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Draft Revised Economic Analysis of Critical Habitat Designation for the Kootenai River White Sturgeon

Prepared for:

U.S. Fish and Wildlife Service
Division of Economics
Arlington, Virginia

Prepared by:

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A Division of ENTRIX, Inc.
Vancouver, Washington

First Draft: June 2006

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The purpose of this report is to identify and analyze the potential economic impacts associated with the proposed critical habitat designation (CHD) for the *Acipenser transmontanus* (Kootenai River white sturgeon, hereafter "sturgeon").

This report is a revision of the February 2006 draft economic analysis (DEA) of CHD for the sturgeon, which was made available for public review with the interim final rule published in the Federal Register on February 8, 2006.[1] Comments on the February 2006 DEA were submitted by Anheuser-Busch Companies, Inc. (Anheuser-Busch).[2] As described by Anheuser-Busch, the February 2006 DEA did not assess the impacts of the Reasonable and Prudent Alternative (RPA) from the U.S. Fish and Wildlife Service's (hereafter "Service") February 18, 2006, biological opinion (BO) regarding the proposed operation of Libby Dam.[3] Components of the RPA were not known at the time the February 2006 DEA was conducted and made available for public comments. This revised economic analysis (EA), therefore, adjusts the economic impacts estimated in the February 2006 DEA to reflect the RPA from the February 2006 BO.

Figure ES-1 summarizes key findings of the economic analysis. Results are presented in greater detail later in this summary. As described in the following paragraphs, this analysis relies heavily on secondary sources of information, including documents and studies conducted by and for the U.S. Army Corps of Engineers (ACOE), Service, and other stakeholders.

1 The notice of availability (NOA) was included in interim final rule. U.S. Fish and Wildlife Service, February 8, 2006, "Critical Habitat Designation for the Kootenai River Population of the White Sturgeon, Interim Rule," *Federal Register*, Vol. 71, No. 26, pp. 6383-6396.

2 Comments of Anheuser-Busch Companies, Inc. on Interim Final Rule: *Endangered and Threatened Wildlife and Plants – Critical Habitat Designation for the Kootenai River Population of the White Sturgeon*, 26 Fed. Reg. 6383 (Feb. 8, 2006); 50 C.F.R. Part 17, April 10, 2006.

3 U.S. Fish and Wildlife Service, February 18, 2006, "Fish and Wildlife Service Biological Opinion Regarding of the Effects of Libby Dam Operations on the Kootenai River White Sturgeon, Bull Trout, and Kootenai Sturgeon Critical Habitat (1-9-01-F-0279R)."

Figure ES-1

KEY FINDINGS[4]
Total impacts: Pre-designation (1994-2005) costs associated with conservation activities for sturgeon and its habitat are estimated to total approximately $240 million in 2005 dollars. Potential post-designation (2006-2025) costs are estimated to range between $570 million and $1.25 billion in undiscounted 2005 dollars. In discounted terms, potential economic costs are estimated to be $425 to $900 million (using a three percent discount rate) and $305 to $610 million (using a seven percent discount rate). In annualized terms, potential costs are expected to range from $29 to $61 million annually (annualized at three percent) and $29 to $58 million annually (annualized at seven percent). The majority of these impacts result from changes in Kootenai River flows and Kootenay Lake elevation to accommodate the sturgeon within the Kootenai River, and related operations at Libby Dam. **Activities most impacted:** The activities affected by sturgeon protection activities may include Libby Dam operations and agriculture. ♦ Libby Dam: Libby Dam-related impacts account for approximately 94 percent of forecast costs. Undiscounted costs are estimated to range between $500 million to $1.2 billion in 2005 dollars, or $375 to $840 million assuming a three percent discount rate and $270 to $570 million assuming a seven percent discount rate. These amounts are driven by power revenue losses extending throughout the Columbia River Power System, capital costs associated with modifications of Libby Dam to provide sturgeon flows without violating state water quality standards, and other sturgeon-related conservation costs. ♦ Agriculture: Potential costs to agriculture operations total between $70 and $79 million in 2005 dollars, or $53 to $59 million assuming a three percent discount rate and $38 to $43 million assuming a seven percent discount rate. The costs primarily consist of crop damage and loss of land value at hops farms owned by Anheuser-Busch, and crop damage to farms along the Kootenai River in the Kootenai River Valley. **Unit impacts:** The geographic area of analysis includes one unit proposed for CHD and a unit previously designated as critical habitat in 2001. However, the flow-related impacts quantified in this analysis are joint costs; the sturgeon flows and almost all of the resulting impacts will likely occur whether or not the proposed unit, or a portion thereof, is added to the existing designation. Thus, there are no incremental impacts associated with the designation of the Braided Reach (Unit 1). **Distribution of impacts:** Federal agencies, primarily ACOE and Bureau of Reclamation (BOR), account for approximately 94 percent of total undiscounted high impacts. The remaining six percent of impacts are expected to be borne by private individuals (i.e. farmers) and Anheuser-Busch.

INFORMATION SOURCES

The primary source of information for this revised EA is the Upper Columbia Basin Alternative Flood Control and Fish Operations Draft Environmental Impact Statement (EIS) and supporting documents, prepared by ACOE and BOR and submitted to the public for comment in November 2005. The purpose of the Draft EIS is to assess the potential effects of providing reservoir and flow conditions at and below Libby and Hungry Horse Dams for anadromous and resident fish listed under the Endangered Species Act (Act), consistent with authorized project purposes,

4 Throughout the report, costs are provided in undiscounted 2005 dollars and in present value (PV) and annualized terms using three and seven percent discount rates. All costs are in 2005 dollars.

including maintaining the current level of flood control benefits.[5] The EIS is in response to the 2000 National Oceanic and Atmospheric Administration (NOAA) and Service BOs on the operation of the Federal Columbia River Power System (FCRPS). Some of the actions recommended in the BOs, including alternative flood control management, would modify dam operations and river flows to avoid jeopardizing the sturgeon and bull trout. The impacts of these actions are assessed in the Draft EIS. Impacts related to other actions recommend in the recently completed February 2006 BO on Libby Dam, including managing Kootenay Lake at a higher elevation and relaxing ramping rates at Libby Dam, were not assessed in the Draft EIS. In these cases, economic impacts are estimated through communication with Bonneville Power Administration (BPA) personnel, as well as information from the Draft EIS and its supporting documentation.

Considering the sturgeon-specific nature of the EIS and the recent date of the EIS and its supporting documentation and modeling, the information provided in the EIS represents the best economic information available for this revised EA. **Note, however, that the data, assumptions, and results from the Draft EIS and its supporting documentation and modeling were not independently tested or verified.** Documents related to the Draft EIS relied upon for the evaluation of Libby Dam impacts in this revised EA of CHD, include the following:

1. Appendix B, Hydrologic Analysis of Upper Columbia Alternative Operations, Local Effects of Alternative Flood Control and Fish Operations at Libby Dam.

2. Appendix E, Recreation Affected Environment (Part 1) and Recreation Impact Analysis (Part 2).

3. Appendix F, Socioeconomic Affected Environment (Part 1) and Socioeconomic Impact Analysis (Part 2).

4. Appendix G, Kootenai River Valley Agriculture Seepage Study, Summary Report.

5. Appendix J, Hydropower Impacts Analysis of Upper Columbia VARQ Flood Control and Fish Operations for Environmental Impact Statement.

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5 The Draft EIS, "…analyzes the impacts of alternative and benchmark flood control and fish operations at Libby Dam and Hungry Horse Dam in northwest Montana. Such operations are being considered for the purpose of providing reservoir and flow conditions at and below these dams for the benefit of fish listed as threatened or endangered under the Endangered Species Act, consistent with authorized project purposes including maintaining the current level of flood control benefits…The preferred alternative for Libby Dam is to implement variable discharge (VARQ) flood control operations with sturgeon, bull trout, and salmon flow augmentation. Sturgeon flow augmentation would provide tiered sturgeon volumes from the 2000 USFWS FCRPS Biological Opinion using a maximum Libby Dam discharge rate up to the existing powerhouse capacity (about 25,000 cfs). This has been the interim operation at Libby Dam since 2003." Source: U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS." November 2005.

6. Appendix K, Upper Columbia Alternative Flood Control (VARQ) and Fish Operations, Hydropower Benefit Impact Statement, Supplemental Report to the Environmental Impact Statement.

7. Appendix L, Transmission Restriction between Libby and Hungry Horse Dams.

Other ACOE-related documents relied upon for the evaluation of Libby Dam impacts in this economic analysis include:

1. Harp, Aaron J. and Tim Darden, June 2005, "Kootenai River Seepage Agricultural Impact Study: Final," for U.S. Army Corps of Engineers, Seattle District.

2. ACOE, September 30, 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report, Appendix D: Kootenai River Channel Capacity Study Report."

3. ACOE, September 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report, Appendix E: Estimated Costs of Damaged Levee Repair, Memorandum for Record."

4. ACOE, August 2004, "Assessment of Increased River Flows on Ground Water Quality in Wells Adjacent to the Kootenai River, Montana."

5. ACOE, September 2005, "Libby Dam Total Dissolved Gas Management Study Initial Appraisal Report."

BACKGROUND OF THE CRITICAL HABITAT DESIGNATION

On September 6, 1994, the Service published the final rule listing sturgeon as endangered. At that time, the Service also concluded that the designation of critical habitat could not be determined until further analyses were conducted.[6] A complaint was filed on June 30, 1999, regarding the Service's failure to designate critical habitat for the sturgeon. As part of a court decision on August 30, 2000, the Service entered into a court-approved settlement agreement to submit a proposed rule for designation. The proposed rule for designation of critical habitat was published on December 21, 2000[7] and finalized on September 6, 2001.[8] Lawsuits, alleging that the Service's designation of critical habitat for the sturgeon was arbitrary and capricious, were

6 U.S. Fish and Wildlife Service, September 6, 1994, "Determination of Endangered Status for the Kootenai River Population of the White Sturgeon, Final Rule" *Federal Register*, Vol. 59, No. 171.

7 U.S. Fish and Wildlife Service, December 21, 2000, "Proposed Designation of Critical Habitat for the Kootenai River Population of the White Sturgeon; Proposed Rule," *Federal Register*, Vol. 65, No. 246.

8 U.S. Fish and Wildlife Service, September 6, 2001, "Final Designation of Critical Habitat for the Kootenai River Population of the White sturgeon, Final Rule," *Federal Register*, Vol. 66, No. 173.

filed in February 2003.[9] The plaintiffs claimed that the designation failed to include areas that contain features essential to the conservation of the species. On May 25, 2005, the U.S. District Court in Montana ruled in favor of the plaintiffs, and remanded the critical habitat designation to the Service for reconsideration, with a February 1, 2006 deadline for releasing a new critical habitat designation. In order to meet the court-ordered deadline, the Service published an interim final rule on February 8, 2006.[10] While the interim rule constitutes a final rule, it is open to public comment. Following the public comment process, the Service will replace the interim final rule with a new final rule. Thus, the interim final rule will serve as the proposed rule for the later final rule. For the purpose of this revised EA, the interim rule is treated as the proposed rule.

In the final rule of critical habitat designation for the sturgeon (September 2001), the Service identified critical habitat as an 11.2 mile portion of the Kootenai River within Boundary County, Idaho, from river kilometer 228 (river mile 141.4, below Shorty's Island) to river kilometer 246 (river mile 152.6, above the Highway 95 Bridge at Bonners Ferry, Idaho). As a result of the May 2005 ruling by the U.S. District Court of Montana, the Service proposes revising this designation by adding one new critical habitat unit (CHU). This unit will add an additional 6.9 miles of Kootenai River (from below the confluence of Moyie River downstream to below the Highway 95 Bridge at Bonners Ferry, Idaho) for a total of 18.1 miles of critical habitat in Boundary County, Idaho.[11]

The Service has defined the lateral extent of the critical habitat as the bed of Kootenai River and its banks up to ordinary high-water lines. The banks and riverbed within the ordinary high-water-lines are owned by the State of Idaho; however, most of the land adjacent to the existing and new CHUs is under private ownership (see Table 2-1 in Section 2). The adjacent public lands are managed by the U.S. Forest Service (USFS), Bureau of Land Management (BLM), and Service. Map 1A in the Map Attachment to this report shows the locations of the existing and new CHUs.

FRAMEWORK FOR THE ANALYSIS AND REGULATORY ALTERNATIVES CONSIDERED

Section 4(b)(2) of the Act requires the Service to designate critical habitat on the basis of the best scientific data available, after taking into consideration the economic impact, and any other relevant impact, of specifying a particular area as critical habitat. The Service may exclude areas from critical habitat designation when the benefits of exclusion outweigh the benefits of including the areas within critical habitat, provided the exclusion will not result in the extinction of the species.[12] In addition, this analysis provides information that allows the Service to address the

9 *Center for Biological Diversity; Ecology Center. v. United States Army Corps of Engineers; United States Fish and Wildlife Service*; No. CV-03-29-M-DWM.

10 U.S. Fish and Wildlife Service, February 8, 2006, "Critical Habitat Designation for the Kootenai River Population of the White Sturgeon, Interim Rule," *Federal Register*, Vol. 71, No. 26, pp. 6383-6396.

11 U.S. Fish and Wildlife Service, February 8, 2006, "Critical Habitat Designation for the Kootenai River Population of the White Sturgeon, Interim Rule," *Federal Register*, Vol. 71, No. 26, pp. 6383-6396.

12 16 U.S.C. §1533(b)(2).

requirements of Executive Orders 12866 and 13211, and the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA).[13] This report also complies with direction from the U.S. Court of Appeals for the Tenth Circuit that "co-extensive" effects should be included in the economic analysis, in order to inform decision-makers when considering areas to designate as critical habitat.[14]

To comply with the 10th Circuit's direction to include all co-extensive effects, this analysis considers the likely economic impacts of efforts to protect the sturgeon and its habitat (hereafter referred to collectively as "species conservation activities") in the potential critical habitat. It does so by taking into account the cost of conservation-related measures that are likely to be associated with future economic activities, which may adversely affect the habitat within the proposed boundaries. Actions undertaken to meet the requirements of other Federal, state, and local laws and policies may afford protection to the sturgeon and its habitat and, thus, contribute to the efficacy of critical habitat-related conservation and recovery efforts. Therefore, the impacts of these activities are relevant for understanding the full impact of the proposed designation.

RESULTS OF THE ANALYSIS

The analysis determined that current operations at Libby Dam, located upstream from the CHD, present the primary threat to sturgeon. Sturgeon-related conservation at Libby is expected to include additional water releases, which will impact lake and river levels in both the United States and Canada, upstream and downstream from the CHD. Given that additional water releases from Libby will flow to the Columbia River, the geographic area of analysis is represented by the upper and lower Columbia River basins, but only the part of the watershed area that is located within the United States.

The geographic area of analysis includes the unit proposed for CHD (Unit 1: Braided Reach) and the unit previously designated as critical habitat in 2001 (Unit 2: Meander Reach). However, the flow-related impacts are joint costs; sturgeon flows and almost all the resulting impacts will occur whether or not the proposed unit (Unit 1), or a portion thereof, is added to the existing designation. Thus, there are no incremental impacts associated with the designation of the Braided Reach (Unit 1).

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

14 In 2001, the U.S. 10th Circuit Court of Appeals instructed the Service to conduct a full analysis of all the economic impacts of proposed CHD, regardless of whether those impacts are attributable co-extensively to other causes (*New Mexico Cattle Growers Ass'n. vs. U.S.F.W.S.,* 248 F.3d 1277 (10th Cir. 2001)).

IMPACTS

Impacts are separated into costs associated with Libby Dam operations, agriculture, and administrative costs for section 7 consultations. Table ES-1 provides detailed pre- and post-designation cost information for all activities. Pre- and post-designation costs are provided in undiscounted 2005 dollars. Post-designation costs are also provided in present value (PV) and annualized terms using three and seven percent discount rates.

Table ES-1
Summary of Conservation Costs for Sturgeon, by Activity ($1,000s)

Activity	Pre-Designation (Total) (1994-2005)	Post-Designation (Total) (2006-2025)			Post-Designation (Annualized)	
		Undiscounted	3%	7%	3%	7%
Libby Dam Operations	$217,562	$500,786 - $1,170,506	$374,127 - $841,150	$267,949 - $566,283	$25,147 - $56,538	$25,292 - $53,453
Agriculture	$17,656 - $20,269	$70,231 - $78,703	$52,674 - $59,375	$37,971 - $43,169	$3,541 - $3,991	$3,584 - $4,075
Section 7 Consultation	$153 - $257	$38 - $59	$14 - $22	$10 - $16	< $10	< $10
Total	**$235,372 - $238,088**	**$571,054 - $1,249,268**	**$426,816 - $900,547**	**$305,930 - $609,467**	**$28,688 - $60,530**	**$28,877 - $57,529**
Impacts Associated with the Braided Reach	**$0**	**$20 - $30**	**$5 - $10**	**$5 - $10**	**$0.5 - $0.75**	**$0.5 - $0.75**

Note: Numbers may not sum due to rounding.

Figure ES-2 illustrates the distribution of impacts across these activities, presenting relative impacts by affected activity using the upper-bound future undiscounted cost figures. As shown, impacts related to Libby Dam operations dominate the cost of species conservation activities, accounting for 94 percent of the anticipated impacts. Costs to agriculture represent approximately six percent of all impacts, while administrative section 7 consultation costs represent less than one percent.[15] These impacts are driven by flow changes implemented at Libby Dam in Montana and lake elevation changes implemented at Kootenay Lake in Canada, to conserve the sturgeon and its habitat in Idaho. Because the sturgeon flows move their way down the Kootenai River through Idaho to Kootenay Lake in Canada, and then through the Columbia River to the Pacific Ocean, sturgeon conservation in Idaho engenders flow changes at Libby Dam in Montana. While this causes some direct impacts at Libby Dam, it also affects other dams downstream as the sturgeon flows move through the Columbia River system. Likewise, holding

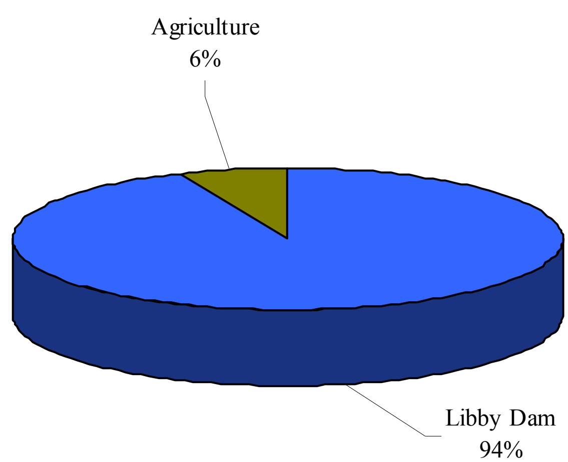
15 The cost breakdown is largely the same when lower-bound costs are considered, although Libby Dam-related costs decrease to approximately 88 percent and agriculture impacts increase to approximately 12 percent.

water in Kootenay Lake, to increase lake elevation during sturgeon spawning in the spring, affects dams downstream (i.e., Columbia River System) when the water is released later in the summer (see Map 1B for the location of major dams downstream from Libby Dam).

All but $20,000 to $30,000 in post-designation anticipated costs (undiscounted 2005 dollars) are joint costs. These costs will occur whether or not the proposed unit (Unit 1, Braided Reach), or a portion thereof, is added to the existing designation. The only impact associated with the Braided Reach is an anticipated maintenance/reconstruction project on the US-2 Bridge over the Moyie River. Based on past experience involving section 7 consultations on aquatic species, the Idaho Transportation Department expects the section 7 consultation would cost approximately $17,000, or about $20,000 to $30,000 after accounting for the Service and Action agency costs (undiscounted 2005 dollars). No project modifications are expected.

Figure ES-2

RELATIVE IMPACT BY AFFECTED ACTIVITY [a/]
(Total Upper-Bound Undiscounted Impacts)



[a/] Section 7 administrative costs were also analyzed, but account for less than 1 percent of the economic impact.

Costs Associated with Libby Dam Operations

Sturgeon conservation activities may impact Libby Dam operations upstream from the existing and proposed CHD, as well as Kootenay Lake management downstream from the existing and proposed CHD. Potential impacts include decreased power revenues, dam modifications to pass additional sturgeon flows without violating Montana's water quality standards, and other sturgeon specific conservation costs, including sturgeon-related studies, monitoring, and reporting, sturgeon hatchery operations and expansion, and sturgeon habitat improvement. Pre-designation costs are estimated at $218 million in 2005 dollars. Post designation costs are expected to range from $500 million to $1.2 billion in undiscounted 2005 dollars. In PV terms, this range is equivalent to $375 to $840 million, assuming a three percent discount rate, and $270 to $570 million, assuming a seven percent discount rate (in 2005 dollars). In annualized terms, potential costs are expected to be $25 to $57 million annually (annualized at three percent) and $25 to $53 million annually (annualized at seven percent). Post-designation impacts consist of the following:

- **Power Revenues:** The ACOE modeled the timing of sturgeon flows to forecast sturgeon flow impacts on power revenues. While the modeling efforts did not consider higher elevations at Kootenay Lake in Canada and relaxed ramping rates at Libby Dam, the modeling results are adapted to reflect the RPA in the February 2006 BO based on estimates obtained from BPA. Columbia River System power values may increase by approximately $1 million annually, relative to the February 2006 DEA, due to the relaxed ramping rates at Libby Dam. Power values from managing Kootenay Lake at higher lake levels (up to three feet) would increase throughout the Columbia River System, including Canada, by about $2 to $5 million annually per foot of additional lake elevation (compared to the February 2006 DEA), with half of this accruing to power facilities in the United States and the remaining half to power facilities in Canada. Considering these adjustments, the power value impacts to the United States portion of the Columbia River system are expected to range between $390 and $560 million in undiscounted 2005 dollars.

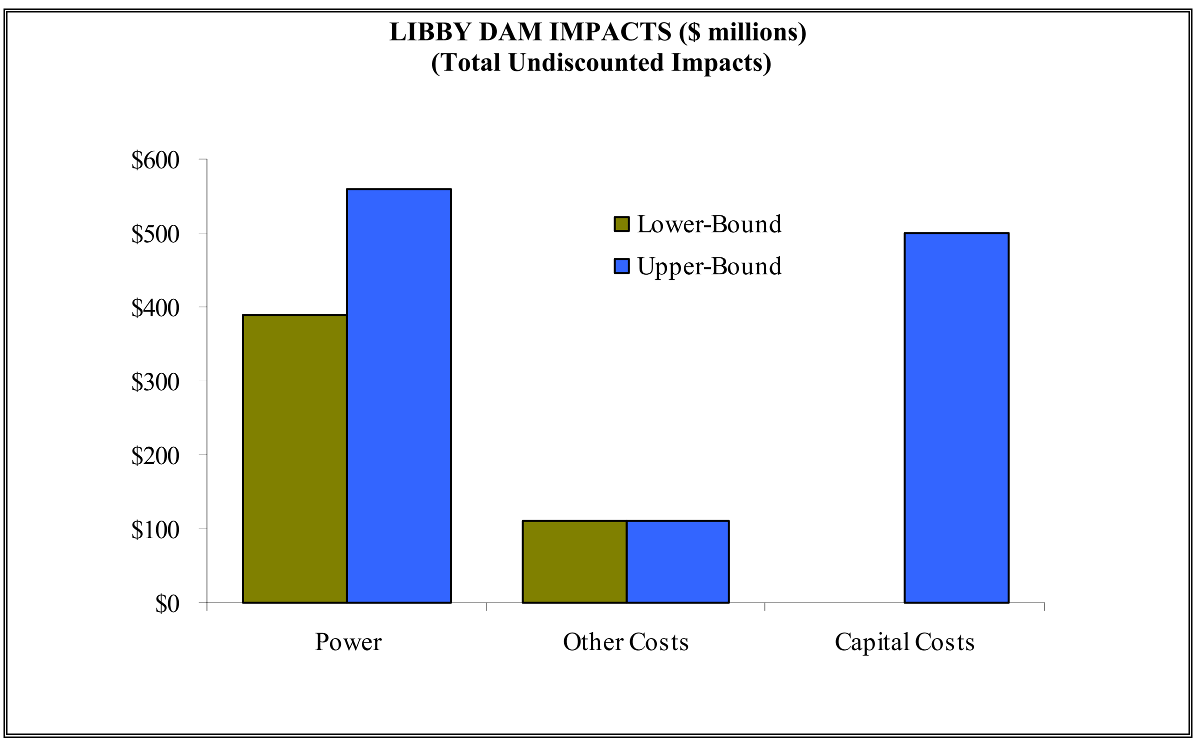
- **Total Dissolved Gas (TDG) Management Alternatives:** Should Kootenay Lake elevation management, habitat improvements, and flows from Libby Dam of up to powerhouse capacity (25,000 cfs) successfully provide the flow, velocity, temperature, depth, and substrate structure attributes as defined in the February 2006 BO, passing flows of more than 25,000 cfs from Libby Dam will not be necessary, and structural modifications to the dam to allow passage of an additional 10,000 cfs while complying with state TDG standards will not be required. However, if increased flows of up to 10,000 cfs above powerhouse discharge are necessary, and therefore TDG management required, no measures (i.e., structural modifications to Libby Dam) would be implemented until after the completion of the release testing during the first ten years.

  The ACOE evaluated the effectiveness of 14 options (i.e., structural modifications) in providing the additional 10,000 cfs above powerhouse capacity while complying with state water quality standards. Of these, only five of the alternatives may comply with state TDG standards without causing water temperature issues. Since the ACOE study was not a technical feasibility/engineering study but only an initial appraisal of options that may meet the TDG requirements, the ACOE is open to all options and no decision has been made regarding a preferred alternative. No one alternative is more likely than another at this time, and while a cheaper alternative that meets the TDG standards may be more likely than a more expensive one that also meets the TDG standards, the suite of options still require supporting engineering and feasibility studies to better determine whether the options will meet the gas requirements. Considering this uncertainty, the capital cost of managing TDG at Libby Dam while providing 35,000 cfs in fish flows, and maintaining adequate water temperature, is presented to range between $54 and $500 million (total undiscounted 2005 dollars). Thus, capital costs for this analysis ranges from $0 (no capital costs associated with providing sturgeon flows up to 25,000 cfs) to $500 million (high range of capital costs associated with sturgeon flows up to 35,000 cfs) in undiscounted 2005 dollars.

- **Other Conservation Costs:** Both BPA and ACOE are expected to incur costs on a regular basis to conserve the sturgeon and its habitat. These costs fund the numerous projects and studies, monitoring, reporting, fish hatchery operations, and other conservation activities outlined in the 1995, 2000, and 2006 BOs. The numerous activities, described in the BOs as RPAs, Reasonable and Prudent Measures (RPMs), terms and conditions, conservation recommendations, and proposed actions, are estimated to cost $110 million in undiscounted 2005 dollars.

Figure ES-3 presents the distribution of Libby Dam impacts in terms of upper- and lower-bound future undiscounted cost figures. As shown, power impacts account for approximately 48 percent of the upper-bound undiscounted costs. Libby-related capital costs account for approximately 43 percent of the anticipated costs followed by other sturgeon conservation costs (nine percent). Lower-bound impacts are dominated by power (approximately 78 percent) and other sturgeon conservation costs (approximately 22 percent). As noted earlier, there are no capital costs in the lower-bound scenario, as the alternative (sturgeon flows provided at powerhouse capacity) does not require Libby Dam modification to comply with state water quality standards for TDG.

Figure ES-3



Impacts to Agriculture Operations

Activities aimed at sturgeon conservation may potentially impact agriculture operations in the Kootenai River Valley. The potential impacts from seepage, caused by additional water releases from Libby Dam and from managing Kootenay Lake at a higher elevation, are concentrated in the area between Moyie, Idaho and the border with Canada. These impacts include reduced crop yields and changes in pumping power requirements for drainage and irrigation purposes. Additional impacts associated with land erosion are also identified, but not quantified due to lack of data. Pre-designation costs are estimated at $17.7 to $20.3 million in 2005 dollars. Post-designation costs are expected to range from $70.2 to $78.7 million in undiscounted 2005 dollars. In PV terms, this range is equivalent to $52.7 to $59.4 million, assuming a three percent discount rate, and $38.0 to $43.2 million, assuming a seven percent discount rate. In annualized terms, potential costs are expected to range between $3.5 and $4.0 million annually (annualized at three percent), and $3.6 and $4.1 million annually (annualized at seven percent). Post-designation impacts comprise the following:

- **Crop Damage:** Higher river stages, a consequence of increased sturgeon flows from Libby Dam and higher lake elevations at Kootenay Lake, result in seepage damage to crops. Crop damage is estimated with data from gauges at Kootenay Lake and Libby Dam, and information contained in the "Kootenai River Seepage Impact Study: Final" (Seepage Study) (Harp and Darden 2005). Since the timing, duration, and magnitude of lake elevation and river flow during 1997 is similar to the lake and river management described in the February 2006 BO, the damage experienced by farmers during 1997 is used as an approximation of the magnitude of damage farmers may experience under the February 2006 BO. Data related to crop damage for 2003 is used as the baseline, i.e. "the cost of farming in the area," and the difference between 1997 and 2003 costs are considered the costs of conservation activities for the sturgeon. Future costs related to crop damage are estimated to range between $69.8 and $78.3 million in undiscounted 2005 dollars. Nearly 50 percent of these costs are associated with two hop farms owned by Anheuser-Busch. While these farms comprise only 5.7 percent of total acreage of agricultural land, the high value of the crop determines the larger impact. The remaining 50 percent (approximately) of crop damage costs are expected to be borne by 30 farmers operating along the Kootenai River in the Kootenai River Valley.
- **Drainage Pumping Costs:** Higher river stages tend to increase power needs for drainage pumping. The estimated pumping costs only represent the power requirements for pumping and do not take into account the cost of additional pumps. Future drainage pumping costs are extrapolated using past costs (1995-1997) estimated by the University of Idaho. These costs are quantified as $0.4 million in undiscounted 2005 dollars.
- **Irrigation Pumping Costs:** Contrary to drainage pumping, power needs for irrigation pumping decrease with higher river stages. Irrigation pumping costs are predicted using the expected power requirements under various flood control scenarios presented in the Upper Columbia Alternative Flood Control and Fish Operations EIS (2005). The decrease in costs associated with irrigation pumping in Idaho is less than $10,000 in undiscounted 2005 dollars.

Section 7 Consultations

Since the listing of the sturgeon in 1994, three formal consultations have been completed on the species, two of which related to the operations of the FCRPS and another related to the operations of Libby Dam. The Service has also completed eight informal consultations on the species since listing. The eleven-year consultation history indicates only a few activities with a Federal nexus that impact the sturgeon. Aside from the emergency consultation on the repair of a ruptured gas pipeline, all but three of the consultations have involved the operations of the FCRPS/Libby Dam and the Kootenai National Wildlife Refuge. While the ACOE recently (February 2006) completed a consultation with the Service on the operations of Libby Dam, future consultations on the operation of the dam are not anticipated. Similarly, the Service does not anticipate future intra-agency consultations on the operation of the Kootenai National Wildlife Refuge.

The Idaho Transportation Department anticipates consulting with the Service on two projects within the 2006 to 2025 timeframe. These include maintenance/reconstruction activities on the US-95 Bridge across the Kootenai River and the US-2 Bridge over the Moyie River. Pre-designation costs are estimated to range from $150,000 to $260,000 in 2005 dollars. After designation, approximately $40,000 to $60,000 in post-designation administrative costs are forecast in undiscounted 2005 dollars, or between $10,000 and $20,000 in PV terms at discount rates of three and seven percent. Annualized impacts are estimated at approximately $1,000 to $1,500. About half of these costs are attributable to the proposed designation (Unit 1, Braided Reach).

