.4.1 POST-DESIGNATION BASELINE IMPACTS

112. Post designation baseline costs are displayed in Exhibit 3-11. Total post-designation baseline costs range from \$731,000 to \$2.43 million, discounted at seven percent. Of this total, the administrative costs of section 7 consultations are forecast to be \$50,500 over the next 20 years (or \$2,020 for each unit, as indicated in Exhibit 3-10), discounted at seven percent. Remaining post-designation baseline impacts are forecasted impacts to recreational and hydropower activities stemming from Detroit releases to support Unit 1A. For the impacts in this unit, flow release events from Detroit Lake are anticipated to occur with a 25 percent probability each year (i.e., one in four years), and cause nominal recreation impacts of between \$7,900 and \$26,400 annually (i.e., 25 percent of the values in Exhibit 3-6 above) and an average of between \$59,300 and \$208,000 in nominal hydropower impacts annually. Discounting the resulting stream of annual impacts between 2010 and 2029 and summing this value with the \$2,020 in administrative costs of section 7 consultation results in total impacts for Unit 1A of \$683,000 to \$2.38 million.

3.4.2 INCREMENTAL IMPACTS

113. As noted above, water management-related incremental impacts of this proposed designation are entirely administrative costs of section 7 consultations. Given that anticipated future consultations are assumed to either benefit all units or occur on any one unit with equal probability, forecast incremental costs are equal among units. The total incremental cost of the proposed designation on water management-related activities is \$890 for each unit over 20 years, totaling \$22,200 for all 25 units (both discounted at seven percent). Annualized, these figures are \$78 and \$1,960, respectively.

EXHIBIT 3-11 POTENTIAL POST-DESIGNATION BASELINE IMPACTS TO WATER MANAGEMENT-RELATED ACTIVITIES BY UNIT (2009 DOLLARS, ASSUMING A SEVEN PERCENT DISCOUNT RATE)

UNIT	PRESENT VALUE IMPACTS		ANNUALIZED IMPACTS	
	LOW	HIGH	LOW	HIGH
1A	\$683,000	\$2,380,000	\$60,200	\$210,000
1B(1)	\$2,020	\$2,020	\$178	\$178
1B(2)	\$2,020	\$2,020	\$178	\$178
1B(3)	\$2,020	\$2,020	\$178	\$178
1B(4)	\$2,020	\$2,020	\$178	\$178
1C	\$2,020	\$2,020	\$178	\$178
2A(1)	\$2,020	\$2,020	\$178	\$178
2A(2)	\$2,020	\$2,020	\$178	\$178
2A(3)	\$2,020	\$2,020	\$178	\$178
2B(1)	\$2,020	\$2,020	\$178	\$178
2B(2)	\$2,020	\$2,020	\$178	\$178
2B(3)	\$2,020	\$2,020	\$178	\$178
2B(4)	\$2,020	\$2,020	\$178	\$178
2B(5)	\$2,020	\$2,020	\$178	\$178
3A	\$2,020	\$2,020	\$178	\$178
3B	\$2,020	\$2,020	\$178	\$178
3C	\$2,020	\$2,020	\$178	\$178
3D	\$2,020	\$2,020	\$178	\$178
3E	\$2,020	\$2,020	\$178	\$178
3F	\$2,020	\$2,020	\$178	\$178
3G	\$2,020	\$2,020	\$178	\$178
3H	\$2,020	\$2,020	\$178	\$178
3I	\$2,020	\$2,020	\$178	\$178
3J	\$2,020	\$2,020	\$178	\$178
3K	\$2,020	\$2,020	\$178	\$178
Total	\$731,000	\$2,430,000	\$64,500	\$214,000
Note: Totals may not sum due to rounding. Also, the negative values for Unit 3H implies that the costs are negative, or alternatively, that conservation actions in that unit provide benefits.				

3.5 SOURCES OF UNCERTAINTY

114. It is important to recognize the uncertainty inherent in the assumptions underlying this analysis. Exhibit 3-12 summarizes these uncertainties and their potential effect on estimated economic impacts.

EXHIBIT 3-12 SUMMARY OF SOURCES OF UNCERTAINTY TO THE WATER MANAGEMENT ANALYSIS

ASSUMPTION	POTENTIAL EFFECT ON RESULTS
WATER MANAGEMENT (GENERAL)	
Climate change and increases in water use will have no effect on water availability in future years. Instead, these factors are likely to increase the frequency of future droughts.	-
Patterned after historic hydrological conditions, "deficit" or "insufficient" runoff (see Exhibit 3-4) in the Willamette Basin have an even 25 percent chance of occurring each year between 2010 and 2029. The actual future likelihood of such conditions may be higher or lower than 25 percent, which would affect the estimated impacts during future years.	+/-
Water users and managers in the basin, such as irrigators or USACE, will not adapt to chub flow releases. Instead, users and managers may be able to more readily adapt operations in order to meet flows for the chub than is assumed in this analysis. These adaptations may result in less costly solutions (i.e., implement less costly adaptive measures).	+
Releases of water to allow for chub breeding in the late spring and early summer months will have no effect on the ability of USACE to meet late season flow requirements for other aquatic species.	-
RECREATION	
The recreation value per acre-foot of reservoir releases developed by Seedang et al. (2008) for Cougar Reservoir can be transferred to other reservoirs in the Willamette Basin using adjustments for relative levels of visitation and reservoir volumes.	+/-
Releases from Detroit Reservoir in March 2005 to support chub populations in Unit 1A have effects on recreation that are comparable to the summer releases evaluated by Seedang et al. (2008). Instead, these earlier season releases may have a less pronounced effect on recreational activity since fewer trips occur during those months.	+
HYDROPOWER	
Monthly power prices will follow the same pattern in future years, and will increase following DOE's price schedule through 2030. Depending on a variety of factors such as climate change, availability of substitutes, and rainfall, these prices are likely to differ from those forecast.	+/-
No effects of cap and trade carbon policies on electricity pricing are in effect through 2029. Depending on how cap and trade policies are designed, they may have a downward or upward effect on prices.	+/-
QUALITATIVELY DISCUSSED ACTIVITIES	
The effect on property values is not quantified. Flows associated with chub conservation efforts will cause lake levels to decline, which may adversely affect property values surrounding these lakes.	-
The effect on river-based recreation is not quantified. Increasing flows in the Willamette River and its tributaries to provide water to chub habitat will increase the recreational benefits (e.g., boating, fishing) on those rivers.	+

ASSUMPTION	POTENTIAL EFFECT ON RESULTS
The effect on diversions and waste water discharge allowances is not quantified. Diversions of water for irrigation and municipal purposes, and waste water discharge from municipalities and other entities, may be further constrained in future years due to the additional flows for the chub. No information was available to estimate these potential impacts.	-
The effect on flood control capacity is not quantified. Lowering reservoir levels may increase flood control capacity by increasing the available buffer during high-flow events.	+
+: This assumption may result in an overestimate of costs. - : This assumption may result in an underestimate of costs. +/-: This assumption has an unknown effect on estimates.	

SECTION 4 | AGRICULTURE

115. This section considers potential economic impacts to agricultural activities resulting from chub conservation efforts. Chub populations adjacent to agricultural areas may be at risk due to reduced water quality resulting from pesticides and nutrient runoff.⁶⁷ According to the National Land Cover Database (NLCD) and parcel-specific assessor information, 10 of the 25 proposed units are adjacent to agricultural land currently in production.⁶⁸
116. This section begins with an overall summary of impacts to agricultural activities. Next, the methods and assumptions used to arrive at impacts are discussed, followed by the presentation of pre- and post-designation impacts. Exhibit 4-1 summarizes pre- and post-designation impacts to agricultural activities.

**EXHIBIT 4-1 SUMMARY OF IMPACTS TO AGRICULTURAL ACTIVITIES
(2009 DOLLARS, ASSUMING A SEVEN PERCENT DISCOUNT RATE)**

VALUES	LOW	HIGH
Pre-Designation Impacts (1993 - 2009)		
Present Value of Impacts	\$0	\$305,000
Post-Designation Baseline Impacts (2010 - 2029)		
Present Value of Impacts	\$0	\$562,000
Annualized Impact Value	\$0	\$53,000
Incremental Impacts (2010 - 2029)		
Present Value of Impacts	\$0	\$0
Annualized Impact Value	\$0	\$0

⁶⁷ 74 FR 10416.

⁶⁸ In the absence of more specific Geographic Information Systems (GIS) data, the analysis defines agricultural land using the 2001 NLCD land cover categories "Pasture/Hay" and "Cropland". The NLCD is a national Landsat 5 and 7 imagery-based raster dataset classifying land into 21 different categories. According to NLCD land cover definitions (<http://www.epa.gov/mrlc/definitions.html>), "Pasture/Hay" lands include "areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation." Areas identified as "Cropland" include "areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled."

On-line interactive parcel maps for Linn, Land, Benton, and Marion counties were also used to corroborate whether agricultural lands adjacent to proposed critical habitat were either zoned for or already classified as being used in agriculture production.

4.1 AGRICULTURAL ACTIVITIES WITHIN THE STUDY AREA

117. Based on a GIS overlay of the study area and lands zoned for agriculture (according to county assessor databases), this analysis identifies 10 units that may experience potentially elevated levels of nutrients and pesticides associated with runoff from adjacent farms. As highlighted in Exhibit 4-2, these units are:

- Unit 1B(4) Gray Slough;
- Unit 2B(2) Dunn Wetland;
- Unit 2B(4) Finley Cheadle Pond;
- Unit 1A Santiam I-5 Side Channels;
- Unit 1B(3) South Stayton Pond;
- Unit 2A(1) Russell Pond;
- Unit 2A(3) Big Island;
- Unit 2B(1) Ankeny Willow Marsh;
- Unit 2B(3) Finley Display Pond; and
- Unit 3E Dexter Reservoir RV Alcove DEX3.

4.2 CURRENT MANAGEMENT FOR PESTICIDES

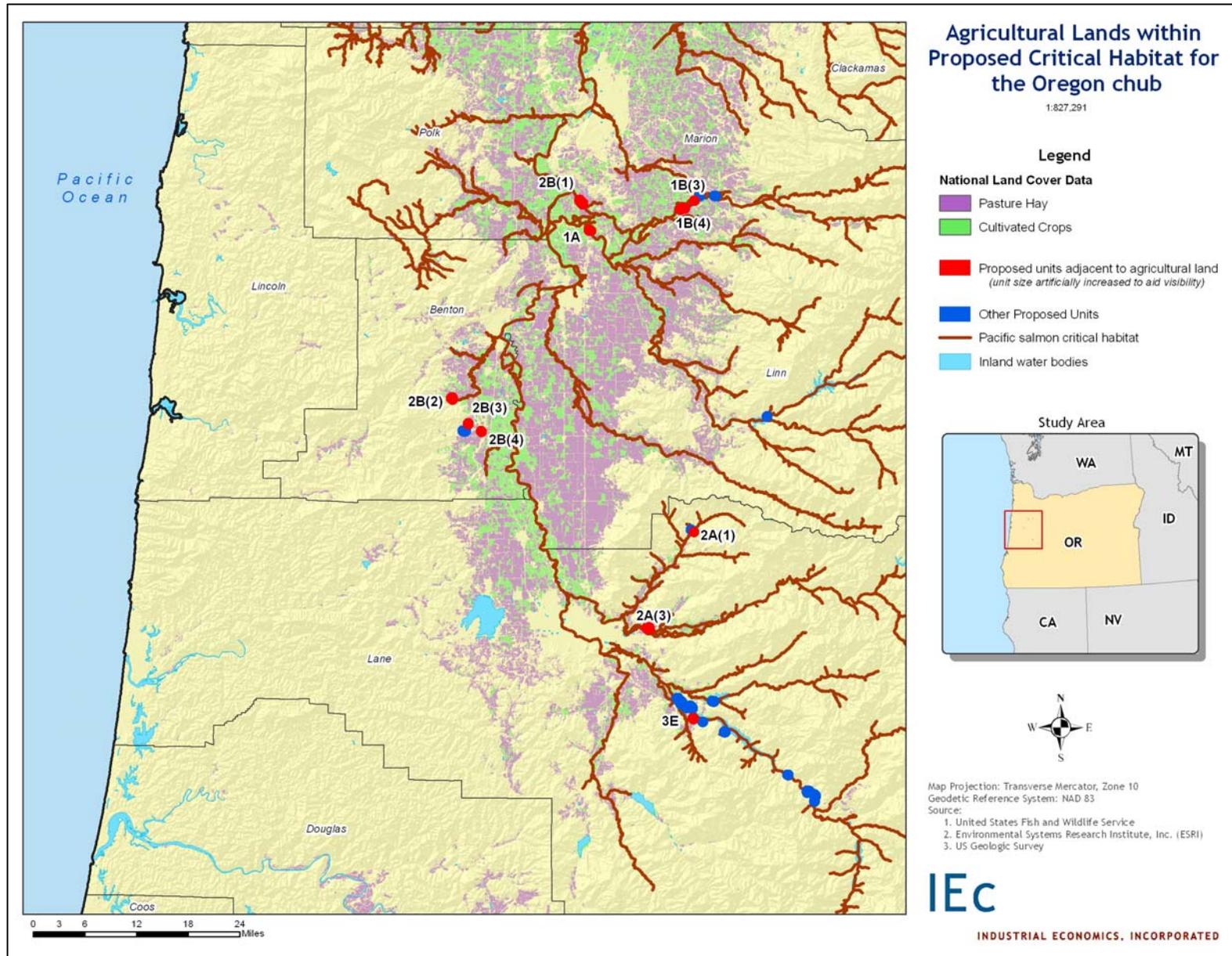
118. To date, there have been no section 7 consultations regarding the effects of pesticides on chub or its habitat. Agricultural-related consultations have been limited to irrigation (USACE) and habitat management projects (NRCS), which are included in Sections 3 and 7, respectively.

119. Historically, preclusion of pesticide use within certain distances of aquatic habitat for listed species has resulted from court-ordered injunctions applied to areas where EPA has been directed to make an “effect determination” on pesticides specific to a listed species. Such determinations have been relatively rare and EPA has not yet faced litigation that would require the agency to review a suite of pesticides specific for the Oregon chub. EPA is currently, however, making an effect determination on 55 pesticide active ingredients for the Pacific salmon, whose critical habitat partially overlaps chub proposed critical habitat (also highlighted in Exhibit 4-2).

4.2.1 EXISTING PESTICIDE-FREE BUFFER ZONES (PACIFIC SALMON)

120. Under section 7, the U.S. Environmental Protection Agency (EPA) may consult with the Service to ensure that registration of products under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) complies with the Endangered Species Act. In 2002, the Washington Toxics Coalition filed a lawsuit in U.S. District Court for the Western District of Washington alleging that EPA violated its obligations under the Act to review the effects of 55 pesticide active ingredients on Pacific salmon. In January of 2004, the

EXHIBIT 4-2 PROPOSED UNITS ADJACENT TO AGRICULTURAL LAND



court ordered an injunction stating that until EPA reviews the effects of the 55 active ingredients and subsequently consults with the National Marine Fisheries Service (NMFS), application of the said ingredients will be precluded within certain distances of the high water mark of water bodies.⁶⁹ The injunction establishes a 20 yard buffer when applying the pesticide ingredients using ground equipment and a 100 yard buffer for aerial application.

121. Where pesticide application is precluded in compliance with the established buffers, this analysis assumes that agricultural land is taken out of production. In places where land is left fallow in compliance with the injunction and also overlaps chub proposed critical habitat, impacts of taking land out of production are included as part of the baseline for this analysis.

4.3 METHODS AND ASSUMPTIONS

122. To estimate baseline impacts from the establishment of pesticide-free buffers for the Pacific salmon, this analysis employs a three-step process:

1. **Identify the geographic extent of pesticide-free buffers** based on placing a 20-yard and 100-yard buffer around final critical habitat for the Pacific salmon.
2. **Calculate acreage of agricultural lands adjacent to chub proposed critical habitat that also fall within existing pesticide-free buffers.** This is completed by placing 20-yard and 100-yard buffers around the proposed critical habitat units and then calculating the agricultural acreage (as defined by the NLCD) where buffered areas overlap.⁷⁰ This effectively isolates the amount of agricultural land taken out of production for the salmon that is also assumed to provide baseline protection for the chub. Because data are unavailable on the proportion of land within the study area for which aerial applications is used versus ground applications, this analysis bounds impacts to agricultural activities based on the two buffer areas.⁷¹
 - At the low-end, the analysis assumes that all areas use ground pesticide application and applies a buffer area of 20 yards around the chub proposed critical habitat and Pacific salmon critical habitat areas.
 - At the high-end, the analysis assumes that all areas use aerial pesticide application and applies a buffer area of 100 yards to the chub proposed critical habitat and Pacific salmon critical habitat areas.

⁶⁹ U.S. District Court Ruling found at: <http://oregon.gov/ODA/PEST/docs/pdf/bufferorder.pdf> . This lawsuit was specific to the pacific salmon, but applies to all listed species.

⁷⁰ This analysis assumes that 20-yard and 100-yard buffers ordered by the court offer a sufficient level of protection for aquatic species. Accordingly, the same buffers were applied to proposed critical habitat.

⁷¹ This analysis only considers the court-ordered buffer around proposed units and does not go further upstream for those units with a full or partial hydrologic connection with the adjacent waterway. The reasonableness of this assumption is based on discussions with Paul Scheerer (ODFW) and Rollie White (USFWS); Personal communication with Paul Scheerer, Oregon Department of Fish and Wildlife; May 13, 2009; Personal communication with Rollie White, U.S. Fish and Wildlife Service, Portland Field Office; May 13, 2009.

As shown in Exhibit 4-3, in the low-end scenario, there are no agricultural lands within areas where the 20-yard buffers overlap. Approximately 50 acres of agricultural land lies within areas where the 100-yard buffers overlap.

3. Estimate impacts resulting from the implementation of pesticide-free buffers.

This analysis assumes that implementation of pesticide-free buffers will result in the loss of productive agricultural production in affected areas.⁷² To estimate the value of foregone agricultural production, this analysis relies on county-specific data from the 2007 USDA National Agriculture Statistics Service (NASS), Census of Agriculture for Oregon. Specifically, this analysis uses data on the agricultural acreage per farm and net revenue (ignoring government payments) per farm. Dividing the total annual net revenue by agricultural acreage by county yields the average net revenue per acre per year, by county (Exhibit 4-3).

EXHIBIT 4-3 ANNUAL NET REVENUE FROM AGRICULTURAL LANDS ADJACENT TO PROPOSED CRITICAL HABITAT (FOR BOTH LOW- AND HIGH-END SCENARIOS)

UNIT	COUNTY	20-YARD BUFFER			100-YARD BUFFER		
		PASTURELAND ACRES	CROPLAND ACRES	TOTAL AGRICULTURAL VALUE	PASTURELAND ACRES	CROPLAND ACRES	TOTAL AGRICULTURAL VALUE
1B(2)	Marion	0	0	\$0.00	0.0	0.4	\$946
1B(4)	Marion	0	0	\$0.00	0.1	0.0	\$86
2A(3)	Lane	0	0	\$0.00	8.1	0.0	\$2,090
2B(1)	Marion	0	0	\$0.00	27.4	8.6	\$48,400
2B(2)	Benton	0	0	\$0.00	5.7	0.0	\$1,490
Total		0.0	0.0	0.0	41.3	9.0	\$53,000

4.4 PRE-DESIGNATION IMPACTS

123. The pre-designation period relevant to this section begins in 2005, the year following the effective date of the stipulated injunction (October 20, 2006), and continues to 2009. Exhibit 4-4 presents total undiscounted and present value costs of pre-designation chub conservation on agricultural farming activities by unit.

⁷² To the extent that there are alternative beneficial uses of agricultural land (e.g., organic farming or grazing), this analysis may overstate future economic impacts. A summary of caveats to this analysis is presented in Exhibit 4-7.

EXHIBIT 4-4 AGRICULTURAL PRE-DESIGNATION ECONOMIC IMPACTS, 2005 TO 2009 (2009 DOLLARS ASSUMING A SEVEN PERCENT DISCOUNT RATE)

UNIT	UNDISCOUNTED COST		PRESENT VALUE COST	
	LOW	HIGH	LOW	HIGH
1B(2)	\$0	\$4,730	\$0	\$5,440
1B(4)	\$0	\$431	\$0	\$495
2A(3)	\$0	\$10,400	\$0	\$12,000
2B(1)	\$0	\$242,000	\$0	\$279,000
2B(2)	\$0	\$7,440	\$0	\$8,560
Total	\$0	\$265,000	\$0	\$305,000
Note: Totals may not sum due to rounding.				

4.5 POST-DESIGNATION IMPACTS

124. The post-designation period for this analysis is 2010 to 2029. During the post-designation time period, this analysis assumes that the pesticide use restrictions established by the stipulated injunction would continue to provide sufficient protection for the Pacific salmon (and thus, chub). Impacts are assumed to occur on an annual basis. Exhibit 4-5 summarizes the post-designation baseline impacts.

EXHIBIT 4-5 AGRICULTURAL POST-DESIGNATION BASELINE ECONOMIC IMPACTS, 2010 TO 2029 (2009 DOLLARS ASSUMING A SEVEN PERCENT DISCOUNT RATE)

UNIT	UNDISCOUNTED COST		PRESENT VALUE COST		ANNUALIZED	
	LOW	HIGH	LOW	HIGH	LOW	HIGH
1B(2)	\$0	\$18,900	\$0	\$10,000	\$0	\$946
1B(4)	\$0	\$1,720	\$0	\$912	\$0	\$86
2A(3)	\$0	\$41,700	\$0	\$22,100	\$0	\$2,090
2B(1)	\$0	\$969,000	\$0	\$513,000	\$0	\$48,400
2B(2)	\$0	\$29,800	\$0	\$15,800	\$0	\$1,490
Total	\$0	\$1,060,000	\$0	\$562,000	\$0	\$53,000
Note: Totals may not sum due to rounding.						

4.6 SOURCES OF UNCERTAINTY

125. It is important to recognize the uncertainty inherent in the assumptions underlying this analysis. Exhibit 4-6 summarizes these uncertainties and their potential effect on estimated economic impacts.

EXHIBIT 4-6 SUMMARY OF CAVEATS TO AGRICULTURAL ANALYSIS

ASSUMPTION	POTENTIAL EFFECT ON RESULTS
This analysis assumes that the court-ordered injunction restricting pesticide use represents the likely outcome of future section 7 consultations between EPA and NMFS. To the extent that future consultations find more flexible ways to avoid jeopardy or adverse modification (e.g., adjustments in cropping or pesticide use practices), this analysis may overstate future economic impacts.	+
To the extent that there are alternative beneficial uses of agricultural land (e.g., organic farming or grazing), this analysis may overstate future economic impacts.	+
Given the current pesticide-free buffer areas around Pacific salmon habitat and its proximity to proposed critical habitat, this analysis assumes that EPA will not be required to consult with the Service on pesticide active ingredients specific to the chub.	-
+: This assumption may result in an overestimate of real costs. -: This assumption may result in an understatement of real costs. +/-: The assumption has an unknown effect on estimates.	

SECTION 5 | FORESTRY ACTIVITIES

126. This section describes the potential economic impacts of chub conservation on forestry activities in the study area. Forestry activities threaten the chub and its habitat by increasing sedimentation to levels that can change the composition and quality of the open-water habitat necessary for chub growth and reproduction.⁷³ According to a spatial overlay of the study area (and confirmed by parcel-specific assessor information), seven of the 25 proposed units lie adjacent to forested areas. Based on stakeholder discussions to date, this analysis assumes that impacts to forestry activities may occur on three of the seven units.
127. Exhibit 5-1 provides an overall summary of impacts to forestry activities as described in the remainder of this section. Chub conservation measures required for forestry activities are intended to preserve aquatic and riparian habitat and protect forested areas immediately adjacent to water bodies. Accordingly, many of these conservation measures are expected to occur even in the absence of the chub and its habitat as a result of existing Federal and State regulations designed to protect water quality, aquatic and riparian areas, and streambed structure in forested areas where timber harvest occurs. Because of the level of existing measures that result in protection of chub habitat, the incremental impacts of critical habitat designation are forecast to be minor and administrative.

EXHIBIT 5-1 SUMMARY OF IMPACTS TO FORESTRY ACTIVITIES (2008 DOLLARS, ASSUMING A SEVEN PERCENT DISCOUNT RATE)

VALUES	LOW	HIGH
Pre-Designation Impacts (1993 - 2009)		
Present Value of Impacts	\$339,000	\$339,000
Post-Designation Baseline Impacts (2010 - 2029)		
Present Value of Impacts	\$37,700	\$37,700
Annualized Impact Value	\$3,360	\$3,360
Incremental Impacts (2010 - 2029)		
Present Value of Impacts	\$4,910	\$4,910
Annualized Impact Value	\$463	\$463

⁷³ 74 FR 10426.

5.1 TIMBER HARVEST ACTIVITIES IN THE STUDY AREA

128. Of the seven units adjacent to forested lands, three are located on private lands (Units 2B(5), 3F, and 3G), and four are located within Willamette National Forest (WNF; Units 3H, 3I, 3J, and 3K). Units adjacent to private lands are zoned for timber management and are subject to regulations set forth by the Oregon Forest Practices Act (FPA) and enforced under the guidance of the Oregon Department of Forestry (ODF).
129. Although lands within WNF are subject to management guidelines set forth by the 1990 Willamette National Forest Land and Resource Management Plan and the 1994 Northwest Forest Plan, no units within WNF are located next to areas currently managed for timber. Units adjacent to both private and public forested lands are highlighted in Exhibit 5-2.

5.1.1 TIMBER HARVEST ON PRIVATE LANDS WITHIN THE STUDY AREA

130. Based on discussion with ODF, commercial timber harvest is known to occur adjacent to Finley Gray Creek Swamp (Unit 2B(5)), Dexter Reservoir Alcove PIT1 (Unit 3F), and East Fork Minnow Creek Pond (Unit 3G). Both Douglas fir and red alder stands lie adjacent to Unit 2B(5), whereas forested areas adjacent to Units 3F and 3G are predominantly Douglas fir.^{74,75} Under Oregon law, private landowners are not legally required to develop timber management plans that explicitly address the presence of federally listed species.⁷⁶ They may, however, voluntarily choose to do so in accordance with the Oregon Forest Practices Act (FPA). The FPA provides guidelines on how to effectively minimize impacts of forestry practices in sensitive habitat areas. In such cases, ODF facilitates the development of a written plan that demonstrates how the actions of private landowners provide adequate protection.⁷⁷ To date, landowners adjacent to 2B(5) have been the only private entities to voluntarily develop management plans for the chub in the study area.
131. This analysis considers the voluntary actions of landowners adjacent to Unit 2B(5) as part of the economic baseline for this analysis. Impacts from restricting timber harvest in this unit, and the methodology of arriving at impacts, are described below. According to ODF, landowners have not yet developed voluntary management plans for the chub populations in Units 3F and 3G, and there are no current plans to do so.⁷⁸ Consequently, this analysis only includes impacts to Unit 2B(5).

⁷⁴ Personal communication with Russ Anderson, Stewardship Forester, Oregon Department of Forestry, West Oregon District; May 29, 2009.

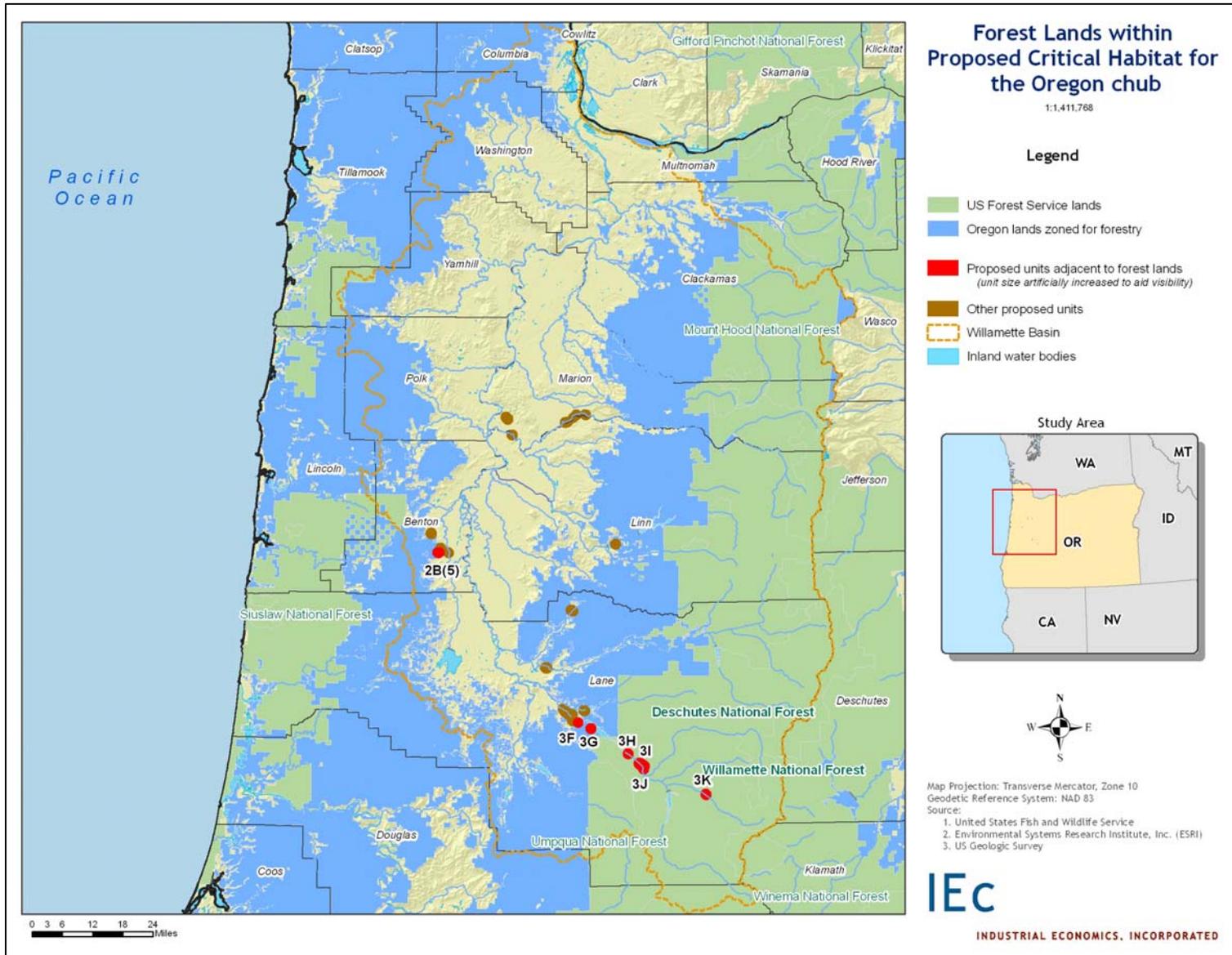
⁷⁵ Personal communication with Marvin Vetter, Stewardship Forester, Oregon Department of Forestry, Eastern Lane Unit; May 29, 2009.

⁷⁶ Ibid.

⁷⁷ Written communication with Russ Anderson, Stewardship Forester, Oregon Department of Forestry, West Oregon; May 15, 2009. The Oregon Administrative Rules for the Department of Forestry, DIVISION 21 STEWARDSHIP AGREEMENTS, 629-021-0100 available at: http://arcweb.sos.state.or.us/rules/OARS_600/OAR_629/629_021.html.

⁷⁸ Personal communication with Marvin Vetter, Stewardship Forester, Oregon Department of Forestry, Eastern Lane Unit; May 29, 2009.

EXHIBIT 5-2 UNITS ADJACENT TO FORESTED AREAS WITHIN STUDY AREA



5.1.2 TIMBER HARVEST WITHIN WILLAMETTE NATIONAL FOREST

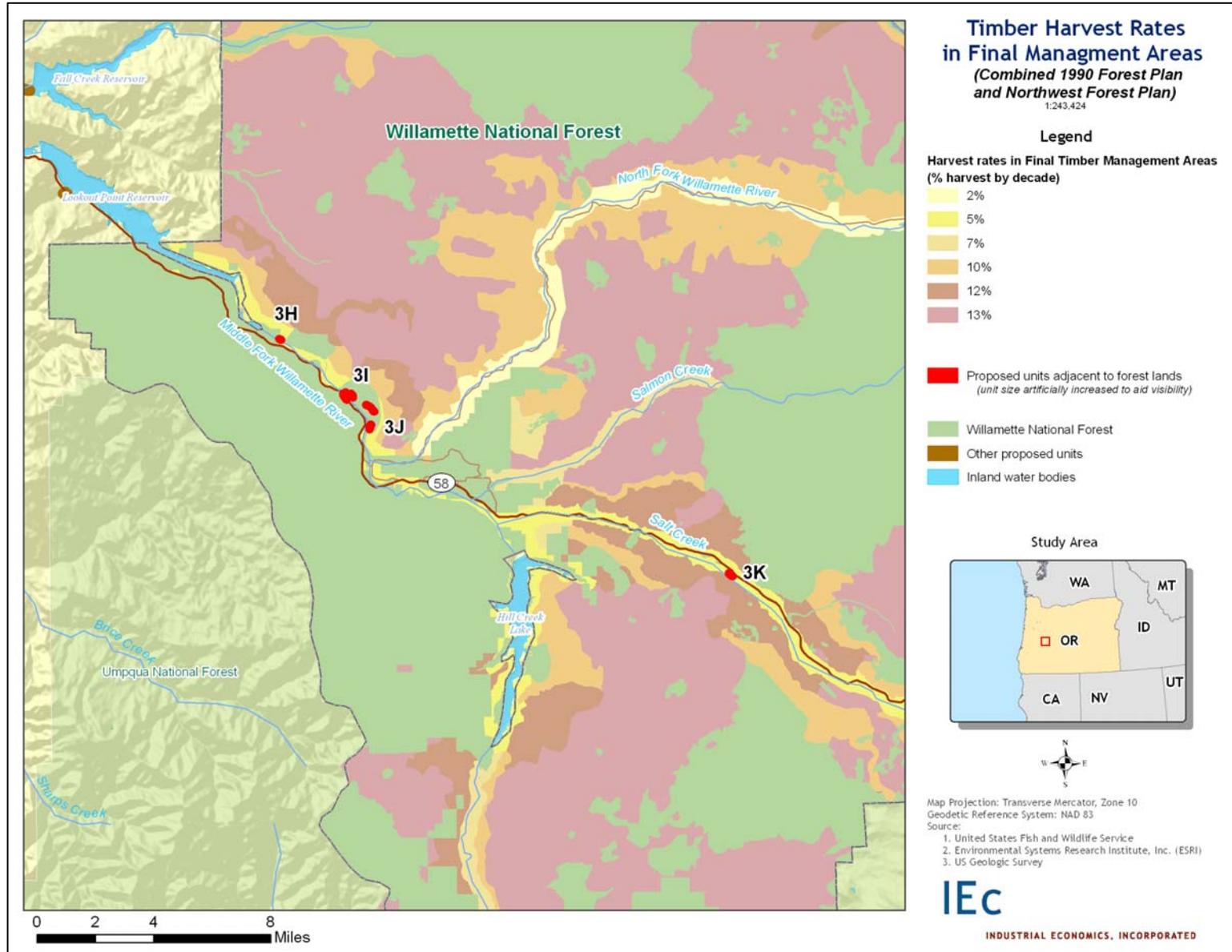
132. Of the four units in WNF, Units 3H, 3I, and 3J are situated just off the Middle Fork Willamette River and 3K runs parallel to Salt Creek (a tributary to the Middle Fork Willamette River). As stated above, timber harvest within WNF is guided by management areas set forth by the 1990 Willamette National Forest Land and Resource Management Plan and the 1994 Northwest Forest Plan. The “combined plan” allows for specified percentages of areas to be harvested for timber on a decadal basis. As highlighted in Exhibit 5-3, all three units on the Middle Fork Willamette River fall within management areas that preclude timber harvest.
133. Unit 3K lies in an area that allows for a five percent harvest rate per decade; however, it runs along a narrow band between Salt Creek and US Highway 58 (a corridor connecting the West Cascades Scenic Byway and the Cascade Lakes Scenic Byway) and is “managed to ensure that landscape alterations are not visibly evident”.⁷⁹ Limited timber harvest may occur within the larger management unit that extends along Salt Creek; however, harvest is not expected to occur within the vicinity of 3K. Furthermore, the USFS does not anticipate altering timber management operations as a result of the critical habitat designation for the Oregon chub.⁸⁰
134. Upon notification of the proposed designation by the Service, USFS anticipates reinitiating a section 7 consultation related to the Buzzard Thin timber sale along the North Fork Willamette River. The proposed timber sale is not adjacent to areas proposed for designation but in the broader vicinity. USFS does not expect that reinitiation will result in an “adverse modification” finding and thus it will not effectively change how the timber sale is administered.⁸¹

⁷⁹ 1990 Land and Resource Management Plan for the Willamette National Forest. USDA Forest Service. Accessed on May 21, 2009 from <http://www.fs.fed.us/r6/willamette/manage/forestplan/index.html>

⁸⁰ Personal communication with Corey Lewellen, Fisheries biologist, Willamette National Forest; May 26, 2009.

⁸¹ Ibid.

EXHIBIT 5-3 LOCATION OF UNITS WITHIN WILLAMETTE NATIONAL FOREST



5.2 ANALYTIC METHODOLOGY

135. This section describes the methodology for estimating costs from foregone timber production in the areas subject to the voluntary management plan in Unit 2B(5) Finley Gray Creek Swamp.

5.2.1 UNIT 2B(5) FINLEY GRAY CREEK SWAMP

136. Finley Gray Creek Swamp is fed by Gray Creek, a small stream flowing into William J. Finley National Wildlife Refuge on its western border. As shown in Exhibit 5-4, the northern portion of the unit lies within the refuge while the southern portion abuts private forest lands. In 1995, Lowther Land and Timber, a private company based in Philomath, Oregon that owned the majority of the land adjacent to Gray Creek, agreed to develop a management plan for the chub with the assistance of ODFW and ODF. The final plan included a minimum 20-foot no-cut buffer along Gray Creek that could be extended up to 50-feet depending on how much land was needed to meet basal area requirements.⁸² The company also voluntarily agreed to apply herbicides within 100-feet from the creek using ground application methods as opposed to aerial methods. This management plan was later fully adopted in 2005 by the current owners, Rosboro Lumber Company of Springfield Oregon.
137. Below are figures used to determine the impacts arising from foregone harvesting in the buffered areas around Gray Creek and additional costs of using ground application of herbicides as opposed to aerial application. These figures were provided by the ODF stewardship forester who has jurisdiction covering Gray Creek.⁸³

Key Assumptions:

- **Timber value**
 - Average board feet of standing volume for stands within 20 feet of the tributaries of Gray Creek: 15 thousand board-feet (MBF) of Douglas fir per acre plus five MBF of red alder per acre.
 - Average logging cost delivered to mill: \$150 per MBF for Douglas fir and \$175 per MBF for red alder.
 - Log price at mill: \$650 for Douglas fir and \$500 for red alder

⁸² The FPA uses “basal area” as a measure of tree density. Basal area is the cross-sectional area of the stems of trees, expressed in square feet, per unit of area. For instance, a tree of 13.5 inches in diameter has one square foot of basal area. For “small, fish” streams, the FPA rules that 40 square feet of conifer basal area must be left within 50 feet of the stream per 1000 feet of stream length per side of stream. If the required conifer basal area can be achieved within 20 feet, no additional buffer is required. If the basal area cannot be met within 20 feet then the buffer must be expanded out until the required basal area per 1000 feet of stream is met. The maximum distance of buffer for a small fish stream is 50 feet. A further discussion of the requirement can be found at the following location: http://www.oregon.gov/ODF/PRIVATE_FORESTS/1995Reforest.shtml

⁸³ Written communication from Russ Anderson, ODF Stewardship forester; May 15, 2009. Note that Mr. Anderson was not directly involved in the development of the management plan and therefore emphasized that the figures may vary in light of a formal timber inventory of the area.

- Harvest and severance taxes: 5 percent of net profit.
- **Timber stand characteristics and buffered area**
 - Assumes a 55-year rotation cycle.
 - Timber stand age was approximately 40 years old in 1995.
 - Assumes basal area requirement in the FPA management plan are met by preserving half of the timber available in the 30-foot buffered area between the mandatory 20-foot buffer and the 50-foot limit on which basal requirements are met.
- **Other**
 - Additional expense incurred by landowner to apply herbicides using ground application equipment is approximately \$25 per acre (measured as the marginal cost above the cost of aerial application).
 - Estimated annual cost of an ODF stewardship forester assisting on chub related research and activities within district is \$400.