Impacts to Recreation

A study on the potential loss of recreation facilities availability resulting from alternative sturgeon flow regimes at Libby Dam (the same flow scenarios used in the power and agriculture impact models) by Tetra Tech, Inc. (2005) indicates sturgeon conservation flows may impact recreation activities upstream from the existing and proposed CHD. The study estimates the percent of time, expressed in user days, that boating, swimming, fishing, and camping facilities will be unavailable due to insufficient water levels in the lakes, or due to the impacts on bank and float fishing from a change in river flows. In addition, interviews with Kootenai River fishing outfitters were also conducted as part of this economic analysis. However, it was not possible to estimate economic impacts to recreation resulting from sturgeon flows or higher Kootenay Lake elevations. Statistics related to visitation to recreation areas and participation in potentially impacted activities are limited, and much of the visitation data that does exist show a trend of increasing visitation and activity participation during historic sturgeon flows compared with visitation prior to sturgeon flows. It is not possible from the available visitation statistics to determine if recreation participation, as reflected by increasing visitation to Kootenai River system sites, would be higher were it not for sturgeon flows. Increasing visitation to the Kootenai River system recreation sites may simply be a product of increased popularity in outdoor recreation. Additionally, other factors, such as drought or a wet water year, may also have influenced visitation/use or facility availability.

While the modeling efforts did not consider higher elevations at Kootenay Lake in Canada, the backwater effect is expected to increase river depth below Bonners Ferry, Idaho, and extending north up to the border with Canada. Considering recreation on Lake Koocanusa would not be affected by lake level management at Kootenay Lake, and that most of the trout fishing, camping, and other recreational opportunities on the Kootenai River occur upstream from Bonners Ferry, managing Kootenay Lake at a higher elevation is not expected to impact recreational activities in the United States.

Flood Risk and Potential Property Damage

ACOE modeling indicates that the Kootenai National Wildlife Refuge will experience an 18 to 22 percent annual probability of flooding with sturgeon flows. Baseline flows (i.e., no fish flows) were not considered in the ACOE modeling, so a measurement of increased risk cannot be assigned. However, all other areas in the Kootenai River basin and along the Columbia River downstream are estimated to experience a negligible probability of annual flooding under sturgeon flow alternatives. Modeling and study results also indicate no increase in expected annual damages (EAD) between baseline and either sturgeon flow alternative, and no damage to wells or septic systems along the river. Therefore, no economic loss to structural properties below Libby Dam is anticipated as result of sturgeon flows.

While the modeling efforts did not consider higher elevations at Kootenay Lake in Canada, the backwater effect is expected to increase river depth downstream from Bonners Ferry, Idaho. Given the Kootenai River Valley below Bonners Ferry and extending north up to the border with Canada is primarily agriculture land, any seepage impacts to property adjacent to the river resulting from managing Kootenay Lake at a higher elevation are captured in the agriculture section of this study. Furthermore, while this analysis attributes no damages to property along Kootenay Lake, Canada, ACOE surveys of the West Arm of Kootenay Lake show that damage commences when the lake reaches an elevation of 1,750 feet. Therefore, managing Kootenay Lake at a higher elevation is expected to cause damage to property along the shore of the lake in Canada. The estimated damage ranges from $4.3 to $13.0 million at a lake level of 1,755 feet, from $1.7 to $4.3 million at a lake level of 1,752 feet, and up to $1.7 million at a lake level of 1,750 feet (in 2005 dollars).

Levee Integrity

In general, the levees that protect the town of Bonners Ferry are in good condition and are well maintained. In contrast, levees downstream of Bonners Ferry are deteriorating. However, the extent of levee erosion cannot be entirely attributed to fish flows. Furthermore, ACOE modeling concludes that sturgeon flows do not significantly impact the rate of deterioration of the levees below Bonners Ferry, Idaho. Therefore, this analysis does not include the cost of levee repair under the sturgeon flow alternatives as a cost of sturgeon conservation.

DISTRIBUTIONAL IMPACTS

Approximately 94 percent of the prospective economic costs (based on upper-bound future undiscounted cost figures) associated with conservation activities for sturgeon are expected to be borne by Federal agencies (primarily ACOE and BOR). Most of the remaining six percent of prospective economic impacts consist of damage to crops growing along the river in the Kootenai River Valley. These impacts are expected to be borne by private individuals (i.e., farmers) and public corporations (i.e., Anheuser-Busch).

This study also analyzes whether a particular group or economic sector bears an undue proportion of the impacts. Specifically, Appendix A describes potential impacts of CHD on small entities and on energy availability.

The purpose of this report is to estimate the economic impact of actions taken to protect the federally-listed Kootenai River population of the white sturgeon (*Acipenser transmontanus,* hereafter "sturgeon") and its habitat. It attempts to quantify the economic effects associated with the proposed designation of critical habitat (i.e., interim final rule). It does so by taking into account the cost of conservation-related measures that are likely to be associated with future economic activities that may adversely affect the proposed critical habitat designation (CHD). The analysis looks retrospectively at costs incurred since the sturgeon was listed in 1994, and it attempts to predict future costs likely to occur after the CHD is finalized in 2006.

This report is a revision of the February 2006 draft economic analysis (DEA) of CHD for the sturgeon, which was made available for public review with the interim final rule published in the Federal Register on February 8, 2006.[16] Comments on the February 2006 DEA were submitted by Anheuser-Busch Companies, Inc. (Anheuser-Busch).[17] As described by Anheuser-Busch, the February 2006 DEA did not assess the impacts of the Reasonable and Prudent Alternative (RPA) from the U.S. Fish and Wildlife Service's (hereafter "Service") February 18, 2006, biological opinion (BO) regarding the proposed operation of Libby Dam.[18] Components of the RPA were not known at the time the February 2006 DEA was conducted and made available for public comment (see Table 4-4 in section 4 for detail on the RPA). This revised economic analysis (EA), therefore, adjusts the economic impacts estimated in the February 2006 DEA to reflect the RPA from the February 2006 BO.

This analysis is intended to assist the Secretary in determining whether the benefits of excluding particular areas from the designation outweigh the benefits of including those areas in the designation.[19] In addition, this information allows the U.S. Fish and Wildlife Service (hereafter "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

16 The notice of availability (NOA) was included in interim final rule. U.S. Fish and Wildlife Service, February 8, 2006, "Critical Habitat Designation for the Kootenai River Population of the White Sturgeon, Interim Rule," *Federal Register*, Vol. 71, No. 26, pp. 6383-6396.

17 Comments of Anheuser-Busch Companies, Inc. on Interim Final Rule: *Endangered and Threatened Wildlife and Plants – Critical Habitat Designation for the Kootenai River Population of the White Sturgeon*, 26 Fed. Reg. 6383 (Feb. 8, 2006); 50 C.F.R. Part 17, April 10, 2006.

18 U.S. Fish and Wildlife Service, February 18, 2006, "Biological opinion regarding the Army Corps of Engineers' and the Bonneville Power Administration's proposed operation of Libby Dam in Idaho and Montana, and its effect on the endangered Kootenai River white sturgeon (*Acipenser transmontanus*), its critical habitat, and the threatened bull trout (*Salvelinus confluentus*) (1-9-01-F-0279R)."

19 16 U.S.C. § 1533(b)(2).

(SBREFA).[20] This report also complies with direction from the U.S. 10th Circuit Court of Appeals that "co-extensive" effects should be included in the economic analysis to inform decision-makers when considering areas to designate as critical habitat.[21]

This section provides the general analytic approach to estimating economic effects, including a discussion of both efficiency and distributional effects. Next, it discusses the scope of the analysis, including the link between existing and critical habitat-related protection efforts and economic impacts. Then, it presents the analytic time frame used in the report. Finally, it lists the information sources relied upon in the analysis.

1.1 APPROACH TO ESTIMATING ECONOMIC EFFECTS

This economic analysis considers both the economic efficiency and regional economic impacts that may result from species and habitat protection. Economic efficiency effects generally reflect "opportunity costs" associated with the commitment of resources required to accomplish species and habitat conservation. For example, if activities on private lands are 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 of the Endangered Species Act (Act) represent opportunity costs of sturgeon conservation efforts, given that those resources committed to the consultation process are not available for alternative activities. To the extent possible, the efficiency analysis also measures the distribution of these opportunity costs across groups, such as producers and consumers. For example, some costs related to conservation actions may fall entirely on one group, or may fall on individuals within a group, such as low income farmers. While economic efficiency is concerned with the total change in societal welfare from a given policy or action, and is thus the appropriate measure to ensure efficient use of society's scarce resources, distributional measures can also be useful to policymakers in assessing who gains and who loses from such policies or actions.

This analysis also addresses the impacts associated with the conservation activities in the areas proposed for critical habitat, including an assessment of any local or regional impacts of habitat conservation and the potential effects of conservation efforts on small entities, the energy industry, or governments. This information may be used by decision-makers to assess whether the effects of sturgeon conservation activities unduly burden a particular group or economic sector. For example, while conservation activities may have a small impact relative to the

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

21 In 2001, the U.S. 10th Circuit Court of Appeals instructed the Service to conduct a full analysis of all of the economic impacts of proposed CHD, regardless of whether those impacts are attributable co-extensively to other causes (*New Mexico Cattle Growers Ass'n vs. U.S.F.W.S.,* 248 F.3d 1277 (10th Cir. 2001)).

national economy, individuals employed in a particular sector of the regional economy may experience a significant level of impact. The difference between economic efficiency effects and regional economic impacts, as well as their application in this analysis, are discussed in greater detail below.

1.1.1 Efficiency Effects

At the guidance of the Office of Management and Budget (OMB) and in compliance with Executive Order 12866 "Regulatory Planning and Review," Federal agencies measure changes in economic efficiency in order to discern the implications on a societal level of a regulatory action. For regulations specific to the conservation of the sturgeon, 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 surplus in affected markets.[22]

In some instances, compliance costs may provide a reasonable approximation for the efficiency effects associated with a regulatory action. For example, a landowner or manager may 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 his or her land not been included in the designation. In the case that 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 provides a reasonable estimate of the change in economic efficiency.

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, a designation that precludes the development of large areas of land may shift the price and quantity of housing supplied in a region. In this case, changes in economic efficiency (i.e., social welfare) can be measured by considering changes in producer and consumer surplus in the real estate market.

This analysis begins by measuring costs associated with measures taken to protect sturgeon 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 activities is expected to significantly impact markets, the analysis will consider changes in consumer and/or producer surplus in affected markets.

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22 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., 1990, *A Guide to Benefit-Cost Analysis (2nd Ed.)*, Prospect Heights, Illinois: Waveland Press, Inc.; and U.S. Environmental Protection Agency, September 2000, *Guidelines for Preparing Economic Analyses*, EPA 240-R-00-003, http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html.

Calculating Present Value and Annualized Impacts

For each land use activity, this analysis compares economic impacts incurred in different time periods in present value (PV) terms. The PV presents 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 economic impacts of past or future costs to PV terms requires the following: a) past or projected future costs of sturgeon conservation activities; and b) the specific years in which these impacts have been or are expected to be incurred. With these data, the PV of the past or future stream of impacts (PV_c) of sturgeon conservation activities from year t to T is measured in 2005 dollars according to the following standard formula:[a]

$$PV_c = \sum_{t=t_0}^{t=T} \frac{C_t}{(1+r)^{t-2005}}$$

C_t = Cost of sturgeon conservation activities in year t

r = Discount rate[b]

Impacts of conservation activities for each activity in each unit are also expressed as annualized values. Annualized values are calculated to provide comparison of impacts across activities with varying forecast periods (T). For this analysis, however, all activities employ a forecast period of 20 years, 2006 through 2025. Annualized impacts of future sturgeon conservation activities (APV_c) are calculated by the following standard formula:

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

N = Number of years in the forecast period (in this analysis, 20 years)

[a] To derive the PV of past conservation activities for this analysis, t is 1995 and T is 2005; to derive the PV of future conservation activities, t is 2006 and T is 2025.

[b] To discount and annualize costs, guidance provided by the OMB specifies the use of a real rate of seven percent. In addition, OMB recommends sensitivity analysis using other discount rates such as three percent, which some economists believe, better reflects the social rate of time preference. (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.)

1.1.2 Distributional and Regional Economic Effects

Measurements of changes in economic efficiency focus on the net impact of conservation activities across broad aggregates of people (e.g., producers and consumers), without consideration of how certain economic sectors or groups of people (e.g., low income farmers) are affected. As noted above, these distributional or equity effects regarding how efficiency gains or losses are borne may be important to policymakers. In addition, economic efficiency effects do not address issues related to impacts on local or regional economies. Thus, a discussion of efficiency effects alone may miss important distributional considerations, as well as impacts on local economies. OMB encourages Federal agencies to consider these latter effects separately from efficiency effects.[23] This analysis considers several types of these effects, including impacts on small entities; impacts on energy supply, distribution, and use; and regional economic impacts. It is important to note that these impacts on local economies or sectors are fundamentally different measures of economic costs than efficiency effects, and thus cannot be added to or compared with estimates of changes in economic efficiency.

1.1.2.1 Impacts on Small Entities and Energy Supply, Distribution, and Use

This analysis considers how small entities, including small businesses, organizations, and governments, as defined by the Regulatory Flexibility Act, might be affected by future sturgeon conservation activities.[24] In addition, in response to Executive Order 13211 "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," this analysis considers the impacts of conservation efforts on the energy industry and its customers.[25] See Appendix A for an analysis of impacts to small entities and the energy industry.

1.1.2.2 Regional Economic Effects

Regional economic impact analysis can provide an assessment of the potential localized effects of conservation activities. 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, such as those created using IMPLAN modeling software and databases. These models rely on multipliers that mathematically represent the relationship between a change in one sector of the economy (e.g., expenditures by recreationists) and the effect of that change on economic output, income, or employment in other local industries (e.g., suppliers of goods and services to recreationists). These economic data provide a quantitative estimate of the magnitude

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

24 5 U.S.C. § 601 *et seq.*

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

of shifts of jobs and revenues in the local economy. These additional impacts are referred to as "secondary impacts."

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 importantly, these models provide a static view of the economy of a region. That is, they measure the initial impact of a regulatory change on an economy but do not consider long-term adjustments that the economy will make in response to this change. For example, these models provide estimates of the number of jobs lost as a result of a regulatory change, but do not consider re-employment of these individuals over time or other adaptive responses by impacted 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.

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

A Regional economic analysis was not performed in this economic analysis. The extent to which regional economic impacts are realized depends largely on whether a significant number of projects are fundamentally altered. The only industry expected to incur impacts from sturgeon flows is agriculture, and the examination of potential agriculture impacts indicated no reductions in farming opportunity, only crop damages and additional pumping costs.

1.2 SCOPE OF THE ECONOMIC ANALYSIS

This analysis identifies those economic activities believed to most likely threaten the listed species and its habitat and, where possible, quantifies the economic impact to avoid, mitigate, or compensate for such threats within the boundaries of the CHD. In instances where critical habitat is being proposed after a species is listed, some future impacts may be unavoidable, regardless of the final designation and exclusions under 4(b)(2). However, due to the difficulty in making a credible distinction between listing and critical habitat effects within critical habitat boundaries, this analysis considers all future conservation-related impacts to be co-extensive with the designation.[26, 27]

26 In 2001, the U.S. Court of Appeals for the 10th Circuit instructed the Service to conduct a full analysis of all of the economic impacts of proposed CHD, regardless of whether those impacts are attributable co-extensively to other causes (New Mexico Cattle Growers Assn v. U.S.F.W.S., 248 F.3d 1277 (10th Cir. 2001)).

Co-extensive effects may also include impacts associated with overlapping protective measures of other Federal, State, and local laws that aid habitat conservation in the areas proposed for designation. In past instances, some of these measures have been precipitated by the listing of the species and impending designation of critical habitat. Because habitat conservation activities affording protection to a listed species likely contribute to the efficacy of the CHD activities, the impacts of these actions are considered relevant for understanding the full effect of the proposed CHD. Enforcement actions taken in response to violations of the Act, however, are not included.

1.2.1 SECTIONS OF THE ACT RELEVANT TO ECONOMIC ANALYSIS

The analysis focuses on activities that are influenced by the Service through sections 4, 7, 9, and 10 of the Act. Section 4 of the Act focuses on the listing and recovery of endangered and threatened species, as well as the CHD. Pursuant to this section, the Secretary is required to list species as endangered or threatened "solely on the basis of the best scientific and commercial data available."[28] Section 4 also requires the Secretary to designate critical habitat "on the basis of the best scientific data available and after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat."[29]

The protections afforded to threatened and endangered species and their habitat are described in sections 7, 9, and 10 of the Act, and economic impacts resulting from these protections are the focus of this analysis:

- Section 7 of the Act requires Federal agencies to consult with the Service to ensure that any action authorized, funded, or carried out will not likely jeopardize the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of critical habitat. The administrative costs of these consultations, along with the costs of project modifications resulting from these consultations, represent compliance costs associated with the listing of the species and CHD.[30]

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27 In 2004, the U.S. Ninth Circuit invalidated the Service's regulation defining destruction or adverse modification of critical habitat (Gifford Pinchot Task Force v. United States Fish and Wildlife Service). The Service is currently reviewing the decision to determine what effect it (and to a limited extent Center for Biological Diversity v. Bureau of Land Management (Case No. C-03-2509-SI, N.D. Cal.)) may have on the outcome of consultations pursuant to section 7 of the Act.

28 16 U.S.C. § 1533.

29 Ibid.

30 The Service notes, however, that a recent Ninth Circuit judicial opinion, *Gifford Pinchot Task Force v. United States Fish and Wildlife Service*, has invalidated the Service's regulation defining destruction or adverse modification of critical habitat. The Service is currently reviewing the decision to determine what effect it (and to a limited extent *Center for Biological Diversity v. Bureau of Land Management* (Case No. C-03-2509-SI, N.D. Cal.)) may have on the outcome of consultations pursuant to section 7 of the Act.

- Section 9 defines the actions that are prohibited by the Act, and in particular, prohibits the "take" of endangered wildlife. The term "take" means to "harass, harm, pursue, ... or collect, or to attempt to engage in any such conduct."[31] 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 species in order to meet the conditions for issuance of an incidental take permit in connection with the development and management of a property.[32] The requirements posed by the HCP may have economic impacts associated with the goal of ensuring that the effects of incidental take are adequately minimized and mitigated. The designation of critical habitat does not require completion of an HCP; however, the designation may influence conservation efforts provided under HCPs. In the case of the sturgeon, there are no HCPs covering areas included in critical habitat.

1.2.2 OTHER RELEVANT PROTECTION EFFORTS

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.[33] For the purpose of this analysis, such protective efforts are considered to be co-extensive with the protection offered by critical habitat, and costs associated with these efforts are included in this report. In addition, under certain circumstances, the CHD may provide new information to a community about the sensitive ecological nature of a geographic region, potentially triggering additional economic impacts under other State or local laws. In cases where these costs would not have been triggered absent the designation of critical habitat, they are included in this economic analysis.

1.2.3 ADDITIONAL ANALYTIC CONSIDERATIONS

Previous economic impact analyses prepared to support critical habitat decisions have considered other types of economic impacts related to section 7 consultations in general and CHD in particular, including time delay, regulatory uncertainty, and stigma impacts. This analysis considers these other types of economic impacts that can be a consequence of sturgeon CHD, as described below.

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31 16 U.S.C. § 1532.

32 U.S. Fish and Wildlife Service, "Endangered Species and Habitat Conservation Planning," http://endangered.fws.gov/hcp/. Sections 9 and 10 of the Act do not apply to plants.

33 For example, the Sikes Act Improvement Act (Sikes Act) of 1997 requires Department of Defense (DoD) military installations to develop Integrated Natural Resources Management Plans (INRMPs) that provide for the conservation, protection, and management of wildlife resources (16 U.S.C. §§ 670a - 670o). These plans must integrate natural resource management with the other activities, such as training exercises, taking place at the facility.

1.2.3.1 Time Delay and Regulatory Uncertainty

In addition to direct costs of consultation and project modification associated with sturgeon conservation efforts, the analysis considers potential indirect impacts, such as may result from project delays. Both public and private entities may experience incremental time delays for projects and other activities due to requirements associated with the section 7 consultation process and/or compliance with other laws associated with the designation. The need to conduct a section 7 consultation will not necessarily delay a project, as often the consultation may be coordinated with the existing regulatory approval process. However, depending on the schedule of the consultation, a project may experience additional delays, resulting in an unanticipated extension in the time needed to fully realize returns from the planned activity. This analysis does not anticipate delays of this nature related to sturgeon conservation activities.

Regulatory uncertainty costs can occur in anticipation of having to modify project parameters, and might include, for example, project proponents retaining outside experts or legal counsel to better understand their responsibilities with regard to CHD.

1.2.3.2 Stigma Effects

Stigma refers to the change in economic value of a particular project or activity due to negative (or positive) perceptions of the role critical habitat will play in developing, implementing, or conducting that project or activity. For example, changes to private property values associated with public attitudes about the limits and costs of implementing a project in critical habitat are known as "stigma" impacts. While stigma impacts are possible in locations where critical habitat is designated, the analysis does not anticipate stigma impacts related to sturgeon conservation activities.

1.2.3.3 Other Impacts

Under certain circumstances, CHD may provide new information to a community about the sensitive ecological nature of a geographic region, potentially triggering additional economic impacts under other State or local laws. In cases where these costs would not have been triggered absent the CHD, they are included in this economic analysis.

1.2.4 BENEFITS

Under Executive Order 12866, OMB directs Federal agencies to provide an assessment of both the social costs and benefits of proposed regulatory actions.[34] OMB's Circular A-4 distinguishes two types of economic benefits: direct benefits and ancillary benefits. Ancillary benefits are

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

defined as favorable impacts of a rulemaking that are typically unrelated, or secondary, to the statutory purpose of the rulemaking.[35]

In the context of CHD, 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.[36] *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.*

CHD may also generate ancillary benefits. Critical habitat aids in the conservation of species specifically by protecting the primary constituent elements (PCEs) on which the species depends. To this end, CHD can result in 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.

It is often difficult to evaluate the ancillary benefits of CHD. To the extent that the ancillary benefits of the rulemaking may be captured by the market though an identifiable shift in resource allocation, they are factored into the overall economic impact assessment in this report. For example, if sturgeon flows from Libby Dam lead to an increase in boating opportunities within the region, the local economy may experience an associated measurable, positive impact. Where data are available, this analysis attempts to capture the net economic impact (i.e., the increased regulatory burden less any discernable offsetting market gains) of species conservation efforts imposed on regulated entities and the regional economy.

1.2.5 GEOGRAPHIC SCOPE OF THE ANALYSIS

The primary threat to the sturgeon is current operations at Libby Dam, located upstream from the CHD. Sturgeon-related conservation at Libby is expected to include additional water releases, which will impact lake and river levels in both the United States and Canada, upstream and down stream from the CHD. Considering the additional water releases from Libby will flow to the

35 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.

36 Ibid.

Columbia River, the geographic area of analysis is represented by the upper and lower Columbia River basin, but only that part of the watershed area located within the United States. Impacts to Canada resulting from sturgeon-related conservation activities, however, will be noted.

The geographic area of analysis includes one unit proposed for CHD and a unit previously designated as critical habitat in 2001. However, the flow-related impacts are joint costs; the sturgeon flows and resulting impacts will occur whether or not the proposed unit, or a portion thereof, is added to the existing designation.[37] Thus, there are no incremental impacts associated with the designation of the Braided Reach (Unit 1).

1.3 Analytic Time Frame

The analysis examines activities taking place both within and adjacent to the proposed CHD, and considers activities that have occurred since the final listing (September 1994) and prior to the final designation (February 2006), as well as activities anticipated to occur after designation. Estimates of post-designation effects are based on activities that are "reasonably foreseeable," including, but not limited to, activities that are currently authorized, permitted, or funded, or for which proposed plans are currently available to the public. The analysis estimates economic effects of activities from 1995 (the first year of spring/summer sturgeon flows from Libby Dam following the final rule for listing in September 1994) through 2025 (20 years from the year of final CHD). Forecasts of economic conditions and other factors beyond the next 20 years would be speculative, and are not included in the analysis.

1.4 Information Sources

The analysis contained in this report is based on data and information collected from a wide range of sources. Communications with and data provided by Service personnel include maps and geographical information system (GIS) data, information on past section 7 consultation project modification and terms and conditions, copies of informal and formal sturgeon consultation documents such as Biological Opinions (BOs), and other material directly related to the proposed designation. The Service's recovery plan addressing the sturgeon was also consulted.[38] Other Federal, State, and local agencies provided information, as well as independent or private sector entities and individuals. The specific sources used to address the effects of sturgeon conservation efforts are identified within each section, and citations are provided where appropriate.

1.5 Organization of the Report

The remainder of this report is divided into six sections. The following section provides information on the history of the sturgeon listing and existing and proposed critical habitat

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37 Personal Communication with Scott Bettin, BPA, Portland, November 15, 2005.

38 U.S. Fish and Wildlife Service, September 30, 1999, "Recovery Plan for the White Sturgeon *(Acipenser Transmontanus):* Kootenai River Population".

designations and a socioeconomic profile of the counties encompassing the existing and proposed critical habitat. The socioeconomic profile is presented in terms of the affected counties as the smallest units of measure for much of the data are presented. This is followed by a discussion of the regulatory environment, which includes the Federal, State, and local laws and regulations that are relevant to the analysis.

The next section presents potential administrative costs of actions taken under section 7 of the Act associated with the geographic area of critical habitat for the sturgeon. First, this section defines the types of administrative costs likely to be associated with sturgeon critical habitat as well as the per-unit costs of section 7 consultation. Next, the analysis presents the costs related to the past sturgeon-related section 7 consultation efforts followed by an estimate of the costs related to future consultations likely to result from the designation of critical habitat for the sturgeon and/or the listing of the species.

This section is then followed by four sections that examine the different categories of economic effects. These sections address the effects on hydropower, agriculture, recreation, and flood control. Included with the report is Appendix A, which addresses the economic effects of sturgeon conservation efforts on small entities and the nation's energy supply. A Map Attachment is also provided and contains all maps referenced in the text of the report.

This section summarizes the history of the sturgeon listing, existing critical habitat and proposed critical habitat, provides an ecological description of the sturgeon and habitat, presents socioeconomic characteristics of identified critical habitat areas, and chronicles the regulatory background that informs the analysis.

2.1 BACKGROUND OF THE STURGEON CRITICAL HABITAT DESIGNATION

On September 6, 1994, the Service published the final rule listing sturgeon as endangered.[39] At that time, the Service also concluded that the designation of critical habitat could not be determined until further analyses were conducted.[40] On June 30, 1999, the Center for Biological Diversity filed a complaint on the Service's failure to designate critical habitat for the sturgeon. As part of a court decision of August 30, 2000, in *Center for Biological Diversity v. Bruce Babbitt, Secretary of the Department of the Interior, and the United States Fish and Wildlife Service, C99–3202 SC*, the Service entered into a court-approved settlement agreement to submit a proposed rule for designation of critical habitat for the sturgeon by December 15, 2000. The proposed rule for designation of critical habitat was published on December 21, 2000[41] and finalized on September 6, 2001.[42] Lawsuits, alleging that the Service's designation of critical habitat for the sturgeon were arbitrary and capricious, were filed in February 2003 by the Center for Biological Diversity.[43] The Center for Biological Diversity claimed that the designation failed to include areas that contain features essential to the conservation of the species. On May 25, 2005, the U.S. District Court in Montana ruled in favor of the plaintiffs and remanded the critical habitat designation to the Service for reconsideration. The Service filed a motion to alter or amend the judgment and the Court extended the deadline for releasing a new critical habitat designation until February 1, 2006. The Court also ruled that the 2001 designation remains in

39 U.S. Fish and Wildlife Service, September 6, 1994, "Determination of Endangered Status for the Kootenai River Population of the White Sturgeon, Final Rule" *Federal Register*, Vol. 59, No. 171, pp. 45989-46002.

40 U.S. Fish and Wildlife Service, September 6, 1994, "Determination of Endangered Status for the Kootenai River Population of the White Sturgeon, Final Rule" *Federal Register*, Vol. 59, No. 171, pp. 46000-46001.

41 U.S. Fish and Wildlife Service, December 21, 2000, "Proposed Designation of Critical Habitat for the Kootenai River Population of the White Sturgeon; Proposed Rule," *Federal Register*, Vol. 65, No. 246, pp. 80698-80708.

42 U.S. Fish and Wildlife Service, September 6, 2001, "Final Designation of Critical Habitat for the Kootenai River Population of the White sturgeon, Final Rule," *Federal Register*, Vol. 66, No. 173, pp. 46548-46561.

43 *Center for Biological Diversity; Ecology Center. v. United States Army Corps of Engineers; United States Fish and Wildlife Service*; No. CV-03-29-M-DWM.

effect.[44] In order to meet the court-ordered deadline, the Service published an interim final rule on February 8, 2006.[45] While the interim rule constitutes a final rule, it is open to public comment. Following the public comment process, the Service will replace the interim final rule with a new final rule. Thus, the interim final rule will serve as the proposed rule for the later final rule. For the purpose of this revised EA, the interim rule is treated as the proposed rule.

2.2 PROPOSED CRITICAL HABITAT DESIGNATION

In the final rule of critical habitat designation for the sturgeon (September 2001), the Service identified critical habitat as an 11.2 mile portion of the Kootenai River within Boundary County, Idaho, from river kilometer 228 (river mile 141.4, below Shorty's Island) to river kilometer 246 (river mile 152.6, above the Highway 95 Bridge at Bonners Ferry, Idaho).[46] This critical habitat unit (CHU) is called the Meander Reach.

As a result of the May 2005 ruling by the U.S. District Court of Montana, the Service proposes revising this designation by adding one new CHU. This unit will add an additional 6.9 miles of Kootenai River for a total of 18.1 miles of critical habitat in Boundary County, Idaho. This proposed unit is called Braided Reach.[47]

The Service has defined the lateral extent of the critical habitat as the bed of the Kootenai River and its banks up to ordinary high-water lines. The banks and riverbed within the ordinary high-water-lines are owned by the State of Idaho; however, numerous private, public, and tribally-owned parcels abut these state-owned riverbed/banks, including lands managed by the Service at the Kootenai National Wildlife Refuge, the USFS, and trust lands managed by the Kootenai Tribe of Idaho.[48] As summarized in Table 2-1, most of the land adjacent to the CHUs is under private ownership. The public lands are managed by the USFS, BLM, and Service.

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44 *Center for Biological Diversity; Ecology Center. v. United States Army Corps of Engineers; United States Fish and Wildlife Service*; No. CV-03-29-M-DWM.

45 U.S. Fish and Wildlife Service, February 8, 2006, "Critical Habitat Designation for the Kootenai River Population of the White Sturgeon, Interim Rule," *Federal Register*, Vol. 71, No. 26, pp. 6383-6396.

46 U.S. Fish and Wildlife Service, September 6, 2001, "Final Designation of Critical Habitat for the Kootenai River Population of the White Sturgeon; Final Rule," *Federal Register*, Vol. 66, No. 173, pp. 46548-46561.

47 U.S. Fish and Wildlife Service, February 8, 2006, "Critical Habitat Designation for the Kootenai River Population of the White Sturgeon, Interim Rule," *Federal Register*, Vol. 71, No. 26, pp. 6383-6396.

48 U.S. Fish and Wildlife Service, February 8, 2006, "Critical Habitat Designation for the Kootenai River Population of the White Sturgeon, Interim Rule," *Federal Register*, Vol. 71, No. 26, pp. 6383-6396.

Table 2-1
Summary of Kootenai River Adjacent Land and Island Ownership for Existing and Proposed Sturgeon Critical Habitat

CHD Unit:	Shoreline Miles			Island Acres		
	Braided Reach (Proposed)	Meander Reach (Existing)	Total	Braided Reach (Proposed)	Meander Reach (Existing)	Total
Shoreline (miles)	6.9	11.2	18.1			
Islands (acres)				143.6	86.6	230.2
Land Ownership						
Federal	0.7%	19.8%	12.5%	56.0%		34.9%
BLM				*56.0%*		*34.9%*
Forest Service	*0.7%*		*0.3%*			
Service		*19.8%*	*12.3%*			
Private	99.3%	80.2%	87.5%	44.0%	100%	65.1%

The proposed CHU is described briefly below. The location of the CHU is shown on Maps 1A (local) and 1B (within the Columbia River Basin) in the Map Attachment to this report. Land ownership of the lands abutting the CHU is shown on Map 2A (Idaho) and 2B (Montana), and land use is illustrated on Maps 3A (Idaho) and 3B (Montana).

2.2.1 UNIT 1: BRAIDED REACH

The braided reach CHU covers 6.9 miles from below the confluence of the Moyie River downstream to below the Highway 95 Bridge at Bonners Ferry, Idaho.

2.3 DESCRIPTION OF THE SPECIES, HABITAT, AND THREATS[49]

The sturgeon belongs to the family *Acipenseridae* and is the largest freshwater fish species in North America, capable of growing up to 1,800 pounds and 20 feet long. Sturgeon are a long lived species, with females living from 34 to 70 years and taking 15 to 32 years to reach full maturity. Only a portion of the adult population spawns each year; the spawning frequency of females is estimated at 2 to 11 years. Sturgeon are broadcast spawners, releasing their eggs and sperm in fast moving water, typically during May and June. Following fertilization, the eggs adhere to a river substrate and hatch after a relatively brief incubation period of 8 to 15 days, depending on water temperature. For a detailed description of the sturgeon, its reproduction and life cycle see the final rule designating the sturgeon as endangered.

The Kootenai River population of sturgeon is a land-locked and genetically-distinct species of sturgeon found solely in the Kootenai River of British Columbia, Montana and Idaho. They are restricted to approximately 168 river miles in the Kootenai River basin. The Kootenai River

49 Information on the sturgeon and its habitat is derived from the September 6, 1994, "Determination of Endangered Status for the Kootenai River Population of the White Sturgeon, Final Rule" Federal Register, Vol. 59, No. 171. It is provided in summary form only; specific citations have been omitted here.

begins in southern British Columbia, Canada in the Rocky Mountains. It flows south until Libby Dam, east of Libby, Montana impounds Lake Koocanusa, and the river flows northwest of Libby Dam through northwestern Montana to the Idaho panhandle. It flows roughly north from Bonner's Ferry, Idaho, to end as Lake Kootenay in Canada.[50]

Using the best available scientific data, the Service has determined the primary constituent elements (PCEs) essential to the conservation of the sturgeon. This analysis is based on the PCEs as described in the interim final rule.[51]

The proposed CHU is threatened by the current operations of Libby Dam.[52] Table 2-2 provides information about the threats within the specific CHUs.

Table 2-2
Summary of Threats to Sturgeon

CHU	River Miles	Primary Threat to Species
Braided Reach (Proposed)	6.9	Libby Dam operations: sudden changes in water temperature, shallow water depths, and low water velocities
Meander Reach (Designated)	11.2	Libby Dam operations: sudden changes in water temperature, shallow water depths, and low water velocities

50 The Kootenay River (spelled Kootenai River for its American portions) is the uppermost major tributary of the Columbia River, flowing through British Columbia, Montana, and Idaho. It is the only river in North America which begins in Canada, enters the United States, and then reenters Canada. The Kootenay originates in the Rocky Mountains of eastern British Columbia, and initially flows south through Kootenay National Park, merging into the Rocky Mountain trench near Canal Flats, British Columbia (here is passes within a kilometer of Columbia Lake, the headwaters of the Columbia River. It continues southwards along the Trench towards the United States border, and at Wardner, British Columbia, it widens into the Lake Koocanusa reservoir created by the Libby Dam near Libby Montana. Lake Koocanusa spans the U.S.-Canadian border; below the dam the river resumes (using the Kootenai spelling), veers westwards out of the Rocky Mountain Trench, crosses into Idaho, and passes through Bonners Ferry, then turns northwards again. It reenters Canada south of Creston, British Columbia, and widens into Kootenay Lake. At Nelson, British Columbia, the Kootenay becomes a river again, now flowing southwest towards Castlegar, where it joins the Columbia River. Source: Wikipedia Foundation, Inc., May 18 2005, Kootenay River, Wikipedia, The Free Encyclopedia, Webpage: http://en.wikipedia.org/wiki/Kootenay_River, accessed on October 24, 2005.

51 U.S. Fish and Wildlife Service, February 8, 2006, "Critical Habitat Designation for the Kootenai River Population of the White Sturgeon, Interim Rule," *Federal Register*, Vol. 71, No. 26, pp. 6383-6396.

52 U.S. Fish and Wildlife Service, February 8, 2006, "Critical Habitat Designation for the Kootenai River Population of the White Sturgeon, Interim Rule," *Federal Register*, Vol. 71, No. 26, pp. 6383-6396.

2.4 RECOVERY PLAN

The Service published a sturgeon Recovery Plan in 1999.[53] The Recovery Plan establishes recovery criteria for the sturgeon and proposes actions to restore viable sturgeon populations. The ultimate goal of the Recovery Plan is to establish criteria and objectives that when implemented should enable the species to recover to the point that it can be removed from the Federal list of endangered and threatened wildlife and plants. The short-term recovery objectives are to re-establish successful natural recruitment and prevent extinction through the use of conservation aquaculture. The long-term objectives are to downlist and then delist the fish when the population becomes self-sustaining. While the Recovery Plan imposes no binding restrictions or obligations on landowners and managers, it serves as an important information source regarding habitat characteristics and sturgeon populations.

Costs for some of the tasks identified in the Recovery Plan to be completed during the first five years (1999 – 2003) are estimated to be $7.5 million.[54] The actual costs associated with these tasks have been captured in the pre-designation impacts associated with BPA and ACOE funded sturgeon conservation activities (surgeon studies, monitoring, and reporting, sturgeon hatchery operations and expansion, and habitat improvement) discussed in Section 4.0.

2.5 SOCIOECONOMIC PROFILE OF THE CRITICAL HABITAT AREA

Key economic and demographic information, including population characteristics and general economic activity, for the counties containing critical habitat for the sturgeon is presented in this section. The smallest area for which reliable socioeconomic data are available is at the county level, so county data are presented to provide context for the discussion of potential economic impacts later in this report. The county data also serve to illuminate trends within the critical habitat areas that could influence the potential economic impacts, and therefore aid in the analysis of those impacts. Although county level data may not precisely reflect the socioeconomic characteristics of the areas immediately surrounding the sturgeon critical habitat, these data provide the best context for the broader analysis.

2.5.1 POPULATION CHARACTERISTICS AND DEMOGRAPHICS

Critical habitat for the sturgeon has been identified within Boundary County, Idaho. Sturgeon flows from Libby Dam will also flow through Lincoln County, Montana, on their way to the CHUs. The proposed critical habitat is described in Section 2.2. Socioeconomic data for these two counties are presented here. Table 2-3 presents the population size, change in population

53 U.S. Fish and Wildlife Service. 1999. Recovery Plan for the White Sturgeon (*Acipenser transmontanus*): Kootenai River Population. Service, Portland, OR.

54 U.S. Fish and Wildlife Service. 1999. Recovery Plan for the White Sturgeon (*Acipenser transmontanus*): Kootenai River Population. Service, Portland, OR, pp. 91-95.

from 1990 to 2004, per capita income, and poverty rates for these counties and the States of Idaho and Montana.

In terms of 2004 population, Montana is the sixth smallest state in the nation and Idaho is the 11th smallest state. Based on the 2004 population estimates, Boundary County is in the lowest quarter of the country in terms of population and contributes less than one percent to the total population of Idaho. Lincoln County also has a small population, contributing approximately two percent to the total population of Montana.[55]

Table 2-3
Socioeconomic Profile of Counties Containing Critical Sturgeon Habitat

County/State	Population (2004)	Percent of State (2004)	Percent Change (1990-2004)	Per Capita Income (2002)	Poverty Rate (2002)
Boundary County	10,396	0.8%	+24.8%	$18,316	14.9%
Idaho State	1,393,262	100.0%	38.4%	$25,476	11.7%
Lincoln County	19,101	2.1%	+9.3%	$22,571	18.8%
Montana State	926,865	100.0%	+16.0%	$24,831	14.0%

Sources: 2004 population estimates: U.S. Census Bureau, April 14, 2005 (last revised), Tables CO-EST2004-01-16 and CO-EST2004-01-30, "Annual Estimates of the Population for Counties: April 1, 2000 to July 1, 2004," downloaded from http://www.census.gov/popest/counties/CO-EST2004-01.html, October 25, 2005.

1990-2004 population change: U.S. Census Bureau, "Ranking Tables for Counties," downloaded from http://www.census.gov/population/www/cen2000/phc-t4.html, May 12, 2004; and U.S. Census Bureau, "Table 1: Counties in Alphabetic Sort Within State, 1990 and 2000 Population, and Numeric and Percent Change: 1990 to 2000," downloaded from http://www.census.gov/population/www/cen2000/phc-t4.html, October 25, 2005.

2002 per capita income: U.S. Department of Commerce, May 2004, Bureau of Economic Analysis, Regional Economic Information System 1969-2002, CD-ROM.

2002 poverty estimates: U.S. Census Bureau, Housing and Household Economic Statistics Division, Small Area Estimates Branch, December 2004, "Small Area Income and Poverty Estimates," accessed at, http://www.census.gov/hhes/www/saipe/tables.html, downloaded from http://www.census.gov/housing/saipe/estmod02/, and http://www.census.gov/housing/saipe/estmod02/est02US.dat, October 25 and 26, 2005.

From 1990 to 2004, the population of Boundary County increased by 24.8 percent, lagging behind the statewide average of 38.4 percent over the same period. Population growth in Lincoln County has also lagged behind that of Montana, increasing by 9.3 percent from 1990-2004, versus 16.0 percent for the state over the same period.[56]

55 U.S. Census Bureau, April 14, 2005 (last revised), Tables CO-EST2004-01-16 and CO-EST2004-01-30, "Annual Estimates of the Population for Counties: April 1, 2000 to July 1, 2004," downloaded from http://www.census.gov/popest/counties/CO-EST2004-01.html, October 25, 2005.

56 U.S. Census Bureau, "Ranking Tables for Counties," downloaded from http://www.census.gov/population/www/cen2000/phc-t4.html, May 12, 2004; and U.S. Census

Per capita incomes for the two counties range from $18,316 in Boundary County to $22,571 in Lincoln County. Per capita incomes for both counties are lower than their respective statewide averages of $25,476 in Idaho and $24,831 in Montana.[57]

The poverty rate for a region is the percentage of people who are estimated to live below the poverty level, which is based on national levels set for minimum income requirements for various sizes of households. Boundary County's poverty rate is 14.9 percent and Lincoln County's is 18.8 percent. These counties' poverty rates exceed those for their respective states at 11.7 percent (Idaho) and 14.0 percent (Montana). Montana's statewide poverty rate exceeds the average national poverty rate of 12.1 percent, while Idaho's poverty rate falls short of the national average.[58]

2.5.2 EMPLOYMENT AND ECONOMIC ACTIVITY

Employment is a key economic indicator, as patterns of growth and decline in a region's employment are largely driven by economic cycles and local economic activity. Current employment figures can be examined to provide a "snapshot" of a region's economy, highlighting key industries. Recent employment data for the two counties containing sturgeon critical habitat are presented in Table 2-4. Employment is given for each industry group in terms of the number of jobs, which includes both full-time and part-time jobs, and as a percentage of the total jobs for each county.

Total 2002 employment in Boundary County was 5,062, accounting for less than one percent of total employment in the State of Idaho.[59] The unemployment rate in Boundary County in 2002 was 8.5 percent, more than 1.5 times the State of Idaho rate of 5.4 percent. In 2004, the unemployment rate in Boundary County and the State improved, falling to 6.9 percent and 4.7 percent, respectively.[60]

Bureau, "Table 1: Counties in Alphabetic Sort Within State, 1990 and 2000 Population, and Numeric and Percent Change: 1990 to 2000," downloaded from http://www.census.gov/population/www/cen2000/phc-t4.html, October 25, 2005.

57 U.S. Department of Commerce, May 2004, Bureau of Economic Analysis, *Regional Economic Information System 1969-2002,* CD-ROM.

58 U.S. Census Bureau, Housing and Household Economic Statistics Division, Small Area Estimates Branch, December 2004, "Small Area Income and Poverty Estimates," accessed at, http://www.census.gov/hhes/www/saipe/tables.html, downloaded from http://www.census.gov/housing/saipe/estmod02/, and http://www.census.gov/housing/saipe/estmod02/est02US.dat, October 25 and 26, 2005.

59 U.S. Department of Commerce, May 2004, Bureau of Economic Analysis, *Regional Economic Information System 1969-2002,* CD-ROM.

60 U.S. Department of Labor, Bureau of Labor Statistics, Local Area Unemployment Statistics, 2002, downloaded from http://data.bls.gov/PDQ/outside.jsp?survey=la, and http://www.bls.gov/lau/lastrk02.htm, November 4, 2005.

Total employment in Lincoln County in 2002 was 8,935, accounting for approximately 1.5 percent of total employment in the State of Montana.[61] The unemployment rate in Lincoln County in 2002 was 9.0 percent, more than two times the State of Montana State rate of 4.4 percent. Lincoln County's unemployment rate increased during the following two years, reaching 9.7 percent in 2004, while Montana's unemployment rate remained at 4.4 percent in 2004.[62]

Table 2-4 illustrates that Boundary County employment is spread among a large number of economic sectors. The largest employer is the government sector with 1,076 jobs and over 21.3 percent of total county employment. State and local government account for the largest share of employment in the government sector with 901 jobs. Other large sectors are the trade, transportation, and utilities sector providing almost 15 percent of total employment in the County and educational and health services providing 13.1 percent of total county jobs. Retail trade provides 510 jobs, and transportation and warehousing provide 162 of the 754 jobs in the trade, transportation, and utilities sector; while 591 jobs out of the 663 jobs in the education and health services sector are provided by employers in health care and social assistance. Agriculture, forestry, hunting, and fishing contribute a total of 14.6 percent of county employment, while the sector with the smallest employment is mining, which accounts for 12 jobs and 0.2 percent of county employment.

Similarly to Boundary County, Lincoln County employment is also spread among a large number of economic sectors, and the largest County employer is government with more than 16 percent of total employment. The spread of employment among economic sectors is similar between the counties in most cases, with some exceptions. Agricultural production contributes less to county employment in Lincoln County than it does in Boundary County, while leisure and hospitality services provide a higher portion of Lincoln County employment than provided to Boundary County employment. Financial activities, in which real estate provides 405 of the 604 jobs, also provide a greater portion of Lincoln County employment than this sector provides to Boundary County employment.

61 U.S. Department of Commerce, May 2004, Bureau of Economic Analysis, *Regional Economic Information System 1969-2002,* CD-ROM.

62 U.S. Department of Labor, Bureau of Labor Statistics, Local Area Unemployment Statistics, 2002, downloaded from http://data.bls.gov/PDQ/outside.jsp?survey=la, and http://www.bls.gov/lau/lastrk02.htm, November 4, 2005.

Table 2-4
2002 Employment in Counties Containing Sturgeon Habitat
(Number of Jobs and Percentage of Total Jobs)

		Boundary [a/]	Lincoln [a/]
	Total Employment	**5,062**	**8,935**
Goods Producing:	Agricultural Production (Farm)	404 *(8.0%)*	314 *(3.5%)*
	Forestry, Hunting, Fishing, and Related Activities [b/]	334 *(6.6%)*	663 *(7.4%)*
	Mining	12 *(0.2%)*	41 *(0.5%)*
	Construction	374 *(7.4%)*	652 *(7.3%)*
	Manufacturing	492 *(9.7%)*	849 *(9.5%)*
Service Providing:	Trade, Transportation, and Utilities [c/]	754 *(14.9%)*	1,313 *(14.7%)*
	Leisure and Hospitality [d/]	211 *(4.2%)*	773 *(8.7%)*
	Financial Activities [e/]	194 *(3.8%)*	604 *(6.8%)*
	Information	40 *(0.8%)*	121 *(1.4%)*
	Professional and Business Services [f/]	281 *(5.6%)*	302 *(3.4%)*
	Educational and Health Services [g/]	663 *(13.1%)*	921 *(10.3%)*
	Other Services	227 *(4.5%)*	614 *(6.9%)*
	Government	1,076 *(21.3%)*	1,477 *(16.5%)*

a/ Sectors may not sum to county totals due to sector data not disclosed for confidentiality purposes.
b/ Also includes Agricultural Services.
c/ For Boundary County includes Utilities, Transportation and Warehousing, Retail Trade, and Wholesale Trade. For Lincoln County, includes Transportation and Warehousing, and Retail Trade as data was not shown in the source document for Utilities and Wholesale trade to avoid disclosure of confidential information.
d/ Includes Accommodation and Food Services, and Arts, Entertainment, and Recreation.
e/ Includes Finance and Insurance, and Real Estate and Rental and Leasing.
f/ For Boundary County includes Professional, Scientific, and Technical Services, Administrative Support, Waste Management, and Remediation Services, and Management of Companies and Enterprises. For Lincoln County includes Professional, Scientific, and Technical Services as data was not shown in the source document for Administrative Support, Waste Management, and Remediation Services, and Management of Companies and Enterprises to avoid disclosure of confidential information.
g/ Includes Education Services and Heath Care and Social Assistance.
Source: U.S. Department of Commerce, May 2004, Bureau of Economic Analysis, *Regional Economic Information System 1969-2002,* CD-ROM.

Earnings from employment in counties containing critical habitat for the sturgeon are presented in Table 2-5, broken out by industry group as employment was in the previous table. Earnings represent the sum of three components of personal income: wage and salary disbursements, other labor income (includes employer contribution to pension and profit-sharing, health and life insurance, and other non-cash compensation), and proprietors' income. Earnings reflect the amount of income that is derived directly from work and work-related factors. Earnings can be used as a proxy for the income that is generated within a geographical area by industry sectors, and can be used to identify the significant income-producing industries of a region or to show trends in industry growth or decline.

Table 2-5
2002 Earnings from Employment in Counties Containing Sturgeon Habitat
(Millions of Dollars and Percentage of Total Earnings)

		Boundary [a/]	Lincoln [a/]
	Total Earnings	**$182.94**	**$366.18**
Goods Producing:	Agricultural Production (Farm)	$8.38 *4.58%*	$0.95 *0.26%*
	Forestry, Hunting, Fishing, and Related Activities[b/]	$9.38 *5.13%*	$22.86 *6.24%*
	Mining	$0.50 *0.27%*	$0.59 *0.16%*
	Construction	$6.49 *3.55%*	$14.24 *3.89%*
	Manufacturing	$17.35 *9.48%*	$32.19 *8.79%*
Service Providing:	Trade, Transportation, and Utilities[c/]	$15.75 *8.61%*	$26.15 *7.14%*
	Leisure and Hospitality[d/]	$1.56 *0.85%*	$7.65 *2.09%*
	Financial Activities[e/]	$1.90 *1.04%*	$6.94 *1.89%*
	Information	$0.90 *0.49%*	$3.38 *0.92%*
	Professional and Business Services[f/]	$7.46 *4.08%*	$5.18 *1.41%*
	Educational and Health Services[g/]	$16.26 *8.89%*	$20.45 *5.59%*
	Other Services	$2.56 *1.40%*	$7.41 *2.02%*
	Government	$36.15 *19.76%*	$61.80 *16.88%*

a/ Sectors may not sum to county totals due to sector data not disclosed for confidentiality purposes.
b/ Also includes Agricultural Services.
c/ For Boundary County includes Utilities, Transportation and Warehousing, Retail Trade, and Wholesale Trade. For Lincoln County, includes Transportation and Warehousing and Retail Trade as data was not shown in the source document for Utilities and Wholesale trade to avoid disclosure of confidential information.
d/ Includes Accommodation and Food Services, and Arts, Entertainment, and Recreation.
e/ Includes Finance and Insurance, and Real Estate and Rental and Leasing.
f/ For Boundary County includes Professional, Scientific, and Technical Services, Administrative Support, Waste Management, and Remediation Services, and Management of Companies and Enterprises. For Lincoln County includes Professional, Scientific, and Technical Services as data was not shown in the source document for

Administrative Support, Waste Management, and Remediation Services, and Management of Companies and Enterprises to avoid disclosure of confidential information.
g/ Includes Education Services and Heath Care and Social Assistance.
Source: U.S. Department of Commerce, May 2004, Bureau of Economic Analysis, *Regional Economic Information System 1969-2002,* CD-ROM.

Total 2002 earnings in Boundary and Lincoln counties were $182.9 million and $366.2 million, respectively. The government sector is the largest contributor to earnings in both counties. Manufacturing; Education and Health Services; Trade Transportation and Utilities; and Forestry, Hunting, Fishing, and Related Activities also contributed significant portions of both counties' earnings. Agricultural Production accounted for a higher portion of Boundary County earnings than it does to Lincoln County earnings, while Leisure and Hospitality accounted for a larger portion of Lincoln County earnings than it did in Boundary County.

2.5.3 IMPACTED INDUSTRIES

2.5.3.1 Agriculture

Maps 3A and 3B in the Map Attachment to this report show the location of agricultural land within northern Idaho and northwestern Montana, respectively. As can be seen, very little agriculture occurs adjacent to the river, upstream from the proposed CHD. The majority of the land in the vicinity of the river in Montana is under the management of the Kootenai National Forest. More agriculture can be seen on the Braided Reach (Unit 1) between Moyie, Idaho and Bonner's Ferry, Idaho as the river leaves the canyon and enters a flatter valley. The Meander Reach, from Bonner's Ferry and continuing north up to the border with Canada, (and indeed into British Columbia where the river is impounded by Kootenay Lake), is where the majority of agriculture occurs along the river. This is called the Kootenai River Valley.[63]

Boundary County has approximately 430 farms and 48,000 acres of cropland.[64] Of these acres, approximately 30,000 acres are farmed annually in the Kootenai River Valley. Primary crops are alfalfa, barley, bluegrass, brome, canola, mustard, oats, peas, soybeans, timothy, and wheat. In addition, Anheuser-Busch grows 1,711 acres of hops on two farms in the valley.[65] Table 2-6 shows the acreage and the percent of total acreage for these crops in the Kootenai River Valley.

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63 US Department of Agriculture, Natural Resource Conservation Service, Bonners Ferry, ID, as cited in, Harp, Aaron J. and Tim Darden, June 2005, Kootenai River Seepage Agricultural Impact Study: Final. Berven Harp & Associates, Prepared for the U.S. Department of the Army Corps of Engineers Seattle District.

64 Quick Stats: Agricultural Statistics Data Base, 2002 Census of Agriculture - Volume 1 Geographic Area Series Census, State - County Data, Table 1. County Summary Highlights: 2002 and 1997, Boundary County, Idaho. From http://151.121.3.33:8080/QuickStats/, viewed on November 9, 2005

65 U.S. Department of the Army, Corps of Engineers, Seattle District, September 2005, Kootenai River Valley Agricultural Seepage Study Summary Report: Boundary County, Idaho, Appendix G in *Upper Columbia Alternative Flood Control and Fish Operations Draft EIS.*

U.S. Department of the Interior, Bureau of Reclamation, Pacific Northwest Region and U.S. Army Corps of Engineers, Seattle District, November 2005, Boise, Idaho and Seattle, WA, page G-4.

Table 2-6
Average Annual Acres by Crop in Kootenai River Valley, 1998 to 2003

Crop	Average Acres	Percent of Total Acres
Winter Wheat	9,385	31.2
Spring Wheat	8,010	26.6
Barley	3,910	13.0
All Other Crops, including Bluegrass, Brome, Mustard, Oats, Peas, and Soybeans	3,123	10.4
Hops	1,711	5.7
Canola	1,611	5.4
Alfalfa	1,491	5.0
Timothy	839	2.8
Total Acres	30,080	100.0

Source: US Department of Agriculture, Natural Resource Conservation Service, Bonners Ferry, ID, as cited in, Harp, Aaron J. and Tim Darden, June 2005, Kootenai River Seepage Agricultural Impact Study: Final. Berven Harp & Associates, Prepared for the U.S. Department of the Army Corps of Engineers Seattle District.

Table 2-7 shows the average yield per acre, the average price, and the estimated annual total value for major crops in the valley for the period of 1998 to 2003 (with some exceptions to these years, as noted). The total value calculation assumes that all average crop acres as listed are planted. Approximately $13 million in crops are grown annually in the Kootenai River Valley. The value of the valley's annual production represents almost 60 percent of the market value of agriculture products sold in the County annually ($22.8 million in 2002).[66] Although hops make up a relatively small amount of valley acreage, they represent the highest valued crop in the valley, approximately $7 million annually. Winter wheat is the next highest, providing an estimated $2.5 million annually. Spring wheat and barley obtain an estimated $1.6 million and $1.4 million annually, respectively. Alfalfa and spring canola have the lowest total estimated returns, bringing in approximately $320,000 and $240,000 annually.

US Department of Agriculture, Natural Resource Conservation Service, Bonners Ferry, ID, *as cited in*, Harp, Aaron J. and Tim Darden, June 2005, Kootenai River Seepage Agricultural Impact Study: Final. Berven Harp & Associates, Prepared for the U.S. Department of the Army Corps of Engineers Seattle District.

66 Quick Stats: Agricultural Statistics Data Base, 2002 Census of Agriculture - Volume 1 Geographic Area Series Census, State - County Data, Table 1. County Summary Highlights: 2002 and 1997, Boundary County, Idaho. From http://151.121.3.33:8080/QuickStats/, viewed on November 9, 2005

Table 2-7
Average Annual Acres, Yield, Price, and Estimated Annual Total Value per Crop in the Kootenai River Valley, Idaho, 1998-2003

	Winter Wheat (bu)	Spring Wheat (bu)	Barley (cwt)	Spring Canola (cwt)	Alfalfa (ton)	Hops (lb) [c/]
Average Acres (1998-2003) [b/]	9,385	8,010	3,910	1,611	1,491	1,711
Average Unit Yield per Acre (1994-2003) [d/]	73.8	54.7	75.8	13.5	2.9	1,052
Average Unit Price (1994-2003) ($) [e/]	$3.55	$3.55	$4.80	$11.00	$75.00	$3.81
Estimated Annual Total Value (millions nominal $) [a/]	$2.46	$1.56	$1.42	$0.24	$0.32	$6.86

a/ The total value calculation assumes that all available crop acres as listed in Table 2-6 are planted.
b/ US Department of Agriculture, Natural Resource Conservation Service, Bonners Ferry, ID, as cited in, Harp, Aaron J. and Tim Darden, June 2005, Kootenai River Seepage Agricultural Impact Study: Final. Berven Harp & Associates, Prepared for the U.S. Department of the Army Corps of Engineers Seattle District.
c/ Average unit yield per acre for hops represents average for 1999 to 2004.
d/ Idaho Agricultural Statistics Service, Various Dates. "Idaho County Estimates." Boise, ID. As cited in Harp, Aaron J. and Tim Darden, June 2005, Kootenai River Seepage Agricultural Impact Study: Final. Berven Harp & Associates, Prepared for the U.S. Department of the Army Corps of Engineers Seattle District.
e/ Idaho Agricultural Statistics Service, Various Dates. "Idaho County Estimates," Boise, ID; Patterson, P.E., C.W. Gray, and N.R. Rimbey, September 2004, "2004-05 Long Range Planning Prices for Idaho Crops and Livestock," (A. E. Extension Series No. 04-08), Department of Agricultural Economics and Rural Sociology, University of Idaho, Moscow, ID, available online at: http://www.ag.uidaho.edu/aers/r_crops.htm; Smathers, R.L. and John C. Foltz, 2003, "Spring Canola," (Publication EBB1-SC-03 Northern Idaho Crop Costs and Returns Estimate Series), Department of Agricultural Economics and Rural Sociology, University of Idaho, Moscow, ID, available online at http://www.ag.uidaho.edu/aers/crop_EB_03.htm; and Elk Mountain Farms; *as cited in* Harp, Aaron J. and Tim Darden, June 2005, Kootenai River Seepage Agricultural Impact Study: Final. Berven Harp & Associates, Prepared for the U.S. Department of the Army Corps of Engineers Seattle District.

County-level data in the 2002 Agriculture Census indicate the return to farming activities in Boundary County is low, compared with other counties. The average net cash farm income67 in Boundary County per operator was $13,833 in 2002, with 52 percent of the farm operators reporting a net average loss of $6,413. By definition, net cash income is cash sales less cash expenses (ignoring non-cash expenses, such as depreciation), a net cash loss means more than

67 Net cash farm income of the operator is "…the operator's total revenue (fees for producing under contract, total sales not under contract, government payments, and farm-related income) minus total expenses paid by the operator. Net cash farm income of the operator removes the value of contract commodities produced and acknowledges the income the operator(s) received for services performed by the contractor." U.S. Department of Agriculture, National Agricultural Statistical Service, "2002 Census of Agriculture," Idaho State and County Data, Volume 1 Geographic Area Series, Part 12, Appendix A, General Explanation. Available at http://www.nass.usda.gov/census/census02/volume1/id/IDVolume104.pdf.

half of the farm operators in the County are operating below break-even (i.e., cash expenses exceed cash income).

2.5.3.2 Recreation

Recreation occurs on the Kootenai River and in all the lakes and some of the wetlands that it fills. As Table 2-4 illustrates, the Leisure and Hospitality sector, including recreation, accounts for approximately 800 jobs, or nine percent of employment in Lincoln County, Montana. The recreational activities that are dependent on water level or flows, such as boating from launches that are only usable when lake water levels are above a minimum threshold, are likely to be impacted more than activities that are less dependent on water levels and flows.

Map 1B in the Map Attachment shows the Kootenai River watershed, beginning at Lake Koocanusa which is impounded by Libby Dam and straddles the border between Canada and the United States. Below Libby Dam the river continues downstream into the US, and then northward again until it forms Kootenay Lake in Canada. The west arm of Kootenay Lake is the outflow of the lake and ultimately leads to the confluence with the Columbia River near Castlegar, British Columbia (BC).

Lake Koocanusa

Lake Koocanusa covers an area of roughly 72 square miles, extending almost 42 miles into Canada and 47 miles into the US.[68] Although it is in a relatively remote location, the lake is an important recreational resource in the area, featuring approximately 21 developed and dispersed facilities.[69] Table 2-8 lists the recreation facilities on Lake Koocanusa in the US and Canada and summarizes the number of these sites that either feature or allow access to the recreational activities described.

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68 Bonneville Power Administration, US Army Corps of Engineers North Pacific Division, and US Department of the Interior Bureau of Reclamation, November 1995, Appendix J: Recreation, *in Columbia River System Operation Review Final Environmental Impact Statement*, page 2-37.

Royal British Columbia Museum, (2005?), Columbia Basin: Physical Structure of Aquatic Ecosystems, in Natural History: A Compendium of Environmental and Resource Information, Accessed online at http://www.livinglandscapes.bc.ca/cbasin/history/index.html, December 4, 2005.

69 Tetra Tech, Inc., May 2005, Recreation Affected Environment, Appendix E in Upper Columbia Alternative Flood Control And Fish Operations Draft Environmental Impact Statement, (Prepared for US Army Corps of Engineers, Seattle District and Bureau of Reclamation), Seattle, WA.

Bonneville Power Administration, US Army Corps of Engineers North Pacific Division, and US Department of the Interior Bureau of Reclamation, November 1995, Appendix J: Recreation, *in Columbia River System Operation Review Final Environmental Impact Statement*, page 2-37.