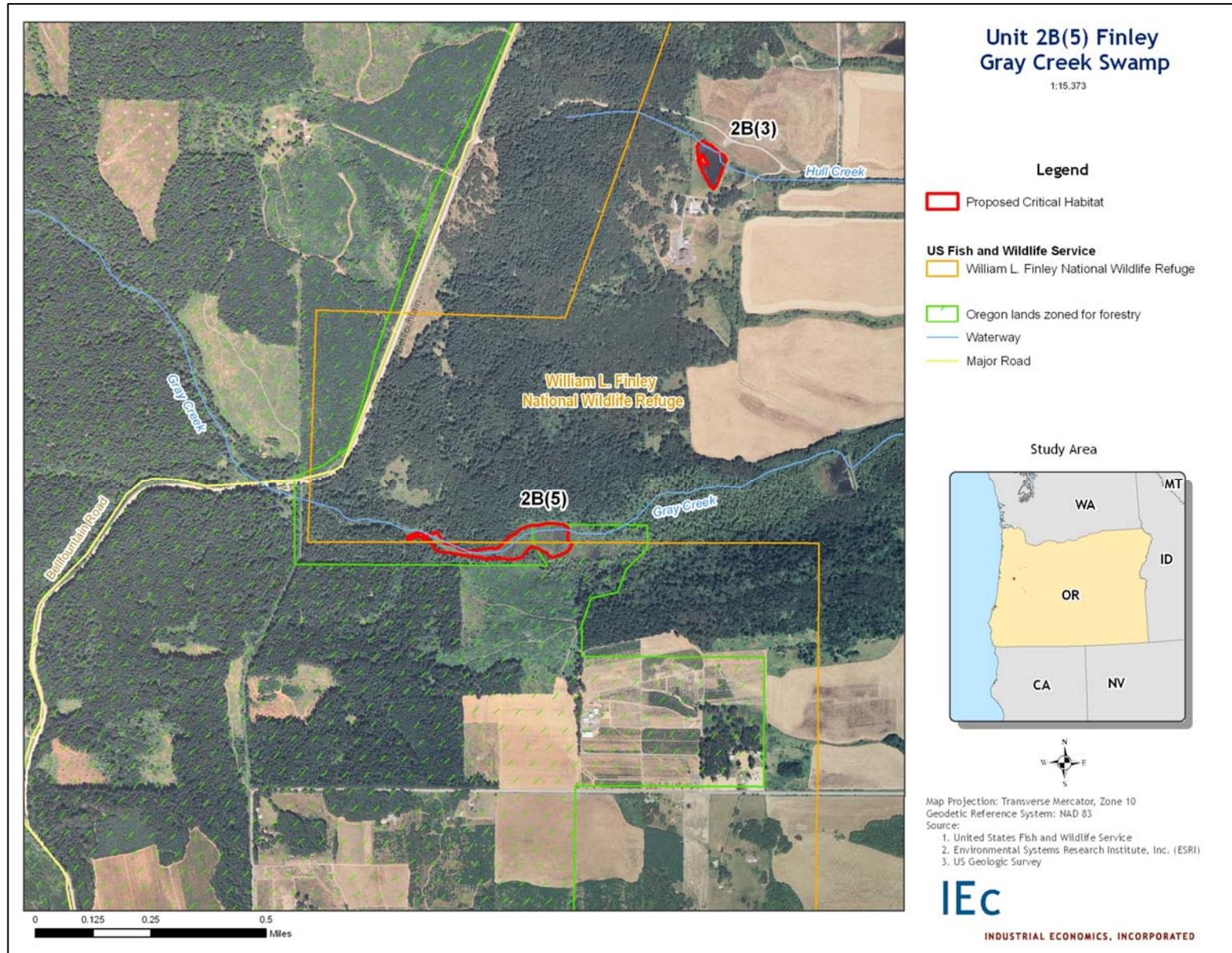
138. The following describes the process by which impacts to landowners are calculated based on the 1995 management plan for the chub. Impacts represent the reduction in land value associated with the preclusion of timber harvest within the prescribed no-cut buffer areas along Gray Creek.

1) Calculation of net revenue per acre: As shown in the text box below, net per-acre timber values are calculated in two steps. First, timber yield per acre (in MBF) for each tree species was multiplied by the net revenue per MBF (i.e., the mill price less delivery costs and taxes). The resulting net revenue of \$8,669 represents the average per acre value of timber for each acre in the areas subject to the Gray Creek management plan, assumed to be in 2009 dollars.

	MBF (per acre)		Net Value (Mill Price – Delivery Cost)		Pre-Tax	Post-Tax
Douglas-fir:	150	x	(\$650 - \$150)	=	\$7,500	\$7,125
Alder:	5	x	(\$500 - \$175)	=	\$1,625	<u>\$1,544</u>
Total :						\$8,669 per acre

2) Estimate acreage within buffered areas along Gray Creek: According to ODF, approximately 25,758 linear feet of stream length along Gray Creek is subject to timber harvest restrictions. Given the 20-foot buffer on each stream bank, this equates to

EXHIBIT 5-4 UNIT 2B(5) FINLEY GRAY CREEK SWAMP



approximately 1,030,320 sq. feet (or 23.7 acres). For the additional 30-foot buffer where thinning is allowed to occur (up to 50 percent), this represents approximately 1,545,480 sq. feet (or 35.5 acres).

3) Calculate the impact from precluding timber harvest in buffered area: The market value of a silvicultural parcel of land is typically composed of an option value (i.e., the option to develop the property at some future date), a conservation value, and a timber harvesting value. This analysis assumes that the no-harvest restrictions outlined in the 1995 management plan eliminate the timber harvesting component of land value in the 20-foot buffer area surrounding Gray Creek. To estimate the value of timber harvesting, the analysis sums the discounted net revenues associated with future foregone harvests. Assuming timber stands around Gray Creek are approximately 40 years old in 1995 and harvested on a 55-year rotation, the first foregone harvest would have occurred in 2010, the second in 2065, the third in 2120, and so on.

The value of each foregone harvest for the 20-foot buffer assumes 23.7 acres multiplied by a per-acre timber value of \$6,430 (adjusted to 1995 dollars). The 30-foot buffer (between the mandatory 20-foot buffer and 50-foot buffer in which to meet basin area requirements) contains approximately 35.5 acres. Approximately half of this area will be subject to thinning and thus will lose an estimated 50 percent of future harvests. Regional timber experts indicate that six percent is the rate generally being applied for timberland appraisals in the Pacific Northwest at present.⁸⁴ At a six percent discount rate in 1995, the total present value of the loss in land value is approximately \$116,000. To remain consistent with the analysis, this impact borne in 1995 is compounded forward at a three and seven percent discount rate.⁸⁵

4) Calculate the additional annual costs of applying herbicides using ground application equipment: ODF estimates that applying herbicides using ground equipment costs \$25 more per acre than aerial application. Ground application is assumed to occur between 20 feet and 100-feet away from Gray Creek (no harvest occurs within 20 feet of the creek). Given the linear stream length of Gray Creek, this restriction applies to approximately 94.6 acres. The annual impact to the landowner is approximately \$2,960. This analysis applies this impact annually from 2005 to 2029 in Unit 2B(5).

5) Calculate the annual cost to ODF in assisting on chub related research and activities: According to ODF, over the past 10 years, about \$400 has been spent annually conducting chub related research within the Benton county stewardship forester district (the district that includes Unit 2B(5) Finley Gray Creek Swamp). Absent specific

⁸⁴ Personal communication with Toby Atterbury, President, Atterbury Consultants, Incorporated; March 13, 2007.

⁸⁵ The three and seven percent discount rates follow the direction in Office of Management and Budget's Circular A-4 and direction provided by the Department of the Interior. These rates are applied to all economic analyses that measure the economic impacts of federal regulatory actions. A more detailed explanation for using the three and seven percent discount rates can be found at the following location: the U.S. Office of Management and Budget, Circular A-4, September 17, 2003 and U.S. Office of Management and Budget, "Draft 2003 Report to Congress on the Costs and Benefits of Federal Regulations; Notice," 68 Federal Register 5492, February 3, 2003.

information on the annual costs to the Eastern Lane county stewardship forester district, this analysis assumes the Benton costs also occur in Eastern Lane.⁸⁶ Therefore, this analysis applies an annual cost of \$200 to Unit 3F Dexter Reservoir Alcove PIT1 and \$200 to Unit 3G East Fork Minnow Creek Pond for chub-related efforts by ODF.

5.3 PRE-DESIGNATION IMPACTS

139. As described above, pre-designation impacts on timber harvest activities have been incurred by ODF and private landowners managing for timber along Unit 2B(5). In addition, administrative costs of section 7 consultations have occurred in the past, including one technical assistance for a timber harvest along Gray Creek by Lowther Land and Timber in 1999 and an informal consultation near Units 3H, 3I, and 3J on the Jump Up thin timber sale in 2002. The total administrative cost of these section 7 efforts is \$15,000.
140. Exhibit 5-5 presents pre-designation impacts by unit. Total pre-designation impacts to timber harvest activities are \$339,000. The majority of this cost estimate is driven by the restrictions on forestry activities in Unit 2B(5), which total \$318,000.

EXHIBIT 5-5 PRE-DESIGNATION IMPACTS ON FORESTRY ACTIVITIES BY UNIT (2009 DOLLARS, ASSUMING A SEVEN PERCENT DISCOUNT RATE)

UNIT	PRESENT VALUE IMPACTS
2B(5)	\$321,000
3F	\$3,160
3G	\$3,160
3H	\$4,010
3I	\$4,010
3J	\$4,010
Total	\$339,000

5.4 POST-DESIGNATION IMPACTS

141. Post-designation baseline and incremental impacts arise from both impacts to forestry activities, as well as forecast administrative costs of section 7 consultations. As mentioned above, USFS anticipates reinitiating consultation to address adverse modification related to the Buzzard thin timber sale along the North Fork Willamette River. This analysis assumes that the consultation occurs in 2010, the year the critical habitat designation is anticipated. Additionally, based on the assumption that consultations will occur at the same frequency as observed between 1993 and 2009, approximately one technical assistance effort and one informal consultation are forecasted to occur between 2010 and 2029.

⁸⁶ Personal communication with Marvin Vetter, Stewardship forester, Oregon Department of Forestry; May 29, 2009.

5.4.1 POST-DESIGNATION BASELINE IMPACTS

142. Post-designation baseline impacts include the on-going conservation measures related to ground application of herbicides on Gray Creek, ODF costs for chub research and activities, and the administrative costs of section 7 consultations. Exhibit 5-6 presents post-designation baseline impacts by unit. Total post-designation baseline impacts to forestry activities are \$37,700, of which \$4,210 is administrative costs of section 7 consultation (both discounted at seven percent).

EXHIBIT 5-6 POST-DESIGNATION BASELINE IMPACTS ON FORESTRY ACTIVITIES BY UNIT (2009 DOLLARS, ASSUMING A SEVEN PERCENT DISCOUNT RATE)

UNIT	PRESENT VALUE IMPACTS	ANNUALIZED IMPACTS
2B(5)	\$30,300	\$2,680
3F	\$2,120	\$187
3G	\$2,120	\$187
3H	\$1,050	\$99
3I	\$1,050	\$99
3J	\$1,050	\$99
Total	\$37,700	\$3,360

5.4.2 INCREMENTAL IMPACTS

143. Incremental impacts of this proposed designation are entirely administrative costs of section 7 consultations. Total incremental impacts to forestry activities are \$4,910, discounted at seven percent.

EXHIBIT 5-7 INCREMENTAL IMPACTS ON FORESTRY ACTIVITIES BY UNIT (2009 DOLLARS, ASSUMING A SEVEN PERCENT DISCOUNT RATE)

UNIT	PRESENT VALUE IMPACTS	ANNUALIZED IMPACTS
2B(5)	\$351	\$33
3H	\$1,520	\$143
3I	\$1,520	\$143
3J	\$1,520	\$143
Total	\$4,910	\$463

5.5 SOURCES OF UNCERTAINTY

144. It is important to recognize the uncertainty inherent in the assumptions underlying this analysis. Exhibit 5-8 summarizes these uncertainties and their potential effect on estimated economic impacts.

EXHIBIT 5-8 SUMMARY OF SOURCES OF UNCERTAINTY TO THE FORESTRY ANALYSIS

ASSUMPTION/CAVEAT	POTENTIAL EFFECT ON RESULTS
This analysis assumes that landowners adjacent to Units 3F and 3G will not develop voluntary management plans specific for the chub. This assumption is based on the fact that they have not yet done so and have no plans to do so in the future. If these landowners developed a plan, impacts to forestry activities would be higher than presented in this analysis.	-
Cost information provided for the impact analysis for the Gray Creek management plan is based on personal communication with ODF rather than a formal timber inventory. Additionally, other input variables are approximations and may vary slightly. If actual estimates of harvest characteristics (i.e., stumpage values, rotation lengths) differ from those provided, the cost estimates presented in this analysis would change.	+/-
Lands currently zoned for timber are assumed to continue to be managed for timber in the foreseeable future unless otherwise indicated. Any future changes in zoning would affect the estimates presented in this analysis.	+/-
+: This assumption may result in an overestimate of real costs. -: This assumption may result in an underestimate of real costs. +/-: This assumption has an unknown effect on estimates.	

SECTION 6 | TRANSPORTATION ACTIVITIES

145. This section describes how conservation efforts to protect the chub and its habitat may affect transportation activities in the study area. These activities represent a potential threat to the species because construction and maintenance of roads and bridges may result in changes in the water level or flow conditions, as well as degradation of in-water habitats. Transportation activities may also pose a risk of chemical spills or runoff either during construction or from the project itself.⁸⁷
146. The Oregon Department of Transportation (ODOT) maintains and builds highways as well as railroads and mass transit lines for the State of Oregon. Most road projects planned and carried out by ODOT involve a Federal nexus through funding from the Federal Highway Administration (FHWA) or from permits required under Section 404 of the Clean Water Act (CWA).
147. Exhibit 6-1 provides an overall summary of impacts to transportation activities as described in the remainder of the section. Conservation measures required for transportation-related activities to protect the chub are primarily designed to identify and isolate the chub prior to and during transportation projects. Where suitable chub habitat is present, ODOT will survey and monitor for the chub, and then designate restricted work areas where chub are known to be present. For larger transportation projects, ODOT may also purchase land from conservation banks to offset direct habitat loss. Aside from these offset purchases and monitoring/survey efforts, other conservation measures are expected to occur even in the absence of the chub and its habitat as a result of existing best management practices (e.g., ODOT's Standard Specifications for Highway Construction). Based on the level of existing measures to protect chub habitat, the incremental impacts of critical habitat designation are forecast to be relatively minor and related primarily to increased administrative effort.
148. The section begins by discussing past and likely future transportation-related impacts within the study area, ODOT's chub site assessment procedures, and past chub conservation measures for transportation-related activities. This discussion is followed by a presentation of pre- and post-designation impacts and a final section highlighting major assumptions and uncertainties of the analysis.

⁸⁷ Service, Proposed Rule, 74 FR 10411.

**EXHIBIT 6-1 SUMMARY OF IMPACTS TO TRANSPORTATION ACTIVITIES
(2009 DOLLARS, ASSUMING A SEVEN PERCENT DISCOUNT RATE)**

VALUES	LOW	HIGH
Pre-Designation Impacts (1992 - 2009)		
Present Value of Impacts	\$100,000	\$100,000
Post-Designation Baseline Impacts (2010 - 2029)		
Present Value of Impacts	\$233,000	\$7,830,000
Annualized Impact Value	\$19,900	\$691,000
Incremental Impacts (2010 - 2029)		
Present Value of Impacts	\$9,000	\$9,000
Annualized Impact Value	\$850	\$850

6.1 BACKGROUND

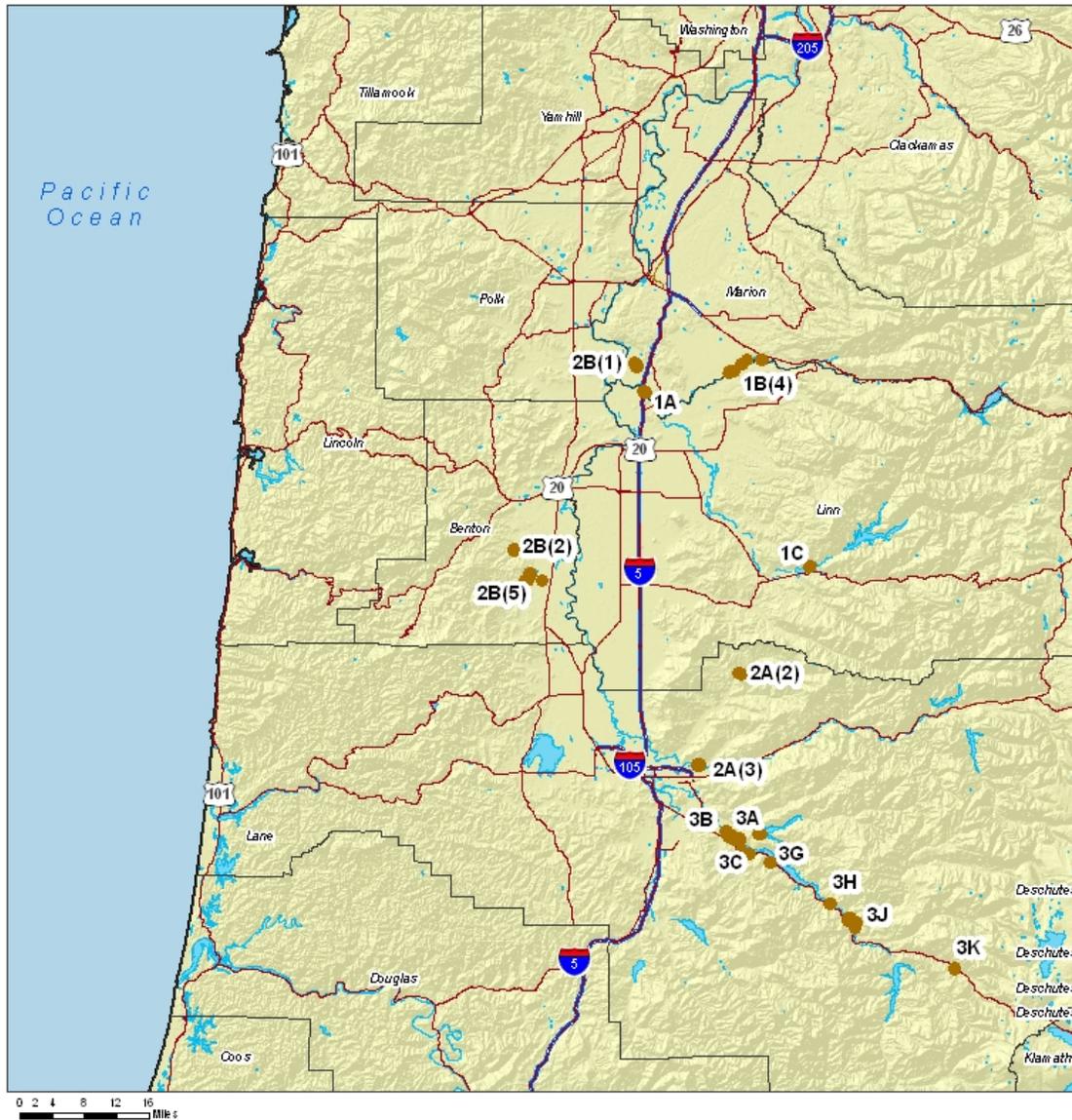
6.1.1 TRANSPORTATION ACTIVITIES IN THE STUDY AREA

149. Oregon contains approximately 104,000 kilometers of public roads. As shown in Exhibit 6-2, most of the public roads in the state are county-owned, rural roads. While these roads do not cross the proposed designation itself, many of the proposed units are located within a mile of major roads like Interstate 5 and the Willamette Highway (Oregon Route 58) (see Exhibit 6-3).

EXHIBIT 6-2 PUBLIC ROAD LENGTH BY OWNERSHIP (KM)

OWNER	RURAL ROADS	URBAN ROADS
State Highway Agency	10,747	1,374
County	48,527	5,153
Municipal	2,560	13,884
Federal Agency	7,295	146
Other *	14,151	34
Total	83,280	20,592
Note: * "Other" ownership includes State park, State toll, other State agency, other local agency, and other roadways not identified by ownership. Source: Federal Highway Administration, Highway Statistics 2005, accessed at: http://www.fhwa.dot.gov/policy/ohim/hs05/metric_tables.htm .		

EXHIBIT 6-3 LOCATION OF CRITICAL HABITAT UNITS RELATIVE TO MAJOR ROADS



Major Roads within Proposed Critical Habitat for the Oregon chub

1:100,000

Legend

- Inland water bodies
- Limited Access
- Highway
- Proposed Critical Habitat Units



Map Projection: Transverse Mercator, Zone 10
 Geodetic Reference System: NAD 83
 Source:
 1. United States Fish and Wildlife Service
 2. Environmental Systems Research Institute, Inc. (ESRI)
 3. US Geological Survey



INDUSTRIAL ECONOMICS, INCORPORATED

150. Since 1992, the Service has consulted for the chub on 49 transportation and construction projects. Of those 49 projects, approximately eight transportation projects were located within the study area.⁸⁸ Based on the past rate of consultation and available project forecasts, this analysis estimates that 10 projects are planned within the study area over the next twenty years.⁸⁹ Both past and forecast projects range in scope but primarily involve bridge and culvert replacements, road widening, and other improvements to roadways and bridges.

6.1.3 CHUB CONSERVATION MEASURES

151. Since the species listing in 1993, there have been 49 section 7 consultations associated with construction and transportation-related activities. Conservation measures required for transportation-related activities are primarily designed to preserve water quality and minimize surface disturbance. Accordingly, the majority of conservation measures required to protect the chub or its habitat are expected to occur even in the absence of the chub and its habitat as part of compliance with ODOT's Standard Specifications and Special Provisions and Oregon's Removal and Fill laws.⁹⁰ Chub-specific conservation measures largely consist of avoiding areas where chub are known to be present and surveying/monitoring activities at a cost of approximately \$1,400 per chub population (see Exhibit 6-4).⁹¹
152. In addition, the Service recently approved ODOT's operation of the first conservation bank in Oregon for the benefit of multiple species in addition to the chub, including Cook's lomatium and the vernal pool fairy shrimp. The 80-acre conservation bank is intended to ensure that future road and highway improvement projects do not conflict with species conservation efforts, and to avoid project delays resulting from species conflicts.⁹² The bank is governed under ODOT's Statewide Banking Program, a

⁸⁸ The location of 13 section 7 consultations was unknown. Based on the frequency at which the other 36 consultations occurred within the study area, this analysis estimates that approximately three of the "unknown" consultations occurred in the study area.

⁸⁹ Oregon Department of Transportation, *Oregon Transportation Plan*, September 20, 2006. Department of Transportation, *Transportation Development Planning: ODOT Region Information*, accessed at: http://www.oregon.gov/ODOT/TD/TP/regionLinks.shtml#ODOT_Region_1 on May 26, 2009. Oregon Department of Transportation, *Northwest Region: Current Projects*, accessed at: http://www.oregon.gov/ODOT/HWY/REGION2/current_projects.shtml on May 26, 2009. Service, Endangered Species Act Formal and Informal Consultation and Conference, Magnuson Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation on the Oregon Department of Transportation's OTIA III Statewide Bridge Delivery Program.

⁹⁰ Oregon Department of Transportation, *Standard Specifications Manual*, accessed at: http://www.oregon.gov/ODOT/HWY/SPECS/standard_specifications.shtml on May 26, 2009. Service, Endangered Species Act Formal and Informal Consultation and Conference, Magnuson Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation on the Oregon Department of Transportation's OTIA III Statewide Bridge Delivery Program, June 29, 2004.

⁹¹ Oregon Department of Fish and Wildlife, *Management Plan for Oregon Department of Transportation Properties that Support Populations of the Endangered Oregon Chub*, accessed at: http://oregonstate.edu/dept/ODFW/NativeFish/pdf_files/OChubODOTManagement.pdf on May 26, 2009.

⁹² US Fish and Wildlife Service, *Oregon's First Conservation Bank*, July 22, 2008. Accessed at: <http://www.fws.gov/oregonFWO/LandAndWater/ConservationPlanning/ConservationBank.asp>

cooperative agreement between ODOT and various State and Federal agencies, including the Service and Oregon Department of Fish and Wildlife (ODFW).

153. ODOT also in the process of developing conservation banks specifically for Oregon chub at two sites on the Santiam River and the East Fork Minnow Creek. Although the banks are in development, they have not been utilized yet. ODOT may utilize these banks in the future when the agency identifies projects where use of a conservation bank is preferred to offsetting the impacts at the project site.⁹³
154. The cost of these conservation bank credits is to be determined on a per-credit basis depending on the acreage and the quality of the habitat.⁹⁴ Because the conservation banks have not yet been utilized for chub conservation efforts, the cost of bank credits specifically for chub are unknown. In the absence of specific information for the chub, this analysis uses a broad range of credit prices for other endangered species at conservation banks nation-wide. The range of \$3,000 to \$125,000 per acre represents credit prices at more than 70 conservation banks in ten states.⁹⁵ It is unclear where prices for chub offsets would fall in this range.
155. Even though to date ODOT has not used conservation banks to offset impacts for chub, the development of chub-specific conservation banks suggest they may do so in the future. Therefore, this analysis assumes that ODOT makes a one-time purchase of conservation credits equivalent to the acreage of the unit impacted at a cost of \$3,000 to \$125,000 per acre in order to offset future impacts and avoid project delays (see Exhibit 6-4). For units where multiple projects are anticipated, this purchase is assumed to occur in the year when the first project begins construction.

EXHIBIT 6-4 EXAMPLE CONSERVATION COSTS FOR TRANSPORTATION ACTIVITIES (2007)

CONSERVATION MEASURE	LOW	HIGH
Purchase of bank credit cost per acre	\$3,000	\$125,000
Monitoring	\$1,400	\$1,400

6.2 PRE-DESIGNATION BASELINE IMPACTS

156. The pre-designation period for this analysis extends from the species listing in 1993 to 2009. Exhibit 6-5 presents total present value costs of pre-designation chub management activities on transportation-related activities. To estimate pre-designation impacts, this analysis applies the monitoring costs listed in Exhibit 6-3 to the year in which the project

⁹³ U.S. Fish and Wildlife Service, *5-year Status Review: Oregon Chub*. Accessed at: <http://www.fws.gov/pacific/ecoservices/endangered/recovery/Documents/Oregon%20chub.pdf> on July 2, 2009.

⁹⁴ Personal communication with Paul Scheerer, Biologist, Oregon Department of Fish and Wildlife, on May 1, 2009.

⁹⁵ Mid-Willamette Valley Council of Governments, *Trading Primer*, accessed at: <http://www.mwvcog.org/WILLAMETTEPARTNERSHIP/DOWNLOADS/TRADING%20PRIMER2.PDF> on May 26, 2009.

occurred. Pre-designation impacts also include the administrative costs of section 7 (as highlighted in Exhibit 2-2).

**EXHIBIT 6-5 TRANSPORTATION PRE-DESIGNATION ECONOMIC IMPACTS
(1993- 2009, 2009 DOLLARS ASSUMING A SEVEN PERCENT DISCOUNT RATE)**

UNIT	TOTAL NUMBER OF PROJECTS	YEARS	PRESENT VALUE COST
1A	0.2	1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,190
1B(1)	0.2	1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,190
1B(2)	0.2	1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,190
1B(3)	0.2	1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,190
1B(4)	0.2	1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,190
1C	0.2	1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,190
2A(1)	0.2	1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,190
2A(2)	0.2	1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,190
2A(3)	0.2	1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,190
2B(1)	0.2	1994, 1995, 1998, 2001, 2005, 2007, 2008	\$15,100
2B(2)	0.2	1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,190
2B(3)	0.2	1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,190
2B(4)	0.2	1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,190
2B(5)	0.2	1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,190
3A	0.29	1993, 1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,970
3B	0.46	1993, 1994, 1995, 1998, 2001, 2005, 2007, 2008	\$4,920
3C	0.46	1993, 1994, 1995, 1998, 2001, 2005, 2007, 2008	\$4,920
3D	0.46	1993, 1994, 1995, 1998, 2001, 2005, 2007, 2008	\$4,920
3E	0.46	1993, 1994, 1995, 1998, 2001, 2005, 2007, 2008	\$4,920
3F	0.46	1993, 1994, 1995, 1998, 2001, 2005, 2007, 2008	\$4,920
3G	0.46	1993, 1994, 1995, 1998, 2001, 2005, 2007, 2008	\$4,920
3H	0.29	1993, 1994, 1995, 1998, 2001, 2005, 2007, 2008	\$13,200
3I	0.29	1993, 1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,970
3J	0.29	1993, 1994, 1995, 1998, 2001, 2005, 2007, 2008	\$2,970
3K	1.29	1993, 1994, 1995, 1998, 2001, 2005, 2007, 2008	\$17,300
Total	8		\$112,000

Note: Some projects appear as fractions because the location of certain section 7 consultations was unknown; therefore, the project was distributed across the study area. In addition, some projects may span more than one proposed unit. Table may not sum due to rounding.

6.3 POST-DESIGNATION IMPACTS

157. The post-designation period for this analysis is 2010 to 2029. Based on the past rate of consultation and available project forecasts, this analysis estimates that 10 projects are planned within the study area over the next twenty years.⁹⁶ Of these, four are assumed to take place between 2010 and 2012. Projects to be built beyond 2012 depend on funding availability; therefore, this analysis assumes an equal probability of the project occurring between 2013 and 2029. The greatest number of projects are forecast to occur in Units 1A and 2B(1), both of which are located close to Interstate-5, a major highway.
158. In the baseline, each forecast project is expected to incur impacts associated with monitoring and the purchase of conservation bank credits, as well as administrative costs associated with section 7 consultations. For example, post-designation baseline impacts associated with Unit 1A assumes \$1,400 in monitoring costs per project for 2.5 projects, as well as associated section 7 consultation costs. In the low-end scenario, it also assumes the purchase of conservation bank credits for 3.3 acres at \$3,000 per acre. In the high-end scenario, it assumes the purchase of conservation bank credits for 3.3 acres at \$125,000 per acre.
159. Because of the high level of baseline protections for the chub, including adherence to ODOT's Standard Specifications, conservation measures are not anticipated to change as a result of critical habitat designation; therefore, this analysis assumes that the only incremental impacts are administrative in nature. For example, post-designation incremental impacts associated with Unit 1A are equivalent to the incremental portion of section 7 consultation on 2.5 forecast transportation projects.
160. Exhibit 6-6 summarizes the post-designation baseline impacts and Exhibit 6-7 presents post-designation incremental impacts.

⁹⁶ Oregon Department of Transportation, *Oregon Transportation Plan*, September 20, 2006. Department of Transportation, *Transportation Development Planning: ODOT Region Information*, accessed at: http://www.oregon.gov/ODOT/TD/TP/regionLinks.shtml#ODOT_Region_1 on May 26, 2009. Oregon Department of Transportation, *Northwest Region: Current Projects*, accessed at: http://www.oregon.gov/ODOT/HWY/REGION2/current_projects.shtml on May 26, 2009. Service, Endangered Species Act Formal and Informal Consultation and Conference, Magnuson Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation on the Oregon Department of Transportation's OTIA III Statewide Bridge Delivery Program.

EXHIBIT 6-6 TRANSPORTATION POST-DESIGNATION BASELINE ECONOMIC IMPACTS (2010 - 2029, 2009 DOLLARS ASSUMING A SEVEN PERCENT DISCOUNT RATE)

UNIT	PRESENT VALUE COST		ANNUALIZED COST	
	LOW	HIGH	LOW	HIGH
1A	\$19,700	\$396,000	\$1,780	\$35,000
1B(1)	\$6,630	\$223,000	\$591	\$19,700
1B(2)	\$4,100	\$118,000	\$368	\$10,400
1B(3)	\$1,860	\$24,700	\$170	\$2,180
1B(4)	\$21,300	\$728,000	\$1,900	\$64,300
1C	\$0	\$0	\$0	\$0
2A(1)	\$0	\$0	\$0	\$0
2A(2)	\$3,220	\$35,200	\$295	\$3,120
2A(3)	\$0	\$0	\$0	\$0
2B(1)	\$105,000	\$4,040,000	\$9,260	\$356,000
2B(2)	\$37,400	\$1,450,000	\$3,310	\$128,000
2B(3)	\$0	\$0	\$0	\$0
2B(4)	\$0	\$0	\$0	\$0
2B(5)	\$24,400	\$813,000	\$2,180	\$71,700
3A	\$0	\$0	\$0	\$0
3B	\$0	\$0	\$0	\$0
3C	\$0	\$0	\$0	\$0
3D	\$0	\$0	\$0	\$0
3E	\$0	\$0	\$0	\$0
3F	\$0	\$0	\$0	\$0
3G	\$0	\$0	\$0	\$0
3H	\$0	\$0	\$0	\$0
3I	\$0	\$0	\$0	\$0
3J	\$0	\$0	\$0	\$0
3K	\$0	\$0	\$0	\$0
Total	\$223,000	\$7,830,000	\$19,900	\$691,000
Note: Totals may not sum due to rounding.				

EXHIBIT 6-7 TRANSPORTATION POST-DESIGNATION INCREMENTAL ECONOMIC IMPACTS (2010 - 2029, 2009 DOLLARS ASSUMING A SEVEN PERCENT DISCOUNT RATE)

UNIT	PRESENT VALUE COST		ANNUALIZED COST	
	LOW	HIGH	LOW	HIGH
1A	\$2,600	\$2,600	\$245	\$245
1B(1)	\$324	\$324	\$31	\$31
1B(2)	\$324	\$324	\$31	\$31
1B(3)	\$324	\$324	\$31	\$31
1B(4)	\$975	\$975	\$92	\$92
1C	\$0	\$0	\$0	\$0
2A(1)	\$0	\$0	\$0	\$0
2A(2)	\$606	\$606	\$57	\$57
2A(3)	\$0	\$0	\$0	\$0
2B(1)	\$1,950	\$1,950	\$184	\$184
2B(2)	\$650	\$650	\$61	\$61
2B(3)	\$0	\$0	\$0	\$0
2B(4)	\$0	\$0	\$0	\$0
2B(5)	\$1,260	\$1,260	\$119	\$119
3A	\$0	\$0	\$0	\$0
3B	\$0	\$0	\$0	\$0
3C	\$0	\$0	\$0	\$0
3D	\$0	\$0	\$0	\$0
3E	\$0	\$0	\$0	\$0
3F	\$0	\$0	\$0	\$0
3G	\$0	\$0	\$0	\$0
3H	\$0	\$0	\$0	\$0
3I	\$0	\$0	\$0	\$0
3J	\$0	\$0	\$0	\$0
3K	\$0	\$0	\$0	\$0
Total	\$9,000	\$9,000	\$850	\$850
Note: Totals may not sum due to rounding.				

6.4 SOURCES OF UNCERTAINTY

161. It is important to recognize the uncertainty inherent in the assumptions underlying this analysis. Exhibit 6-8 summarizes these uncertainties and their potential effect on estimated economic impacts.

EXHIBIT 6-8 SUMMARY OF SOURCES OF UNCERTAINTY TO TRANSPORTATION ANALYSIS

ASSUMPTION	POTENTIAL EFFECT ON RESULTS
Project forecasts beyond 2012 are dependent on funding. Currently, the analysis forecasts six future projects occurring between 2013 and 2029. To the extent that this forecast over- or underestimates actual projects, this analysis may over- or underestimate associated impacts.	+/-
ODOT will choose to purchase conservation bank credits for each project.	+
Number of conservation bank acres purchased is equivalent to the size of the critical habitat unit.	+
Cost of conservation bank credits for chub will be similar to credit prices at conservation banks for other species, ranging from \$3,000 to \$125,000.	+/-
+: This assumption may result in an overestimate of real costs. -: This assumption may result in an underestimate of real costs. +/-: This assumption has an unknown effect on estimates.	

SECTION 7 | HABITAT MANAGEMENT ACTIVITIES

162. This section describes past and ongoing research, survey and monitoring, and habitat management activities implemented for the chub. Unlike the other activities described in this analysis, the activities described in this section do not pose a threat to the chub or its habitat. Rather, the activities described in this section are implemented specifically to benefit the chub and its habitat.
163. In general, baseline impacts arise from ongoing survey, monitoring, research, and habitat improvement efforts for the chub on Federal and State land. Based on discussions with affected Federal and State agencies, surveying and monitoring efforts, as well as habitat management activities are not expected to change due to the designation of critical habitat. Accordingly, the only incremental impacts quantified in this analysis are administrative costs of section 7 consultations addressing adverse modification of critical habitat. Impacts concerning habitat management activities are summarized in Exhibit 7-1 and further described in the following sections.

**EXHIBIT 7-1 SUMMARY OF IMPACTS TO HABITAT MANAGEMENT ACTIVITIES
(2009 DOLLARS, ASSUMING A SEVEN PERCENT DISCOUNT RATE)**

VALUES	LOW	HIGH
PRE-DESIGNATION IMPACTS (1993 - 2009)		
Present Value of Impacts	\$3,800,000	\$3,800,000
POST-DESIGNATION BASELINE IMPACTS (2010 - 2029)		
Present Value of Impacts	\$2,340,000	\$2,340,000
Annualized Impact Value	\$221,000	\$221,000
INCREMENTAL IMPACTS (2010 - 2029)		
Present Value of Impacts	\$72,200	\$72,200
Annualized Impact Value	\$6,810	\$6,810

7.1 DETAILED IMPACTS TO HABITAT MANAGEMENT ACTIVITIES

164. Habitat management activities for the chub have consisted of surveys, research, and monitoring for the species, as well as species reintroduction efforts and implementation of habitat improvement projects. Habitat management activities stem from the 1993 species listing, the 1998 Oregon Chub Recovery Plan (recovery plan), and the 2008 Biological Opinion (BiOp) on the continued operation and maintenance of the Willamette

Project. The recovery plan stipulates criteria for the downlisting of the species from endangered to threatened, as well as the delisting of the species altogether.⁹⁷ Specifically, the plan calls for four actions: (1) management of existing sites; (2) establishment of new populations; (3) research into the attributes of suitable habitats, spawning cues, survival rates, and effects of non-native predators and competitors; and (4) public education and outreach to foster greater understanding of the chub.⁹⁸ The 2007 Five Year Status Report (5-Year Report) recommends a number of actions aimed at securing the long-term viability of the chub, which continue to direct baseline habitat management activities.⁹⁹

165. The following paragraphs present information on habitat management activities that have occurred or are expected to occur within proposed critical habitat.

7.1.1 ODFW SPECIES SURVEYS AND MONITORING

166. Species surveys have been conducted annually in all units since the listing of the species and are expected to continue to occur annually at a cost of \$27,500 per year.¹⁰⁰ These surveys continued after 1998 pursuant to the recovery plan, which recommends surveying the distribution and abundance of the chub relative to the down- and delisting criteria. Together, these pre-designation impacts total \$848,000 (discounted at seven percent). Continued surveying is estimated to total \$291,000 over the next 20 years (discounted at seven percent).

7.1.2 ODFW REINTRODUCTION AND RESTORATION PROJECTS

167. Beginning in 1994, ODFW has conducted an average of two chub reintroduction and habitat restoration efforts a year at an estimated annual cost of \$37,500.¹⁰¹ These activities are expected to continue at an equal rate for the next 20 years. These pre-designation impacts total \$1,050,000 (discounted at seven percent), and future projects are anticipated to total \$397,000 over the next 20 years (discounted at seven percent).

7.1.3 HOSPITAL POND RESEARCH (UNIT 3H)

168. Hospital Pond (Unit 3H) is a small water body (1.12 acres) that is hydrologically connected to Lookout Point Reservoir, east of the city of Oakridge in Lane County. As of 2007, species surveys indicated that the chub population in Hospital Pond was roughly 1,520 individuals and considered stable.¹⁰² In order to allow for chub breeding in the unit,

⁹⁷ On May 15, 2009, the Service released: Proposed Rule To Reclassify the Oregon Chub (*Oregonichthys crameri*) From Endangered to Threatened (50 CFR 22870). This document does not have bearing on this analysis, however.

⁹⁸ U.S. Fish and Wildlife Service. Recovery Plan for the Oregon Chub (*oregonichthys crameri*). 1998. Pg. iv.

⁹⁹ U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office. Oregon chub 5-Year Review Summary and Evaluation. 2007. Pg. 6.

¹⁰⁰ Personal communication with Paul Scheerer, ODFW; May 1, 2009. The figure \$27,500 is an average of a \$50,000 to \$60,000 range provided by ODFW, adjusted for the fraction of effort that occurs within proposed critical habitat (roughly 50 percent).

¹⁰¹ Based on written communication with Paul Scheerer, ODFW; May 13, 2009. The figure \$37,500 is \$60,000 adjusted for the fraction of effort that occurs within proposed critical habitat (roughly 62.5 percent).

¹⁰² U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office. Oregon chub 5-Year Review Summary and Evaluation. 2007. Pg. 6.

water in Hospital Pond must reach a sufficiently warm temperature. As noted in the Service's 2008 BiOp on the Willamette Project, these temperatures are presently only reached when Lookout Point Reservoir levels are high enough to spill warm water into Hospital Pond.¹⁰³ As increasing reservoir levels to benefit the chub imposes a constraint on water management operations, USACE has been researching alternative methods to supply water to this pond while simultaneously monitoring the chub population. See Section 3 on water management for a further discussion of the economic effects related to this activity.

169. As part of these efforts, Hospital Pond has been the site of four habitat enhancement projects and two research surveys since the species was listed. Between 2001 and 2002, USACE unsuccessfully made three attempts to allow the pond to fill independently of water elevation changes in Lookout Point Reservoir. In 2001, USACE installed a culvert gate, to which the Service issued a no-jeopardy BiOp on June 7, 2001. Following construction, however, monitoring revealed that water levels in Hospital Pond were not being sustained because the roadbed separating the pond from Lookout Point Reservoir was excessively porous. In 2002, USACE responded by applying a bentonite lining along the roadbed at an estimated cost of \$80,000.¹⁰⁴ The Service issued a no-jeopardy BiOp on the project on February 12, 2002. In 2003, USACE dug a spawning cove in Hospital Pond in order to provide insurance that a high quality spawning habitat be available even if desired water levels are not attained in late spring and summer. The Service issued a concurrence on the "not likely to adversely affect" determination by USACE in February of that year. Together, enhancement efforts at Hospital Pond cost an estimated \$100,000.¹⁰⁵
170. Between 1996 and 2008, ODFW conducted research at Hospital Pond focused on flow management and chub spawning and abundance in the unit. Related impacts totaled \$40,000 annually. The need for further measures will be determined by FWS, ODFW, and USACE upon continued monitoring of the success of the enhancement projects. Together, pre-designation impacts from enhancement projects and research at Hospital Pond total \$1,020,000 (discounted at seven percent).