Canada's portion of Lake Koocanusa features two BC provincial parks, two BC Ministry of Forestry camping and boating access sites, and two private resorts.[70] In the US, the entire area of the lake falls within the Kootenai National Forest. The USFS administers eight recreation sites on the lake, of which six offer camping and two are day use only facilities. Five sites offer boating and fishing access, while two sites have swimming beaches. The ACOE manages the operation of Libby Dam, the Lake Koocanusa Visitor Center, and the Souse Gulch day use area which offers boating and fishing access. The USFS owns, but a private operator runs, the Lake Koocanusa Resort and Marina which features camping, boating and fishing access. Three other private operators have recreation access sites on the US portion of the lake, two of which offer camping, two offer boating, and one offers fishing access.[71,72]

Table 2-8
Summary of Recreation Facilities and Access, Lake Koocanusa

		Number of Facilities Featuring				
Country	**Total Facilities**	**Boating Access**	**Fishing Access**	**Swimming Beach**	**Camping**	**Sightseeing**
Canada	6	5	3	2	5	
US	15	12	10	3	13	1

Source: Tetra Tech, Inc., May 2005, Recreation Affected Environment, Appendix E in Upper Columbia Alternative Flood Control And Fish Operations Draft Environmental Impact Statement, (Prepared for US Army Corps of Engineers, Seattle District and Bureau of Reclamation), Seattle, WA.

Bonneville Power Administration, US Army Corps of Engineers North Pacific Division, and US Department of the Interior Bureau of Reclamation, November 1995, Appendix J: Recreation, *in Columbia River System Operation Review Final Environmental Impact*.

70 Tetra Tech, Inc., May 2005, Recreation Affected Environment, Appendix E in Upper Columbia Alternative Flood Control And Fish Operations Draft Environmental Impact Statement, (Prepared for US Army Corps of Engineers, Seattle District and Bureau of Reclamation), Seattle, WA.

Bonneville Power Administration, US Army Corps of Engineers North Pacific Division, and US Department of the Interior Bureau of Reclamation, November 1995, Appendix J: Recreation, *in Columbia River System Operation Review Final Environmental Impact Statement*, page 2-37.

71 Tetra Tech, Inc., May 2005, Recreation Affected Environment, Appendix E in Upper Columbia Alternative Flood Control And Fish Operations Draft Environmental Impact Statement, (Prepared for US Army Corps of Engineers, Seattle District and Bureau of Reclamation), Seattle, WA.

Bonneville Power Administration, US Army Corps of Engineers North Pacific Division, and US Department of the Interior Bureau of Reclamation, November 1995, Appendix J: Recreation, *in Columbia River System Operation Review Final Environmental Impact Statement*, page 2-37.

72 Not listed in Table 2-8 is the Murray Springs Fish Hatchery, owned by the ACOE and operated by the Montana Department of Fish, Wildlife, and Parks (MFWP). It is not clear from either MFWP or the ACOE websites if the hatchery is open to the public.

Kootenai River

The primary recreation activity on the river from Libby Dam to the Idaho border is fishing. The Kootenai River is a Class I (or blue ribbon) trout fishery from Libby Dam to the Kootenai Falls.[73] There is a limited amount of bank fishing on the river in Montana; most fishing is done either by drift boat, or by boating to a site and wading. When the river flows are strong and the river levels are high, bank fishing in Montana becomes almost impossible due to the steepness of the river canyon.[74]

The ACOE operates four boating and fishing access sites from Libby dam to about 2.5 miles below the dam. The USFS service operates another three boat launch sites, two located above the Kootenai falls, and one below the falls at the Yaak River Campground. There are also two city launches, one operated by the City of Libby, and another by the City of Troy. Additionally, there are a number of less developed and private launches located along the river in Montana and Idaho.[75] The USFS and ACOE operate, respectively, one and two campgrounds on the Montana portion of the river. There are also three privately owned motels or hotels on the Montana portion of the river, and six privately owned campgrounds and RV parks.[76]

Approximately seven fishing outfitters have operated on the river in Montana for each of the past ten years.[77] The outfitters typically offer one day trips with one to two people per boat.[78] At least four of the outfitters offer campgrounds, cabins, or other lodging.[79]

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73 Montana Department of Fish, Wildlife, and Parks, January 13, 2000, Montana Department of Fish, Wildlife, and Parks Stream Fishery Classification 1999 Final Sport Fisheries Value, Class I and II Streams, Helena, MT.

74 Personal communication with Tim Linehan, Linehan Outfitting Company and president of the Kootenai Valley Trout Club Chapter of Trout Unlimited, Troy, MT, November 14, 2005.

75 Personal communication with Ben Fansler, Kootenai National Forest head of boat launch permitting, November 16, 2005.

76 DexOnline.com Directory, Accessed online at http://www.dexonline.com/servlet/ActionServlet?pid=bsearch, December 4, 2005.

77 Board of Outfitters, Years 1995-2005, Resident and Non-Resident Fishing, Montana Department of Labor and Industry, Business Standards Division, Helena, MT, Printed October 27, 2005.

78 Personal communication with Tim Linehan, Linehan Outfitting Company and president of the Kootenai Valley Trout Club Chapter of Trout Unlimited, Troy, MT, November 14, 2005.

Personal communication with Ben Fansler, Kootenai National Forest head of boat launch permitting, November 14, 2005.

Personal communication with Robert Winstrom, owner, Kootenai River Outfitters, Troy, MT, November 9, 2005.

Dave Blackburn's Kootenai Angler, Rates, Accessed online at http://www.montana-flyfishing.com/?id=7, December 2, 2005.

79 Kootenai River Outfitters, Guest Ranch, Accessed online at http://www.kroutfitters.com/guestranch.htm, December 4, 2005.

Some angling also occurs on the Kootenai River in Idaho, north of Bonners Ferry. However, the quality of trout habitat on the Idaho portion of the river is not as good as that in Montana as the river spreads out and has fewer riffles and produces less invertebrates for feed than the Montana sections.[80] Idaho has one state-operated boating access site near the Kootenai National Wildlife Refuge in Bonner's Ferry, Idaho.[81] The Refuge also offers waterfowl hunting in its wetlands.[82] Another popular boating activity is kayaking or rafting at Kootenai Falls[83] and from the Yaak River confluence to the Highway 2 Bridge in Bonners Ferry, Idaho.[84]

There are at least two boat ramps on the Canadian portion of the river from the US border to Kootenay Lake.[85] It is unknown how many campgrounds, other lodging, or recreational facilities are available in Canada. Table 2-9 lists the developed recreational facilities on the Kootenai River and summarizes the number of these sites that either feature or allow access to the recreational activities described.

Dave Blackburn's Kootenai Angler, Riverfront Accomodations, Accessed online at http://www.montana-flyfishing.com/?id=4 , November 3, 2005.

Linehan Outfitting Company, Kootanei River Guides, Lodging, Accessed online at http://www.fishmontana.com/lodging.cfm, November 3, 2005.

Silver Bow Outfitters, Camps, Accessed online at http://www.silverbowoutfitters.com/camps.html, December 4, 2005.

80 Personal communication with Tim Linehan, Linehan Outfitting Company and president of the Kootenai Valley Trout Club Chapter of Trout Unlimited, Troy, MT, November 14, 2005.

81 Personal communication with Wayne Wilkersen, Maintenance Manager, Kootenai National Wildlife Refuge, Bonners Ferry, ID, December 1, 2005.

82 Personal communication with Dianna Ellis, Refuge Manager, Kootenai National Wildlife Refuge, Bonners Ferry, ID, November 15, 29, 2005.

83 Big Sky Fishing (BSF), 2004, Website regarding boating and kayaking opportunities on the Kootenai River, accessed online at http://www.bigskyfishing.com/River-Fishing/NW-MT-Rivers/Kootenai-River/Kootenai-River.htm, December 4, 2005.

84 Tetra Tech, Inc., May 2005, Recreation Affected Environment, Appendix E in Upper Columbia Alternative Flood Control And Fish Operations Draft Environmental Impact Statement, (Prepared for US Army Corps of Engineers, Seattle District and Bureau of Reclamation), Seattle, WA.

85 Tetra Tech, Inc., May 2005, Recreation Affected Environment, Appendix E in Upper Columbia Alternative Flood Control And Fish Operations Draft Environmental Impact Statement, (Prepared for US Army Corps of Engineers, Seattle District and Bureau of Reclamation), Seattle, WA.

Table 2-9
Summary of Recreation Facilities and Access, Kootenai River

Country or State	Total Facilities	Number of Facilities Featuring: Boating Access	Fishing Access	Kayaking	Camping & Lodging	Waterfowl Hunting	Sightseeing & Wildlife Viewing
Montana	13+	12+	12+	2	12+		
Idaho	2	1	1			1	1
Canada	2	2	2				

Kootenay Lake

Kootenay Lake is formed by the waters of the Kootenay River north of Creston in southern British Columbia. The Lake is shaped like a bow and arrow, with the main north-south portion of the lake forming the bow, and the smaller and thinner east-west portion, or the "West Arm," from Balfour in the east to Nelson in the west, forming the arrow. The arrow-shaped portion of the lake is also the lake's outlet, which confluences with the Columbia River near Castlegar, BC.[86]

All portions of the lake offer recreational facilities and activities, although the west arm is more recreationally developed.[87] Boating, angling, and camping are popular throughout the region. Table 2-10 summarizes the recreational facilities and the types of recreational activities offered. Twenty recreational facilities were identified; six are privately run campgrounds and marinas, seven are operated by the BC Ministry of Parks, and four are operated by the BC Kootenai Lake Forest District. The Creston Valley Wildlife Management Area is operated by an organization of the same name.[88] Three of the provincial parks (Davis Creek/Lost Ledge, Drewry Point, and

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86 Shangaan Webservices Inc., Victoria, BC, 2003, "Kootenay Lake," and "Maps: The BC Rockies and the Kootenays," accessed online at http://www.britishcolumbia.com/regions/towns/?townID=4108, and http://www.britishcolumbia.com/Maps/?id=8BritishColumbia.com, respectively, December 4, 2005.

87 Shangaan Webservices Inc., Victoria, BC, 2003, "Kootenay Lake," accessed online at http://www.britishcolumbia.com/regions/towns/?townID=4108, December 4, 2005.

88 Tetra Tech, Inc., May 2005, Recreation Affected Environment, Appendix E in Upper Columbia Alternative Flood Control And Fish Operations Draft Environmental Impact Statement, (Prepared for US Army Corps of Engineers, Seattle District and Bureau of Reclamation), Seattle, WA.

Creston Valley Wildlife Management Area, November 23, 2005, "About the CVWMA," Creston, BC, accessed online at http://www.crestonwildlife.ca/aboutus.shtml, December 4, 2005.

Kootenai Lake Chamber of Commerce, "Camping," accessed online at http://www.kootenaylake.bc.ca/AC_Camping.shtml, December 4, 2005.

British Columbia Ministry of Forests, Kootenay Lake Forest District, Recreation Sites, accessed online at http://www.for.gov.bc.ca/dkl/rec/recsites/recsites.htm, December 5, 2005.

Kookanee Chalets, RV Park, and Campground, 2005(?), accessed online at http://www.kokaneechalets.com/, December 5, 2005.

Midge Creek) are located near the southern end of the lake and are Marine Parks with boat access only. One Forest District campground, Tye Beach is also boat-in only.

One private fishing charter business and one private kayak and canoe rental business were identified in web sites maintained by local chambers of commerce. However, it may be that additional private businesses are dependent on Kootenay Lake recreation.

Table 2-10
Summary of Recreational Facilities and Access on Kootenay Lake, BC

	Number of Sites Featuring					
Total Facilities	**Boat Access**	**Fishing Access**	**Swimming Beach**	**Camping**	**Sightseeing & Wildlife Viewing**	**Waterfowl Hunting**
20+	14	17	15	15	4	1

Sources: Tetra Tech, Inc., May 2005, Recreation Affected Environment, Appendix E in Upper Columbia Alternative Flood Control And Fish Operations Draft Environmental Impact Statement, (Prepared for US Army Corps of Engineers, Seattle District and Bureau of Reclamation), Seattle, WA.

Creston Valley Wildlife Management Area, November 23, 2005, "About the CVWMA," Creston, BC, accessed online at http://www.crestonwildlife.ca/aboutus.shtml, December 4, 2005.

Kootenai Lake Chamber of Commerce, "Camping," accessed online at http://www.kootenaylake.bc.ca/AC_Camping.shtml, December 4, 2005.

British Columbia Ministry of Forests, Kootenay Lake Forest District, Recreation Sites, accessed online at http://www.for.gov.bc.ca/dkl/rec/recsites/recsites.htm, December 5, 2005.

Kookanee Chalets, RV Park, and Campground, 2005(?), accessed online at http://www.kokaneechalets.com/, December 5, 2005.

British Columbia Ministry of Environment, BC Parks, Map, accessed online at: http://wlapwww.gov.bc.ca/bcparks/explore/regional_maps/nelson.htm, December 5, 2005.

The International Selkirk Loop, Bonner's Ferry, ID, "Kootenay Lake, BC," Accessed online at http://www.selkirkloop.org/map_bc-kootenaylake.htm, December 5, 2005.

2.6 REGULATORY ENVIRONMENT

This section provides relevant information about the regulatory elements that exist in the absence of listing or CHD for the sturgeon. Where proposed activities directly affect critical habitat areas, these regulations may provide a level of protection to the species even in the absence of section 7 of the Act. There are no HCPs associated with the sturgeon.

British Columbia Ministry of Environment, BC Parks, Map, accessed online at: http://wlapwww.gov.bc.ca/bcparks/explore/regional_maps/nelson.htm, December 5, 2005.

The International Selkirk Loop, Bonner's Ferry, ID, "Kootenay Lake, BC," Accessed online at http://www.selkirkloop.org/map_bc-kootenaylake.htm, December 5, 2005.

2.6.1 Federal Regulations

Federal statutes that protect aquatic species and are particularly applicable to this analysis include the Clean Water Act (CWA), Inland Native Fish Strategy (INFISH) program of the USFS and BLM, the Pacific Northwest Electric Power Planning Conservation Act (Northwest Power Act), the National Forest Management Act (NFMA), and the Federal Land Policy and Management Act (FLPMA).

2.6.1.1 Clean Water Act

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

Under the NPDES program, the U.S. Environmental Protection Agency (EPA) sets pollutant-specific limits on the point source discharges for major industries and provides permits to individual point sources that apply these limits. EPA has delegated responsibility for the NPDES permitting program to most states. State-issued NPDES permits are treated as non-Federal actions. As such, the issuance of NPDES permits by states is not subject to the consultation requirements of the Act.

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

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 of the United States are required to submit a State certification to the licensing or permitting agency. Section 404 of the CWA prescribes a permit program for the discharge of dredged or fill material into navigable waters. Specifically, pursuant to section 404, permit applicants are required to show that they have “taken steps to avoid wetland impacts, where practicable, minimized potential impacts to wetlands, and provided compensation for any remaining, unavoidable impacts through activities to restore or recreate wetlands.”

The CWA will influence activities occurring within the proposed sturgeon CHU because these activities (e.g., road/bridge construction) may require NPDES or section 404 permits.

2.6.1.2 Pacific Northwest Electric Power Planning and Conservation Act

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

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

2.6.1.3 INFISH (Inland Native Fish Strategy)

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

2.6.1.4 National Forest Management Act of 1976[89]

The National Forest Management Act (NFMA) reorganized, expanded and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on national forest lands. The NFMA requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use,

89 6 U.S.C. §§ 1600-1614, August 17, 1974, as amended 1976, 1978, 1980, 1981, 1983, 1985, 1988 and 1990.

sustained-yield principles, and implement a resource management plan for each unit of the National Forest System. It is the primary statute governing the administration of national forests.

The NFMA requires the Secretary to promulgate an extensive list of regulations regarding the development and revision of management plans. Several of these required regulations address wildlife resources and environmental protection. For example, the Secretary must specify procedures to ensure management plans are in accordance with the National Environmental Policy Act of 1969 (NEPA). Also, the Secretary must specify guidelines for developing management plans that: ensure consideration of both economic and environmental factors; provide for wildlife and fish; provide for the diversity of plant and animal communities; ensure timber harvesting will occur only where water quality and fish habitat are adequately protected from serious detriment; ensure clearcutting and other harvesting will occur only where it may be done in a manner consistent with the protection of soil, watersheds, fish, wildlife, recreation, aesthetic resources and regeneration of the timber resource.

The existing and proposed critical habitat for the sturgeon is surrounded by the Kootenai and Idaho Panhandle National Forests. Both forests are operating under Forest Plans adopted in 1987, however, the Forest Plans are near the end of their intended lives and are being revised to reflect resource and social changes as well as new scientific information. The Forest Plans are scheduled to be updated by early 2007. Management considerations for the sturgeon will include: (1) provide for the recovery of the sturgeon; (2) avoid habitat degradation that would put the sturgeon at risk; (3) habitat restoration; and (4) maintain and protect species richness/biological significance.[90]

2.6.1.5 Federal Land Policy and Management Act of 1976[91]

The Federal Land Policy and Management Act (FLPMA) constitutes the organic act for the BLM and governs most uses of the Federal public lands, including grazing. The FLPMA requires the BLM to execute its management powers under a land use planning process that is based on multiple use and sustained yield principles.

Congress declared it is the policy of the U.S. that: public lands be retained in Federal ownership; public lands and their resources be periodically inventoried and their use coordinated with other Federal and State planning; the Secretary of the Interior establish rules for administering public lands and adjudicating disputes; public lands management be based generally on multiple use and sustained yield; public lands be managed to protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values; public lands be managed to preserve and protect certain lands in their natural condition, to provide food

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90 "Entire Document," Geographic Areas (GAs) and Workgroups Information for Lower Kootenai, Bull, and Libby GAs, viewed on November 28, 2005. Available at http://www.fs.fed.us/kipz/ga/

91 3 U.S.C. §§ 1701-1782, October 21, 1976, as amended 1978, 1984, 1986, 1988, 1990-1992, 1994 and 1996.

and habitat for fish, wildlife and domestic animals and to provide outdoor recreation and human use; the U.S. receive fair market value for the use of public lands and their resources unless otherwise provided by statute; uniform procedures for the disposal, acquisition and exchange of public land be established by statute; regulations and plans for protection of public lands of critical environmental concern be promptly developed; public lands be managed in a manner that recognizes the nation's need for domestic sources of minerals, food, timber and fiber; the Federal government should compensate state and local governments for burdens created as a result of the immunity of Federal lands from state and local taxation.[92]

Since 1981, BLM has managed its North Idaho public lands in accordance with a land use plan entitled the Emerald Empire Management Framework Plan. To ensure that management decisions are in compliance with current regulations and policies and consistent with current issues, the BLM is preparing and will replace the 1981 plan with the Coeur d'Alene Resource Management Plan (RMP).[93] A RMP is a land use plan that describes broad, multiple-use guidance for managing public lands. The Coeur d'Alene RMP is scheduled to be updated by early 2007. Management decisions affecting "special fish" (i.e., sturgeon, bull trout, burbot, westslope cutthroat trout, and shorthead sculpin) will include establishing streamside vegetation buffers and restricting development activities (e.g., road construction, timber sale planning).[94]

2.6.2 STATE REGULATIONS

Sturgeon are listed as a "species of concern" by both Idaho and Montana.[95] Other relevant state laws and regulations directed toward protection of aquatic habitat include the Montana Stream Protection Act, Montana Streamside Management Zone Law, Montana Natural Streambed and Land Preservation Act, and Idaho Forest Practices Act.

2.6.2.1 Idaho Forest Practices Act

The State of Idaho supplements requirements of the CWA through the Idaho Forest Practices Act. This Act applies to state and private forest land in Idaho, and also to Federal forest lands within the state. The Idaho Department of Lands is responsible for administering the Act on state and private lands. The forest practices regulated through the Act include timber harvest, reforestation activities, slashing practices, salvage logging, and the use of chemicals and fertilizers. Idaho

92 3 U.S.C. § 1701.

93 U.S. Department of the Interior / Bureau of Land Management / Idaho, Land Use Planning in Idaho, viewed on November 28, 2005. Available at: http://www.blm.gov/rmp/id/cda/general/maps.htm

94 U.S. Department of the Interior / Bureau of Land Management / Coeur d'Alene Field Office, Idaho, Summary of the Analysis of the Management Situation Coeur d'Alene Field Office Planning Area January 2005.

95 http://fishandgame.idaho.gov/cms/wildlife/nongame/specialspecies.cfm and http://fwp.state.mt.us/wildthings/concern/default.html

requires the use of BMPs to protect water quality during timber harvest or other forestry operations. The BMPs are designed to meet the requirements of the CWA.

2.6.2.2 Montana Streamside Management Zone Law

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

2.6.2.3 Montana Stream Protection Act

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

2.6.2.4 Montana Natural Streambed and Land Preservation Act

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

2.7 OTHER LISTED SPECIES

Numerous other federally or state-listed species may exist within or near sturgeon critical habitat. To the extent that these other species require the same protective measures as sturgeon, costs incurred that protect sturgeon habitat may not be solely attributable to the presence of sturgeon. This analysis does not attempt to allocate costs among different species. Instead, all costs of conservation within sturgeon habitat are assumed to be attributable to the presence of sturgeon. Table 2-11 summarizes federally-listed species that may occur within or near sturgeon critical habitat.

Table 2-11
Other Federally-Listed Species Considered in Previous Section 7 Consultations with Sturgeon

Common Name	Species
Bull trout	*Salvelinus confluentus*
Snake River spring/summer Chinook salmon	*Oncorhynchus tshawytscha*
Snake River fall Chinook salmon	*Oncorhynchus tshawytscha*
Snake River sockeye salmon	*Oncorhynchus nerka*
Snake River steelhead	*Oncorhynchus mykiss*
Idaho springsnail	*Pyrgulopsis[-Fontelicella] idahoensis*
Snake River physa snail	*Physa natricina*
Bliss Rapids snail	*Taylorconcha serpenticola*
Utah valvata snail	*Valvata utahensis*
Bruneau hotspring snail	*Pyrgulopsis bruneauensis*
Bald eagle	*Haliaeetus leucocephalus*
Woodland caribou	*Rangifer tarandus caribou*
Canada lynx	*Lynx Canadensis*
Gray wolf	*Canis lupus*
Grizzly bear	*Ursus arctos horribilus*
Northern Idaho ground squirrel	*Spermophilus brunneus brunneus*
Whooping crane	*Grus Americana*
Banbury spring lanx	*Lanx sp.*
Spalding’s catchfly	*Silene spaldingii*
Macfarlane’s four o’clock	*Mirabilis macfarlanei*
Water howellia	*Howellia acqatilis*
Ute’s ladies’ tresses	*Spiranthes diluvialis*

This section presents potential administrative costs of actions taken under section 7 of the Act associated with the geographic area proposed as critical habitat for the sturgeon. First, this section defines the types of administrative costs likely to be associated with sturgeon critical habitat. Next, the analysis presents estimates of the number of technical assistance efforts and consultations likely to result from the designation of critical habitat for the sturgeon and/or the listing of the species, as well as the per-unit costs of each of these activities. Based on this analysis, estimates of past and future expected administrative costs are derived.

3.1 CATEGORIES OF ADMINISTRATIVE COSTS

The following section provides an overview of the categories of administrative cost impacts that arise due to the implementation of section 7 in the geographic area proposed as sturgeon critical habitat.

3.1.1 TECHNICAL ASSISTANCE

Frequently, the Service responds to requests for technical assistance from State agencies, local municipalities, and private landowners and developers who may have questions regarding whether specific activities may affect critical habitat. Technical assistance costs represent the estimated economic costs of informational conversations between these entities and the Service regarding the designation of critical habitat for the sturgeon. Most likely, such conversations will occur between municipal or private property owners and the Service regarding lands designated as critical habitat or lands adjacent to critical habitat. The Service's technical assistance activities are voluntary and generally occur in instances where a federal nexus does not exist.

3.1.2 SECTION 7 CONSULTATIONS

Section 7(a)(2) of the Act requires federal agencies (Action agencies) to consult with the Service whenever activities that they undertake, authorize, permit, or fund may affect a listed species or designated critical habitat. In some cases, consultations will involve the Service and another Federal agency only, such as the ACOE. More often, they will also include a third party involved in projects on non-Federal lands with a Federal nexus, such as state agencies and private landowners.

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

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

3.2 Estimated Costs of Consultations and Technical Assistance

Estimates of the cost of an individual consultation and technical assistance request were developed from a review and analysis of historical section 7 files from a number of Service field offices around the country conducted in 2002. These files addressed consultations conducted for both listings and critical habitat designations. Cost figures were based on an average level of effort of low, medium, or high complexity, multiplied by the appropriate labor rates for staff from the Service and other Federal agencies.

The administrative cost estimates presented in this section take into consideration the level of effort of the Service, the Action agency, and the applicant, as well as the varying complexity of the consultation or the technical assistance request. Costs associated with these consultations include the administrative costs associated with conducting the consultation, such as the cost of time spent in meetings, preparing letters, and the development of a biological opinion. Table 3-1 provides a summary of the estimated administrative cost per consultation or technical assistance request.

Table 3-1
Estimated Administrative Cost per Consultation or Technical Assistance Request [a]

Consultation Type	Service	Action Agency	Third Party	Biological Assessment
Technical Assistance	$260 - $680	N/A	$600 - $1,500	N/A
Informal Consultation	$1,000 - $3,100	$1,300 - $3,900	$1,200 - $2,900	$0 - $4,000
Formal Consultation	$3,100 - $6,100	$3,900 - $6,500	$2,900 - $4,100	$4,000 - $5,600

[a] Low and high estimates primarily reflect variations in staff wages and time involvement by staff.

Sources: Industrial Economics, Inc., analysis based on data from the Federal Government General Schedule Rates, Office of Personnel Management, 2002, and a review of consultation records from several Service field offices across the country.

3.3 SUMMARY OF PRE-DESIGNATION ADMINISTRATIVE COSTS

Since the listing of the sturgeon in 1994, three formal consultations have been completed on the species, two related to the operations of the Federal Columbia River Power System (FCRPS), and another, related to the operations of Libby Dam. In addition, two formal consultations related to state water quality standards in Idaho (one related to water temperature and another related to numeric criteria for toxic substances) ended prematurely, prior to completion. The Service has also conducted nine informal consultations on the species since the listing of the sturgeon in 1994. One of these informal consultations was on Idaho statewide water quality standards (the application of natural background condition as a water quality standard). Similar to the two formal consultations of statewide water quality standards, this consultation also ended prematurely prior to completion.

Pre-designation administrative costs associated with section 7 consultations for sturgeon conservation are summarized in Table 3-2. Except for the consultations related to the Kootenai National Wildlife Refuge, all of the consultations are related to broader water flow and quality issues upstream or outside of the critical habitat and are not specific to a particular unit. Considering more than 80 percent of the pre-designation consultations cannot be divided and/or assigned to a unit, the pre-designation administrative costs are not reported at the unit level. As shown, since 1994, pre-designation costs are estimated to range from $150,000 to $260,000 (2005 dollars). This is likely an overestimate as the full range of costs from the cost model (Table 3-1) were applied to all consultations, including the three consultations that ended prematurely, the four inter-agency consultations on activities occurring at the Kootenai National Wildlife Refuge, and the emergency consultation on the repair of the ruptured natural gas pipeline. It is likely the administrative costs for these eight consultations were on the lower end of the cost range. Pre-designation costs for associated project modifications are discussed in the relevant activity chapters that follow.

3.4 PROJECTED FUTURE SECTION 7 CONSULTATIONS INVOLVING THE STURGEON

The eleven-year consultation history for the sturgeon indicates few activities with a Federal nexus impact the sturgeon, and none have involved a private individual or landowner. Aside from the emergency consultation on the repair of a ruptured gas pipeline and three abandoned programmatic consultations on statewide water quality standards, all but three of the consultations have involved the operations of the FCRPS/Libby Dam and the Kootenai National Wildlife Refuge. While the ACOE recently completed consultation with the Service on the operations of Libby,[96] future consultations on the operation of the dam are not anticipated.[97] Similarly, the Service does not anticipate future inter-agency consultations on the operation of the Kootenai National Wildlife Refuge.[98]

Given that bridges cross the existing and proposed designation, the Montana Department of Transportation (MDT) and Idaho Transportation Department (ITD) were contacted regarding future road/bridge construction activities in the vicinity of the CHD. MDT does not anticipate any section 7 consultations on road/bridge projects in the vicinity of the CHD in Montana during the next 20 years.[99] While no such projects are currently planned in Idaho, the ITD anticipates two projects within the 2006 to 2025 timeframe, maintenance/reconstruction activities on the US-95 Bridge across the Kootenai River and the US-2 Bridge over the Moyie River.[100] Based on past experience involving section 7 consultations on aquatic species, ITD expects each section 7 consultation would cost approximately $17,000, or about $20,000 (low level informal consultation) to $30,000 (high level formal consultation) per consultation after accounting for the Service and Action agency costs (Table 3-1). No project modifications are expected. The project on the US-95 Bridge across the Kootenai River is attributable to Unit 2 (Meander Reach), and the project on the US-2 Bridge is attributable to Unit 1 (Braided Reach).

Table 3-3 provides a summary of administrative costs that have occurred (pre-designation) or are anticipated to occur (post-designation) associated with section 7 consultations and CHD. An estimated cost of about $150,000 to $260,000 has occurred prior to the designation of CHD in February 2006. After designation, approximately $40,000 to $60,000 in post-designation administrative costs are forecast in undiscounted 2005 dollars, or between $10,000 and $20,000

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96 The Service recently completed the BO on the operations of Libby Dam on February 18, 2006, after the publication of the interim final rule (February 8, 2006) and after the completion of the initial Draft Economic Analysis of Critical Habitat Designation for the Kootenai River White Sturgeon (February 1, 2006). Thus, for the purpose of this revised economic analysis, the administrative costs related to the BO are considered a pre-designation impact.

97 Personal communication with Kenneth Brunner, ACOE, November 10, 2005.

98 Personal communication with Service Biologist, Spokane, WA, November 22, 2005.

99 Personal communication with Pat Basting, Montana Department of Transportation, Missoula, MT, November 14, 2005.

100 Personal communication with Mike Hartz, Environmental Planner, Idaho Transportation Department, Coeur d'Alene, ID, November 14, 22, and 29, 2005.

in PV terms at discount rates of three and seven percent. Annualized costs are estimated at approximately $1,000 to $1,500.[101] *Half of these costs are attributable to the proposed designation (Unit 1, Braided Reach).*

Table 3-3
Summary of Administrative Costs for Sturgeon

	Pre-Designation (Total) (1994-2005)	Post-Designation (Total) (2006-2025)			Post-Designation (Annualized)	
		Undiscounted	3%	7%	3%	7%
Total Section 7 Costs	$150,000 - $260,000	$40,000 - $60,000	$10,000 - $20,000	$10,000 - $20,000	$1,000 - $1,500	$1,000 - $1,500
Impacts Associated with the Braided Reach	**$0**	**$20,000 - $30,000**	**5,000 - $10,000**	**$5,000 - $10,000**	**$500 - $750**	**$500 - $750**

101 Because the time frame of the future section 7 consultations on ITD's bridge projects is unknown, the analysis assigns a uniform probability to administrative consultation costs being incurred in each year. As a result, the annualized post-designation administrative consultation costs are equal at three and seven percent discount rates.