7.1.4 SAFE HARBOR AGREEMENTS

171. The Service established two Safe Harbor Agreements (SHAs) for the Oregon chub on June 7, 2001 and on September 5, 2007, in units 2A(1) and 2B(2), respectively.¹⁰⁶ In both of these instances, artificial ponds were created in order to establish new populations that would preserve donor populations for future conservation efforts. In exchange for their voluntary undertaking of management activities to enhance, restore, or maintain listed species populations, SHAs provide assurances to private landowners undertaking

¹⁰³ U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office. USFWS Final Biological Opinion on the Willamette River Basin Flood Control Project. 2008. p174.

¹⁰⁴ Personal communication with Greg Taylor, USACE; May 20, 2009.

¹⁰⁵ Personal communication with Greg Taylor, USACE; April 7, 2007.

¹⁰⁶ 66 FR 30745, and 72 FR 50976, respectively.

development activities that may result in the incidental take of listed species. Costs of these SHAs are administrative in nature. In addition, the Service is currently implementing a Programmatic SHA in conjunction with ODFW and the Service. ODFW spent roughly \$40,000 on this effort, which constitutes expected costs over the next 20 years. Pre-designation impacts arising from these SHAs total \$115,000 (discounted at seven percent).

7.1.5 ONGOING RESEARCH AT HOSPITAL POND, DEXTER ALCOVES, AND BELOW FALL CREEK DAM

172. Between 2009 and 2023, ODFW will receive funding from USACE to conduct ongoing research focused on chub habitat issues at Hospital Pond (Unit 3H), Dexter Alcoves (Units 3E and 3F), and below Fall Creek Dam (Unit 3A), as specified in the 2008 BiOp on the Willamette Project.¹⁰⁷ In 2009, ODFW will require \$135,000 in funding for equipment purchases and research efforts. Between 2010 and 2023, ODFW anticipates needing only \$125,000 per year.¹⁰⁸ This analysis assumes that when the term of the BiOp expires in 2023, a new BiOp will request this research be continued at least through 2029. Pre-designation impacts associated with this research are \$135,000 for 2009 alone, and post-designation impacts total \$1,320,000 between 2010 and 2029 (discounted at seven percent).

7.1.6 HABITAT IMPROVEMENTS AT HOSPITAL POND, DEXTER ALCOVES, AND BELOW FALL CREEK DAM

173. In 2010, USACE will implement habitat improvements to Hospital Pond (Unit 3H), Dexter Alcoves (Units 3E and 3F), and below Fall Creek Dam (Unit 3A). These efforts are expected to cost \$40,000 each and will include the cost of environmental clearance, engineering work, and implementation.¹⁰⁹ Together, USACE research and implementation efforts are expected to total \$112,000 in 2010 (discounted at seven percent).

7.2 PRE-DESIGNATION IMPACTS

174. Pre-designation economic impacts related to the habitat management activities result primarily from annual survey, research, reintroduction, and restoration activities that have been undertaken by ODFW and USACE. Additionally, 59 section 7 consultations have been undertaken for habitat management activities since 1993. Of these 59 consultations, 32 occurred within the study area, 18 occurred outside of the study area, and the locations of nine are unknown. Assuming that the proportion of consultations within the study area can be transferred to the consultations where locations are unknown, approximately six of these nine consultations occurred within the study area. The analysis therefore assumes

¹⁰⁷ U.S. Fish and Wildlife Service. 2008. Biological Opinion on the Continued Operation and Maintenance of the Willamette River Basin Project and Effects to Oregon Chub, Bull Trout, and Bull Trout Critical Habitat Designated Under the Endangered Species Act. Tails Number: 13420-2007-F-0024.

¹⁰⁸ Personal communication with Paul Scheerer, ODFW; May 1, 2009.

¹⁰⁹ Personal communication with Greg Taylor, USACE; May 20, 2009.

that 38 consultations within proposed critical habitat (four technical assistance efforts, 14 informal consultations, and 20 formal consultations). Baseline impacts associated with these consultations total \$630,000 since 1993, discounted at seven percent.

175. Exhibit 7-2 presents pre-designation impacts arising from surveying, monitoring, habitat management, and administrative costs of section 7 consultation for the chub by unit. Total pre-designation impacts are \$3,800,000, discounted at seven percent.

EXHIBIT 7-2 PRE-DESIGNATION IMPACTS TO HABITAT MANAGEMENT ACTIVITIES BY UNIT (2009 DOLLARS, ASSUMING A SEVEN PERCENT DISCOUNT RATE)

UNIT		PRESENT VALUE IMPACTS
1A	Santiam I-5 Side Channels	\$85,100
1B(1)	Geren Island North Channel	\$110,000
1B(2)	Stayton Public Works Pond	\$110,000
1B(3)	South Stayton Pond	\$94,000
1B(4)	Gray Slough	\$94,000
1C	Foster Pullout Pond	\$97,200
2A(1)	Russell Pond	\$181,000
2A(2)	Shetzline Pond	\$116,000
2A(3)	Big Island	\$85,100
2B(1)	Ankeny Willow Marsh	\$85,100
2B(2)	Dunn Wetland	\$139,000
2B(3)	Finley Display Pond	\$101,000
2B(4)	Finley Cheadle Pond	\$92,700
2B(5)	Finley Gray Creek Swamp	\$92,700
3A	Fall Creek Spillway Ponds	\$144,000
3B	Elijah Bristow State Park Berry Slough	\$93,600
3C	Elijah Bristow State Park Northeast Slough	\$85,100
3D	Elijah Bristow State Park Island Pond	\$85,100
3E	Dexter Reservoir RV Alcove DEX3	\$108,000
3F	Dexter Reservoir Alcove PIT1	\$116,000
3G	East Fork Minnow Creek Pond	\$93,600
3H	Hospital Pond	\$1,250,000
3I	Shady Dell Pond	\$117,000
3J	Buckhead Creek	\$117,000
3K	Wicopee Pond	\$109,000
Total		\$3,800,000

7.3 POST-DESIGNATION IMPACTS

176. Post-designation baseline impacts are forecast for continued survey, research, introduction, restoration activities by ODFW and USACE, and administrative costs of section 7 consultations. Incremental impacts, on the other hand, arise from the administrative costs of section 7 consultations only.
177. Administrative costs of section 7 consultations relate to chub research currently being conducted. Three consultations in particular are currently anticipated: (1) on the current research and construction occurring at Hospital Pond (Unit 3H), (2) on the encroachment of nonnative fish into the alcoves along Dexter Reservoir (units 3E and 3F), and (3) on construction of an emergency spillway at Fall Creek Spillway Ponds (Unit 3A).¹¹⁰ In the absence of information on other upcoming consultation activities, administrative costs of section 7 consultation on habitat management issues are forecast based on the observed pattern of past consultations (i.e., five technical assistance efforts, 15 informal consultations, and 21 formal consultations). Post-designation baseline and incremental impacts associated with these consultations total \$199,000 and \$66,300 over the next 20 years, both discounted at seven percent.

7.3.1 POST-DESIGNATION BASELINE IMPACTS

178. Total post-designation baseline impacts related to habitat management activities are forecast at \$2,340,000 or an annualized impact of \$22,100, both discounted at seven percent. These costs are summarized in Exhibit 7-3. Note that annual species introduction, restoration, and surveys are anticipated to occur on all units and cost \$34,500 in present value terms (discounted at seven percent), explaining the frequent occurrence of that number in the exhibit.

¹¹⁰ Personal communication with Greg Taylor at USACE on May 20, 2009.

EXHIBIT 7-3 POST-DESIGNATION BASELINE IMPACTS TO HABITAT MANAGEMENT ACTIVITIES BY UNIT (2009 DOLLARS, ASSUMING A SEVEN PERCENT DISCOUNT RATE)

UNIT		BASELINE IMPACTS	
		PRESENT VALUE	ANNUALIZED
1A	Santiam I-5 Side Channels	\$35,200	\$3,330
1B(1)	Geran Island North Channel	\$35,200	\$3,330
1B(2)	Stayton Public Works Pond	\$35,200	\$3,330
1B(3)	South Stayton Pond	\$35,200	\$3,330
1B(4)	Gray Slough	\$35,200	\$3,330
1C	Foster Pullout Pond	\$35,200	\$3,330
2A(1)	Russell Pond	\$35,200	\$3,330
2A(2)	Shetzline Pond	\$35,200	\$3,330
2A(3)	Big Island	\$35,200	\$3,330
2B(1)	Ankeny Willow Marsh	\$35,200	\$3,330
2B(2)	Dunn Wetland	\$35,200	\$3,330
2B(3)	Finley Display Pond	\$35,200	\$3,330
2B(4)	Finley Cheadle Pond	\$35,200	\$3,330
2B(5)	Finley Gray Creek Swamp	\$35,200	\$3,330
3A	Fall Creek Spillway Ponds	\$522,000	\$49,300
3B	Elijah Bristow State Park Berry Slough	\$35,200	\$3,330
3C	Elijah Bristow State Park Northeast Slough	\$35,200	\$3,330
3D	Elijah Bristow State Park Island Pond	\$35,200	\$3,330
3E	Dexter Reservoir RV Alcove DEX3	\$279,000	\$26,300
3F	Dexter Reservoir Alcove PIT1	\$279,000	\$26,300
3G	East Fork Minnow Creek Pond	\$35,200	\$3,330
3H	Hospital Pond	\$522,000	\$49,300
3I	Shady Dell Pond	\$35,200	\$3,330
3J	Buckhead Creek	\$35,200	\$3,330
3K	Wicopee Pond	\$35,200	\$3,330
Total		\$2,340,000	\$221,000

7.3.2 INCREMENTAL IMPACTS

179. Incremental impacts are summarized in Exhibit 7-4. These impacts are anticipated to be entirely administrative costs of section 7 consultation. As noted above, three consultations are anticipated to occur in 2010; the remaining consultations are forecasted to occur with equal probability in each unit. Total impacts are forecast at \$72,200, or an annualized impact of \$6,810 (both discounted at seven percent).

EXHIBIT 7-4 INCREMENTAL IMPACTS BY UNIT (2009 DOLLARS, ASSUMING A SEVEN PERCENT DISCOUNT RATE)

UNIT		INCREMENTAL IMPACTS	
		PRESENT VALUE	ANNUALIZED
1A	Santiam I-5 Side Channels	\$2,560	\$242
1B(1)	Geren Island North Channel	\$2,560	\$242
1B(2)	Stayton Public Works Pond	\$2,560	\$242
1B(3)	South Stayton Pond	\$2,560	\$242
1B(4)	Gray Slough	\$2,560	\$242
1C	Foster Pullout Pond	\$2,560	\$242
2A(1)	Russell Pond	\$2,560	\$242
2A(2)	Shetzline Pond	\$2,560	\$242
2A(3)	Big Island	\$2,560	\$242
2B(1)	Ankeny Willow Marsh	\$2,560	\$242
2B(2)	Dunn Wetland	\$2,560	\$242
2B(3)	Finley Display Pond	\$2,560	\$242
2B(4)	Finley Cheadle Pond	\$2,560	\$242
2B(5)	Finley Gray Creek Swamp	\$2,560	\$242
3A	Fall Creek Spillway Ponds	\$5,270	\$498
3B	Elijah Bristow State Park Berry Slough	\$2,560	\$242
3C	Elijah Bristow State Park Northeast Slough	\$2,560	\$242
3D	Elijah Bristow State Park Island Pond	\$2,560	\$242
3E	Dexter Reservoir RV Alcove DEX3	\$3,920	\$370
3F	Dexter Reservoir Alcove PIT1	\$3,920	\$370
3G	East Fork Minnow Creek Pond	\$2,560	\$242
3H	Hospital Pond	\$5,270	\$498
3I	Shady Dell Pond	\$2,560	\$242
3J	Buckhead Creek	\$2,560	\$242
3K	Wicopee Pond	\$2,560	\$242
Total		\$72,200	\$6,810

7.4 SOURCES OF UNCERTAINTY

180. Costs presented in this section reflect estimates that ODFW and USACE biologists provided through personal and written communications. If actual habitat management-related costs differ from those provided by these agencies, costs presented in this section may over- or underestimate actual costs.

SECTION 8 | ECONOMIC BENEFITS

181. Characterization of the potential economic benefits of critical habitat designation for the chub provides context to the cost analyses presented in the preceding sections.¹¹¹ This section first describes the categories of economic benefit that may derive from the conservation of species and habitats, and discusses the research methods that economists employ to quantify these benefits. Next, this section summarizes the chub conservation efforts described in Sections 3 through 7 of this report and links them with potential categories of economic benefit that may derive from their implementation. Given data limitations, this section does not, however, monetize the potential benefits described.¹¹²

8.1 CATEGORIES OF BENEFITS RELATING TO SPECIES AND HABITAT CONSERVATION

182. The primary goal of listing a species is to preserve the species from extinction. Various economic benefits, measured in terms of social welfare or regional economic performance, may also result from species and habitat conservation. The benefits of species and habitat conservation can be placed into two broad categories: (1) those associated with the primary goal of species conservation, and (2) those that derive from the habitat conservation efforts to achieve this primary goal.

183. Because a purpose of the Act is to provide for the conservation of endangered and threatened species, the benefits of actions taken under the Act are often measured in terms of the value placed by the public on species preservation (e.g., avoidance of extinction, and/or increase in a species' population). Such social welfare values for a species may reflect both use and non-use values for the species. Use values derive from a direct use for a species, such as commercial harvesting or recreational wildlife-viewing opportunities. Non-use values are not derived from direct use of the species, but instead reflect the utility the public derives from knowledge that a species continues to exist (e.g., existence or bequest values).

184. As a result of actions taken to preserve endangered and threatened species, such as habitat management, various other benefits may accrue to the public. Conservation efforts for species and habitat may result in improved environmental quality, which in

¹¹¹ The Service's policy has been to compare the financial and economic costs of critical habitat designation to the biological benefits to the species, which are generally not monetized. In addition, the Service's policy is that these economic analyses should report net costs; that is, costs of actions to protect the chub and its habitat net of any benefits received by the landowner, resource manager, resource users or the regional economy from these actions.

¹¹² Note that Section 3 of this analysis quantifies benefits in one instance where chub-related water transfers potentially increase recreational activities in Lookout Point Reservoir. This issue is described briefly below and in greater detail in Section 3.

turn may have collateral human health or recreational use benefits. Recent literature has emphasized the importance of including the value of natural capital and ecosystem services in benefits calculations.¹¹³ In addition, conservation efforts undertaken for the benefit of a threatened or endangered species may enhance shared habitat for other wildlife. Such benefits may be a direct result of modifications to projects, or may be collateral to such actions. For example, a section 7 consultation may result in the conservation of buffer strips along streams, in order to reduce sedimentation due to construction activities. A reduction in sediment load may directly benefit water quality, while the presence of buffer strips may also provide the collateral benefits of preserving habitat for terrestrial species and enhancing nearby residential property values (e.g., preservation of open space).

185. Economists apply a variety of methodological approaches in estimating both use and non-use values for species and for habitat improvements, including stated preference and revealed preference methods. Stated preference techniques include the contingent valuation method and conjoint analysis or contingent ranking methods. In simplest terms, these methods employ survey techniques, asking respondents to state what they would be willing to pay for a resource or for programs designed to protect that resource. A substantial literature has developed that describes the application of this technique to the valuation of natural resource assets.
186. More specifically with respect to use values for species or habitats, revealed preference techniques examine individuals' behavior in markets in response to changes in environmental or other amenities, i.e., people "reveal" their value by their behavior. For example, travel cost models are frequently applied to value access to recreational opportunities, as well as to value changes in the quality and characteristics of these opportunities. Basic travel cost models are rooted in the idea that the value of a recreation resource can be estimated by analyzing the travel and time costs incurred by individuals visiting the site. Another revealed preference technique is hedonic analysis, which is often employed to determine the effect of specific site characteristics on property values.

8.2 POTENTIAL BENEFITS OF CHUB CONSERVATION

187. This section describes the categories of benefits resulting from chub conservation efforts within the study area. Exhibit 8-1 summarizes potential benefits associated with the specific chub conservation efforts described in Sections 3 through 7 of this report. The first column summarizes chub conservation efforts by land use activity. The second column identifies potential categories of benefits that may derive from implementation of these conservation efforts. A description of these categories of benefits is provided

¹¹³ For example, Daily, Gretchen C., Stephen Polasky, Joshua Goldstein, Peter M. Kareiva, Harold A. Mooney, Liba Pejchar, Taylor H. Ricketts, James Salzman, and Robert Shallenberger. 2009. Ecosystem Services in Decision Making: Time to Deliver. *Frontiers in Ecology and the Environment*, 7(1): 21-28. Also, TNC (2008): The Nature Conservancy, Natural Capital Project. 2008. Ecosystem Services: Can Ecosystem Services Work for Your Conservation Project? Accessed May 19, 2009 from http://www.naturalcapitalproject.org/ConEX/ConEx_A_CanESWork_for_you_FINAL.pdf

below. The final columns of the exhibit identify the units in which baseline benefits may occur. Note that, based on the assessment of incremental costs related to the proposed rule, incremental benefits related to the rule would be limited.

188. The categories of economic benefits that may derive from the chub conservation efforts described in this report include:
- **Increased river flows:** Modification of the timing of flows and releases from impoundments in the Willamette Basin may increase the potential for hydropower production at certain generation facilities, and may improve the recreational experience in the Willamette Basin, increasing demand for fishing, boating, or other river- and reservoir-based recreation. As described in Section 3, pre-designation transfers of water from Hills Creek Reservoir to Lookout Point Reservoir to support a Hospital Pond (Unit 3H) chub population provided an estimated \$32,900 to \$87,700 in potential recreational benefits at Lookout Point. These ancillary benefits are subtracted from the total estimated costs to water management-related activities.
 - **Flood control:** Maintaining or enhancing the flood control services provided by reservoirs (i.e., through increases releases from impoundments) or an ecosystem (i.e., by maintaining agricultural buffers around streams) may increase property values within the watershed, and avoid costs of flood-related damage or replacement flood control programs.
 - **Improved water quality:** Managing economic activities that occur adjacent to riparian and aquatic habitats (e.g., agriculture, construction, and timber harvests) may improve water quality by reducing chemical runoff, erosion, and sedimentation. Water quality improvements may in turn have human health and human use (e.g., recreation) benefits, as well as facility maintenance cost benefits.¹¹⁴
 - **Aesthetic benefits:** Social welfare gains may be associated with enhanced aesthetic quality of habitat. Preferences for aesthetic improvements may be measured through increased willingness-to-pay to visit a habitat region for recreation or increased visitation.
189. In addition to these categories of potential benefits, all of the conservation efforts described in Exhibit 8-1 are related to the broader conservation and recovery of the species. For example, monitoring and surveying for the species is undertaken to better understand the effects of projects on species, and therefore inform the avoidance or minimization of those effects. All conservation efforts therefore relate to the maintenance or enhancement of the use (e.g., wildlife-viewing) and non-use value (e.g., existence value) that the public may hold specifically for the chub. Further, many of the conservation efforts undertaken for the chub may also result in improvements to ecosystem health that are shared by other, coexisting species. The maintenance or

¹¹⁴ Moore, Walter B. and Bruce A. McCarl. 1987. off-Site Costs of Soil Erosion: A Case Study in the Willamette Valley. *Western Journal of Agricultural Economics*. 12(1): 42-29.

enhancement of use and non-use values for these other species, or for biodiversity in general, may also result from these chub conservation efforts.

190. Additionally, to the extent that conservation efforts lead to increased open space, aesthetic benefits, increased river flows, or improved water quality, which in turn prompt an increase in visitation to the region (e.g., for recreation such as hiking or wildlife-viewing), the economy and employment may benefit from increased regional spending.