Table 3-2
SUMMARY OF SECTION 7 CONSULTATIONS FOR PROJECTS IN STURGEON HABITAT

Date	Agency	Unit	Project Summary	Project Modification Summary	Costs
			Formal Consultations		
7/9/04	ACOE, BPA	n/a	Libby Dam. Future operations and maintenance (BO completed February 18, 2006).	Regulate lake levels and operate Libby Dam using VARQ to provide sturgeon flows, conduct studies and monitoring, create spawning substrate and rearing habitat, support experiments to relocate spawning pair, lake fertilization, and operation and expansion of the fish hatchery (see Table 4-4).	Administrative cost of consultation, with a biological assessment (BA): $13,900 - $22,300
2/04	EPA	n/a	Idaho Water Quality. Revisions to Idaho's statewide water quality standards. The revisions allow water temperatures in a waterbody to be insignificantly higher than the applicable criteria.	Consultation prematurely ended.	Administrative cost of programmatic consultation, without BA: $20,700 - $29,900
12/99	ACOE, BPA, BOR	n/a	Federal Columbia River Power System. Future operations and maintenance.	Regulate lake levels and operate Libby Dam using VARQ to provide sturgeon flows, conduct studies and monitoring, support lake fertilization and operation of the fish hatchery (see Table 4-4).	Administrative cost of consultation, with BA: $13,900 - $22,300

Date	Agency	Unit	Project Summary	Project Modification Summary	Costs
12/20/99	EPA	n/a	Idaho Water Quality. Idaho's water quality standards for numeric criteria for toxic substances.	BA completed, but consultation prematurely ended.	Administrative cost of programmatic consultation, with BA: $26,300 - $35,500
12-15-94	ACOE, BPA, BOR	n/a	Federal Columbia River Power System. Operations.	Regulate lake levels and operate Libby Dam to provide sturgeon flows, studies, and monitoring (see Table 4-4).	Administrative cost of consultation, with BA: $13,900 - $22,300
			Informal Consultations		
6/28/05	Service	2	Kootenai National Wildlife Refuge Kootenai River Pump Replacement. Replace primary water supply pump.	No adverse impact is expected due to project timing (mid-September).	Administrative cost of intra-Service consultation: $3,500 - $9,900
2/22/05	DOE, BPA	n/a	Kootenai River Nutrient Restoration Project. Add liquid nitrogen and phosphorus during the natural river growing season (late June – early September) to stimulate food web production.	None	Administrative cost of consultation, with BA: $7,500 - $13,900
12/7/04	ACOE	n/a	City of Bonners Ferry Water Meter Installation. Install individual water meters at each residential connection within the City of Bonners Ferry service area.	Best Management Practices (BMPs) will be implemented to prevent storm water run-off from entering the Kootenai River or its side channels.	Administrative cost of consultation, with BA: $7,500 - $13,900

Date	Agency	Unit	Project Summary	Project Modification Summary	Costs
11/29/04	FERC	n/a	City of Bonners Ferry Sediment Removal Plan for Moyie River Hydroelectric Project. Establish protocols for periodic removal of accumulated sediments upstream from the Moyie River Hydroelectric Project 1.5 miles upstream from the confluence with the Kootenai River.	Implement BMPs (i.e., install silt curtains around dredging operations) if turbidity concentrations exceed background concentrations. Ensure that settlement ponds are maintained properly so that they fully contain sediment during sediment removal operations and extreme weather/precipitation events.	Administrative cost of consultation, with BA: $7,500 - $13,900
7/29/04	Service	2	Kootenai National Wildlife Refuge Myrtle Creek Restoration. Plant trees and shrubs along the banks of Myrtle Creek.	None	Administrative cost of intra-Service consultation, with BA: $7,500 - $13,900
1/04	EPA	n/a	Idaho Water Quality. Revisions to Idaho's statewide water quality standards. The revisions specifically address the application of natural background condition as a water quality standard.	Consultation prematurely ended.	Administrative cost of programmatic consultation, without BA: $20,700 - $29,900
12/9/03	Service	2	Kootenai National Wildlife Refuge Dike Repair Project. Provide bank stabilization, restoration, and rehabilitation activities along the Kootenai River dike and Myrtle Creek channel.	Minimize disturbance from and duration of dike construction/restoration activities.	Administrative cost of intra-Service consultation: $3,500 - $9,900
Pre-2-01		n/a	Repair of ruptured gas pipeline crossing Kootenai River at Bonners Ferry. Emergency repairs of ruptured gas pipeline.	Emergency consultation. No conservation measures are known.	Administrative cost of consultation: $3,500 - $9,900

Date	Agency	Unit	Project Summary	Project Modification Summary	Costs
8/25/95	Service	2	Kootenai National Wildlife Refuge Kootenai River Pump Installation. Replace existing pump station with reinforced concrete intake structure, pipeline, and pump sump.	Construction "work window" to avoid impacts to spawning and rearing sturgeon and maximum fish screen opening size.	Administrative cost of intra-Service consultation: $3,500 - $9,900
TOTAL Administrative Costs					**$153,400 – 257,400**

4.1 OVERVIEW AND HISTORY OF LIBBY DAM

Libby Dam is a multi-purpose dam located on the Kootenai River in Northwestern Montana, 17 miles upstream of Libby, Montana. Its functions include flood control, power generation, recreation, and related water uses.[102] Construction of Libby Dam commenced in 1966, and it began power generating operations in 1975. The dam is 422 feet tall, about one-half mile long, 310 feet wide at the base, and 54 feet wide at the crest.[103] In case of emergency situations, the dam is able to release water from the reservoir without sending it through any of the generators. This water is discharged through two spillways, which release it from the top of the reservoir, and three sluiceways, which release it from the bottom of the reservoir.[104]

The Libby Dam powerhouse contains five Francis turbines with an individual capacity of 120 megawatts. The powerhouse has a peak capacity of 600 megawatts. Power is marketed by BPA, servicing Montana, Idaho, Washington, Wyoming, California, Utah, Oregon, and Nevada.[105]

This section presents the revised economic analysis, and describes and analyzes the power generation and resulting cost impacts on Libby Dam and the Columbia River System as a whole from conservation activities intended to protect the sturgeon and its habitat. The impact results are modified from the February 2006 DEA to reflect the "Reasonable and Prudent Alternatives" (RPA) from the Service's February 18, 2006 Biological Option (BO). The RPA identified three mechanisms to meet the flow, velocity, temperature, depth, and substrate structure attributes defined in the February 2006 BO (see Table 4-4 for more detail on these attributes). These mechanisms include:

1. Increasing Kootenay Lake elevation (up to three feet higher) to provide a backwater effect;

2. Conducting work within habitat to deepen the channel; and

102 Libby Dam Scrapbook, website: http://www.libby.org/homepage/Libby-Dam/LibbyDam2.html, accessed November 28, 2005.

103 U.S. Army Corps of Engineers, website: http://www.nws.usace.army.mil/PublicMenu/Meny.cfm?sitename=libby&pagename=Tour_the_Dam, accessed November 28, 2005.

104 U.S. Army Corps of Engineers, website: http://www.nws.usace.army.mil/PublicMenu/Meny.cfm?sitename=libby&pagename=Tour_the_Dam, accessed November 28, 2005.

105 U.S. Army Corps of Engineers, website: http://www.nws.usace.army.mil/PublicMenu/Meny.cfm?sitename=libby&pagename=Tour_the_Dam, accessed November 28, 2005.

3. Providing VARQ flows from Libby Dam in coordination with the State of Montana (powerhouse capacity of 25,000 cfs plus an additional 10,000 cfs).

If Kootenay Lake elevation management, habitat improvements, and discharges from Libby Dam of up to powerhouse capacity (25,000 cfs) successfully provide the flow, velocity, temperature, depth, and substrate structure attributes defined in the February 2006 BO, releasing more than 25,000 cfs from Libby Dam will not be necessary, and structural modifications to the dam to allow passage of an additional 10,000 cfs while complying with state water quality standards will not be required.

Based on components of the February 2006 BO, including the relaxation of ramping rates and the increased lake levels at Kootenay Lake, the modeled hydropower generation and power value numbers will differ from the February 2006 DEA for the Columbia River System as a whole, as well as for Libby Dam. The relaxation of ramping rates at Libby Dam will enable quicker decision-making responses to market conditions, while the management of Kootenay Lake at higher elevations during June and July will result in the availability of water used to generate power downstream throughout the Columbia River Power System later in the summer when energy prices are typically higher. However, the magnitude of difference in power generation remains unclear without additional modeling by ACOE. While the power generation results presented in the February 2006 DEA cannot be adjusted without additional modeling efforts, the impact of the relaxed ramping rates and higher Kootenay Lake elevation on power value results can be estimated and are adjusted accordingly.

4.2 SOURCES OF INFORMATION

The ACOE Seattle District simulated fish flow operations at Libby Dam using the power impacts quantified in the Draft EIS. The simulation is based on three models. First, the ACOE modeled power generation impacts (i.e., quantity) using a Hydro System Seasonal Regulation (HYSSR) hydrologic routing model. BPA then used two models to quantify impacts to energy value, a Hydro Simulator (HYDSIM) model to quantify the power generation impact and AURORA, a model used by the Northwest Power Planning Council, BPA, and others in the region, to forecast the future market cost of electricity.

The ACOE Northwestern Division, Water Management Division, Power Branch, and Seattle District simulated fish flow operations at Libby Dam using HYSSR, a FORTRAN[106] model that utilizes a monthly time step to simulate reservoir operations, with the months of April and August split into half months to better simulate the flow variability during those months. The model simulation was based on a 52-year hydrologic record (1947 – 1999), with Libby and Hungry

106 "Fortran (also FORTRAN) is a statically typed, compiled (sometimes interpreted), imperative, computer programming language originally developed in the 1950s and still heavily used for scientific computing and numerical computation half a century later. The name is a portmanteau of Formula Translator/Translation." Source: http://en.wikipedia.org/wiki/Main_Page.

Horse dams modeled to target elevations specific to the Upper Columbia Alternative Flood Control and Fish Operations Draft EIS,[107] while the remaining dams in the Columbia River System modeled in accordance with the Pacific Northwest Coordination Agreement (PNCA). Under the PNCA, the operation of system dams is coordinated for flood control and to optimize power production. The HYSSR model simulates dam operations under each dam's respective Operating Rule Curve (ORC), which includes flood control, refill, and power critical rule curves. "The projects that operate for power first run to their ORCs, and if the energy produced is greater than the load, then the model run is complete. If the energy produced by running to the ORC is less than the load, then the projects draft until the load is met. Projects that operate specifically for fish flows do not operate to ORCs, but still generate power, which contributes toward meeting the power demand."[108] The modeling of Libby Dam also includes following the International Joint Commission (IJC) rules for Kootenay Lake, downstream from Libby Dam and the proposed and existing CHUs, as well as the agreed upon operation of the Canadian Columbia River Treaty projects (Mica, Duncan, and Arrow Dams), including Brilliant Dam expansion data and a January maximum outflow of 80,000 cfs (cubic feet per second) at Arrow, to determine the flow across the US and Canadian border.

BPA utilized HYDSIM to simulate the power generation impacts for the varying flow conditions. This program is similar to the HYSSR in that it uses a monthly time step to simulate reservoir operations. However, since HYDSIM is only capable of simulating a 50-year water record, BPA utilized hydrologic data for the years 1928 – 1978 in its modeling of power generation impacts while ACOE used the hydrologic record for 1947 – 1999. BPA then used the HYDSIM output as input into the AURORA model, "…a chronological hourly production-cost model that economically simulate[s] the operation of an electric power system. AURORA dispatches system generating resources hour-by-hour in order to meet hourly system loads, with the resources having the least variable costs (primarily the cost of fuel) being dispatched first."[109] Using AURORA, BPA developed an hourly marginal cost for the Western Electricity Coordinating Council (WECC), a region consisting of western portions of the US and Canada, for the load year

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107 The Draft EIS "…analyzes the impacts of alternative and benchmark flood control and fish operations at Libby Dam and Hungry Horse Dam in northwest Montana. Such operations are being considered for the purpose of providing reservoir and flow conditions at and below these dams for the benefit of fish listed as threatened or endangered under the Endangered Species Act, consistent with authorized project purposes including maintaining the current level of flood control benefits … The preferred alternative for Libby Dam is to implement variable discharge (VARQ) flood control operations with sturgeon, bull trout, and salmon flow augmentation. Sturgeon flow augmentation would provide tiered sturgeon volumes from the 2000 USFWS FCRPS Biological Opinion using a maximum Libby Dam discharge rate up to the existing powerhouse capacity (about 25,000 cfs). This has been the interim operation at Libby Dam since 2003." Source: U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," November 2005.

108 U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," November 2005. Appendix K.

109 U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," August 2005. Appendix K.

being modeled for two blocks of power, light load, and heavy load, in order to account for the operation of the FCRPS as a "peaking" hydro system.[110] These hourly marginal cost values (8,760 for each of the 50 water years modeled), representing the Mid-Columbia trading hub energy prices for northwestern hydroelectric power, were then used to calculate average values for each of the 14 periods modeled and the value of energy change for the EIS scenarios (described below).[111]

Considering the sturgeon-specific nature of the EIS and the recent date of the EIS and its supporting documentation and modeling, the information provided in the EIS represents the best economic information available for this economic analysis. **Note, however, that the data, assumptions, and results from the Draft EIS and its supporting documentation and modeling were not independently tested or verified.** The supporting documents relied upon for the evaluation of Libby Dam impacts in this economic analysis of critical habitat designation includes the following:

1. U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," November 2005. Executive Summary.

2. U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," November 2005. Appendix B, Hydrologic Analysis of Upper Columbia Alternative Operations, Local Effects of Alternative Flood Control and Fish Operations at Libby Dam.

3. U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," June 2005. Appendix J, Hydropower Impacts Analysis of Upper Columbia VARQ Flood Control and Fish Operations for Environmental Impact Statement.

4. U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," August 2005. Appendix K, Upper Columbia Alternative Flood Control (VARQ) and Fish Operations, Hydropower Benefit Impact Statement, Supplemental Report to the Environmental Impact Statement.

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110 "The value of energy varies hourly, daily, weekly and seasonally. Hydropower systems such as the Columbia River hydropower system are typically operated to maximize generation during higher value (on-peak) periods and minimize generation during lower value (off-peak) periods. For this evaluation [the ACOE Columbia Alternative Flood Control and Fish Operations Draft EIS, Appendix K], capturing the value of changes to weekly "on-peak" and "off-peak" energy generation should represent impacts to hydropower benefits for Columbia River basin projects. Heavy load hours (HLH) hours are what are traditionally considered "on-peak" hours. There are 96 HLH in a typical week, Monday through Saturday, 6am to 10pm. Light load hours, (LLH) are traditionally considered "off-peak" hours and are the remaining 72 hours in the week." U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," November 2005. Appendix K.

111 The Mid-Columbia trading hub is a Dow Jones & Company, Inc., forward-pricing index for power at delivery points along the mid-Columbia River.

5. U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," November 2005. Appendix L, Transmission Restriction Between Libby and Hungry Horse Dams.

6. U.S. Army Corps of Engineers, "Libby Dam Total Dissolved Gas Management Study Initial Appraisal Report," September 30, 2005.

7. Personal conversation with Scott Bettin (BPA, Portland Oregon), May 5, 2006.

4.3 OPERATIONS BASELINE AND ALTERNATIVES DESCRIPTIONS

One baseline, one no-action alternative, and two action alternative flow regimes are evaluated in this economic analysis of critical habitat designation. These scenarios are modeled by ACOE in its Upper Columbia Alternative Flood Control and Fish Operations Draft EIS, and the results are used in this economic analysis of critical habitat designation. The scenarios include LS (baseline), LS1 (no-action), LV1, and LV2 (alternative flow regimes). The definitions of each flow regime listed below are from the Upper Columbia Alternative Flood Control and Fish Operations Draft EIS, prepared for and by ACOE, Appendix K, August 2005, and Executive Summary, November 2005.

1. LS is the baseline alternative and is the operation of Libby Dam with standard flood control without any fish flows. Under standard flood control, Libby Dam generally releases high flows from January through April, while reservoir levels drop. Then the reservoir is refilled from May through July, with little water released during those months.

2. LS1 is the same as LS in terms of operating Libby Dam with standard flood control; however, LS1 incorporates fish flows, including fish flows up to current powerhouse capacity. In addition to sturgeon, Libby Dam provides flow augmentation for summer bull trout minimum flows (4,000 cfs) and salmon flow augmentation [up to 891,000 acre-feet of water from Lake Koocanusa, depending on the reservoir's elevation on July 1].[112]

3. LV1 is the operation of Libby Dam with VARQ flood control and fish flows up to current powerhouse capacity (25,000 cfs).[113] VARQ is variable discharge flood control,

112 The Service, in its 2000 FCRPS BO, recommended minimum flows from Libby and Hungry Horse dams throughout the year for the benefit of bull trout. The minimum year-round flow for bull trout from Libby Dam is 4,000 cfs. In July, August, and the period between sturgeon and salmon flow augmentation, minimum bull trout flows are based on the April through August water supply forecast (WSF) at Libby. Bull trout minimum flows would be provided through August in years when no salmon flow augmentation occurs due to low reservoir levels. Source: "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," November 2005. Executive Summary.

113 "Currently, the maximum discharge rate for sturgeon flows is limited by the existing powerhouse capacity at Libby Dam (about 25,000 cfs when the reservoir is close to full) plus about 1,000 cfs via the spillway in order to stay within the state of Montana's water quality standard for total dissolved gas (TDG)." Source: U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," August 2005. Appendix K.

developed to improve the multipurpose operations of Libby Dam, while not reducing the level of flood protection.[114] In the past, Libby Dam operated using standard flood control. As previously described, under standard flood control high flows would be released from Libby from January through April in order to make space to capture the spring runoff in May, June, and July; from January through April, reservoir levels typically dropped. Because Libby released a large amount of storage under standard flood control, the dam historically released little water during the May through July period in order to refill. Under VARQ, less system flood control space is required at Libby and Hungry Horse dams prior to spring runoff, leaving more water for fish flows. The flood control space required each year varies depending on the year's seasonal water forecast, and discharge from the dam each year varies on the seasonal water forecast, the reservoir elevation, and the estimated duration of flood control.[115]

4. LV2 is the operation of Libby Dam with VARQ flood control and fish flows up to current powerhouse capacity plus 10,000 cfs (35,000 cfs in total). This flow regime is intended to be achieved through either spilling, which could take the project out of State water quality compliance (i.e., total dissolved gas [TDG]) thereby requiring capital outlay to modify the spillways, or through the installation of additional generators to send the 10,000 cfs through the powerhouse.[116] Although it is currently not possible to spill more than 1,000 – 2,000 cfs without exceeding Montana's state water quality standards for TDG just downstream of Libby Dam, the ACOE model simulation assumes that it would be possible to discharge up to 10,000 cfs above the current powerhouse capacity of 25,000 cfs for sturgeon flow augmentation. No assumptions were made by the ACOE as to which outlets would be used for the additional 10,000 cfs release above power house capacity, as the appropriate mechanism, which may include spill, has not been determined (as is discussed below).[117]

114 "Abbreviation for Variable Flow (Q represents engineering shorthand for flow or discharge), an alternative flood control operation whereby a storage reservoir is lowered less in winter during years with a low or medium runoff forecast." Source: U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," November 2005, pp. 439-440.

115 "Generally, VARQ FC [flood control] requires less system flood control space at Libby and Hungry Horse Dams prior to spring runoff. The flood control space required in a given year varies based on each dam's seasonal water supply forecast (WSF) for that year. In years where the April to August seasonal WSF is between about 80 and 120 percent of average at Libby Dam and between 80 and 130 percent at Hungry Horse Dam, the VARQ FC reservoir elevation typically would be higher than Standard FC during the January through April drawdown period. For forecasts greater than 120 percent of average, Libby Dam typically does not achieve the draft required by either VARQ FC or Standard FC because Libby Dam outflows must be reduced to comply with the IJC Order of 1938 concerning Kootenay Lake levels. In years where the seasonal water supply forecast is higher than about 120 percent of the average volume at Libby Dam and 130 percent at Hungry Horse Dam, storage space for flood control would be the same for either VARQ FC or Standard FC." Source: U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," November 2005. Executive Summary.

116 U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," August 2005. Appendix K.

117 U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," November 2005. Appendix B.

4.4 LIBBY DAM OPERATIONS AND ENERGY GENERATED UNDER EACH ALTERNATIVE – MODELED RESULTS

The ACOE modeling (completed prior to the February 2006 BO) includes an assessment of impacts to the entire Columbia River Hydropower system (see Map 1B for placement of major dams downstream from Libby Dam) under each of the three alternatives. Additionally, it includes direct impacts at Libby Dam itself. In the ACOE analysis, impacts also accrue from operational changes at Hungry Horse Dam, however, the ACOE modeling results allow for the removal of Hungry Horse Dam to isolate the system-wide impacts attributable to Libby Dam only. Based on the ACOE modeling results, approximately 80 percent of the combined annual impacts at Libby and Hungry Horse dams are attributable to Libby Dam. For the purpose of this economic analysis of critical habitat designation, the monthly shares of impact attributable to Libby Dam are applied to the Columbia River System impacts in order to remove the estimated Hungry Horse Dam impacts and isolate the system impacts attributable to operational changes at Libby Dam.

The three different flow regimes produce different sets of energy production. Table 4-1 provides the monthly and annual generation model results under each of the three alternatives for both Libby Dam individually, and the total Columbia River system as a whole. Generation impacts, defined as the difference between each action alternative and the baseline (LV1 – LS and LV2 – LS), are also provided for Libby Dam and the Columbia River system. Although total annual generation actually increases at Libby Dam, by 13 – 24 gigawatt-hours (GWh), as water moves through the system under the two action alternatives, the Columbia River system as a whole experiences a generation decline, from 256 – 274 GWh.

Table 4-1
Generation GWh

LIBBY DAM														
Alternative	**Aug 1-15**	**Aug 16-31**	**September**	**October**	**November**	**December**	**January**	**February**	**March**	**April 1-15**	**April 16-31**	**May**	**June**	**July**	**Total**
Generation															
LS	97	79	385	125	108	288	284	147	81	28	35	80	140	263	**2,141**
LV1	140	137	148	118	104	279	180	116	86	33	43	214	278	287	**2,164**
LV2	136	134	146	118	104	278	180	116	86	33	43	227	272	280	**2,154**
Generation Impacts															
LV1-LS	44	58	(237)	(7)	(4)	(9)	(104)	(31)	4	6	8	134	138	25	**24**
LV2-LS	40	55	(238)	(7)	(4)	(10)	(104)	(31)	4	6	8	147	132	17	**13**

COLUMBIA RIVER SYSTEM															
Alternative	**Aug 1-15**	**Aug 16-31**	**September**	**October**	**November**	**December**	**January**	**February**	**March**	**April 1-15**	**April 16-31**	**May**	**June**	**July**	**Total**
Generation															
LS	4,906	4,318	7,217	7,825	9,031	10,557	14,809	10,737	10,974	5,394	5,743	14,238	13,681	12,292	**131,722**
LV1	5,029	4,550	6,281	7,823	9,118	10,467	14,278	10,572	10,967	5,505	5,758	14,512	14,067	12,541	**131,466**
LV2	5,015	4,535	6,272	7,821	9,095	10,492	14,290	10,572	10,966	5,505	5,757	14,544	14,074	12,511	**131,448**
Generation Impacts															
LV1-LS	123	232	(936)	(2)	87	(90)	(531)	(165)	(8)	111	15	274	386	249	**(256)**
LV2-LS	109	217	(945)	(4)	64	(65)	(519)	(165)	(8)	111	14	306	393	219	**(274)**

Source: Appendix K Hydropower Economic Benefits Report /Upper Columbia Alternative Flood Control and Fish Operations Draft EIS.

Note: Total Columbia River System impacts have been adjusted to include impact from Libby Dam only (Hungry Horse impacts have been estimated and removed).

4.5 LIBBY DAM OPERATIONS AND POWER VALUES UNDER EACH ALTERNATIVE – MODELED RESULTS

The economic analysis of critical habitat designation also studies both heavy load hours (HLH) and light load hours (LLH), as modeled by ACOE in its Hydropower Benefits Impact Analysis, since each type of energy has a different value.[118] Table 4-2 shows the monthly and average annual generation at Libby Dam under each alternative for HLH and LLH generation, as well as the assumed monthly prices for each type of energy, as defined by ACOE. The monthly power values used by ACOE to determine the dollar value of energy impacts were derived from hourly power prices data from the Pacific Northwest Mid-Columbia energy trading hub. The value of energy is generally higher in the on-peak period (HLH) and lower in the off-peak period (LLH).[119] These prices are applied to the generation, and Table 4-2 presents the monthly total power value of each alternative as well as the monthly power value impact for the two action alternatives for both Libby Dam and the total Columbia River system. Although Libby Dam actually increases its generation under both action alternatives, the timing, both monthly and daily, are such that modeled power value declines under both action alternatives, between $4.4 and $5.0 million (in 2005 dollars). The Columbia River system impacts from modeled Libby Dam operational changes under both action alternatives range between $28 and $29 million (in 2005 dollars).

Adaptation of the February 2006 DEA to reflect the February 2006 BO requires adjusting the modeled power values to reflect the relaxed ramping rates at Libby Dam and increased elevation at Kootenay Lake. The adjustments are estimated and attributed to the Columbia River System as a whole, although power values may change at Libby Dam. Columbia River System power values may increase by approximately $1 million annually, relative to the February 2006 DEA, due to the relaxed ramping rates at Libby Dam. Power values from managing Kootenay Lake at higher lake levels (up to three feet) would increase throughout the Columbia River System, including Canada, by about $2 to $5 million annually per foot of additional lake elevation

118 "The value of energy varies hourly, daily, weekly and seasonally. Hydropower systems such as the Columbia River hydropower system are typically operated to maximize generation during higher value (on-peak) periods and minimize generation during lower value (off-peak) periods. For this evaluation [the ACOE Columbia Alternative Flood Control and Fish Operations Draft EIS, Appendix K], capturing the value of changes to weekly "on-peak" and "off-peak" energy generation should represent impacts to hydropower benefits for Columbia River basin projects. Heavy load hours (HLH) hours are what are traditionally considered "on-peak" hours. There are 96 HLH in a typical week, Monday through Saturday, 6am to 10pm. Light load hours, (LLH) are traditionally considered "off-peak" hours and are the remaining 72 hours in the week." U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," November 2005. Appendix K.

119 U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," November 2005. Appendix K.

(compared to the February 2006 DEA), with half of this accruing to power facilities in the U.S. and the remaining half to power facilities in Canada.[120]

120 Personal communication with Scott W. Bettin, BPA, Portland, OR, May 5, 2006.

Table 4-2
Power Value – 2000 Biological Opinion

LIBBY DAM														
Alternative	**Aug 1-15**	**Aug 16-31**	**September**	**October**	**November**	**December**	**January**	**February**	**March**	**April 1-15**	**April 16-31**	**May**	**June**	**July**	**Total**
Generation (GWh)															
LS HLH	67	54	268	88	75	206	194	101	56	18	23	53	95	180	**1,478**
LS LLH	30	25	117	37	33	82	90	46	25	10	12	28	46	82	**662**
LV1 HLH	97	94	103	83	73	199	123	80	59	22	28	141	188	197	**1,487**
LV1 LLH	43	43	45	35	32	80	57	37	26	12	14	73	90	90	**678**
LV2 HLH	94	92	102	83	73	199	123	80	59	22	28	149	184	192	**1,479**
LV2 LLH	42	42	45	35	32	80	57	37	26	12	14	78	89	88	**675**
Price ($/MWh)															
HLH Price	$ 48.48	$ 39.37	$ 42.38	$ 38.59	$ 50.11	$ 57.84	$ 47.82	$ 55.21	$ 37.58	$ 32.98	$ 33.10	$ 26.28	$ 24.31	$ 37.85	
LLH Price	$ 38.21	$ 33.78	$ 37.54	$ 32.53	$ 36.07	$ 37.67	$ 34.59	$ 37.01	$ 32.56	$ 29.18	$ 28.78	$ 25.05	$ 19.23	$ 28.56	
Power Value ($1,000)															
LS	$ 4,373	$ 2,976	$ 15,734	$ 4,602	$ 4,955	$ 14,997	$ 12,405	$ 7,285	$ 2,923	$ 878	$ 1,117	$ 2,079	$ 3,183	$ 9,179	**$ 86,686**
LV1	$ 6,346	$ 5,143	$ 6,041	$ 4,356	$ 4,789	$ 14,533	$ 7,858	$ 5,755	$ 3,084	$ 1,060	$ 1,356	$ 5,543	$ 6,300	$ 10,038	**$ 82,202**
LV2	$ 6,168	$ 5,028	$ 5,981	$ 4,328	$ 4,789	$ 14,494	$ 7,858	$ 5,755	$ 3,084	$ 1,060	$ 1,356	$ 5,871	$ 6,169	$ 9,777	**$ 81,718**
Power Value Impact ($1,000)															
LV1-LS	$ 1,973	$ 2,167	$ (9,693)	$ (246)	$ (166)	$ (464)	$ (4,547)	$ (1,530)	$ 161	$ 182	$ 239	$ 3,464	$ 3,117	$ 859	**$ (4,484)**
LV2-LS	$ 1,795	$ 2,052	$ (9,753)	$ (274)	$ (166)	$ (503)	$ (4,547)	$ (1,530)	$ 161	$ 182	$ 239	$ 3,792	$ 2,986	$ 598	**$ (4,968)**
COLUMBIA RIVER SYSTEM															
Alternative	**Aug 1-15**	**Aug 16-31**	**September**	**October**	**November**	**December**	**January**	**February**	**March**	**April 1-15**	**April 16-31**	**May**	**June**	**July**	**Total**
Power Value ($1,000)															
LS	$ 222,296	$ 162,205	$ 295,665	$ 287,513	$ 414,608	$ 550,347	$ 648,054	$ 530,806	$ 395,404	$ 170,525	$ 181,257	$ 368,170	$ 309,948	$ 428,862	**$ 4,965,658**
LV1	$ 227,869	$ 170,920	$ 257,319	$ 287,439	$ 418,602	$ 545,665	$ 624,803	$ 522,670	$ 395,134	$ 174,022	$ 181,716	$ 375,248	$ 318,695	$ 437,537	**$ 4,937,639**
LV2	$ 227,235	$ 170,357	$ 256,950	$ 287,366	$ 417,546	$ 546,967	$ 625,340	$ 522,643	$ 395,116	$ 174,022	$ 181,691	$ 376,085	$ 318,841	$ 436,495	**$ 4,936,653**
Power Value Impact ($1,000)															
LV1-LS	$ 5,573	$ 8,715	$ (38,346)	$ (73)	$ 3,994	$ (4,682)	$ (23,251)	$ (8,136)	$ (270)	$ 3,497	$ 460	$ 7,078	$ 8,747	$ 8,676	**$ (28,019)**
LV2-LS	$ 4,939	$ 8,152	$ (38,715)	$ (147)	$ 2,938	$ (3,379)	$ (22,714)	$ (8,164)	$ (288)	$ 3,497	$ 434	$ 7,915	$ 8,893	$ 7,634	**$ (29,005)**

Source: Appendix K Hydropower Economic Benefits Report /Upper Columbia Alternative Flood Control and Fish Operations Draft EIS.

Note: Total Columbia River System impacts have been adjusted to include impact from Libby Dam only (Hungry Horse impacts have been estimated and removed).

Considering the February BO does not specify an elevation to manage Kootenay Lake, and that ACOE and BPA have the flexibility to use a combination of mechanisms[121] to meet the flow, velocity, temperature, depth, and substrate structure attributes defined in the February 2006 BO (see Table 4-4 for more detail on these attributes), the revised DEA presents power value results assuming the increase in lake elevation at Kootenay Lake will range from 0 to 3 feet. Managing Kootenay Lake's elevation at three feet higher would result in increase in power values in the U.S. by approximately $3 to $7.5 million (in 2005 dollars), while managing it at 0 feet higher would result in no power value increase (relative to the February 2006 DEA). Adding to these values the power value increase attributable to the relaxed ramping rates at Libby Dam results in a total increase of power values ranging from $4 to $8.5 million when Kootenay Lake is managed three feet higher, and an increase in power values of $1 million when Kootenay Lake elevation is not increased (relative to the February 2006 DEA) (in 2005 dollars). Adjusting the power revenue impacts estimated in the February 2006 DEA ($28 to $29 million in 2005 dollars) for the relaxed ramping rates and the Kootenay Lake elevation management results in annual power value impacts that range from a low $19.5 million (VARQ flows at powerhouse capacity with Kootenay Lake elevation managed 3 feet higher) to a high of $28 million (VARQ flows at power house capacity plus 10,000 cfs with Kootenay Lake elevation managed 0 feet higher) (undiscounted 2005 dollars).