EXHIBIT 8-1 CHUB CONSERVATION EFFORTS AND POTENTIAL ASSOCIATED BENEFITS

CONSERVATION EFFORT	POTENTIAL ASSOCIATED BASELINE BENEFITS	UNITS APPLIED
WATER MANAGEMENT		
Minimizing the spread of invasive species, pathogens, and disease in aquatic habitat.	<ul style="list-style-type: none"> Improved water quality 	1A, 3B, 3C, 3D, 3H
Changing in timing or magnitude of flow releases.	<ul style="list-style-type: none"> Increased river flows Improved water quality Flood control 	
AGRICULTURE		
Avoid pesticide use in chub habitat and in buffer zones around chub habitat for 54 pesticide active ingredients.	<ul style="list-style-type: none"> Improved water quality 	1B(2), 1B(4), 2A(3), 2B(1), 2B(2)
TIMBER MANAGEMENT		
Avoid pesticide use in chub habitat and in buffer zones around chub habitat for 55 pesticide active ingredients.	<ul style="list-style-type: none"> Improved water quality 	2B(5)
Restricted harvesting within buffer zones around chub habitat.	<ul style="list-style-type: none"> Improved water quality Flood control 	
TRANSPORTATION		
Construction confined to the dry season.	<i>Not Applicable</i>	1A(1), 1B(1), 1B(2), 1B(3), 1B(4), 2A(2), 2B(1), 2B(2), 2B(5)
In areas temporarily disturbed, vegetation will be removed by hand, where feasible, instead of by heavy equipment.	<i>Not Applicable</i>	
No water will be used from streams or ponds that support the chub.	<ul style="list-style-type: none"> Improved water quality Flood control 	
Ground disturbance and vegetation clearing along river banks will be minimized.	<ul style="list-style-type: none"> Improved water quality Flood control 	
Upon project completion, hydroseed project areas to stabilize soils prior to the onset of winter rains.	<ul style="list-style-type: none"> Improved water quality Flood control 	
HABITAT MANAGEMENT		
Species surveys, monitoring, research, and introductions.	<i>Not Applicable</i>	

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APPENDIX A | SMALL BUSINESS ANALYSIS AND ENERGY IMPACTS ANALYSIS

1. This appendix considers the extent to which incremental impacts from critical habitat designation may be borne by small entities and the energy industry. The analysis presented in Section A.1 is conducted pursuant to the RFA as amended by the SBREFA of 1996. Information for this analysis was gathered from the Small Business Administration (SBA), the Service, and from interviews with stakeholders contacted in the development of the economic analysis. The energy analysis in Section A.2 is conducted pursuant to Executive Order No. 13211.
 2. The analyses of impacts to small entities and the energy industry rely on the estimated incremental impacts resulting from the proposed critical habitat designation. The incremental impacts of the rulemaking are most relevant for the small business and energy impacts analyses because they reflect costs that may be avoided or reduced based on decisions regarding the composition of the final rule. The post-designation baseline impacts associated with the listing of the chub and other Federal, State, and local regulations and policies, as quantified in Sections 3 through 7 of this report, are expected to occur regardless of the outcome of this rulemaking.
- A.1 SBREFA ANALYSIS**
3. When a Federal agency proposes regulations, the RFA requires the agency to prepare and make available for public comment an analysis that describes the effect of the rule on small entities (i.e., small businesses, small organizations, and small government jurisdictions).¹ No initial regulatory flexibility analysis (IRFA) 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. SBREFA amended the RFA to require Federal agencies to provide a statement of the factual basis for certifying that a rule will not have significant economic impact on a substantial number of small entities. To assist in this process, this appendix provides a screening level analysis of the potential for chub critical habitat to affect small entities.
 4. To ensure broad consideration of impacts on small entities, the Service has prepared this small business analysis without first making the threshold determination whether the proposed critical habitat designation could be certified as not having a significant economic impact on a substantial number of small entities.

¹ 5 U.S.C. § 601 et seq.

A.1.1 SUMMARY OF IMPACTS TO SMALL ENTITIES

5. This screening analysis is based on the estimated incremental impacts associated with the proposed rulemaking as described in Sections 3 through 7 of this analysis. These sections estimate potential economic impacts related to water management (Section 3), agriculture (Section 4), forestry (Section 5), transportation (Section 6), and habitat management (Section 7). All incremental impacts quantified in this analysis are administrative costs of conducting forecasted section 7 consultations. That is, the designation of critical habitat is not forecast to result in changes in operations and management of the activities considered in Sections 3 through 7. Small entities may, however, be required to spend additional time considering critical habitat during section 7 consultation. These incremental, administrative impacts are the focus of this analysis of impacts to small entities.
6. Of the activities addressed in this analysis, only forestry activities are expected to experience incremental, administrative consultation costs that may be borne by small businesses. These costs may arise when the U.S. Forest Service consults on Federal timber sales with small logging and timber tract companies as third parties.
7. The following activities are not expected to experience any incremental costs that will be borne by small businesses, and are therefore not addressed in this screening analysis:
 - **Water management** - Aside from three informal consultations anticipated between the Service and the U.S. Army Corps of Engineers in 2010, future water management-related consultations are forecast based on the pattern observed in the consultation history. Past consultations involved Federal, State, and county agencies, and occurred on revetment repair projects, construction of hydroelectric facilities, dredging activities for irrigation diversions, and wastewater releases from water treatment facilities. None of these consultations involved small entities, so this analysis does not forecast future impacts to small entities.
 - **Agriculture** - The analysis forecasts no incremental impacts, administrative or otherwise, to agricultural activities.
 - **Transportation** - Incremental administrative impacts are not expected to be borne by small entities as the parties involved in consultation include State and county agencies.
 - **Habitat management activities** - Forecast incremental administrative impacts are expected to be borne by the Oregon Department of Fish and Wildlife, the U.S. Army Corps of Engineers, the U.S. Forest Service, and other State, Federal, and county agencies, none of which are small entities.
8. Exhibit A-1 summarizes relevant NAICS codes and the forecast incremental impacts that may be borne by small businesses engaged in forestry activities. Given that data were not available regarding the average per business revenues for potentially-affected small businesses, information is provided in Exhibit A-1 regarding the threshold for small businesses by NAICS code. For timber tract operations, the threshold is expressed in terms of annual revenues; whereas the threshold for logging operations is expressed as an

employment figure. Given that the relationship between the economic impacts estimated in this analysis and the logging threshold employment figures is uncertain, this screening analysis focuses on the revenue threshold for timber tract operations. While this threshold represents a high-end estimate for the potentially affected small entities, impacts per entity as described in the exhibit are significantly less than this threshold.

9. Conservatively assuming a single business is associated with all of the forecasted impacts to forestry activities, the present value, 20-year impact of \$1,440 to a single small business is approximately 0.02 percent of the small business annual revenue thresholds for a timber tract operation in this case. The annualized impact to timber tract operations is estimated at \$136, or approximately 0.002 percent of annual sales. Therefore, while assuming that each small business has annual sales just under its SBA industry small business threshold may underestimate impacts as a percentage of annual sales, forecast impacts still are likely to be relatively small in comparison to annual revenues.

EXHIBIT A-1 SUMMARY OF POTENTIAL IMPACTS ON SMALL TIMBER BUSINESSES, 20 YEARS

INDUSTRIES AND NAICS CODES	SMALL BUSINESS SIZE STANDARD	INCREMENTAL ECONOMIC IMPACTS, 2010-2029 (DISCOUNTED AT 7%)
Timber tract operations (NAICS code 113110)	\$7.0 million in annual revenues	\$1,440
Logging (NAICS code 113310)	500 employees	

A.1.2 DETAILED ANALYSIS OF IMPACTS TO SMALL BUSINESSES

10. This analysis is intended to improve the Service's understanding of the potential effects of the proposed rule on small entities and to identify opportunities to minimize these impacts in the final rulemaking. The Endangered Species Act (Act) requires the Service to designate critical habitat for threatened and endangered species to the maximum extent prudent and determinable. Section 4(b)(2) of the Act requires that the Service designate critical habitat "on the basis of the best scientific data available and after taking into consideration the economic impact, the impact on national security, and any other relevant impact, of specifying any particular areas as critical habitat." The Secretary's discretion is limited as (s)he may not exclude areas if so doing "will result in the extinction of the species."
11. Three types of small entities are defined in the RFA:
 - **Small Business** - Section 601(3) of the RFA defines a small business as having the same meaning as small business concern under section 3 of the Small Business Act. This includes any firm that is independently owned and operated and is not dominant in its field of operation. The U.S. Small Business Administration (SBA) has developed size standards to carry out the purposes of

the Small Business Act, and those size standards can be found in 13 CFR 121.201. The size standards are matched to North American Industry Classification System (NAICS) industries. The SBA definition of a small business applies to a firm's parent company and all affiliates as a single entity.

- **Small Governmental Jurisdiction** - Section 601(5) defines small governmental jurisdictions as governments of cities, counties, towns, townships, villages, school districts, or special districts with a population of less than 50,000. Special districts may include those servicing irrigation, ports, parks and recreation, sanitation, drainage, soil and water conservation, road assessment, etc. When counties have populations greater than 50,000, those municipalities of fewer than 50,000 can be identified using population reports. Other types of small government entities are not as easily identified under this standard, as they are not typically classified by population.
 - **Small Organization** - Section 601(4) defines a small organization as any not-for-profit enterprise that is independently owned and operated and not dominant in its field. Small organizations may include private hospitals, educational institutions, irrigation districts, public utilities, agricultural co-ops, etc.
12. The courts have held that the RFA/SBREFEA requires Federal agencies to perform a regulatory flexibility analysis of forecast impacts to small entities that are directly regulated. In the case of *Mid-Tex Electric Cooperative, Inc., v. Federal Energy Regulatory Commission (FERC)*, FERC proposed regulations affecting the manner in which generating utilities incorporated construction work in progress in their rates. The generating utilities that expected to be regulated were large businesses; however, their customers -- transmitting utilities such as electric cooperatives -- included numerous small entities. In this case, the court agreed that FERC simply authorized large electric generators to pass these costs through to their transmitting and retail utility customers, and FERC could therefore certify that small entities were not directly impacted within the definition of the RFA.²
13. Similarly, *American Trucking Associations, Inc. v. Environmental Protection Agency (EPA)* addressed a rulemaking in which EPA established a primary national ambient air quality standard for ozone and particulate matter.³ The basis of EPA's RFA/SBREFEA certification was that this standard did not directly regulate small entities; instead, small entities were indirectly regulated through the implementation of state plans that incorporated the standards. The court found that, while EPA imposed regulation on states, it did not have authority under this rule to impose regulations directly on small entities and therefore small entities were not directly impacted within the definition of the RFA.
14. The Small Business Administration (SBA) in its guidance on how to comply with the RFA recognizes that consideration of indirectly affected small entities is not required by

² 773 F. 2d 327 (D.C. Cir. 1985).

³ 175 F. 3d 1027, 1044 (D.C. Cir. 1999).

the RFA, but encourages agencies to perform a regulatory flexibility analysis even when the impacts of its regulation are indirect.⁴ "If an agency can accomplish its statutory mission in a more cost-effective manner, the Office of Advocacy [of the SBA] believes that it is good public policy to do so. The only way an agency can determine this is if it does not certify regulations that it knows will have a significant impact on small entities even if the small entities are regulated by a delegation of authority from the Federal agency to some other governing body."⁵

15. The regulatory mechanism through which critical habitat protections are enforced is section 7 of the Act, which directly regulates only those activities carried out, funded, or permitted by a Federal agency. By definition, Federal agencies are not considered small entities, although the activities they may fund or permit may be proposed or carried out by small entities. Given the SBA guidance described above, this analysis considers the extent to which this designation could potentially affect small entities, regardless of whether these entities would be directly regulated by the Service through the proposed rule or by a delegation of impact from the directly regulated entity.
16. This screening analysis focuses on small entities that may bear the incremental impacts of this rulemaking quantified in Sections 3 through 7 of this economic analysis.

Potential Administrative Costs of Section 7 Consultation That May Be Borne By Small Entities

17. As described above and detailed in Sections 3 through 7 of this report, the only incremental impacts associated with this rulemaking are administrative costs of section 7 consultations. Of these, only forestry-related consultations may involve small businesses, which may be logging operations (NAICS code 113310) or timber tract operations (NAICS code 113110). Between 1993 and 2009, one technical assistance effort and one informal consultation on timber sales on Federal land occurred that may have involved small entities. This analysis forecasts potential future incremental administrative costs to small entities based on this pattern, and assumes that one technical assistance effort and one informal consultation will occur in the next 20 years in Lane County. In addition, the U.S. Forest Service (USFS) has indicated that they will reinitiate consultation on a timber sale in Benton County once critical habitat is designated for the chub. In these two counties, there are 178 logging operations (NAICS code 113310) and 98 timber tract operations (NAICS code 113110) that are considered small, representing between 98 and 100 percent of all businesses in the affected industry sector within these two counties.⁶ These small businesses may bear a total of \$1,440 (discounted at seven percent) in incremental impacts related to these consultations through 2029.

⁴ Small Business Administration, Office of Advocacy. May 2003. A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act. pg. 20.

⁵ *Ibid.*, pg. 21.

⁶ Dialog search of File 516, Dun and Bradstreet, "Duns Market Identifiers," on June 1, 2009 based on the small business threshold as defined by the Small Business Administration (SBA) for the respective NAICS codes.

A.2 POTENTIAL IMPACTS TO THE ENERGY INDUSTRY

18. 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.”⁷
19. The Office of Management and Budget provides guidance for implementing this Executive Order, outlining nine outcomes that may constitute “a significant adverse effect” when compared with 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 5 million tons per year;
 - Reductions in natural gas production in excess of 25 million Mcf per year;
 - Reductions in electricity production in excess of 1 billion kilowatts-hours per year or in excess of 500 megawatts 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.⁸
20. As discussed in Section 3 of this analysis, operational change recommendations for the chub may include maintenance of flows including timing and duration of releases at the Detroit hydroelectric facility. However, no incremental impacts are forecast associated specifically with this rulemaking on the production, distribution, or use of energy. That is, all forecast impacts are expected to occur associated with the listing of the chub, regardless of the designation of critical habitat.

⁷ Memorandum For Heads of Executive Department Agencies, and Independent Regulatory Agencies, Guidance For Implementing E.O. 13211, M-01-27, Office of Management and Budget, July 13, 2001, <http://www.whitehouse.gov/omb/memoranda/m01-27.html>.

⁸ Ibid.

APPENDIX B | THREE PERCENT DISCOUNT RATE EXHIBITS

Appendix B provides detailed tables for impacts discussed in the Chapters. Present values and annualized costs are estimated based on a discount rate of three percent.

Calculating Present Value and Annualized Impacts

For each land use activity, this analysis presents economic impacts incurred in different time periods in present value terms. The present value represents the value of a payment or stream of payments in common dollar terms. That is, it is the sum of a series of past or future cash flows expressed in today's dollars. Translation of the economic impacts of past or future impacts to present value terms requires the following: a) past or projected future impacts of species conservation efforts; and b) the specific years in which these impacts have been or are expected to be incurred. With these data, the present value of the past or future stream of impacts (PV_c) of sturgeon conservation efforts from year t to T is measured in 2008 dollars according to the following standard formula:^a

$$PV_c = \sum_{t=t_0}^{t=T} \frac{C_t}{(1+r)^{t-2008}}$$

C_t = cost of species conservation efforts in year t

r = discount rate^b

Impacts of conservation efforts for each land use activity in each unit are also expressed as annualized values (i.e., the series of equal annual costs over some defined time period that have the same present value as estimated total impacts). Annualized values are calculated to provide comparison of impacts across activities with varying forecast periods (T). This analysis employs a forecast period of 20 years, 2009 through 2028. Annualized impacts of future sturgeon conservation efforts (APV_c) are calculated using the following standard formula:

$$APV_c = PV_c \left[\frac{r}{1 - (1+r)^{-N}} \right]$$

N = number of years in the forecast period

^a To derive the present value of pre-designation conservation efforts for this analysis, t is 2000 and T is 2008; to derive the present value of post-designation conservation efforts, t is 2009 and T is 2028.

^b To discount and annualize costs, guidance provided by the OMB specifies the use of a real rate of seven percent. In addition, OMB

EXHIBIT B-1 PRESENT VALUE POST-DESIGNATION BASELINE IMPACTS BY PROPOSED CRITICAL HABITAT UNIT AND ACTIVITY (2009 DOLLARS, THREE PERCENT DISCOUNT RATE)

UNIT	WATER MANAGEMENT		AGRICULTURE		FORESTRY ACTIVITIES	TRANSPORTATION		HABITAT MANAGEMENT	TOTAL	
	LOW	HIGH	LOW	HIGH		LOW	HIGH		LOW	HIGH
1A	\$982,000	\$3,420,000	\$0	\$0	\$0	\$21,700	\$413,000	\$49,500	\$201,000	\$888,000
1B(1)	\$2,960	\$2,960	\$0	\$0	\$0	\$6,880	\$232,000	\$49,500	\$59,300	\$284,000
1B(2)	\$2,960	\$2,960	\$0	\$14,100	\$0	\$4,260	\$123,000	\$49,500	\$56,700	\$189,000
1B(3)	\$2,960	\$2,960	\$0	\$0	\$0	\$1,930	\$25,600	\$49,500	\$54,400	\$78,100
1B(4)	\$2,960	\$2,960	\$0	\$1,280	\$0	\$23,400	\$758,000	\$49,500	\$75,800	\$811,000
1C	\$2,960	\$2,960	\$0	\$0	\$0	\$0	\$0	\$49,500	\$52,400	\$52,400
2A(1)	\$2,960	\$2,960	\$0	\$0	\$0	\$0	\$0	\$49,500	\$52,400	\$52,400
2A(2)	\$2,960	\$2,960	\$0	\$0	\$0	\$3,470	\$38,000	\$49,500	\$55,900	\$90,400
2A(3)	\$2,960	\$2,960	\$0	\$31,000	\$0	\$0	\$0	\$49,500	\$52,400	\$83,500
2B(1)	\$2,960	\$2,960	\$0	\$721,000	\$0	\$111,000	\$4,200,000	\$49,500	\$164,000	\$4,970,000
2B(2)	\$2,960	\$2,960	\$0	\$22,100	\$0	\$44,500	\$1,690,000	\$49,500	\$96,900	\$1,770,000
2B(3)	\$2,960	\$2,960	\$0	\$0	\$0	\$0	\$0	\$49,500	\$52,400	\$52,400
2B(4)	\$2,960	\$2,960	\$0	\$0	\$0	\$0	\$0	\$49,500	\$52,400	\$52,400
2B(5)	\$2,960	\$2,960	\$0	\$0	\$42,600	\$27,500	\$878,000	\$49,500	\$123,000	\$974,000
3A	\$2,960	\$2,960	\$0	\$0	\$0	\$0	\$0	\$717,000	\$720,000	\$720,000
3B	\$2,960	\$2,960	\$0	\$0	\$0	\$0	\$0	\$49,500	\$52,400	\$52,400
3C	\$2,960	\$2,960	\$0	\$0	\$0	\$0	\$0	\$49,500	\$52,400	\$52,400
3D	\$2,960	\$2,960	\$0	\$0	\$0	\$0	\$0	\$49,500	\$52,400	\$52,400
3E	\$2,960	\$2,960	\$0	\$0	\$0	\$0	\$0	\$383,000	\$386,000	\$386,000
3F	\$2,960	\$2,960	\$0	\$0	\$2,980	\$0	\$0	\$383,000	\$389,000	\$389,000
3G	\$2,960	\$2,960	\$0	\$0	\$2,980	\$0	\$0	\$49,500	\$55,400	\$55,400
3H	\$2,960	\$2,960	\$0	\$0	\$1,480	\$0	\$0	\$717,000	\$721,000	\$721,000
3I	\$2,960	\$2,960	\$0	\$0	\$1,480	\$0	\$0	\$49,500	\$53,900	\$53,900

UNIT	WATER MANAGEMENT		AGRICULTURE		FORESTRY ACTIVITIES	TRANSPORTATION		HABITAT MANAGEMENT	TOTAL	
	LOW	HIGH	LOW	HIGH		LOW	HIGH		LOW	HIGH
3J	\$2,960	\$2,960	\$0	\$0	\$1,480	\$0	\$0	\$49,500	\$53,900	\$53,900
3K	\$2,960	\$2,960	\$0	\$0	\$0	\$0	\$0	\$49,500	\$52,400	\$52,400
Total	\$1,050,000	\$3,490,000	\$0	\$789,000	\$53,000	\$245,000	\$8,360,000	\$3,240,000	\$3,740,000	\$12,900,000

EXHIBIT B-2 PRESENT VALUE INCREMENTAL IMPACTS BY PROPOSED CRITICAL HABITAT UNIT AND ACTIVITY (2009 DOLLARS, THREE PERCENT DISCOUNT RATE)

UNIT	WATER MANAGEMENT	AGRICULTURE	FORESTRY ACTIVITIES	TRANSPORTATION	HABITAT MANAGEMENT	TOTAL
1A	\$1,210	\$0	\$0	\$3,000	\$3,600	\$7,810
1B(1)	\$1,210	\$0	\$0	\$337	\$3,600	\$5,150
1B(2)	\$1,210	\$0	\$0	\$337	\$3,600	\$5,150
1B(3)	\$1,210	\$0	\$0	\$337	\$3,600	\$5,150
1B(4)	\$1,210	\$0	\$0	\$1,320	\$3,600	\$6,130
1C	\$1,210	\$0	\$0	\$0	\$3,600	\$4,810
2A(1)	\$1,210	\$0	\$0	\$0	\$3,600	\$4,810
2A(2)	\$1,210	\$0	\$0	\$654	\$3,600	\$5,460
2A(3)	\$1,210	\$0	\$0	\$0	\$3,600	\$4,810
2B(1)	\$1,210	\$0	\$0	\$2,640	\$3,600	\$7,450
2B(2)	\$1,210	\$0	\$0	\$983	\$3,600	\$5,790
2B(3)	\$1,210	\$0	\$0	\$0	\$3,600	\$4,810
2B(4)	\$1,210	\$0	\$0	\$0	\$3,600	\$4,810
2B(5)	\$1,210	\$0	\$492	\$1,640	\$3,600	\$6,940
3A	\$1,210	\$0	\$0	\$0	\$6,410	\$7,620
3B	\$1,210	\$0	\$0	\$0	\$3,600	\$4,810