4.6 LIBBY DAM TOTAL DISSOLVED GAS (TDG) MANAGEMENT ALTERNATIVES

The Service, in its 2000 BO, recommended that the ACOE release up to 10,000 cfs of flow in addition to the maximum powerhouse discharge, while staying under a TDG saturation level of 110 percent. "TDG supersaturation can cause potentially harmful gas bubble trauma (GBT) in fish and aquatic insects, resulting in direct or indirect morbidity and mortality. Symptoms of GBT generally include the internal or external formation of bubbles in the impacted organism, similar to decompression sickness or "the bends" in human divers. The bubbles damage tissue or block blood flow."[122] However, in its February 2006 BO, the Service recommended the use of three mechanisms,[123] in combination or alone, to meet the flow, velocity, temperature, depth, and substrate structure attributes defined in the February 2006 BO (see Table 4-4 for more detail on these attributes), of which only one includes the release of up to 10,000 cfs of flow in addition to the maximum powerhouse discharge, and then only as a test release during the next ten years. If

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121 These mechanisms include: (1) increasing Kootenay Lake elevation (up to three feet higher) to provide a backwater effect; (2) conducting work within habitat to deepen the channel; and (3) providing VARQ flows from Libby Dam in coordination with the State of Montana (powerhouse capacity of 25,000 cfs plus an additional 10,000 cfs).

122 U.S. Army Corps of Engineers, "Libby Dam Total Dissolved Gas Management Study Initial Appraisal Report," September 30, 2005.

123 These mechanisms include: (1) increasing Kootenay Lake elevation (up to three feet higher) to provide a backwater effect; (2) conducting work within habitat to deepen the channel; and (3) providing VARQ flows from Libby Dam in coordination with the State of Montana (powerhouse capacity of 25,000 cfs plus an additional 10,000 cfs).

Kootenay Lake elevation management, habitat improvements, and flows from Libby Dam of up to powerhouse capacity (25,000 cfs) successfully provide the flow, velocity, temperature, depth, and substrate structure attributes as defined in the February 2006 BO, passing flows of more than 25,000 cfs from Libby Dam will not be necessary and structural modifications to the dam, which allow passage of an additional 10,000 cfs while complying with state water quality standards (i.e., TDG), will not be required.

However, if increased flows of up to 10,000 cfs above powerhouse discharge are necessary, and therefore TDG management required, no measures (i.e., structural modifications to Libby Dam) would be implemented until after the completion of the release testing during the first ten years. For analysis under existing conditions, providing up to 35,000 cfs under LV2 would require use of the spillway or sluiceways at Libby Dam, which leads to TDG supersaturation in the river below the dam, exceeding State standards and the 2000 BO criterion of 110 percent. [124] In response to the Service's 2000 BO, the ACOE initiated a study to identify and evaluate structural and operational alternatives to spill the extra flow over the spillway while meeting Montana's state water quality standards (see Table 4-3).[125]

Table 4-3
Capital Costs for TDG Management Alternatives

ALTERNATIVE	IMPLEMENTATION COST	ELIMINATES TDG ISSUE	TEMPERATURE ISSUES
Upper Spillway Flow Deflectors	$5 - $10 million	No	No
Sluiceway Flow Deflectors	$6 - $8 million	No	Yes
Tailwater Mixing Structure	$5 - $10 million	No	Maybe
Side Channel with Spillway	$200 - $500 million	Yes	No
Raised Stilling Basin Floor	Could be substantial	No	Maybe
Raised Tailrace	$15 - 20 million	No	Maybe
Installation of Additional Generating Units	$54 - $200.5 million	Yes	No
Conversion of Unused Penstocks	Unknown until physical	Yes (if pressure flow	No

124 "Under normal operation, water can be discharged through the powerhouse without appreciably adding to the total dissolved gas (TDG) level of the reservoir forebay. All discharges through the powerhouse are generally well below the Montana water quality maximum for TDG of 110 percent saturation [the powerhouse passes flow through the dam under a pressurized flow regime, which minimizes TDG saturation]. When either the sluiceways or the spillway are used, the flow through or over these structures becomes highly aerated. The plunging action of these flows into the stilling basin causes TDG levels below the project to rise to levels which exceed the Montana maximum level of 110 percent saturation. Given this, the project [Libby Dam] is operated such that use of the sluiceways and/or the spillway is minimized." Source: U.S. Army Corps of Engineers, "Libby Dam Total Dissolved Gas Management Study Initial Appraisal Report," September 30, 2005.

125 U.S. Army Corps of Engineers, "Libby Dam Total Dissolved Gas Management Study Initial Appraisal Report," September 30, 2005.

ALTERNATIVE	IMPLEMENTATION COST	ELIMINATES TDG ISSUE	TEMPERATURE ISSUES
to Regulating Outlets	model study completed	regime can be preserved)	
Modifications to Submerge Sluice Outlets	Could be relatively inexpensive, but unknown until physical model study completed	Yes (if alternative functions as envisioned), but potential temperature issues	Yes
Installation of Two Additional Generating Units with Onsite Load Banks	\$60 - \$70 million	Yes	No
Siphon/Dedicated Pressure Flow System	Unknown, but probably a high cost alternative	Yes (most likely), but potential temperature issues	Maybe
Extended Right (west) Training Wall	Unknown without further study	No	No
Side Channel with Baffled Chute Spillway	\$200 - \$500 million	Yes	No
Spillway Flip Bucket	\$14 million and up	Yes (with right configuration), but potential temperature issues	Maybe

Source: U.S. Army Corps of Engineers, "Libby Dam Total Dissolved Gas Management Study Initial Appraisal Report," September 30, 2005.

One of the options includes the installation of more generators, through which the additional 10,000 cfs would flow and power would be generated and transmitted. While this alternative would increase costs, it would also facilitate an increase in revenues from Libby Dam power generation. However, the ACOE modeling results do not include any additional power generation associated with this option and the amount of additional power that would be generated is not known as power values cannot be independently estimated and the net balance of revenues and costs cannot be evaluated quantitatively. Thus, this option is evaluated only qualitatively. However, it is clear that the additional generation revenues would likely not cover the capital costs associated with installing, operating, and maintaining the additional generators, as additional generators would only operate during the period of sturgeon flows and not year around.[126] Also, generation is currently limited by the transmission capacity. Transmission of power from Libby Dam and Hungry Horse Dam is linked, and while the current combined generating capacity of the two facilities is 1,028 MW, the transmission system limits the

126 "Even with additional units beyond unit five, the project would not likely operate more than five units except during the sturgeon flow period due to downstream concerns about high flows. Thus, additional units would provide little benefit to project power reliability or be of any real benefit outside the sturgeon flow period." Source: U.S. Army Corps of Engineers, Libby Dam Total Dissolved Gas Management Study Initial Appraisal Report, September 30, 2005.

combined power generation of the two dams to 944 MW.[127] Therefore, without additional transmission capacity, increases in generation at Libby may need to be offset by decreased generation at Hungry Horse Dam.

Of the fourteen options evaluated and included in Table 4-3, only eight may eliminate the TDG issue. Three of the remaining options may produce temperature issues, thus leaving five potentially viable options for providing up to 35,000 cfs of fish flows without violating State water quality and temperature standards. These options are:

1. Side Channel with Spillway: Cost $200 - $500 million (in 2005 dollars).
2. Installation of Additional Generating Units: Cost $54 - $200.5 million (in 2005 dollars) (note that additional generation revenues are not included in the ACOE analysis to offset the costs of this option).
3. Conversion of Unused Penstocks to Regulating Outlets: Cost unknown until physical model study completed.
4. Installation of Two Additional Generating Units with Onsite Load Banks: Cost $60 - $70 million
5. Side Channel with Baffled Chute Spillway: Cost $200 - $500 million (in 2005 dollars).

The ACOE is open to all options, and no decision has been made as to which alternative is more likely as the ACOE study is only an initial appraisal of options that may meet the total dissolved gas requirements and not a technical feasibility/engineering study. No alternative is more likely than the others at this time.[128] As stated in the EIS, "[t]o date, a reliable method has not been identified that would provide the additional flows within existing TDG standards, or within existing power system limitations concerning power markets and transmission facilities."[129]

While a cheaper alternative that meets the TDG standards may be more likely than a more expensive alternative that also meets the TDG standards, the suite of options still requires engineering and feasibility studies to better determine whether the options will meet the gas requirements. Considering this uncertainty, the cost for managing TDG at Libby Dam under LV2, while maintaining adequate water temperature, is presented as a range between $54 and $500 million (total undiscounted 2005 dollars). This estimate is based on the most current and best available information on the potential costs of a suite of alternatives that might meet fish flows and not violate gas requirements or create water temperature issues.

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127 U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," November 2005. Appendix L.

128 Personal communication with Kenneth R. Brunner, Endangered Species Coordinator, ACOE, Seattle, WA, January 9, 2006.

129 U.S. Army Corps of Engineers, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS," November 2005. Executive Summary.

4.7 OTHER CONSERVATION COSTS

This section includes the economic impacts to Libby Dam from other conservation costs incurred during the pre-designation and post-designation periods. Although conservation efforts for the sturgeon began as early as 1988, this analysis limits the pre-designation costs to the period between listing and designation of critical habitat.

Both BPA and ACOE incurred costs on a regular basis to conserve the sturgeon and its habitat. These costs funded the numerous projects and studies, monitoring, reporting, fish hatchery operations, and other conservation activities outlined in the 1994/95 and 2000 BOs. The activities, described in the BOs as Reasonable and Prudent Alternatives (RPAs), Reasonable and Prudent Measures (RPMs), terms and conditions, and conservation recommendations, are summarized in Table 4-4, and are estimated to have cost ACOE $5.6 million[130] and BPA $26.6 million,[131] during the pre-designation period (in 2005 dollars). As described in the recently completed February 2006 BO, these conservation efforts are expected to continue during the post-designation period.

Other conservation efforts funded by ACOE during the post-designation period are estimated to total $4.3 million in undiscounted 2005 dollars, or $2.4 to $3.2 million in PV terms using discount rates of three percent and seven percent, respectively.[132] Annualized costs are estimated to range from $220,000 to $225,000, also at three and seven percent, respectively. BPA's portion of these post-designation conservation efforts are estimated to total $106.1 million in undiscounted 2005 dollars, or $58.8 to $80.5 million in PV terms using discount rates of three percent and seven percent, respectively.[133] Annualized costs are estimated to range from $5.4 to $5.5 million, also at three and seven percent, respectively. The total cost to ACOE and BPA of these pre- and post-designation sturgeon-related conservation efforts are presented in Table 4-5 (the cost is presented in total, not by agency).

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130 Personal communication with Kenneth R. Brunner, Endangered Species Coordinator, ACOE, Seattle, WA, November 8, 2005.

131 Personal communication with Scott W. Bettin, BPA, Portland, OR, December 6, 2005.

132 Personal communication with Kenneth R. Brunner, Endangered Species Coordinator, ACOE, Seattle, WA, November 10, 2005.

133 Personal communication with Scott W. Bettin, BPA, Portland, OR, December 6, 2005.

Table 4-4
Libby Dam Study and Other Conservation Costs for Sturgeon

1994/1995 FCRPS BO	2000 FCRPS BO	2006 Libby Dam BO
RPA	**RPA**	**RPA**
Regulate flows consistent with existing treaties and laws to maximize probability of recruitment.	Regulate flows consistent with existing treaties, public safety, and laws to maximize probability of recruitment.	Regulate flows consistent with existing statutes, treaties, executive orders, etc.
Provide flow targets of 35,000 cfs at Bonners Ferry for 42 days followed by 21 days of incubation flows of 11,000 cfs.	Beginning in 2001, implement VARQ flood control/storage, a tiered approach that varies the volume of flows depending on the forecast runoff volume to the reservoir expected in April-August.	Use a combination of releases from Libby Dam, habitat improvements, and greater Kootenai Lake elevation (backwater effect) to achieve the following 6 attributes: (1) Provide augmentation flows during May – July; (2) Maximize peak augmentation flows for up to 14 days; (3) Maximize post-peak augmentation flows for up to 21 days; (4) Provide a flow velocity of at least 3.3 ft/s in 60 percent of the rocky substrate in the Braided Reach during post-peak augmentation flows; (5) Optimize temperature releases at Libby Dam to maintain 50 degrees F with no more than a 3.6 degree F drop; (6) and Provide depths of 16.5 – 23 ft or greater in 60 percent of the rocky substrate in the Braided Reach during peak augmentation flows.

1994/1995 FCRPS BO	2000 FCRPS BO	2006 Libby Dam BO
1995 based on 4 operable turbines and maximum powerhouse flows of ~20,000 to 22,000 cfs plus spills while not exceeding state total dissolved gas supersaturation water quality standards (TDG) below Libby Dam.	Increase release capacity at Libby Dam to 35,000 cfs. Conduct spillway flow test of TDG. Beginning in 2002, use spillway for flow augmentation. Conduct NEPA analysis on structural alternatives if spillway can not be used to release 5,000 cfs.	Develop flow plan implementation protocol, including flow releases for all tiers, provisions for real time implementation of operations to coincide with the optimum temperatures, and an assessment of the probability of having appropriate conditions necessary to provide test releases of powerhouse plus 10,000 cfs during the next 10 years with implementation of VARQ flood control procedures and fish flows. Re-evaluate tiers to assess whether additional storage volumes are available to allow for a normative hydrograph to provide up to 14 days of peak (35,000 cfs) releases from Libby Dam.
>1996 based on 5 operable turbines and maximum powerhouse flows of ~25,000 to 27,000 cfs plus spills to achieve 35,000 cfs at Bonners Ferry while meeting state TDG.	Seek: (1) means to release additional 10,000 cfs from dam (5,000 cfs in 2002 and another 5,000 cfs in 2007); (2) redundancy in transformers at Libby to assure that flows can be released; and (3) means to restore, maintain, or enhance levees.	(1) Continue to implement VARQ flood control procedures; (2) implement test flow release of powerhouse plus 10,000 cfs 3 or more times during the next 10 years (3 times within the next 4 years if conditions allow) and habitat improvement projects; and (3) if test flow releases result in biological benefit and there are no other means to provide for the 6 attributes, ACOE/BPA shall seek means to more reliably provide the additional 10,000 cfs, including structural modifications to Libby Dam.

1994/1995 FCRPS BO	2000 FCRPS BO	2006 Libby Dam BO
Implement flows and studies and provide the physical means to minimize or eliminate TDG problems below Libby Dam.	Conduct studies, evaluations, and monitoring that: (1) determine effectiveness of increased flows and ramping rates; (2) verify river channel capacity and floodplain encroachment; (3) evaluate spillway maintenance needs; (4) evaluate flood levels and public safety concerns and feasibility of increasing releases above channel capacity constraints; (5) quantify effects of groundwater seepage on agriculture; (6) determine indirect effects of Libby Dam operations on sturgeon recruitment and mortality; (7) report the effects of 26 years of load following on levee integrity; (8) evaluate changes in depth, water velocity, and substrate in the vicinity of Bonners Ferry since Libby Dam became operational; (9) evaluate the feasibility of a variable December 31 flood control target of 2,411 feet at Libby Dam; (10) evaluate volume forecast procedures; and (11) investigate costs and feasibility of options that preclude additional flows of 10,000 cfs through powerhouse.	Provide (1) funding for study assessing all habitat features, including turbulence, at spawning sites; (2) one additional transformer at Libby Dam to ensure that releases of maximum powerhouse capacity can be achieved in the event of transformer failure; (3) detailed implementation plan of sturgeon management actions to meet the 6 attributes.
Insure availability of stored water for successful out-year sturgeon flows.	Support: (1) ongoing Kootenai Lake fertilization program; and (2) ongoing maintenance and monitoring of the preservation stocking program operated by the KTOI.	Coordinate with Canadian authorities to manage Kootenay Lake levels to increase river depth at Bonners Ferry during the Kootenai sturgeon spawning period.

1994/1995 FCRPS BO	2000 FCRPS BO	2006 Libby Dam BO
Study levee and stage damage curves, initiate monitoring program to evaluate downstream conditions, and modify powerhouse releases to avoid significant damage.	Attempt to limit: (1) sturgeon flows so that they do not exceed a levee elevation of 1,764 feet at Bonners Ferry; and (2) daily load following in the outflow from Libby Dam to the extent levees are no longer damaged.	Develop, implement, and monitor pilot study to structurally improve river depth and velocity at the Braided Reach. If the study is successful, design and implement permanent structural habitat features. Continue to evaluate enhancement of sturgeon spawning substrate in the Braided Reach and evaluate and implement habitat restoration measures to restore natural recruitment.
		Complete construction of and monitor Shorty's Island rock placement pilot study in the Meander Reach. Develop and model plan for full-scale placement of rocky substrate at Shorty's Island. If modeling is successful, design and implement permanent structural habitat features. Continue to evaluate enhancement of sturgeon spawning substrate in the Braided Reach and evaluate and implement habitat restoration measures to restore natural recruitment.
		Support/Fund: (1) ongoing Kootenai Lake fertilization program; (2) ongoing Kootenai River fertilization experiment; (3) continued operation and expansion of the KTOI's Aquaculture Program (hatchery program); (4) the release of fertilized eggs; and (5) ongoing studies and monitoring.

1994/1995 FCRPS BO	2000 FCRPS BO	2006 Libby Dam BO
		Utilize performance standards and adaptive management, informed by monitoring and reporting, to implement the BO. Provide Service with annual report regarding progress on RPA implementation.
	RPM	
Monitor and study effects of RPAs and modify Libby Dam operations to reduce take.	None	None
	Terms and Conditions	
Monitor sturgeon movements, spawning, egg deposition, fry production, and recruitment.	None	None
Design and conduct studies to determine effects of Libby Dam operations on sturgeon life history.		
Study discharge relationship with sturgeon life history requirements and habitat.		
	Conservation Recommendations	
Provide powerhouse report on feasibility of installing additional generation.	Negotiate for higher Kootenai Lake and River stages with agencies in Canada.	Develop an educational outreach program that informs residents along the Kootenai River about the ESA listed fish species, management techniques in force for those species, and the need for a diverse native riparian vegetation community.
Operate flows for sturgeon while meeting needs of reservoir management for resident fish and wildlife and down-river and in-reservoir interests.	Initiate section 7 consultation on the proposed Columbia River Treaty Flood Control Operating Plan, October 1999.	Seek opportunities to implement actions that will contribute to ecosystem recovery in the Kootenai Valley and to improve levee conditions in the Kootenai Flats area.

1994/1995 FCRPS BO	2000 FCRPS BO	2006 Libby Dam BO
	Monitor TDG levels and invest in facility improvements to keep TDG levels at or below state water quality standards.	Continue to provide funding for the sturgeon genetics library and to implement actions consistent with the Memorandum of Understanding for the Kootenai River/Kootenay Lake Burbot Conservation Strategy.
		Participate in the development and implementation of the final bull trout recovery plan for the Kootenai Basin.

4.8 LIBBY DAM COSTS

Table 4-5 summarizes the range of Libby Dam-related conservation costs for the sturgeon, including total pre-designation costs and total and annualized post-designation costs. The PV of total post-designation costs are assessed at a three percent discount rate, a seven percent discount rate, and undiscounted. The annualized post-designation costs are derived using both three and seven percent rates.

BPA does not currently have an assessment of pre-designation power costs. However, the system has essentially been run under the LS1 operational flow regime between 1994 and 2005, with no fish flows in 2001 and 2002. Therefore, this economic analysis of critical habitat designation estimates pre-designation power costs at the average annual system cost difference of LS1 – LS over nine years. This estimate is presented in Table 4-2.[134]

Capital costs are only incurred under the LV2 scenario and are assumed to be distributed equally over a five year period, with construction beginning in 2016 (under the February 2006 BO, structural modifications to Libby Dam, if any, would be delayed ten years until after the completion of the flow release testing). The low range of capital costs in Table 4-5 represents the cost of the LV1 scenario, providing VARQ flows of up to powerhouse capacity (i.e., $0). Under the LV2 alternative, providing flows of powerhouse capacity and an additional 10,000 cfs, capital costs range from $0 to $500 million (undiscounted 2005 dollars).

134 Generation impacts can be estimated for the no-action alternative (LS1 – LS). At Libby Dam, generation is reduced by 78 GWh and the Columbia River System generation declines by 261 MWh under LS1 as compared to LS. Comparing the no-action alternative to baseline (LS1 – LS) power values results in a decrease of $6.2 million at Libby Dam and a decrease of $20.6 million through the Columbia River System (in 2005 dollars).

Table 4-5
Summary of Libby Dam Conservation Costs for Sturgeon

Category of Impact	Pre-Designation (Total) (1994-2005)	Post-Designation (Total) (2006-2025)			Post-Designation (Annualized)	
		Undiscounted	3%	7%	3%	7%
Power Generation	$185,400,000[1]	$390,383,000-$560,103,000	$290,396,000-$416,646,000	$206,786,000-$296,687,000	$19,519,000-$28,005,000	$19,519,000-$28,005,000
Capital Costs	$0	$0 - $500,000,000	$0 - $340,773,000	$0 - $208,433,000	$ 0 - $22,908,000	$0 - $19,675,000
Other Costs[2]	$32,160,000	$110,403,000	$83,731,000	$61,163,000	$5,628,000	$5,773,000
Total Power Costs	**$217,560,000**	**$500,786,000-$1,170,506,000**	**$374,127,000-$841,150,000**	**$267,949,000-$566,283,000**	**$25,147,000-$56,538,000**	**$25,292,000-$53,453,000**
Impacts Associated with the Braided Reach	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Note: Numbers may not sum due to rounding.

[1] Not available from BPA, so a best estimate was calculated for nine years of impact (no fish flows in 2001 and 2002).

[2] Studies, monitoring, reporting, hatchery operations and expansion, habitat improvement, etc. costs are included as "Other."

4.9 SUMMARY/CONCLUSIONS

Libby Dam will be impacted by sturgeon flows in several ways. First, under either alternative LV1 or LV2, changes in dam operations will result in increased power generation at Libby Dam, but overall decreased generation through the Columbia River System. Second, although Libby Dam actually increases its generation under both action alternatives, the timing, both monthly and daily, are such that actual power value declines both at Libby Dam and throughout the Columbia River System. Third, under the LV2 alternative, the dam may require modifications after ten years in order to pass up to 35,000 cfs without violating state water quality standards. Finally, BPA and ACOE will fund the operation of the sturgeon fish hatchery, habitat improvement, and various study and monitoring programs. The post-designation Libby Dam costs are estimated to total $500 million to $1.2 billion in undiscounted 2005 dollars, or $375 to $840 million and $270 to $565 million in PV terms using discount rates of three percent and seven percent, respectively. Annualized costs are estimated to range from $25 to $56 million at three percent and $25 to $53 million at seven percent.

As mentioned previously, the geographic area of analysis includes the unit proposed for CHD (Unit 1: Braided Reach) and the unit previously designated as critical habitat in 2001 (Unit 2: Meander Reach). However, the flow-related impacts to Libby Dam are joint costs; the sturgeon flows and resulting impacts will occur whether or not the proposed unit (Unit 1), or a portion thereof, is added to the existing designation. Thus, there are no incremental impacts associated with the designation of the Braided Reach (Unit 1).

Agriculture in the study area is concentrated in the Kootenai River Valley of Boundary County, Idaho (Valley). The area is comprised of approximately 30,000 acres of agricultural land along the Kootenai River (River), both above and below Bonners Ferry, Idaho, and extending north up to the border with Canada.[135] This land is farmed by approximately 30 growers, while two farms are owned by Anheuser-Busch Companies, Inc. (Anheuser-Busch). The farmland is separated into 16 drainage districts.[136]

This section evaluates how conservation activities to protect the sturgeon and its habitat affect the agricultural industry in Kootenai River Valley, including crop cultivation and groundwater pumping for irrigation and drainage. The analysis in this section focuses only on damages to agriculture caused by groundwater seepage as a consequence of higher river stages (resulting from increased flows from Libby Dam and higher lake elevations at Kootenay Lake) to protect the sturgeon. It does not take into account the effects of flooding, including erosion of levees, as that is dealt with in Section 7.0. Additionally, the section is revised/updated from the February 2006 DEA based on the following:

1. The agriculture damage section of the DEA primarily relies upon crop damage projected in the "Kootenai River Seepage Impact Study: Final" (Seepage Study) (Harp and Darden 2005) under the various Libby Dam fish flow scenarios presented in the "Upper Columbia Alternative Flood Control and Fish Operations Draft Environmental Impact Statement" (DEIS) on Libby operations (November 2005). In this report, the hydro-regulation modeling operates Libby Dam under VARQ flood control operations to avoid exceeding a river stage of 1,764 feet (ft) above mean sea level (MSL) at Bonners Ferry, whenever possible, and simulates agriculture damage in the Kootenai River Valley and river stages at Bonners Ferry for the Libby Dam operating scenarios during 1961 (a more significant water year) and 1964 (a typical water year). The scenarios simulated in the DEIS include LS (operation of Libby Dam under standard flood control without fish flows), LV1 (operation of Libby Dam with VARQ flood control and fish flows up to current powerhouse capacity), and LV2 (operation of Libby Dam with VARQ flood control and fish flows up to current powerhouse capacity plus 10,000 cfs). Since the scenarios presented in the DEIS stemmed from the December 2000 Biological Opinion (BO), modifications in the new February 2006 BO justify a revision of impacts to agriculture from conservation efforts regarding the sturgeon.

135 Harp, Aaron J. and Tim Darden, June 2005, "Kootenai River Seepage Impact Study: Final," for U.S. Army Corps of Engineers, Seattle District.

136 HDR Engineering, August 2003, "Upper Columbia Basin Alternative Flood Control NEPA EIS: Kootenai Flats Seepage Analysis, Bonners Ferry, Idaho," for U.S. Army Corps of Engineers, Seattle District.

2. As described by Anheuser-Busch in its comment letter on the February 2006 DEA for the sturgeon, managing Kootenai Lake to achieve a lake level of 1,755 ft MSL in June would result in a lake level that is seven feet higher than the median June lake levels projected under the various Libby Dam fish flow scenarios and presented in the DEIS on Libby operations (November 2005). The associated backwater effects of this higher lake elevation will significantly impair operations at Elk Mountain Farm (Farm), and may render the Farm inoperable in its entirety because of flooding and/or saturation, resulting in Anheuser-Bush permanently losing 100 percent of the value of its property bordering the Kootenai River. The DEA does not assess the impacts to the Farm of the RPA to manage Kootenay Lake as described in the Service BO regarding ACOE and BPA's proposed operation of Libby Dam in Idaho and Montana (February 2006).[137]

   As stated earlier, the agriculture damage section of the DEA stems from the Seepage Study (Harp and Darden 2005). The hydro-regulation model in the study does not simulate the effects of managing Kootenay Lake at an elevation of 1,755 ft MSL. Thus, the range of agriculture impacts presented in the DEA for the Farm, $800,000 to $870,000 annually, likely underestimates the impacts associated with the RPA described in the February 2006 BO. The backwater effects associated with the higher lake elevation, combined with VARQ flows of 25,000 to 35,000 cfs may cause greater damage to the Farm than estimated in the DEA.

5.1 SOURCES OF INFORMATION AND METHODOLOGY

This economic analysis primarily relies upon secondary sources in the form of existing documents and studies conducted by and for the ACOE, Service, and other stakeholders. Written and verbal comments by concerned individuals and groups on the critical habitat designation, the February 2006 DEA, and the earlier February 2001 DEA are also considered. GIS maps of the area developed by ENTRIX, Inc. are used to identify the land use in the valley. Additionally, firsthand information on farming practices and impacts to agriculture in the area is obtained through direct communication with local farmers. Table 5-1 summarizes the main sources of data/information for historical and future impacts to agricultural resources and outputs in the Kootenai River Valley. While the table presents the key documents and sources used for quantifying costs, the analysis is not limited to these.

137 Comments of Anheuser-Busch Companies, Inc. on Interim Final Rule: *Endangered and Threatened Wildlife and Plants – Critical Habitat Designation for the Kootenai River Population of the White Sturgeon*, 26 Fed. Reg. 6383 (Feb. 8, 2006); 50 C.F.R. Part 17, April 10, 2006.

Table 5-1
Sources of Information on Agricultural Impacts

Period and Area of Impact	Source(s) of Information/Data
Historical Impacts (Pre-Designation)	
Crop Damage	Identified by Dave Wattenbarger, University of Idaho, College of Agriculture in letter to Phil Laumeyer, U.S. Fish and Wildlife Service, dated April 9, 1998. (Used for calculating costs for all crops, except hops) Harp, Aaron J. and Tim Darden, June 2005, "Kootenai River Seepage Agricultural Impact Study: Final," for U.S. Army Corps of Engineers, Seattle District. (Used for calculating costs for hops)
Drainage Pumping Costs	Identified by Dave Wattenbarger, University of Idaho, College of Agriculture in letter to Phil Laumeyer, U.S. Fish and Wildlife Service, dated April 9, 1998.
Agricultural Land Erosion	Personal communication with local farmers.
Future Impacts (Post-Designation)	
Crop Damage	Identified by Dave Wattenbarger, University of Idaho, College of Agriculture in letter to Phil Laumeyer, U.S. Fish and Wildlife Service, dated April 9, 1998. (Used for calculating low range costs for all crops, except hops) Harp, Aaron J. and Tim Darden, June 2005, "Kootenai River Seepage Agricultural Impact Study: Final," for U.S. Army Corps of Engineers, Seattle District. (Used for calculating high range costs for all crops, and high and low range costs for hops)
Irrigation Pumping Costs	Tetra Tech, Inc., May 2005, "Upper Columbia Alternative Flood Control and Fish Operations EIS, Socioeconomic Impact Analysis (Appendix F)," for U.S. Army Corps of Engineers, Seattle District.
Drainage Pumping Costs	Extrapolated from pre-designation costs identified by Dave Wattenbarger, University of Idaho, College of Agriculture in letter to Phil Laumeyer, U.S. Fish and Wildlife Service, dated April 9, 1998.

The future damage to crops from the February 2006 BO is estimated with existing data from gauges at Kootenay Lake and Libby Dam, and information contained in the Seepage Study (Harp and Darden 2005), including notes from interviews with farmers conducted for the Seepage Study. Lake and river gauge records show (see Figure 5-1 at the end of this section) that Kootenay Lake exceeded 1,755 ft MSL water-surface elevation in 1997, during a 24-day period from May 31 through June 23 (exceeding 1,757 ft MSL on June 12). During this same period, the discharge from Libby dam exceeded 25,000 cfs for 15 consecutive days (June 5 to June 19), ranging from 26,700 to 28,000 cfs.[138] Since the timing, duration, and magnitude of lake elevation and river flow during 1997 is similar to the lake and river management described in the February 2006 BO, the damage experienced by the farms during 1997 should be a good approximation of the magnitude of damage the farms may experience under the February 2006 BO.[139] Data related to crop damage for 2003 is used as the baseline, i.e. "the cost of farming in the area," and the difference between 1997 and 2003 costs are considered the costs of conservation activities for the sturgeon. Future pumping costs are calculated by taking LS (Standard Flood Control Operations without Fish Flows) as benchmark and comparing it to VARQ Flood Control Operations with Fish Flows at 25,000 (LV1) and 35,000 cfs (LV2).

A brief description of the methodologies applied in two studies used for estimating costs is provided in sections 5.1.1 and 5.1.2.

5.1.1 THE KOOTENAI RIVER SEEPAGE AGRICULTURAL IMPACT STUDY: FINAL (HARP AND DARDEN, 2005)

The primary source of data on crop damage and the associated costs is the study on agricultural impacts from seepage by Aaron J. Harp and Jim Darden (2005). The definition of agricultural costs due to seepage is dependent upon whether the damage occurs before or after the crop is planted. For the purpose of the analysis presented in the Seepage Study, costs are estimated in the following manner: "…..cash production costs that are lost due to reduced yield are added to the value of the yield loss, based on the time of year in which loss occurred."[140] This implies that if damage occurs before planting, the loss is valued at the lost potential yield only. However, yield reduction occurring after the crop is planted results in loss of production inputs in addition to potential yield loss.