UNIT	WATER MANAGEMENT	AGRICULTURE	FORESTRY ACTIVITIES	TRANSPORTATION	HABITAT MANAGEMENT	TOTAL
3C	\$1,210	\$0	\$0	\$0	\$3,600	\$4,810
3D	\$1,210	\$0	\$0	\$0	\$3,600	\$4,810
3E	\$1,210	\$0	\$0	\$0	\$5,000	\$6,220
3F	\$1,210	\$0	\$0	\$0	\$5,000	\$6,220
3G	\$1,210	\$0	\$0	\$0	\$3,600	\$4,810
3H	\$1,210	\$0	\$1,710	\$0	\$6,410	\$9,330
3I	\$1,210	\$0	\$1,710	\$0	\$3,600	\$6,510
3J	\$1,210	\$0	\$1,710	\$0	\$3,600	\$6,510
3K	\$1,210	\$0	\$0	\$0	\$3,600	\$4,810
Total	\$30,300	\$0	\$5,610	\$11,200	\$98,400	\$146,000

EXHIBIT B-3 PRESENT VALUE POST-DESIGNATION BASELINE IMPACTS BY ACTIVITY AND DISTRIBUTION OF IMPACTS BY ACTIVITY (2009 DOLLARS, THREE PERCENT DISCOUNT RATE)

ACTIVITY	LOW SCENARIO		HIGH SCENARIO	
	PRESENT VALUE IMPACTS	PERCENT OF TOTAL IMPACTS	PRESENT VALUE IMPACTS	PERCENT OF TOTAL IMPACTS
Transportation	\$245,000	5.3%	\$8,360,000	52.6%
Water Management	\$1,050,000	22.9%	\$3,490,000	21.9%
Habitat Management	\$3,240,000	70.6%	\$3,240,000	20.4%
Agriculture	\$0	0.0%	\$789,000	5.0%
Forestry Activities	\$53,000	1.2%	\$53,000	0.3%
Total	\$5,590,000	100.0%	\$15,900,000	100.0%

EXHIBIT B-4 PRESENT VALUE INCREMENTAL IMPACTS BY ACTIVITY AND DISTRIBUTION OF IMPACTS BY ACTIVITY (2009 DOLLARS, THREE PERCENT DISCOUNT RATE)

ACTIVITY	PRESENT VALUE IMPACTS	PERCENT OF TOTAL IMPACTS
Habitat Management	\$98,400	67.4%
Water Management	\$30,300	20.8%
Transportation	\$11,200	7.7%
Forestry Activities	\$5,610	3.8%
Agriculture	\$0	0.0%
Total	\$146,000	100.0%

EXHIBIT B-5 ANNUALIZED POST-DESIGNATION BASELINE IMPACTS BY PROPOSED CRITICAL HABITAT UNIT AND ACTIVITY (2009 DOLLARS, THREE PERCENT DISCOUNT RATE)

UNIT	WATER MANAGEMENT		AGRICULTURE		FORESTRY ACTIVITIES	TRANSPORTATION		HABITAT MANAGEMENT	TOTAL	
	LOW	HIGH	LOW	HIGH		LOW	HIGH		LOW	HIGH
1A	\$64,100	\$223,000	\$0	\$0	\$0	\$1,430	\$26,900	\$3,330	\$13,200	\$58,100
1B(1)	\$193	\$193	\$0	\$0	\$0	\$451	\$15,100	\$3,330	\$3,970	\$18,700
1B(2)	\$193	\$193	\$0	\$946	\$0	\$280	\$8,010	\$3,330	\$3,800	\$12,500
1B(3)	\$193	\$193	\$0	\$0	\$0	\$128	\$1,670	\$3,330	\$3,650	\$5,190
1B(4)	\$193	\$193	\$0	\$86	\$0	\$1,530	\$49,500	\$3,330	\$5,050	\$53,100
1C	\$193	\$193	\$0	\$0	\$0	\$0	\$0	\$3,330	\$3,520	\$3,520
2A(1)	\$193	\$193	\$0	\$0	\$0	\$0	\$0	\$3,330	\$3,520	\$3,520
2A(2)	\$193	\$193	\$0	\$0	\$0	\$230	\$2,480	\$3,330	\$3,750	\$6,000
2A(3)	\$193	\$193	\$0	\$2,090	\$0	\$0	\$0	\$3,330	\$3,520	\$5,610
2B(1)	\$193	\$193	\$0	\$48,400	\$0	\$7,260	\$274,000	\$3,330	\$10,800	\$326,000
2B(2)	\$193	\$193	\$0	\$1,490	\$0	\$2,910	\$110,000	\$3,330	\$6,430	\$115,000
2B(3)	\$193	\$193	\$0	\$0	\$0	\$0	\$0	\$3,330	\$3,520	\$3,520
2B(4)	\$193	\$193	\$0	\$0	\$0	\$0	\$0	\$3,330	\$3,520	\$3,520
2B(5)	\$193	\$193	\$0	\$0	\$2,780	\$1,800	\$57,300	\$3,330	\$8,110	\$63,600
3A	\$193	\$193	\$0	\$0	\$0	\$0	\$0	\$48,200	\$48,400	\$48,400
3B	\$193	\$193	\$0	\$0	\$0	\$0	\$0	\$3,330	\$3,520	\$3,520
3C	\$193	\$193	\$0	\$0	\$0	\$0	\$0	\$3,330	\$3,520	\$3,520
3D	\$193	\$193	\$0	\$0	\$0	\$0	\$0	\$3,330	\$3,520	\$3,520
3E	\$193	\$193	\$0	\$0	\$0	\$0	\$0	\$25,700	\$25,900	\$25,900
3F	\$193	\$193	\$0	\$0	\$194	\$0	\$0	\$25,700	\$26,100	\$26,100
3G	\$193	\$193	\$0	\$0	\$194	\$0	\$0	\$3,330	\$3,710	\$3,710
3H	\$193	\$193	\$0	\$0	\$99	\$0	\$0	\$48,200	\$48,500	\$48,500
3I	\$193	\$193	\$0	\$0	\$99	\$0	\$0	\$3,330	\$3,620	\$3,620

UNIT	WATER MANAGEMENT		AGRICULTURE		FORESTRY ACTIVITIES	TRANSPORTATION		HABITAT MANAGEMENT	TOTAL	
	LOW	HIGH	LOW	HIGH		LOW	HIGH		LOW	HIGH
3J	\$193	\$193	\$0	\$0	\$99	\$0	\$0	\$3,330	\$3,620	\$3,620
3K	\$193	\$193	\$0	\$0	\$0	\$0	\$0	\$3,330	\$3,520	\$3,520
Total	\$68,700	\$228,000	\$0	\$53,000	\$3,470	\$16,000	\$545,000	\$218,000	\$250,000	\$852,000

EXHIBIT B-6 ANNUALIZED INCREMENTAL IMPACTS BY PROPOSED CRITICAL HABITAT UNIT AND ACTIVITY (2009 DOLLARS, THREE PERCENT DISCOUNT RATE)

UNIT	WATER MANAGEMENT	AGRICULTURE	FORESTRY ACTIVITIES	TRANSPORTATION	HABITAT MANAGEMENT	TOTAL
1A	\$79	\$0	\$0	\$202	\$242	\$523
1B(1)	\$79	\$0	\$0	\$23	\$242	\$343
1B(2)	\$79	\$0	\$0	\$23	\$242	\$343
1B(3)	\$79	\$0	\$0	\$23	\$242	\$343
1B(4)	\$79	\$0	\$0	\$89	\$242	\$410
1C	\$79	\$0	\$0	\$0	\$242	\$321
2A(1)	\$79	\$0	\$0	\$0	\$242	\$321
2A(2)	\$79	\$0	\$0	\$44	\$242	\$365
2A(3)	\$79	\$0	\$0	\$0	\$242	\$321
2B(1)	\$79	\$0	\$0	\$177	\$242	\$498
2B(2)	\$79	\$0	\$0	\$66	\$242	\$387
2B(3)	\$79	\$0	\$0	\$0	\$242	\$321
2B(4)	\$79	\$0	\$0	\$0	\$242	\$321
2B(5)	\$79	\$0	\$33	\$110	\$242	\$464
3A	\$79	\$0	\$0	\$0	\$431	\$510
3B	\$79	\$0	\$0	\$0	\$242	\$321

UNIT	WATER MANAGEMENT	AGRICULTURE	FORESTRY ACTIVITIES	TRANSPORTATION	HABITAT MANAGEMENT	TOTAL
3C	\$79	\$0	\$0	\$0	\$242	\$321
3D	\$79	\$0	\$0	\$0	\$242	\$321
3E	\$79	\$0	\$0	\$0	\$336	\$415
3F	\$79	\$0	\$0	\$0	\$336	\$415
3G	\$79	\$0	\$0	\$0	\$242	\$321
3H	\$79	\$0	\$115	\$0	\$431	\$625
3I	\$79	\$0	\$115	\$0	\$242	\$436
3J	\$79	\$0	\$115	\$0	\$242	\$436
3K	\$79	\$0	\$0	\$0	\$242	\$321
Total	\$1,980	\$0	\$377	\$756	\$6,610	\$9,720

APPENDIX C | UNDISCOUNTED IMPACTS TO ACTIVITIES BY UNIT

This appendix provides details of the undiscounted impacts by year for each activity. These details are provided in accordance with OMB guidelines for developing benefit and cost estimates. OMB directs the analysis to: “include separate schedules of the monetized benefits and costs that show the type and timing of benefits and costs, and express the estimates in this table in constant, undiscounted dollars.”¹ For this analysis, this applies to the cost estimates for future years. Circular A-4 directs that future estimates of value should be presented in undiscounted terms. This is an important way to clarify future costs. For example, if a program will cost \$10,000 ten years in the future, that future cost estimate should be noted as such to clarify what the cost estimate is in that year.

¹ Office of Management and Budget, Circular A-4, September 17, 2003, p. 18). The reference to “constant” dollars indicates that the effects of general price level inflation (the tendency of all prices to increase over time) should be removed through the use of an inflation adjustment index.

EXHIBIT C-1 UNDISCOUNTED POST-DESIGNATION BASELINE IMPACTS ASSOCIATED WITH WATER MANAGEMENT

SUBUNIT	ANNUAL IMPACT		YEAR(S)	DESCRIPTION
	LOW	HIGH		
1A	\$45,200	\$161,000	2010	Lost hydropower revenues resulting from changes in generation due to water releases
	\$48,200	\$169,000	2011	
	\$48,700	\$171,000	2012	
	\$48,900	\$172,000	2013	
	\$50,200	\$176,000	2014	
	\$52,000	\$183,000	2015	
	\$53,700	\$189,000	2016	
	\$55,400	\$194,000	2017	
	\$57,200	\$201,000	2018	
	\$59,500	\$209,000	2019	
	\$62,100	\$218,000	2020	
	\$64,100	\$225,000	2021	
	\$64,700	\$227,000	2022	
	\$63,200	\$222,000	2023	
	\$63,500	\$223,000	2024	
	\$63,100	\$221,000	2025	
	\$64,300	\$226,000	2026	
	\$66,600	\$234,000	2027	
	\$69,400	\$244,000	2028	
	\$71,300	\$250,000	2029	
	\$8,540	\$28,500	2010-2029	Recreational benefits lost in Detroit Reservoir
	\$151	\$151	2010-2022; 2024-2029	Administrative costs associated with section 7 consultation
	\$1,220	\$1,220	2023	
1B(1), 1B(2), 1B(3), 1B(4), 1C, 2A(1), 2A(2), 2A(3), 2B(1), 2B(2), 2B(3), 2B(4), 2B(5), 3A, 3B, 3C, 3D, 3E, 3F, 3G, 3H, 3I, 3J, 3K	\$151	\$151	2010-2022; 2024-2029	
	\$1,220	\$1,220	2023	

EXHIBIT C-2 UNDISCOUNTED INCREMENTAL IMPACTS ASSOCIATED WITH WATER MANAGEMENT

SUBUNIT	ANNUAL IMPACT	YEAR(S)	DESCRIPTION
All	\$282	2010	Administrative costs associated with section 7 consultation
	\$50	2011-2022; 2024-2029	
	\$407	2023	

EXHIBIT C-3 UNDISCOUNTED POST-DESIGNATION BASELINE IMPACTS ASSOCIATED WITH AGRICULTURE

SUBUNIT	ANNUAL IMPACT		YEAR(S)	DESCRIPTION
	LOW	HIGH		
1B(2)	\$0	\$946	2010-2029	Crop losses resulting from no-pesticide use areas
1B(4)	\$0	\$86	2010-2029	
2A(3)	\$0	\$2,090	2010-2029	
2B(1)	\$0	\$48,400	2010-2029	
2B(2)	\$0	\$1490	2010-2029	

EXHIBIT C-4 UNDISCOUNTED POST-DESIGNATION BASELINE IMPACTS ASSOCIATED WITH FORESTRY

SUBUNIT	ANNUAL IMPACT	YEAR(S)	DESCRIPTION
2B(5)	\$2,770	2010-2029	Lost timber harvest revenue resulting from no aerial pesticide application
	\$99	2010-2029	Administrative costs associated with section 7 consultation
3F	\$200	2010-2029	Miscellaneous impacts to Oregon Department of Forestry
3G	\$200	2010-2029	
3H	\$99	2010-2029	Administrative costs associated with section 7 consultation
3I	\$99	2010-2029	
3J	\$99	2010-2029	

EXHIBIT C-5 UNDISCOUNTED INCREMENTAL IMPACTS ASSOCIATED WITH FORESTRY

SUBUNIT	ANNUAL IMPACT	YEAR(S)	DESCRIPTION
2B(5)	\$33	2010-2029	Administrative costs associated with section 7 consultation
3H	\$1,280	2010	
	\$33	2011-2029	
3I	\$1,280	2010	
	\$33	2011-2029	
3J	\$1,280	2010	
3J	\$33	2011-2029	

EXHIBIT C-6 UNDISCOUNTED POST-DESIGNATION BASELINE IMPACTS ASSOCIATED WITH TRANSPORTATION ACTIVITIES

SUBUNIT	ANNUAL IMPACT		YEAR(S)	DESCRIPTION
	LOW	HIGH		
1A	\$9,900	\$413,000	2010	Purchase of conservation bank credits
	\$2,100	\$2,100	2010	Monitoring costs
	\$82	\$82	2013-2029	
	\$6,240	\$6,240	2010	Administrative costs associated with section 7 consultation
	\$245	\$245	2013-2029	
1B(1)	\$5,700	\$238,000	2010	Purchase of conservation bank credits
	\$350	\$350	2010	Monitoring cost
	\$1,040	\$1,040	2010	Administrative costs associated with section 7 consultation
1B(2)	\$3,000	\$125,000	2010	Purchase of conservation bank credits
	\$350	\$350	2010	Monitoring cost
	\$1,040	\$1,040	2010	Administrative costs associated with section 7 consultation
1B(3)	\$600	\$25,000	2010	Purchase of conservation bank credits
	\$350	\$350	2010	Monitoring cost
	\$1,040	\$1,040	2010	Administrative costs associated with section 7 consultation

SUBUNIT	ANNUAL IMPACT		YEAR(S)	DESCRIPTION
	LOW	HIGH		
1B(4)	\$18,600	\$775,000	2010	Impacts associated with purchase of conservation bank credits
	\$350	\$350	2010	Monitoring cost
	\$82	\$82	2013-2029	
	\$1,040	\$1,040	2010	Administrative costs associated with section 7 consultation
	\$245	\$245	2013-2029	
2A(2)	\$900	\$37,500	2011	Impacts associated with purchase of conservation bank credits
	\$700	\$700	2011	Monitoring cost
	\$2,080	\$2,080	2011	Administrative costs associated with section 7 consultation
2B(1)	\$104,000	\$4,310,000	2010	Impacts associated with purchase of conservation bank credits
	\$700	\$700	2010	Monitoring cost
	\$165	\$165	2013-2029	
	\$2,080	\$2,080	2010	Administrative costs associated with section 7 consultation
	\$490	\$490	2013-2029	
2B(2)	\$45,600	\$1,900,000	2013	Purchase of conservation bank credits
	\$82	\$82	2013-2029	Monitoring cost
	\$245	\$245	2013-2029	Administrative costs associated with section 7 consultation
2B(5)	\$22,200	\$925,000	2011	Purchase of conservation bank credits
	\$700	\$700	2011	Monitoring cost
	\$82	\$82	2013-2029	
	\$2,080	\$2,080	2011	Administrative costs associated with section 7 consultation
	\$245	\$245	2013-2029	

EXHIBIT C-7 UNDISCOUNTED INCREMENTAL IMPACTS ASSOCIATED WITH TRANSPORTATION ACTIVITIES

SUBUNIT	ANNUAL IMPACT		YEAR(S)	DESCRIPTION
	LOW	HIGH		
1A	\$2,080	\$2,080	2010	Administrative costs associated with section 7 consultation
	\$82	\$82	2013-2029	
1B(1)	\$347	\$347	2010	
1B(2)	\$347	\$347	2010	
1B(3)	\$347	\$347	2010	
1B(4)	\$347	\$347	2010	
	\$82	\$82	2013-2029	
2A(2)	\$694	\$694	2011	
2B(1)	\$694	\$694	2010	
	\$163	\$163	2013-2029	
2B(2)	\$82	\$82	2013-2029	
2B(5)	\$694	\$694	2011	
	\$82	\$82	2013-2029	

EXHIBIT C-8 UNDISCOUNTED INCREMENTAL IMPACTS ASSOCIATED WITH SPECIES MANAGEMENT

SUBUNIT	ANNUAL IMPACT	YEAR(S)	DESCRIPTION
1A	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
1B(1)	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
1B(2)	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated

SUBUNIT	ANNUAL IMPACT	YEAR(S)	DESCRIPTION
			with section 7 consultation
1B(3)	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
1B(4)	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
1C	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
2A(1)	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
2A(2)	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
2A(3)	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
2B(1)	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
2B(2)	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs

SUBUNIT	ANNUAL IMPACT	YEAR(S)	DESCRIPTION
	\$659	2010-2029	Administrative costs associated with section 7 consultation
2B(3)	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
2B(4)	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
2B(5)	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
3A	\$1,100	2010-2029	Annual ODFW survey costs
	\$41,700	2010-2029	USACE research and management costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$40,000	2010	USACE engineering solution costs below Fall Creek dam
	\$9,360	2010	Administrative costs associated with section 7 consultation
	\$659	2011-2029	Administrative costs associated with section 7 consultation
3B	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
3C	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
3D	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs

SUBUNIT	ANNUAL IMPACT	YEAR(S)	DESCRIPTION
	\$659	2010-2029	Administrative costs associated with section 7 consultation
3E	\$1,100	2010-2029	Annual ODFW survey costs
	\$20,800	2010-2029	USACE research and management costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$20,000	2010	USACE engineering solution costs below Dexter dam
	\$5,010	2010	Administrative costs associated with section 7 consultation
	\$659	2011-2029	Administrative costs associated with section 7 consultation
3F	\$1,100	2010-2029	Annual ODFW survey costs
	\$20,800	2010-2029	USACE research and management costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$20,000	2010	USACE engineering solution costs below Dexter dam
	\$5,010	2010	Administrative costs associated with section 7 consultation
	\$659	2011-2029	Administrative costs associated with section 7 consultation
3G	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
3H	\$1,100	2010-2029	Annual ODFW survey costs
	\$41,700	2010-2029	USACE research and management costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$40,000	2010	USACE engineering solution costs
	\$9,360	2010	Administrative costs associated with section 7 consultation
	\$659	2011-2029	Administrative costs associated with section 7 consultation
3I	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
3J	\$1,100	2010-2029	Annual ODFW survey costs

SUBUNIT	ANNUAL IMPACT	YEAR(S)	DESCRIPTION
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation
3K	\$1,100	2010-2029	Annual ODFW survey costs
	\$1,500	2010-2029	Annual species introduction and habitat restoration costs
	\$659	2010-2029	Administrative costs associated with section 7 consultation

EXHIBIT C-9 UNDISCOUNTED INCREMENTAL IMPACTS ASSOCIATED WITH SPECIES MANAGEMENT

SUBUNIT	ANNUAL IMPACT	YEAR(S)	DESCRIPTION
1A	\$220	2010-2029	Administrative costs associated with section 7 consultation
1B(1)	\$220	2010-2029	Administrative costs associated with section 7 consultation
1B(2)	\$220	2010-2029	Administrative costs associated with section 7 consultation
1B(3)	\$220	2010-2029	Administrative costs associated with section 7 consultation
1B(4)	\$220	2010-2029	Administrative costs associated with section 7 consultation
1C	\$220	2010-2029	Administrative costs associated with section 7 consultation
2A(1)	\$220	2010-2029	Administrative costs associated with section 7 consultation
2A(2)	\$220	2010-2029	Administrative costs associated with section 7 consultation
2A(3)	\$220	2010-2029	Administrative costs associated with section 7 consultation
2B(1)	\$220	2010-2029	Administrative costs associated with section 7 consultation
2B(2)	\$220	2010-2029	Administrative costs associated with section 7 consultation
2B(3)	\$220	2010-2029	Administrative costs associated with section 7 consultation
2B(4)	\$220	2010-2029	Administrative costs associated with section 7 consultation
2B(5)	\$220	2010-2029	Administrative costs associated with section 7 consultation

SUBUNIT	ANNUAL IMPACT	YEAR(S)	DESCRIPTION
3A	\$3,120	2010	Administrative costs associated with section 7 consultation
	\$220	2011-2029	
3B	\$220	2010-2029	Administrative costs associated with section 7 consultation
3C	\$220	2010-2029	Administrative costs associated with section 7 consultation
3D	\$220	2010-2029	Administrative costs associated with section 7 consultation
3E	\$1,670	2010	Administrative costs associated with section 7 consultation
	\$220	2011-2029	
3F	\$1,670	2010	Administrative costs associated with section 7 consultation
	\$220	2011-2029	
3G	\$220	2010-2029	Administrative costs associated with section 7 consultation
3H	\$3,120	2010	Administrative costs associated with section 7 consultation
	\$220	2011-2029	
3I	\$220	2011-2029	Administrative costs associated with section 7 consultation
3J	\$220	2010-2029	Administrative costs associated with section 7 consultation
3K	\$220	2010-2029	Administrative costs associated with section 7 consultation

APPENDIX D | EXISTING FEDERAL AND STATE LAWS AND REGULATIONS THAT MAY PROTECT THE CHUB

1. Federal laws other than the ESA, as well as state and local laws and regulations may protect Oregon chub in the absence of critical habitat designation. The following sections discuss the major sources of legal and regulatory baseline protection. Other laws and regulations that may constrain habitat-modifying federal actions but are unlikely to provide significant protection are also listed.