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138 Kootenay lake elevation exceeded 1,754 feet from May 17 to June 29 (41 days). During this period, the discharge from Libby dam exceeded 25,000 cfs (but was less than 30,000 cfs) for another 3 day period (June 24 to June 26). During the 41 day period from May 17 to June 26, no discharge occurred over the spillway.

139 In 1997, discharge from Libby Dam did not exceed powerhouse capacity as the reservoir was drawn down in anticipation of the heavy water year. During June 1997, the River picked up more than 20,000 cfs of flow between Libby and Bonners Ferry. Thus, during a heavy water year flows greater than powerhouse capacity would not be likely as the River would pick up sufficient volume downstream from the dam to provide necessary flows to sturgeon (additional flows would also be unlikely because the river is managed to avoid flood damage at Bonners Ferry). In dryer years, the River would not pick up as much water between the dam and Bonners Ferry. During these years, releases of powerhouse capacity plus 10,000 cfs (35,000 cfs in total) would still provide water levels at Bonners Ferry similar to those provided during a wet year at lesser releases from the dam. Considering also the elevation of Kootenay Lake exceeded 1,755 ft MSL for more than three weeks, the 1997 water year should provide a good scenario from with to approximate damages to the Farm under the February 2006 BO. Personal communication with Scott Bettin, BPA, Portland, Oregon, May 22, 2006.

140 Harp, Aaron J. and Tim Darden, June 2005, "Kootenai River Seepage Agricultural Impact Study: Final," for U.S. Army Corps of Engineers, Seattle District.

The report integrates three preceding studies and builds upon the results to quantify economic effects of high groundwater levels in the Valley:

- First, in August 1993, HDR Engineering, Inc. completed the "Upper Columbia Basin Alternative Flood Control NEPA EIS: Kootenai Flats Seepage Analysis, Bonners Ferry, Idaho," for ACOE, Seattle District. This report details the characteristics of Kootenai Valley agriculture and agricultural practices, and forms the basis for studying impacts to agriculture from high groundwater levels. Field interviews with growers, past reports, aerial photographs, and information from agencies like Natural Resources Conservation Service and U.S. Geological Survey provided information on agriculture in the Valley. The effort covered approximately 90 percent of the acreage being farmed in the Valley, and interviewed approximately 90 percent (25) of the growers.

- Second, an agronomist, Glen A. Murray, prepared an agronomic literature review in August 2003 for HDR Engineering, Inc. and ACOE, Seattle District. The report titled "Water Logging and Crop Production in the Kootenai River Valley – Final Report," used existing literature and information from producers in Boundary County and other local and regional experts to develop relationships between depth-to-groundwater (DTGW) at specific durations and crop yield reduction by plant growth stage. The study identified the determining factors for yield reduction as timing, depth, and duration of high groundwater levels.

- Third, ACOE developed a groundwater model of the Kootenai Valley in order to generate information on DTGW at more than 80,000 locations in the Valley. The model and its output are presented in "Kootenai Flats Seepage Analysis: Groundwater Modeling Report. Upper Columbia Alternative Flood Control and Fish Operations EIS," (May 2005). The model was calibrated using observed conditions in water year 2002-2003 (a dry year) and validated using water year 1996-1997 (a wet year). The Seepage Study also presents the costs associated with seepage based on these results for 2002-2003 and 1996-1997. The groundwater model is used to estimate the percent of total acres at each DTGW and duration. The processed output identifies nodes where groundwater remains shallow long enough to reduce crop yields.

  The model is used to simulate the effects of various dam operations (six operational scenarios) on the Kootenai River, Kootenay Lake, and groundwater levels throughout the Valley. These predicted simulations are carried out for two selected water years: 1964 representing a "typical year" of hydrologic conditions, and 1961 representing a "more significant year" of hydrologic conditions.[141] The data outputs from groundwater model

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141 Based on stakeholder input, these years were selected for the simulation, 1961 represents a wet year and 1964 represents a typical year. "For each of these two years, the observed hydrologic conditions (local stream flows, basin precipitation, and inflow to Libby Dam) were combined with simulated Kootenai River and Kootenay Lake stages for six regulated outflow scenarios for Libby Dam, resulting

simulations are then processed by Harp and Darden (2005) to facilitate quantification of economic effects of high groundwater levels on agriculture in the area.

5.1.2 Upper Columbia Alternative Flood Control And Fish Operations EIS, Socioeconomic Impact Analysis (Tetra Tech, 2005)

As part of the Upper Columbia Alternative Flood Control and Fish Operations EIS, Tetra Tech carried out the Socioeconomic Impact Analysis in 2005. One area of impact evaluated was the effects on agriculture and irrigation in the Kootenai River Basin associated with changes in Libby Dam operations. Irrigation pumping costs for Montana and Idaho are calculated by distributing the quantity of water pumped for irrigation over the growing season of May to September based upon a typical irrigation season in the Upper Columbia Basin (see Table 5-2). A standard power pumping formula is used to calculate the power requirements for each flow scenario (LS, LV1, and LV2).

Table 5-2
Irrigation Water Use by Month

Month	Percent Use
May	10%
June	10%
July	30%
August	30%
September	20%
Total	**100%**

Note: Because stage data were not modeled for the Kootenai River at Bonners Ferry, ID gauge in September, for that reach, Tetra Tech, Inc., assumes that 30 percent of the irrigation occurs in July and 30 percent in August.

Source: Tetra Tech, Inc., May 2005, "Upper Columbia Alternative Flood Control and Fish Operations EIS, Socioeconomic Impact Analysis (Appendix F)," for U.S. Army Corps of Engineers, Seattle District.

5.2 Limitations of Applied Methodology

As stated earlier, the analysis in this section is primarily dependent upon secondary sources. The cited documents were authored by state and Federal employees and agencies, or by government contractors. However, due to the variety of information sources, the data may not be consistent across time periods and categories of impact. Additionally, reliable and documented data on past costs is only available for three years, 1995-1997. Also, the Seepage Study presents data

in a total of twelve predictive simulations." Source: HDR Engineering, Inc., August 2003, "Upper Columbia Basin Alternative Flood Control EIS, Kootenai Flats Seepage Analysis, Bonners Ferry, Idaho," for U.S. Army Corps of Engineers, Seattle District, p. 12.

generated using groundwater model data from the validation and calibration runs for 1997 and 2003, respectively. This analysis utilizes the 1995 and 2003 (low water years) and 1997 (high water year) costs to represent the annual costs incurred from 1998 to 2005 (with the exception of the years 2001 and 2002, when it is known that no sturgeon flows were released). This cost assignment is based on a visual observation of trends in daily water levels on Kootenay Lake, British Columbia and daily discharge at Libby Dam, Montana (see Figure 5-2 at the end of this section). Another limitation is the lack of scientific information on land erosion due to seepage. The brief analysis of this impact category is based solely upon communication with three of the approximately 30 landowners.

5.3 HISTORICAL IMPACTS

This section includes the economic impacts to agriculture from seepage in the Kootenai River Valley from listing of the sturgeon to the present. Although Libby Dam flow augmentation to protect the species began in 1992, this analysis is limited to the period between listing and designation of critical habitat (1994-2005).

The three major categories of impact to agriculture identified for this period are crop damage, increased pumping requirements, and land erosion. Additional effects of seepage not evaluated in this analysis include, but are not limited to, additional spray, seed, fuel, and time costs due to irregular shaped fields caused by wet soil, stream bank sloughing in some areas, high soil moisture content preventing the movement of farm equipment over the ground, time spent in setting up portable pumps when gravity drainage is insufficient, loss of investment when areas are affected after the application of fertilizers and pesticides, damages to dikes, reduced cattle grazing along river (pasture), and destruction of cross fences by high and low water levels.[142]

5.3.1 CROP DAMAGE

Documented information on historical costs (between listing and critical habitat designation) of crop damage due to flow augmentation at Libby Dam is only available for three years, 1995 to 1997, and does not include damage to hops. These figures are provided by the University of Idaho's Cooperative Extension System in Bonners Ferry, Idaho and include all crop damages, including those that may have been incurred without sturgeon flows. Since the level of baseline crop damage is unknown, it is not clear to what extent these damages are overstated. Further, the Seepage Study presents data generated using groundwater model data from the validation and calibration runs for 1997 and 2003, respectively. Two measures are taken to extrapolate data for the analysis in order to provide the closest possible approximation to historical impacts in the area:

142 Farmers' interviews for HDR Engineering, Inc., August 2003, "Upper Columbia Basin Alternative Flood Control NEPA EIS: Kootenai Flats Seepage Analysis, Bonners Ferry, Idaho," for U.S. Army Corps of Engineers, Seattle District.

1. First, as no documented costs are available for the years following 1997, this analysis utilizes the 1995 (low water year) and 1997 (high water year) costs to represent the annual costs incurred from 1998 to 2005 (with the exception of the years 2001 and 2002, when it is known that no sturgeon flows were released). This cost assignment is based on a visual observation of trends in daily water levels on Kootenay Lake, British Columbia, and daily discharge at Libby Dam, Montana (see Figure 5-1 at the end of this section).

   Table 5-3 presents the number of acres completely or partially impacted by high river flows and the costs of crop damage associated with these. While no damage occurred in 1994 from a maximum river stage of 1,753.4 ft, river levels of 1,758.5 ft in 1995 affected 670 acres with losses worth $146,000 (in 2005 dollars). River levels reached 1,763.4 ft and 1,764.7 ft in 1996 and 1997, respectively, leading to costs of $1,671,000 in 1996 and $1,759,000 in 1997 (in 2005 dollars). The low water year (1995) and high water year (1997) costs are assigned to the years between 1998 and 2005 for a total pre-designation crop damage estimate of $4,452,000 (in 2005 dollars). The crop damage of $1,759,000 (in 2005 dollars) for a high water year is equal to approximately eight percent of the market value of agriculture products sold in the County annually ($22.8 million in 2002).[143]

143 Quick Stats: Agricultural Statistics Data Base, 2002 Census of Agriculture - Volume 1 Geographic Area Series Census, State - County Data, Table 1. County Summary Highlights: 2002 and 1997, Boundary County, Idaho, http://151.121.3.33:8080/QuickStats/, accessed November 9, 2005.

Table 5-3
Crop Damage (excluding hops) Associated with Increased Sturgeon Flows in the Kootenai River Floodplain – 1994 to 2005

Year	Acres Impacted		Crop Damage		Other Costs	Total Costs	Total Costs (2005$)
	Total	Partial	Total Lost Acres	Partial Lost Acres			
1994-1997							
1994[1]						$0	$0
1995	140	530[a]	$34,000[b]	$80,000[c]		$114,000	$146,000
1996	3,500	3,500[a,g]	$858,000[b]	$429,000[d]	$50,000[f]	$1,336,000	$1,671,000
1997	2,000	8,000[a,h]	$490,000[b]	$784,000[e]	$168,000[f]	$1,442,000	$1,759,000
Sub-Total	5,640	12,030	$1,382,000	$1,292,000	$218,000	$2,892,000	$3,576,000
1998-2005 (Costs assigned based on trends in daily water levels on Kootenay Lake and daily discharge at Libby Dam)							
1998						$114,000[i]	$146,000
1999						$114,000[i]	$146,000
2000						$114,000[i]	$146,000
2001[2]						$0	$0
2002[3]						$0	$0
2003						$114,000[i]	$146,000
2004[4]						$114,000[i]	$146,000
2005[4]						$114,000[i]	$146,000
Sub-Total						$684,000[i]	$876,000
Total						$3,576,000	$4,452,000

Total costs figures may not sum due to rounding.
a) Reduced yields from water damage, late seeding, and lack of pest management.
b) Based on the assumption of $245 cost per acre (70 bu. wheat x $3.50/bu. = $245 / acre).
c) Based on the assumption of $150 lost per acre.
d) Based on the assumption of $122.50 lost per acre.
e) Based on the assumption of $98 lost per acre.
f) Increased cultivation, increased pest management (weeds and disease), replant costs, increased loan costs (new and established), and increased harvest costs.
g) 50 percent loss.
h) 40 percent loss.
i) Crop damages are in 1995 dollars.
[1] The sturgeon was listed in September 1994, which was after the peak flow season. Thus, no crop damage occurred in 1994 due to listing.
[2] No sturgeon flows were released in 2001.[144]
[3] Sturgeon flows in 2002 coincided with the spill test and flood control spill at Libby.[145]
[4] Sturgeon flows released in 2004 and 2005 did not exceed 17,000 cfs, and were for facilitating sturgeon egg incubation.[146]

Source: Letter dated April 9, 1998 sent to U.S. Fish and Wildlife Service by University of Idaho – Cooperative Extension System, Bonners Ferry, Idaho.

144 U.S . Army Corps of Engineers, September 2005, "Bonners Ferry Flood Level Study Report."

145 U.S . Army Corps of Engineers, September 2005, "Bonners Ferry Flood Level Study Report."

146 Personal communication with Scott W. Bettin, BPA, December 6, 2005.

2. The second modification is associated with the inclusion of hops in the analysis. Since the data compiled by the University of Idaho's Cooperative Extension System at Bonners Ferry does not take into account past damage to hops, this study relies upon the Seepage Study (Harp and Darden 2005) for these costs. The Seepage Study presents data generated using groundwater model data from the validation and calibration runs for 1997 and 2003, respectively. This analysis utilizes the 2003 (low water year) and 1997 (high water year) costs to represent the annual costs incurred by the Farm from 1998 to 2005 (with the exception of the years 2001 and 2002, when it is known that no sturgeon flows were released). This cost assignment is based on a visual observation of trends in daily water levels on Kootenay Lake, British Columbia and daily discharge at Libby Dam, Montana (see Figure 5-2 at the end of this section). Further, for the two high water years, 1996 and 1997, a range of costs is provided. While the upper range is based on the 1997 costs, the lower range assumes 2003 costs as the baseline, i.e. the costs the Farm will likely incur even without sturgeon flows. Thus, the lower range is the difference between costs incurred in the high and low water years (1997 and 2003, respectively) presented in the Seepage Study.

   Table 5-4 presents the costs associated with damage to hops due to increased sturgeon flows. While annual costs in low water years are over $1.3 million, these range between $1.9 and $3.2 million during high water years (in 2005 dollars). The total pre-designation cost to the Farm is approximately between $11.0 and $15.6 million (in 2005 dollars).

Table 5-4
Damage to Hops Associated with Increased Sturgeon Flows in the Kootenai River Floodplain – 1994 to 2005

Year	Acres Impacted	Total Costs (2003$)	Total Costs (2005$)
1994[1]	0	$0	$0
1995	342	$1,250,000	$1,306,000
1996	548 – 892	$1,848,000 – 3,098,000	$1,932,000 – $3,238,000
1997	548 – 892	$1,848,000 – $3,098,000	$1,932,000 – $3,238,000
1998	342	$1,250,000	$1,306,000
1999	342	$1,250,000	$1,306,000
2000	342	$1,250,000	$1,306,000
2001[2]	0	$0	$0
2002[3]	0	$0	$0
2003	342	$1,250,000	$1,306,000
2004[4]	342	$1,250,000	$1,306,000
2005[4]	342	$1,250,000	$1,306,000
Total		$12,447,000 – $14,947,000	$11,076,000 – $15,621,000

Total costs figures may not sum due to rounding.

[1] The sturgeon was listed in September 1994, which was after the peak flow season. Thus, no crop damage occurred in 1994 due to listing.

[2] No sturgeon flows were released in 2001.147

[3] Sturgeon flows in 2002 coincided with the spill test and flood control spill at Libby.[148]

[4] Sturgeon flows released in 2004 and 2005 did not exceed 17,000 cfs, and were for facilitating sturgeon egg incubation.[149]

Source: Harp, Aaron J. and Tim Darden, June 2005, "Kootenai River Seepage Agricultural Impact Study: Final," for U.S. Army Corps of Engineers, Seattle District.

5.3.2 Drainage Pumping Costs

Increased sturgeon flows from Libby Dam lead to higher water tables in the Valley and, consequently, changes in both drainage and irrigation pumping requirements. While higher river

147 U.S . Army Corps of Engineers, September 2005, "Bonners Ferry Flood Level Study Report."

148 U.S . Army Corps of Engineers, September 2005, "Bonners Ferry Flood Level Study Report."

149 Personal communication with Scott W. Bettin, BPA, December 6, 2005.

stages tend to decrease power needs for irrigation pumping, they increase power requirements for drainage pumping. According to local farmers, flow augmentation since 1992 has increased the use of existing pumps for drainage, although no new pumps have been installed in the area.[150]

As presented in Table 5-5, average pumping costs in the Valley for the years 1983-1991 for the months of May and June are $33,000 (in 2005 dollars). Due to sturgeon flows, pumping costs from May 16 to July 1 in 1995, 1996 and 1997 increased from the pre-sturgeon flow average to $55,000. Similar to the analysis in Section 5.3.1, due to the unavailability of documented costs for the years between 1998 and 2005, 1995 (low water year) and 1997 (high water year) costs are assigned to each year based on trends in daily water levels on Kootenay Lake and daily discharge at Libby Dam (with the exception of the years 2001 and 2002, when it is known that no sturgeon flows were released).

Therefore, additional costs incurred each year due to flow increases are estimated at $22,000, resulting in an estimated cost of $196,000 over a period of eleven years (in 2005 dollars). This may be an underestimate as the time period that costs were measured each year is shorter once sturgeon flows were introduced. It is unclear whether the data includes both drainage and irrigation pumping costs or represents only the costs incurred due to pumping for drainage purposes. However, given the relatively small decreases in irrigation pumping costs annually, as projected over a twenty year period in Tables 5-8 and 5-9, the overall cost estimates are not significantly affected by this assumption.

150 Personal communication with Bob Olsen, Chairman, Drainage Districts, Idaho, November 2, 2005.

Table 5-5
Drainage Pumping Costs Associated with Increased Sturgeon Flows in the Kootenai River Floodplain – 1994 to 2005

Year	Drainage Pumping Costs (1995$)	Drainage Pumping Costs (2005$)	Additional Drainage Pumping Costs Due to Increased Flows (1995$)	Additional Drainage Pumping Costs Due to Increased Flows (2005$)
1983-1991	$26,000[1]	$33,000[1]		
1994[2]			$0	$0
1995	$43,000	$55,000	$17,000	$22,000
1996	$43,000	$55,000	$17,000	$22,000
1997	$43,000	$55,000	$17,000	$22,000
1998			$17,000	$22,000
1999			$17,000	$22,000
2000			$17,000	$22,000
2001[3]			$0	$0
2002[4]			$0	$0
2003			$17,000	$22,000
2004[5]			$17,000	$22,000
2005[5]			$17,000	$22,000
Total			$153,000	$196,000

Numbers may not sum due to rounding.

Pumping costs from 1994 to 2005 are based on costs incurred from May 16 to July 1 in 1995, 1996 and 1997. These costs are higher compared to the average due to increased flows.

[1] Average pumping cost for the valley for the years 1983-1991 for the months of May and June – used as baseline for this analysis.

[2] The sturgeon was listed in September 1994, which was after the peak flow season. Thus, no additional drainage pumping costs occurred in 1994 due to listing.

[3] No sturgeon flows were released in 2001.[151]

[4] Sturgeon flows in 2002 coincided with the spill test and flood control spill at Libby.[152]

[5] Sturgeon flows released in 2004 and 2005 did not exceed 17,000 cfs, and were for facilitating sturgeon egg incubation.[153]

Source: Letter dated April 9, 1998 sent to U.S. Fish and Wildlife Service by University of Idaho – Cooperative Extension System, Bonners Ferry, Idaho.

5.3.3 LOST AGRICULTURAL LAND DUE TO EROSION

Conversations with local farmers indicate that land erosion is considered an important effect of seepage caused by increased flows. According to a local drainage district official, most of this

151 U.S . Army Corps of Engineers, September 2005, "Bonners Ferry Flood Level Study Report."

152 U.S . Army Corps of Engineers, September 2005, "Bonners Ferry Flood Level Study Report."

153 Personal communication with Scott W. Bettin, BPA, December 6, 2005.

erosion occurred in the Bonners Ferry area.[154] Although lack of scientific information on acreage lost led to exclusion of this impact from the overall cost analysis, Table 5-6 provides examples of land losses as quoted by the affected landowners.

Table 5-6
Land Erosion due to Seepage
(based on information received from select local farmers)

Year of Damage	Contact	Estimated Damage due to Land Erosion
1995	Victor Amoth, Landowner, Drainage District 4, Idaho	60 acres of land lost.[155]
2002	Victor Amoth, Landowner, Drainage District 4, Idaho	50 acres of land lost.[156]
1992-2005	Bill Michalk, Landowner, Drainage District, Idaho	Approximately 30 acres of land lost.[157]

5.4 FUTURE IMPACTS

Analysis of future (i.e., post-designation) impacts encompasses a twenty-year time frame between 2006 and 2025. The final costs are presented in PV terms and annualized values using three and seven percent discount rates. Details on discounting techniques used are provided in Section 1.0. The areas of impact analyzed are crop damage and irrigation pumping costs:

1. In order to calculate **high range crop damage costs**, data generated using groundwater model from the calibration run for 2003 (presented in the Seepage Study) is used as the baseline, representing the "cost of farming in the area." Data from the validation run for 1997 is considered to reflect conditions similar to the Kootenay Lake and Kootenai River management described in the February 2006 BO in term of the timing, duration, and magnitude of lake elevation and river flow. Thus, the difference between crop damage costs in 2003 and 1997 are used to provide a good approximation of the magnitude of damage the farms may experience under the February 2006 BO.

154 Personal communication with Bob Olsen, Chairman, Drainage Districts, Idaho, November 2, 2005.

155 Personal communication with Victor Amoth, Landowner, Drainage District 4, Idaho, November 2, 2005.

156 Personal communication with Victor Amoth, Landowner, Drainage District 4, Idaho, November 2, 2005.

157 Personal communication with Bill Michalk, Landowner, Drainage District 2, Idaho, November 14, 2005.

Additionally, **low range crop damage costs** are calculated based on 1997 costs provided by the University of Idaho's Cooperative Extension System in Bonners Ferry, Idaho for all crops, except hops. Since this source does not include hops, the difference between 1997 and 2003 costs to the Farm from the Seepage Study are added to crop damage costs associated with other crops.

2. The two VARQ Flood Control Operations with Fish Flows at 25,000 cfs and 35,000 cfs (LV1 and LV2) are compared to the benchmark LS (Standard Flood Control Operations without Fish Flows) in order to calculate the additional **irrigation pumping costs** resulting from increased flows.

5.4.1 Crop Damage

Table 5-7 details the average and percentage of total acres of crops in the Kootenai River Valley from 1998 to 2003. The table further presents the acres affected by seepage in low and high water years, 2003 and 1997, respectively, as estimated by ACOE. The difference between affected acres in the baseline year (2003) and high water year (1997) leads to 8,176 acres being impacted, 3,025 of which are spring wheat, followed by winter wheat and barley (2,045 and 1,476 acres, respectively). Additionally, 548 acres of hops can potentially be impacted by conservation activities for the sturgeon. Of these hops acres, 84[158] are not protected by the levee and, thus, it is unlikely that the Farm will replant these acres if the hops are expected to be damaged regularly by managing Kootenay Lake at a higher elevation. This acreage may also be pulled from production, considering long-term water logging permanently damages and weakens the hops plant, making a plant more susceptible to disease, and that a single diseased plant can infect the entire crop.[159]

158 The 84 acres of hops that the Farm replanted following the 1997 flows are not protected by the levee, thus, it is unlikely that Farm will replant these acres if the hops are damaged frequently by managing Kootenay Lake at a higher elevation. Personal communication with Scott Bettin, BPA, Portland, Oregon, May 22, 2006.

159 Notes from interview with Elk Mountain Farm officials, conducted June 11, 2003, for HDR Engineering, Inc., August 2003, "Upper Columbia Basin Alternative Flood Control NEPA EIS: Kootenai Flats Seepage Analysis, Bonners Ferry, Idaho," for U.S. Army Corps of Engineers, Seattle District.

Table 5-7
Acreage Impacted due to Seepage

Crop	Average Acres[1]	% of Total Acres	Affected Acres[2]		
			2003	1997	1997 – 2003
Winter Wheat	9,385	31.2%	2,135	4,180	2,045
Spring Wheat	8,010	26.6%	1,778	4,803	3,025
Barley	3,910	13.0%	868	2,344	1,476
Canola	1,611	5.4%	358	966	608
Alfalfa	1,491	5.0%	472	946	474
Timothy	839	2.8%			
Other[3]	3,123	10.4%			
Total Affected Non-Hops Acres	**28,369**	**94.3%**	**5,611**	**13,239**	**7,628**
Hops	1,711	5.7%	342	890	548
Total Affected Acres	**30,080**	**100.0%**	**5,953**	**14,129**	**8,176**

[1] Average acres of crops in the Kootenai Valley from 1998 to 2003 – Source: Natural Resource Conservation Service, Bonners Ferry, Idaho.

[2] Total affected acres for all crop stages and DTGW-river durations.

[3] 'Other' category includes acres of all crops not presented in the table (e.g. mustard seeds and oats) [See HDR, Inc. (2003)].

Source: Harp, Aaron J. and Tim Darden, June 2005, "Kootenai River Seepage Agricultural Impact Study: Final," for U.S. Army Corps of Engineers, Seattle District.

The costs associated with acreage affected by seepage are presented in Tables 5-8 (all crops, except hops) and 5-9 (only hops). Table 5-8 only reflects the high range crop damage costs derived from data generated using the groundwater model from the 2003 calibration and 1997 validation runs, as presented in the Seepage Study (Harp and Darden 2005). The low range crop damage costs presented in Table 5-12 stem from information provided by the University of Idaho's Cooperative Extension System in Bonners Ferry, Idaho for all crops, except hops.

As presented in Table 5-8, in a high water year similar to 1997, the increased crop losses due to sturgeon flows are approximately $2,096,000 (in 2005 dollars). This is consistent with the acreage impacts presented in Table 5-7 for these crops. Over a third of these costs, $808,000, are associated with spring wheat, followed by barley and winter wheat with potential costs of $568,000 and $505,000, respectively (in 2005 dollars).

Table 5-8
Crop Loss Impacts due to Seepage for all Crop Stages and DTGW-Duration Categories (does not include hops)

Crop	Crop Damage Costs (2003$)		Impact (2005$)		
	2003	1997	2003	1997	1997 – 2003
Winter Wheat	$363,000	$846,000	$379,000	$884,000	$505,000
Spring Wheat	$344,000	$1,117,000	$360,000	$1,167,000	$808,000
Barley	$270,000	$814,000	$282,000	$850,000	$568,000
Canola	$67,000	$201,000	$70,000	$210,000	$140,000
Alfalfa	$54,000	$126,000	$57,000	$131,000	$75,000
Aggregate Impacts	**$1,098,000**	**$3,103,000**	**$1,147,000**	**$3,243,000**	**$2,096,000**[1]

Numbers may not sum due to rounding.

1. The total aggregate impact does not reflect the loss associated with 548 acres of hops and, thus, the number is lower than the one presented for high range costs associated with crop damage in Table 5-12.

Source: Harp, Aaron J. and Tim Darden, June 2005, "Kootenai River Seepage Agricultural Impact Study: Final," for U.S. Army Corps of Engineers, Seattle District.

Table 5-9 presents the annually recurring and one-time crop damage costs associated with hops in the area. Based on the Farm officials' interview for the NEPA EIS,[160] it can be determined that 464 acres of hops can potentially be water logged and 84[161] acres may be permanently damaged (out of approximately 1,700 acres of hops) if conditions are similar to those in 1997.

Because of the high probability of seepage damage associated with Kootenay Lake elevation managed at 1,755 ft MSL and river flows of up to 25,000 to 35,000 cfs from Libby Dam, it is likely the Farm will not replant acreage damaged by seepage on a regular basis. Additional acreage may also be pulled from production considering long-term water logging permanently damages and weakens the hops plant, making a plant more susceptible to disease, and that a single diseased plant can infect the entire crop.[162] Should the Farm permanently remove just the 84 acres from production, the annual damage would approximate $1.6 million (in 2005 dollars) in

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160 Notes from interview with Elk Mountain Farm officials, conducted June 11, 2003, for HDR Engineering, Inc., August 2003, "Upper Columbia Basin Alternative Flood Control NEPA EIS: Kootenai Flats Seepage Analysis, Bonners Ferry, Idaho," for U.S. Army Corps of Engineers, Seattle District.

161 The 84 acres of hops that the Farm replanted are not protected by the levee, thus, it is unlikely that Farm will replant these acres if the hops are damaged frequently by managing Kootenay Lake at a higher elevation. Personal communication with Scott Bettin, BPA, Portland, Oregon, May 22, 2006.

162 Notes from interview with Elk Mountain Farm officials, conducted June 11, 2003, for HDR Engineering, Inc., August 2003, "Upper Columbia Basin Alternative Flood Control NEPA EIS: Kootenai Flats Seepage Analysis, Bonners Ferry, Idaho," for U.S. Army Corps of Engineers, Seattle District.

yield and production cost impacts on the 464 acres of water logged hops, plus the one-time loss of economic value (i.e., land value) of the 84 acres that is no longer farmed because of recurring flooding. The loss of economic value to acreage that is no longer farmed can be estimated using the Farm's ten-year average of yield (1,052 pounds per acre), price ($3.81 per pound), and cash production costs ($2,703 per acre).[163] Considering these variables, the estimated annual net cash income lost is $1,305 per acre, or $110,000 in total (in 2005 dollars). Using a three percent discount rate, the estimated lost economic value to the 84 acres is $43,500 per acre, or $3.7 million in total (in 2005 dollars). The lost economic value is approximately $18,600 per acre when a seven percent discount rate is used, or $1.6 million in total (in 2005 dollars).

Table 5-9
Crop Loss Impacts due to Seepage for all Crop Stages and DTGW-Duration Categories for Hops

Type of cost	Affected Hops Acres	Cost Per Acre (2005$)			Impact (2005$)
		Lost Production & Cash Production Costs	Land Value @ 7%	Land Value @ 3%	
Recurring[1]	464	$3,526	N/A	N/A	$1,636,000
One-Time[2]	84	N/A	$18,645	$43,504	$1,566,000 – $3,654,000

Numbers may not sum due to rounding.

[1.] These costs are annual and are based on the lost production and cash production costs associated with 464 acres of hops that may be water-logged.

[2.] These costs are based on the value of land of the 84 acres of hops that may be permanently lost to production immediately following the implementation of the RPA in the February 2006 BO in 2006.

Source: Extrapolated from data in Harp, Aaron J. and Tim Darden, June 2005, "Kootenai River Seepage Agricultural Impact Study: Final," for U.S. Army Corps of Engineers, Seattle District.

5.4.2 IRRIGATION PUMPING COSTS

As discussed in Section 5.3.2, higher river stages tend to decrease power needs for irrigation pumping.[164] The "Upper Columbia Alternative Flood Control and Fish Operations EIS, Socioeconomic Impact Analysis (Appendix F)" (Tetra Tech 2005) evaluates the impacts to irrigation pumping from various flow scenarios in the Kootenai River. Pumping power requirements (given in kWh) for each scenario are converted to power costs using the power rate for irrigation offered by Avista Utilities in Idaho ($0.05589 per kWh, when monthly usage

163 Harp, Aaron J. and Tim Darden, June 2005, "Kootenai River Seepage Impact Study: Final," for U.S. Army Corps of Engineers, Seattle District, pp. 8 and 43.

164 Tetra Tech, Inc., May 2005, "Upper Columbia Alternative Flood Control and Fish Operations EIS, Socioeconomic Impact Analysis (Appendix F)," for U.S. Army Corps of Engineers, Seattle District.

exceeds 85 kWh). As is evident in Table 5-10, overall irrigation pumping costs in Montana are not significantly affected by increased flows, as costs decrease by less than $50 (in 2005 dollars) for all months except September, which actually shows a slight increase in pumping costs. In the case of Idaho, where most of the agricultural activities occur, the irrigation pumping cost reduction is still less than $300 (in 2005 dollars) in both LV1 and LV2 scenarios (see Table 5-11).