D.1 FEDERAL STATUTES AND REGULATIONS

CLEAN WATER ACT (33 U.S.C. 1251 ET SEQ. 1987)

2. The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States. It gives the Environmental Protection Agency (EPA) the authority to implement pollution control programs such as setting wastewater standards for industry. The CWA also continued requirements to set water quality standards for all contaminants in surface waters.
3. According to the CWA, it is unlawful for any person to discharge a pollutant from a point source into navigable waters, unless a permit is obtained under its provisions; this requires issuance of Section 404 permits from the USACE. As part of pollution prevention activities, the USACE may limit activities in waterways through its 404 permitting process, independent of chub concerns. These reductions in pollution may benefit the chub.
4. Under the National Pollutant Discharge Elimination System (NPDES) program, EPA sets pollutant specific limits on the point source discharges for major industries and provides permits to individual point sources that apply to these limits. Under the water quality standards program, EPA, in collaboration with States, establishes water quality criteria to regulate ambient concentrations of pollutants in surface waters. 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.
5. Section 3 of this analysis discusses impacts related to water temperature control requirements implemented through the NPDES program. Other potential CWA protections that are not reinforced through section 7 of the ESA (e.g., as project modifications in biological opinions) are considered baseline protections.

NATIONAL FOREST MANAGEMENT ACT (16 USC §§ 1600-1614 1976)

6. This Act requires assessment of forest lands, development of a management program based on multiple-use, sustained-yield principles, and implementation of a resource management plan for each unit of the National Forest System. The Act may provide protection to the chub within National Forests, primarily through its authorization of the Northwest Forest Plan (NWFP) and PACFISH. NWFP and PACFISH provide numerous protections for aquatic species related to Federal lands management activities, as discussed in more detail below.
7. As stated below, this analysis considers Service recommended alterations (as described in biological opinions) to planned USFS and BLM actions in these areas to be section 7 impacts. NWFP-dictated protections that are not reinforced through section 7 are considered baseline protections.

NORTHWEST FOREST PLAN (1994)

8. The Northwest Forest Plan defines Standards and Guidelines (S&Gs) for forest use throughout the 24 million acres of Federal lands in its planning area (the range of the Northern spotted owl). All Federal lands management activities in the NWFP planning area are affected by the Northwest Forest Plan. Specifically, the NWFP provides S&Gs for management of timber, roads, grazing, recreation, minerals, fire/fuels management, fish and wildlife management, general land management, riparian area management, watershed and habitat restoration, and research activities on USFS and BLM lands. To accomplish its goals, the NWFP defines seven land allocation categories, including “matrix lands,” which are areas where the majority of timber is to be taken, and Riparian Reserves and Key Watersheds, where distances from rivers are set within which many activities are restricted. The Aquatic Conservation Strategy (ACS) component of the plan specifically provides for fishery habitat, protection, and restoration, which may provide baseline protections to the chub.

PACFISH (INTERIM STRATEGIES FOR MANAGING ANADROMOUS FISH-PRODUCING WATERSHEDS) (1995)

9. For anadromous fish-producing watersheds on Federal lands in eastern Oregon, Washington, Idaho and Northern California that are not covered by the Northwest Forest Plan (NWFP), USFS and BLM adopted a management strategy to arrest the degradation and begin the restoration of anadromous fish protection.
10. Federal lands management activities in the NWFP planning area are affected by PACFISH. Like the NWFP, PACFISH provides guidelines for timber, roads, grazing, recreation, minerals, fire/fuels management, lands, riparian area, watershed and habitat restoration, and fisheries and wildlife restoration. Standards and guidelines under PACFISH are nearly identical to those in the NWFP. To the extent that activities subject to PACFISH management affect chub habitat, this regulation is considered as potentially providing baseline protections to the chub.

FEDERAL POWER ACT (16 U.S.C. § 800 1920, AS AMENDED)

11. The purpose of the Federal Power Act (FPA) was to establish a regulatory agency to oversee nonfederal hydropower generation. The resulting Federal Energy Regulatory Commission (FERC), an independent Federal agency governing approximately 2,500 licenses for non-Federal hydropower facilities, has responsibility for national energy regulatory issues.
12. This Act may provide protection to chub habitat from hydropower activities. Section 10(j) of the Federal Power Act (FPA) was promulgated to ensure that FERC considers both power and non-power resources during the licensing process.

NORTHWEST ELECTRIC POWER PLANNING AND CONSERVATION ACT (NORTHWEST POWER ACT) (16 U.S.C. §§839-839H 1920, AS AMENDED)

13. This regulation provides for the protection, mitigation, and enhancement of fish and wildlife, including related spawning grounds and habitat, of the Columbia River and its tributaries. Hydropower activities in the Northwest Region are impacted through the Northwest Power Act's Fish and Wildlife Program, which directs the Northwest Power and Conservation Council to adopt programs to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat, on the Columbia River system. This regulation has encouraged the use of the Bonneville Power Administration's resources to mitigate and enhance fish and wildlife and habitat affected by the development and operation of hydroelectric projects in the Columbia River and its tributaries.
14. Through the Northwest Power Act, the Council is directed to consider recommendations from all stakeholders including Federal and State agencies, tribes, and power customers in the region. This analysis, therefore, considers most of the hydropower modifications covered by the Northwest Power Act to be baseline section 7 impacts.

FISH AND WILDLIFE COORDINATION ACT (16 U.S.C. §§ 661-666 1934, AS AMENDED)

15. This regulation provides that, whenever the waters or channels of a body of water are modified by a department or agency of the U.S., the department or agency first shall consult with the Service and with the head of the agency exercising administration over the wildlife resources of the State where modification will occur with a view to the conservation of wildlife resources. This analysis assumes that the Service's recommendations to Federal agencies through consultation under the FWCA are the same, or similar, to those provided through section 7 for the chub, and are therefore considered as providing baseline protections to the species.

RIVERS AND HARBORS ACT (33 USC §§ 401 ET SEQ. 1938)

16. The Rivers and Harbors Act (RHA) places Federal investigations and improvements of rivers, harbors and other waterways under the jurisdiction of the Department of the Army (USACE) and requires that all investigations and improvements include due regard for wildlife conservation. This Act may provide protection to the chub from instream

construction activities. Under sections 9 and 10 of the RHA, the USACE is authorized to regulate the construction of any structure or work within navigable water. This includes, for example, bridges and docks. RHA protections that are not reinforced through section 7 (e.g., as project modifications in biological opinions) are considered baseline protections in this analysis.

NATIONAL ENVIRONMENTAL POLICY ACT (42 USC §§ 4321-4345 1969)

17. The National Environmental Policy Act (NEPA) requires that all Federal agencies conduct a detailed environmental impact statement in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment. The NEPA process may provide protection to the chub for all activities that have Federal involvement, if alternatives are considered and selected that are less harmful to the chub and its habitat than other possible alternatives.

WILDERNESS ACT (16 USC §§ 1131-1136 1964)

18. The Wilderness Act established the National Wilderness Preservation System. With a few exceptions, no commercial enterprise or permanent road is allowed within a wilderness area. Temporary roads, motor vehicles, motorized equipment, landing of aircraft, structures and installations are only allowed for administration of the area. The Wilderness Act may offer baseline protections to the chub by limiting land disturbing activities in Wilderness Areas in National Forests.

THE SIKES IMPROVEMENT ACT (16 USC §670 1997)

19. The Sikes Improvement Act (SIA) requires military installations to prepare and implement an Integrated Natural Resources Management Plan (INRMP). While this analysis does not include any military lands, INRMPs developed in accordance with SAIA may potentially provide baseline protection to the chub habitat on military lands.

FARM BILL LANDOWNER INCENTIVES PROGRAMS

20. The NRCS administers a host of conservation programs in Oregon, including “Farm Bill” programs, which could provide potential baseline protections to the chub. The Farm Bill is a voluntary program that provides financial and technical assistance to producers who advance the conservation and improvement of soil, water, air, energy, plant and animal life, and other resources.

OTHER STATUTES AND REGULATIONS THAT APPLY TO LAND USE ACTIVITIES

21. While the following statutes and regulations may apply to the land within proposed critical habitat, they are unlikely to provide significant baseline protection to the chub and are not considered in the analysis.
22. *Fish and Wildlife Conservation Act (16 USC §§ 2901-2911 1980, as amended)* – The FWCA encourages States to develop, revise and implement, in consultation with Federal,

State, local and regional agencies, a plan for the conservation of fish and wildlife, particularly species indigenous to the state.

23. *Fisheries Restoration and Irrigation Mitigation Act (16 USC § 777 2000)* - The FRIMA directs the Secretary of Interior, in consultation with the heads of other appropriate agencies, to develop and implement projects to mitigate impacts to fisheries resulting from the construction and operation of water diversions by local government entities (including soil and water conservation districts) in the Pacific Ocean drainage area.
24. *Water Resources Development Act (33 USC §§ 2201-2330 1986, as amended)* - WRDA authorizes the construction or study of USACE projects and outlines environmental assessment and mitigation requirements.
25. *Wild and Scenic Rivers Act (16 USC §§ 1271-1287 2001)* - WSRA authorizes the creation of the National Wilderness Preservation System and prohibits extractive activities on specific lands.
26. *North American Wetland Conservation Act (16 USC § 4401 et seq. 1989)* - NAWCA encourages partnerships among public agencies and other interests to protect, enhance, restore and manage an appropriate distribution and diversity of wetland ecosystems and other habitats for migratory birds and other fish and wildlife.
27. *Federal Land Policy and Management Act (43 USC §§ 1701-1782 1976)* – This Act requires the Bureau of Land Management to employ a land planning process that is based on multiple use and sustained yield principles
28. *Executive Order 11988 and 11990 (1977)* – These Executive Orders require, to the extent possible, prevention of long and short term adverse impacts associated with the occupancy and modification of floodplains and prevention of direct or indirect support of floodplain development wherever there is a practicable alternative.

D.2 STATE STATUTES AND REGULATIONS

ODFW NATIVE FISH CONSERVATION POLICY

29. The policy's primary purpose is to remove fish species from Endangered Species Act lists and avoid future listings while providing sport, commercial, cultural and aesthetic benefits for current and future generations. It focuses on the sustainability of naturally produced native fish; identifies naturally produced fish as the foundation for hatchery programs and fisheries; and provides for basin-by-basin management for individual watersheds through conservation plans with measurable criteria. Past conservation efforts within the Willamette Basin include treatment of riparian zones, floodplain restoration projects, road closures, decommissionings, and improvements, and land enrolled in the Conservation Reserve Enhancement Program (CREP).

ODFW WILDLIFE DIVERSITY PLAN AND PROGRAM

30. The plan, originally designed to conserve the diversity of fish and wildlife species in the state, is a blueprint for addressing the needs of Oregon's native fishes, amphibians, reptiles, bird and mammals, and contains information on all species and habitats in the state. The plan guides the Wildlife Diversity Program which focuses on protecting and managing the 88 percent of the state's native fish and wildlife species that are not hunted, angled or trapped. ODFW has also begun work on a Statewide Conservation Plan.
31. The chub may benefit either directly or indirectly from projects included in the plan such as critical habitat restorations, inventories, conservation programs for sensitive species, and educational materials.

ODFW WILLAMETTE MITIGATION PROGRAM

32. The goal of the Willamette Basin Mitigation Program is to cooperatively develop and implement measures to mitigate for fish and wildlife habitat losses resulting from the construction of federally licensed hydro-electric dams and facilities. As part of the Program, the Council implements easements, acquisitions, management plans, and enhancement activities designed to: (1) achieve the Council's mitigation goals for target species and habitats; and (2) maintain and improve water quality and quantity, habitat connectivity, integrity and functionality, biodiversity and overall ecosystem health.
33. The program could benefit the chub directly or indirectly through various projects, including purchase of riparian forest and farm land, development of partnerships on public lands, assistance with surveys, and inventory of habitats.

OREGON DEPARTMENT OF FISH AND WILDLIFE'S (ODFW) HABITAT MITIGATION GOALS AND STANDARDS (OAR 635-415-030(1))

34. These goals and standards provide that critical habitat of any state or federally listed threatened or endangered species is considered Habitat Category 1. Under ODFW's Fish and Wildlife Habitat Mitigation Policy, Category 1" habitat has the highest priority for protection when ODFW is carrying out, approving, or making recommendations on actions by private and government entities. The policy sets a mitigation goal of no loss of either habitat units or habitat value for Category 1. ODFW is also required to act to protect such habitats by recommending or requiring:
 - (A) avoidance of impacts through alternatives to the proposed action; or
 - (B) no authorization of the proposed action if impacts cannot be avoided. (Note that the no loss and avoidance of impacts standards appear to be more stringent than the Service's definition of adverse modification. Note also that ODFW's authority extends to situations where there is no federal nexus.)

ODFW's habitat mitigation goals and standards may provide baseline protections to the chub by minimizing impacts from projects approved by ODFW.

GENERAL AUTHORIZATION FOR FISH HABITAT ENHANCEMENT (OAR 141-089-0005(4)(D))

35. This rule mandates that persons may place or remove material within waters of the state for the purposes of fish habitat enhancement only if the activity will not adversely affect federally-designated critical habitat. This may provide baseline protection to the chub by minimizing damages to chub units from habitat modification.

GENERAL AUTHORIZATION FOR FISH HABITAT ENHANCEMENT (OAR 141-089-0015(3)(L))

36. This rule provides that, where federal, state, and local agencies place or remove material in non-estuarine waters of the state while repairing or modifying existing roads or bridges or replacing culverts, the activity shall not adversely affect state or federal threatened or endangered species or their critical habitat. This may provide baseline protection to the chub by minimizing damages to chub units from transportation construction projects.

DEPARTMENT OF ENVIRONMENTAL QUALITY, SOLID WASTE: MUNICIPAL SOLID WASTE

37. Municipal Solid Waste laws prohibit the establishment, expansion, or modification of a municipal solid waste landfill in a manner that will alter a critical habitat in a way that appreciably diminishes the likelihood of the survival and recovery of threatened or endangered species using that habitat. This may provide baseline protection to the chub by minimizing damages to chub units from solid waste landfills.

HAZARDOUS SUBSTANCE REMEDIAL ACTION RULES (OAR 340-122-0115(49))

38. These rules define, for purposes of carrying out hazardous substance remedial actions, a “sensitive environment” to include critical habitat for federal endangered or threatened species. This may provide baseline protection to the chub by minimizing damages to chub units in the event of a release or threat of a release of a hazardous substance.

UNDERGROUND STORAGE TANK (UST) FINANCIAL ASSISTANCE PROGRAM (OAR 340-172-0010(17))

39. Although established for purposes of providing financial assistance for remediation of underground storage tanks, the program is applicable to this analysis because its definition of “imminent hazard” includes releases of petroleum that threaten critical habitat or an endangered species. Therefore, the UST financial assistance program may provide baseline protection to the chub by minimizing damages to chub units in the event of a release of petroleum from underground storage tanks.

MINING AND MINING CLAIMS - STANDARDS FOR CHEMICAL PROCESS MINING OPERATION (ORS 517.956(2)(C))

40. This Act requires that chemical process mining operations (e.g. cyanide heap leach gold mines) meet the following “No loss standard”: No loss of existing critical habitat of any state or federally listed threatened or endangered species. Note that the no loss standard

appears to be more stringent than the Service's standard for adverse modification. The standard under this Act provides baseline protection for the chub by protecting chub units from adverse impacts from chemical process mining operations.

AGRICULTURAL WATER QUALITY MANAGEMENT PLANS

41. In 1993, the Oregon Legislature passed Senate Bill 1010, or the Agricultural Water Quality Management Act. The Act, and one that followed it, designate the Oregon Department of Agriculture (ODA) as the state agency solely responsible for regulating agricultural activities that affect water quality. The Act authorizes ODA to develop water quality management plans and rules in coordination with farmers and ranchers to prevent and control water pollution.
42. Agricultural Water Quality Management Plans developed under the Act may provide baseline protection to the chub by limiting and managing adverse water quality alterations related to agricultural activities through the implementation of Prevention and Control Measures.

OREGON FOREST PRACTICES ACT

43. Through the establishment of legally required best management practices, the Forest Practices Act works to promote effective and efficient forest management; sustain healthy forests; maintain the continuous growing and harvesting of forest trees on non-federal lands; protect soil productivity, fish and wildlife habitat, air and water quality; and foster other forestland values and benefits.
44. Oregon Forest Practices Act may provide baseline protections through vegetation prescription measures that relate to chub conservation. Forest Practices Act rules provide benefit to the chub through the protection of water quality and habitat, but are not intended as a recovery mechanism for chub.

OREGON PLAN FOR SALMON AND WATERSHEDS-WRI

45. The goal of the Oregon Plan is to involve public and private groups with various interests in efforts to "restore populations and fisheries to productive and sustainable levels that will provide substantial environmental, cultural, and economic benefits." The Oregon Plan for Salmon and Watersheds may provide baseline protection to the chub through overall improvement to ecological quality and environmental management.

OREGON DIVISION OF STATE LANDS: REMOVAL-FILL AND WETLANDS PROGRAMS

46. Oregon's Removal-Fill Law (ORS 196.795-990) requires that any person or organization planning to remove or put material in waters of the state obtain a permit from the Division of State Lands. The law seeks to protect public navigation, fishery and recreational uses of the "waters of the state." The Division of State Lands is also responsible for implementing the 1989 Wetlands Conservation Act, including administering the Statewide Wetlands Inventory and National Wetlands Inventory.

47. The Oregon Division of State Lands Removal-Fill Program may provide baseline protections to the chub by ensuring that projects involving the removal or fill of materials in and around essential salmon habitat conform to Division of State Lands permit requirements. The Wetlands Conservation Act may provide baseline protections to the chub by increasing scientific knowledge of the surrounding ecosystems via data inventories.

OREGON LAND USE PLANNING PROGRAM—GOALS 5 & 6

48. Oregon's statewide land use planning program was enacted in 1973 and is built on 19 goals that address a wide range of resources and issues, including citizen involvement, farm and forestland, transportation, public facilities, and natural resources and open space. Goal 5—the natural resources goal—seeks "to protect natural resources and conserve scenic and historic areas and open spaces" through requiring local governments to identify significant natural resources and adopt unspecified programs to protect them. Also relevant is Goal 6—the air, water and land resources quality goal—which seeks to "maintain and improve the quality of the air, water, and land resources of the state." Guidelines for Goal 6 recommend that comprehensive plans "buffer and separate those land uses which create or lead to conflicting requirements and impacts upon the air, land and water resources." The guidelines encourage local governments to use carrying capacity as a "major determinant" in providing for the "maintenance and improvement" of these resources.
49. Willamette Subbasin Plan goals may provide baseline protections to the chub through a variety of ecosystem improvement and management efforts. In particular, Goal 5 has prompted the local government to undertake several conservation efforts.