Table 5-10
Irrigation Pumping Costs Associated with Increased Sturgeon Flows in Kootenai River Floodplain in Montana

Location	Month	Pumping Costs (Based on $0.05589 per kWh)				
		LS	LV1	LV2	LV1-LS	LV2-LS
Libby	May	$911	$894	$894	$-17	$-17
	June	$905	$889	$889	$-16	$-16
	July	$2,381	$2,375	$2,375	$-6	$-6
	August	$2,409	$2,381	$2,381	$-28	$-28
	September	$2,347	$2,414	$2,414	$67	$67
Total		$8,953	$8,953	$8,953	$0	$0

Numbers not rounded due to the small values.

Source: Tetra Tech, Inc., May 2005, "Upper Columbia Alternative Flood Control and Fish Operations EIS, Socioeconomic Impact Analysis (Appendix F)," for U.S. Army Corps of Engineers, Seattle District.

Table 5-11
Irrigation Pumping Costs Associated with Increased Sturgeon Flows in Kootenai River Floodplain in Idaho

Location	Month	Pumping Costs (Based on $0.05589 per kWh)				
		LS	LV1	LV2	LV1-LS	LV2-LS
Bonners Ferry	May	$2,509	$2,470	$2,465	$-39	$-44
	June	$2,504	$2,454	$2,455	$-50	$-49
	July	$10,122	$10,111	$10,127	$-11	$5
	August	$10,412	$10,256	$10,273	$-156	$-139
Total		$25,547	$25,291	$25,320	$-256	$-227

Numbers not rounded due to the small values.

Source: Tetra Tech, Inc., May 2005, "Upper Columbia Alternative Flood Control and Fish Operations EIS, Socioeconomic Impact Analysis (Appendix F)," for U.S. Army Corps of Engineers, Seattle District.

5.4.3 DRAINAGE PUMPING COSTS

Higher river stages increase power requirements for drainage pumping, as per the discussion in Section 5.3.2. Due to the unavailability of documented costs for drainage pumping for the years following 1997, the average of documented costs for 1995-1997 are used as an estimate of the annual costs incurred in 1998 to 2005, and to predict future costs in 2006-2025. This extrapolation leads to an estimate of additional costs incurred each year due to flow increases at $22,000, and the undiscounted cost of $440,000 over a period of twenty years (2006-2025) (in 2005 dollars).

5.5 TOTAL AGRICULTURE RELATED COSTS

Table 5-12 provides a summary of agricultural costs associated with conservation efforts for the sturgeon. The first column in the table presents the total pre-designation (1994-2005) costs in 2005 dollars. The second column reports the total post-designation costs from 2006-2025 in undiscounted dollars, while the third and fourth columns report the total post-designation costs using discount rates of three percent and seven percent, respectively. The last two columns present the annualized costs, also using discount rates of three percent and seven percent, respectively.

Table 5-12
Summary of Agriculture Related Conservation Costs for Sturgeon

Agricultural Impact	Pre-Designation (Total) (1994-2005)	Post-Designation (Total) (2006-2025)			Post-Designation (Annualized)	
		Undiscounted	3%	7%	3%	7%
Crop Damage	$17,460,000 – $20,070,000	$69,800,000 – $78,270,000	$52,350,000– $59,050,000	$37,740,000 – $42,940,000	$3,520,000 – $3,970,000	$3,560,000 – $4,050,000
Irrigation Pumping Costs[2]	-	< -$10,000 – < -$10,000	< -$10,000 – < -$10,000	< -$10,000 – < -$10,000	< -$10,000 – < -$10,000	< -$10,000 – < -$10,000
Drainage Pumping Costs	$200,000[1]	$440,000	$320,000	$230,000	$20,000	$20,000
Total Agriculture Costs	**$17,660,000 – $20,270,000**	**$70,230,000 – $78,700,000**	**$52,670,000 – $59,370,000**	**$37,970,000 – $43,170,000**	**$3,540,000 – $3,990,000**	**$3,580,000 – $4,070,000**
Impacts Associated with the Braided Reach	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Numbers rounded to the nearest $10,000 and may not sum due to rounding.

[1] It is unclear whether the available historic data on pumping costs combines the pumping costs for both irrigation and drainage purposes or only represents the drainage pumping costs. However, this discrepancy will not have a significant affect on the overall costs since the annual decrease in irrigation pumping costs is very small, as is evident from the post-designation irrigation pumping costs.

[2] The negative numbers indicate benefits from sturgeon flows – higher river stages tend to reduce power requirements for irrigation pumping.

Sources of original data:

- Harp, Aaron J. and Tim Darden, June 2005, "Kootenai River Seepage Agricultural Impact Study: Final," for U.S. Army Corps of Engineers, Seattle District.

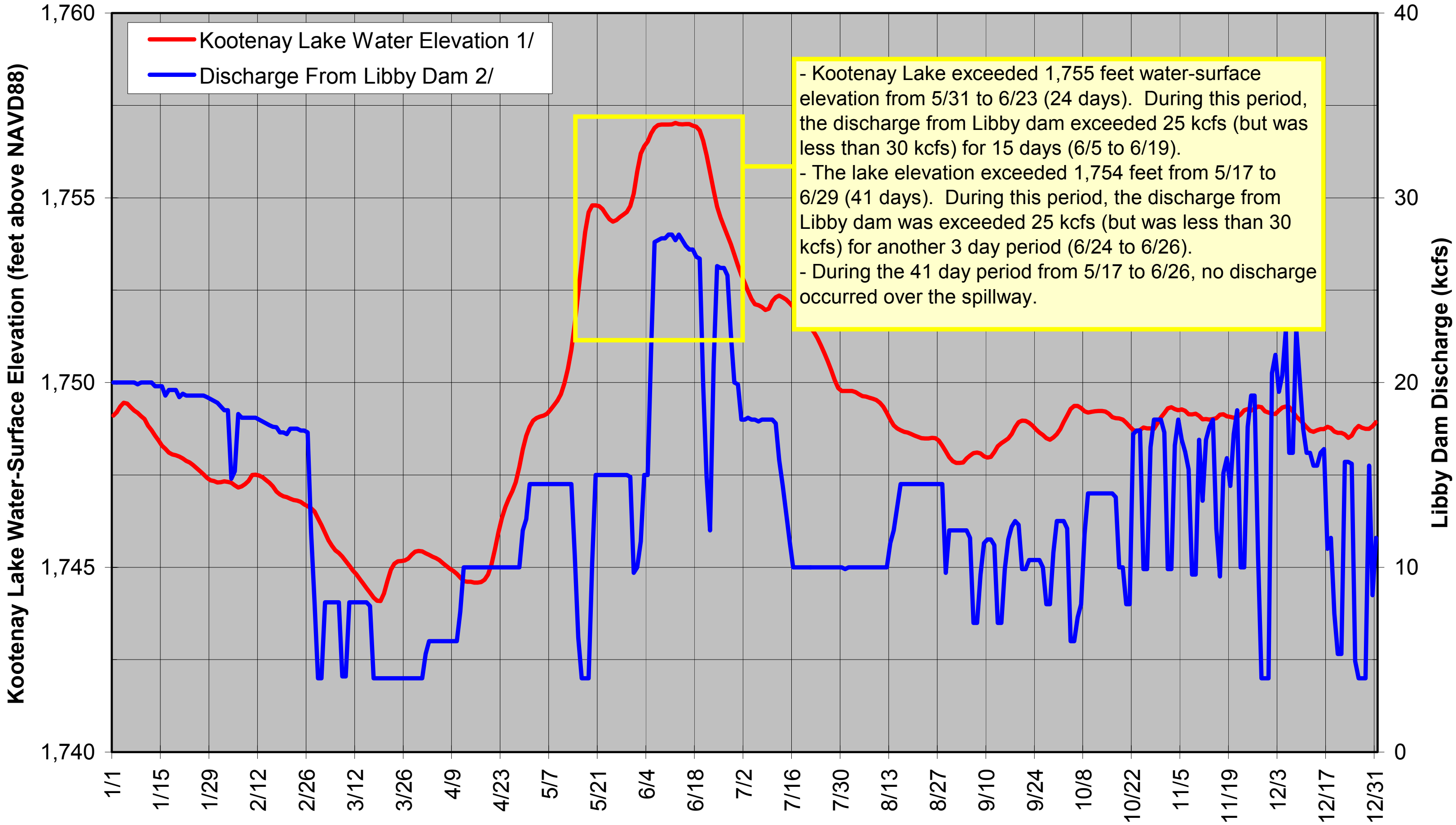
- Tetra Tech, Inc., May 2005, "Upper Columbia Alternative Flood Control and Fish Operations EIS, Socioeconomic Impact Analysis (Appendix F)," for U.S. Army Corps of Engineers, Seattle District.

- Historic costs identified by Dave Wattenbarger, University of Idaho, College of Agriculture in letter to Phil Laumeyer, U.S. Fish and Wildlife Service, date April 9, 1998.

The pre-designation costs are dominated by crop damage, making up $17.5 to $20.1 million of the total amount of $17.7 to $20.3 million (in 2005 dollars). Drainage pumping costs comprise the remaining pre-designation agricultural costs of $200,000 (in 2005 dollars). The post-designation agricultural costs are estimated to total $70.2 to $78.7 million in undiscounted dollars, or $52.7 to $59.4 million and $38.0 to $43.2 million in PV terms using discount rates of three percent and seven percent, respectively. Annualized costs are estimated to range from $3.5 to $4.0 million at three percent discount rate and $3.6 to 4.1 million at seven percent discount rate. Similar to the pre-designation costs, crop damage comprises most of the post-designation costs. As discussed in Section 5.4.1, the Farm may incur higher costs immediately following the designation of critical habitat in 2006 due to a permanent loss of 84 acres that are not protected by the levee. The irrigation pumping costs are mostly negative, since these costs tend to decrease as the water table rises. The drainage pumping costs are also small compared to the crop damage costs.

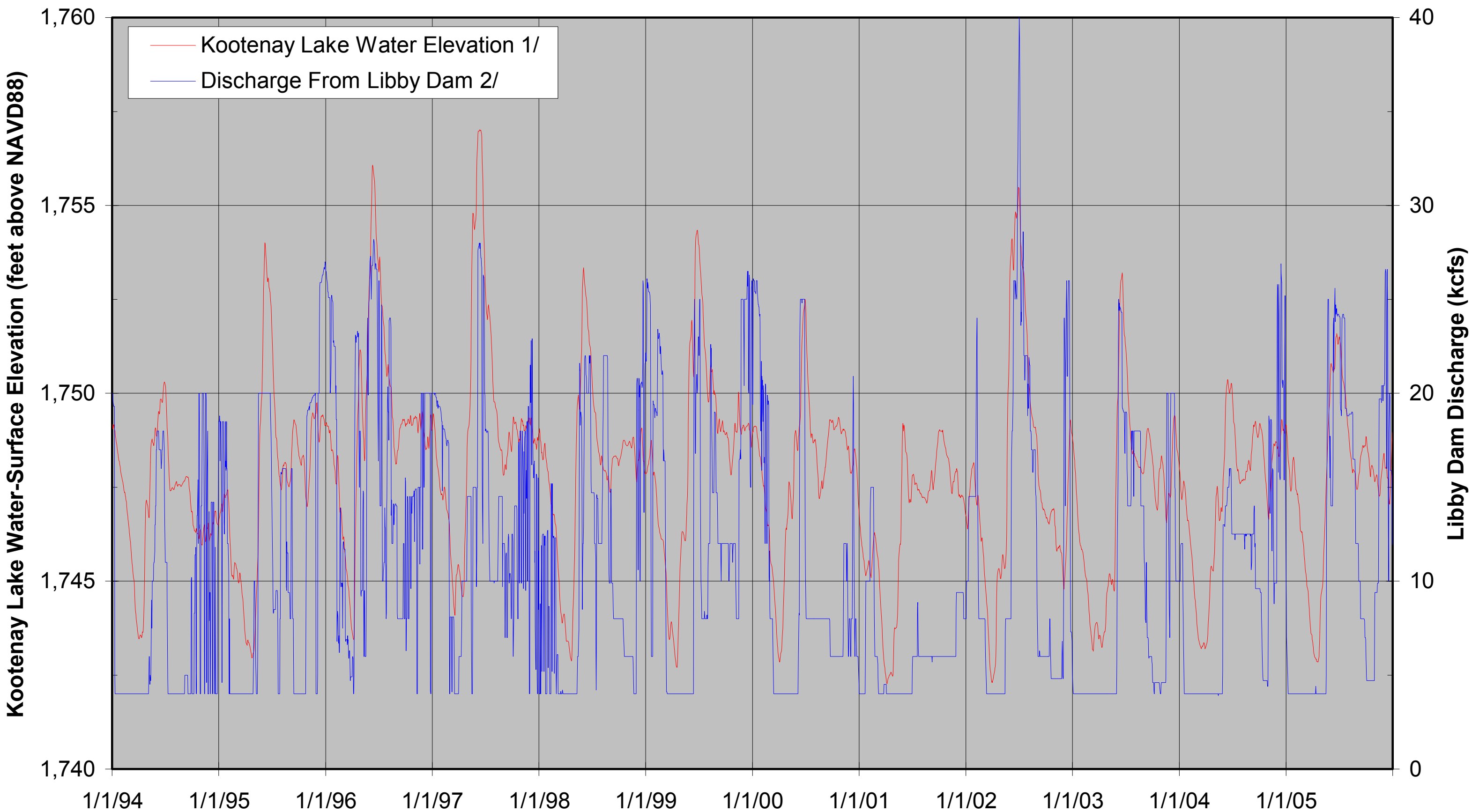
As mentioned previously, the geographic area of analysis includes the unit proposed for CHD (Unit 1: Braided Reach) and the unit previously designated as critical habitat in 2001 (Unit 2: Meander Reach). However, the impacts to agriculture are joint costs; the sturgeon flows and resulting impacts will occur whether or not the proposed unit (Unit 1), or a portion thereof, is added to the existing designation. Thus, there are no incremental impacts associated with the designation of the Braided Reach (Unit 1).

Figure 5-1
Daily Water Levels on Kootenay Lake at Queens Bay, British Columbia, Canada, and Daily Discharge at Libby Dam, Libby, Montana, in 1997



1/ http://www.wsc.ec.gc.ca/hydat/H2O/index_e.cfm?cname=WEBfrmDailyReport_e.cfm
2/ http://www.nwd-wc.usace.army.mil/perl/dataquery.pl?k=id:LIB

Figure 5-2
Daily Water Levels on Kootenay Lake at Queens Bay, British Columbia, Canada, and Daily Discharge at Libby Dam, Libby, Montana, 1994-2005



1/ http://www.wsc.ec.gc.ca/hydat/H2O/index_e.cfm?cname=WEBfrmDailyReport_e.cfm
2/ http://www.nwd-wc.usace.army.mil/perl/dataquery.pl?k=id:LIB

An analysis performed by Tetra Tech for the ACOE in May 2005 (May 2005) estimated the decreased recreation days at Libby Dam resulting from a number of alternative flow regimes.[165] The May 2005 study used projected average monthly discharges from Libby Dam, and projected water levels for Lake Koocanusa and Kootenai Lake under four alternative flow regimes: standard (non-fish) flood control flows (LS, the baseline for this study), standard flood control with up to 25,000 cfs in fish flows (LS1), VARQ flows up to 25,000 cfs (LV1), and VARQ flows up to 35,000 cfs (LV2).

Tetra Tech estimated for each flow regime the total number of days that each facility or area was accessible or provided sufficient quality to allow recreation. By comparing the number of days of access or quality for the same facility/activity across different flow regimes, the relative impact of the flow regimes on recreation availability can be assessed in a quantitative, but non-monetary manner. The Tetra Tech study, however, did not estimate the impact of flows on recreation visitation. Table 6-1 summarizes the projected impacts to the recreation facility/activity availability on Lake Koocanusa (US and Canada), the Kootenai River in Montana, and Kootenay Lake in Canada.

The results of the May 2005 Study show that VARQ flows negatively impact the availability of Lake Koocanusa boating, swimming, and camping in the US and the availability of Kootenai River shore fishing in Montana, but positively impact boat fishing availability on the river in Montana. The results also show that impacts from VARQ fish flows are less than the impacts under standard flood control with fish flows up to 25,000 cfs (LS1).

165 Tetra Tech, Inc., May 2005, Socioeconomic Impact Analysis, Appendix F in *Upper Columbia Alternative Flood Control And Fish Operations Draft Environmental Impact Statement*, (Prepared for U.S. Army Corps of Engineers, Seattle District and Bureau of Reclamation), Seattle, WA.

Table 6-1
Annual Recreation Facility/Activity Impacts Under Fish Flows, Available Recreation Days

Facility Type/Activity	LS Days	LS1 Days	% Change from LS	LV1 Days	% Change from LS	LV2 Days	% Change from LS
Lake Koocanusa - US							
Boat Ramp (May - Sep.)	1,627	1,340	-18%	1,468	-10%	1,454	-11%
Swimming (June - Aug.)	217	107	-51%	150	-31%	142	-35%
Camping >2,439' (May - Sep.)	102	45	-56%	65	-36%	61	-40%
Camping >2,409' (May - Sep.)	122	113	-7%	126	3%	124	2%
Lake Koocanusa - Canada							
Boat Ramp (May - Sep.)	503	352	-30%	414	-18%	404	-20%
Swimming (June - Aug.)	131	29	-78%	51	-61%	45	-66%
Kootenai River - US							
Shore Fishing (May - Sep.)	74	77	4%	50	-32%	54	-27%
Boating and Boat Fishing (May - Sep.)	85	88	4%	101	19%	105	24%
Kootenay Lake - Canada							
General Recreation Non-Detrimental Range (May - Sep.)	142	135	-5%	132	-7%	132	-7%
Pilot Bay Resorts Boat Moorage (Jan. - May)	51	52	2%	52	2%	52	2%
Kootenay Kampsites Fishing >1,744' Elevation (May - Sep.)	79	83	5%	90	14%	89	13%
Swimming <1,749' Elevation (Jun - Aug.)	84	77	-8%	76	-10%	75	-11%

Source: Tetra Tech, Inc., May 2005, Recreation Affected Environment, Appendix E in Upper Columbia Alternative Flood Control And Fish Operations Draft Environmental Impact Statement, (Prepared for U.S. Army Corps of Engineers, Seattle District and Bureau of Reclamation), Seattle, WA, pp. 59 - 69.

To evaluate the effects of sturgeon flows on recreation visitation/use, the historic relationship between fish flows and visitation/use was analyzed. From 1992 to 2000, fish flows at Libby Dam were provided under the LS1 scenario of standard flood control operations with fish flows up to 25,000 cfs (20,000 cfs in 1995). Beginning in 2001, VARQ flows were implemented in accordance to the 2000 BO. However, no fish flows were provided in 2001 because of drought, and fish flows were replaced in 2002 with flood control.[166] Because the May 2005 Study estimates that recreation impacts should occur from LS1 flows, it would be reasonable to expect that historic visitation/use data on recreation at Lake Koocanusa and the Kootenai River would show a decline in visitation during the LS1 flows compared to baseline LS flows.

6.1 VISITATION/USER DATA

Data on visitation to US recreation sites on Lake Koocanusa[167] and angling on the US portion of the Kootenai River are limited and the available data are presented in Table 6-2. The historic visitation/user data show that recreation has not declined since sturgeon flows began in 1992. For sites and activities with both pre- and post-flow visitation/use data, some show increased visitation/use during the post-flow period (use of ACOE day use facilities on Lake Koocanusa, use of ACOE camping facilities on the Kootenai River, and Kootenai River angling in Montana and Idaho), while others show no change in visitation/use during the post-flow period (angling on Lake Koocanusa[168]). Pre-flow visitor/use data were not available for the remaining facilities/activities. While a comparison to pre-flow visitation/use is not possible for these facilities, some show an increasing trend in visitation/use during the post-flow period (Kootenai National Wildlife Refuge). However, the USFS (Lake Koocanusa camping and boating and Kootenai River camping) and Montana Board of Outfitter data show an annual variability that cannot be explained by the historic sturgeon flows alone.

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166 1.083 MAF of flow was provided during June 25 - July 26, however, the flows were the result of flood control operations. During the flood control operation, spill amounts were increased and the project reached a maximum total outflow of 40,000 cfs on 2 July (15,600 cfs over the spillway and 24,400 cfs through the powerhouse). The average inflow to Libby Dam during June 2002 was 53,600 cfs, which is 146 percent of normal. The maximum inflow to Libby Dam in water year 2002 was 71,900 cfs, occurring on June 18. Source: September 30, 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report, Appendix D: Kootenai River Channel Capacity Study Report". Seattle, WA, p. D-12.

167 A limited amount of data is available on visitation to Lake Koocanusa. The ACOE collects data on visitation to their sites (three day-use facilities at Libby Dam, the Visitor Center, and Souse Gulch), Montana Fish, Wildlife, and Parks (MFWP) collects angler use statistics, and the USFS collects data on the number of visits to its hosted campgrounds on the lake. The USFS data summarized in Table 6-2 represents use for four of the six USFS managed camping sites on the lake: McGillivary, Peck Gulch, Rexford Bench (including boat ramp), and Rocky Gorge. User data was not available for Barron Creek or Gateway; data is also unavailable for Little North Fork Falls and Stone Hill, both day use facilities for hiking and climbing.

168 Excluding 1985, the year Kokanee salmon, a popular sport fish, were accidentally introduced to the lake, and for which MFWP data show a large increase in lake angling days, the average lake angling days have not changed since sturgeon flows began in 1992.

6.2 OUTFITTER INTERVIEWS

The owners of three of the largest fly fishing outfitting businesses on the Kootenai River were also contacted regarding fish flow impacts on business. Each was asked to estimate the impact of sturgeon flows on client numbers, with the caveat that the outfitter distinguish between impacts on clientele from fish flows versus from standard flood-protection flows at Libby Dam. According to the May 2005 Study, shore fishing trips should decrease under sturgeon flows, while boat fishing availability on the river should increase.[169] In contrast to the study results, outfitters believe both shore and boat fishing trips should decrease under sturgeon flows. The high river flows drive game fish away from popular fishing areas accessible only by boat and make shore fishing nearly impossible.[170]

The interviews revealed a wide range of sturgeon flow impacts. The largest outfitting business on the river indicated that fish flows decreased his clientele by five percent, compared to regular flood control operations. This outfitter found that although the river could be fished, clients were intimidated by the high flows.[171] The second outfitter indicated that fish flows mimic natural runoff and flood flows. This outfitter runs fishing trips on high flow days by moving his fishing efforts into channels with slower flows; therefore, there are no impacts to his business.[172] The third outfitter estimated that he is unable to book one and one half months worth of trips each year (out of a five month season). He found that it is not possible to predict whether the fish flows in a given year would be too high to allow for an enjoyable and successful river fishing experience for his clients. Clients who have an unsuccessful trip would be unlikely to book with his firm again, so he limits booking to months when successful trips are most likely (i.e., non-sturgeon flow months). This outfitter also indicated that because clients book trips well in advance of the notice of whether fish flows will occur in a given year, he is unable to book trips during the fish-flow season in any year, even if fish flows do not occur.[173]

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169 The study estimates the optimal river flows for shore and boat (float) fishing on the Kootenai River. The optimal flows range from 4,000 to 10,000 cfs for shore fishing and 8,000 to 25,000 cfs for boat fishing.

170 Personal communication with Tim Linehan, owner of Linehan Outfitting Company and president of the Kootenai Valley Trout Club Chapter of Trout Unlimited, Troy, MT, November 14, 2005.

Personal communication and with Dave Blackburn, owner of Dave Blackburn's Kootenai Angler, Libby, MT, November 17, 2005.

Personal communication with Robert Winstrom, owner of Kootenai River Outfitters, Troy, MT, November 9, 2005.

171 Personal communication and with Dave Blackburn, owner of Dave Blackburn's Kootenai Angler, Libby, MT, November 17, 2005.

172 Personal communication with Tim Linehan, owner of Linehan Outfitting Company and president of the Kootenai Valley Trout Club Chapter of Trout Unlimited, Troy, MT, November 14, 2005.

173 Personal communication with Robert Winstrom, owner of Kootenai River Outfitters, Troy, MT, November 9, 2005.

However, the annual post-flow river angling and outfitter statistics do not necessarily support the outfitter estimates as visitation increases during the LS1 flow period. Additionally, it is difficult to derive a relationship between visitation and flow regime, as other factors, such as drought, a wet water year, and wildfires along rivers elsewhere in Montana may have also influenced past angler visitation to the river. In both the MFWP (angler days) and Board of Outfitter (outfitter service days) data, an increase in angling on the Montana sections of the Kootenai can be seen in the late 1990s and in 2000. Several sources indicated the possibility that drought and fires along southern Montana rivers drove anglers to northern state rivers.[174] Angler days and outfitter service days then decreased in 2001 and 2002. While the reasons for this decrease are uncertain, there were no sturgeon flows in either year. The drought prevented sturgeon flows in 2001, and the wet year in 2002 required flood control flows during the sturgeon flow period.

6.3 SUMMARY/CONCLUSIONS

While the May 2005 Study indicates a decrease in recreational facility availability because of sturgeon flows, a decrease in visitation/use is not necessarily supported by the visitation/user data from years with past sturgeon flows. In fact, some of the visitation data show a trend of increasing visitation and activity participation during the sturgeon flows compared with visitation prior to sturgeon flows. However, visitation statistics to the recreation areas and participation in potentially impacted activities are limited and incomplete. Additionally, other factors, such as drought or a wet water year may have also influenced visitation/use or facility availability. It is not possible from the available visitation statistics to determine if recreation participation would be even higher were it not for sturgeon flows. Participation in outdoor recreation increased across the country before and after sturgeon flows (until a recent downward trend between 2001 and the present). Increasing visitation to the Kootenai River system recreation sites may simply be a product of this increased popularity.[175] *While it is possible that fish flows have negatively affected recreation, given the variability in the data, it is not possible to estimate the economic impact on recreation resulting from sturgeon flows.*

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174 Personal communication with Ben Fansler, Kootenai National Forest head of boat launch permitting, November 16, 2005. Personal communication with James Vashro, Regional Fisheries Manager, Montana Department of Fish, Wildlife, and Parks Region 1, Kalispell, MT, November 16, 2005.

175 Roper ASW, January 2004, Outdoor Recreation in America 2003: Recreation's Benefits to Society Challenged by Trends, (Prepared for the Recreation Roundtable, Washington, DC). This study did not assess the impact of increased gasoline prices on recreation between 2001 and 2003.

Table 6-2
Historic Visitor/User/Angler/Outfitter Service Days, Lake Koocanusa (US) and Kootenai River

Year	Sturgeon Flows (MAF) [i]	Lake Koocanusa				Kootenai River					
						Montana				Idaho	
		ACOE Day Use [a]	USFS Camping [b]	USFS Boating [b]	Angling [c]	Angling [c]	Fishing Outfitting [d]	ACOE Camping [a]	USFS Camping [e]	Angling [f]	KNWR Visits [g]
1982					35,245	31,044				3,584	
1983					33,977	21,503					
1984					39,932	16,758					
1985					114,911	22,828					
1986											
1987		18,118									
1988		35,893						4,680			
1989		31,988			43,906	23,693		4,228			
1990		44,483						4,334			
1991		49,180			47,320	25,213		9,847			
1992	Unknown	48,259						8,678			
1993	Unknown	45,497			29,224	29,854		7,830		5,935	
1994	Unknown	53,341						7,905			
1995	1.508	62,909	14,576	15,504	35,867	19,289	1,076	7,475	4,094		17,495
1996	0.125	53,891	11,068	13,294			808	6,766	4,109		17,952
1997	1.000	45,579	20,465	13,590	48,750	41,084	975	5,552	4,130		20,195
1998	0.866	57,253	23,056	3,157			1,108	6,996	4,817		20,492
1999	0.708	48,550	24,502	9,598	57,493	37,491	1,062	8,697	3,003		21,827
2000	0.784	53,790	5,711	20,916			1,316	8,140	3,128		19,178
2001	0.000	50,640	14,102	9,916	38,217	30,852	1,160	24,084	3,822	5,981	19,689
2002	0.000 [j]	49,670					672	23,450	2,581	1,339	21,309
2003	0.698	48,826			29,420	27,499	858	23,324	2,382		21,438
2004	Unknown	38,039					963	16,732	4,157		21,523
Avg pre-1992		35,932	n/a	n/a	40,076 [h]	23,507	n/a	5,772	n/a	3,584	n/a
Avg post-1992		50,480	16,211	12,282	39,829	31,012	1,000	11,971	3,622	4,418	20,110

a/ Andreasen, Mark, October 26, 2005, "Libby Dam Visitation 1987_2005.xls" (Microsoft Excel File), US Army Corps of Engineers, Libby, MT.
b/ Stewart, Lana, December 5, 2005, "Kootenai_use.xls" (Microsoft Excel File), Kootenai National Forest, Libby, MT.

c/ Total angler days (resident and non-resident) from the Biannual Statewide Angling Use Survey conducted via mail by Montana Fish, Wildlife and Parks Information Services Unit, Bozeman, MT. An Angler Day is one angler for any length of time in one day on one body of water. Personal communication with Robert McFarland, Systems Analyst, Montana Department of Fish, Wildlife, and Parks, Bozeman, MT, December 1, 2003

d/ Board of Outfitters, Years 1995-2005, Resident and Non-Resident Fishing, Montana Department of Labor and Industry, Business Standards Division, Helena, MT, Printed October 27, 2005.

e/ Stewart, Lana K., November 30, 2005, Kootenai.xls (Microsoft Excel File), Kootenai National Forest, Libby, MT.

f/ Walters, Jody, October 25, 2005, Letter in Response to Request for Angling Pressure Information on the Kootenai River in Idaho, Idaho Fish and Game, Coeur d'Alene, ID.

g/ KNWR = Kootenai National Wildlife Refuge. Total visitation includes migratory bird hunting, fishing, special events, staff interpretation, nature observation, and environmental education. US Department of the Interior, Fish and Wildlife Service, Pacific Region, 2005, "PubRec95_04_ID_OR_WA_NV.

h/ Average excluding 1985, the year Kokanee salmon were introduced to the lake.

i/ MAF = Million acre feet, ACOE, September 30, 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report, Appendix D: Kootenai River Channel Capacity Study Report". Seattle, WA, p. D-11.

j/ Provided 1.083 MAF of flow during June 25 - July 26, but the flows were the result of flood control operations. During the flood control operation, spill amounts were increased and the project reached a maximum total outflow of 40,000 cfs on 2 July (15,600 cfs over the spillway and 24,400 cfs through the powerhouse). The average inflow to Libby Dam during June 2002 was 53,600 cfs, which is 146 percent of normal. The maximum inflow to Libby Dam in water year 2002 was 71,900 cfs, occurring on June 18. September 30, 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report, Appendix D: Kootenai River Channel Capacity Study Report". Seattle, WA, p. D-12.

Under the variable discharge strategy (VARQ), water volumes in excess of typical discharge are released from Libby Dam during the spring and summer months to simulate natural sturgeon spawning conditions. The release of more water results in a higher risk of downstream flooding. The ACOE has recognized this effect and has modeled fish flows to quantitatively assess the increase in flood risk and resulting potential damages. ACOE also evaluated whether VARQ alternatives would adversely impact local well and septic systems. This section summarizes ACOE's findings, regarding the potential cost of VARQ alternatives in terms of increased flooding, structural damages, and the condition of levees.

The Kootenai River is a tributary to the Kootenay River system in British Columbia, Canada, which in turn is a tributary of the Columbia River. Longstanding policy compacts between the US and Canada, such as the International Joint Commission Order of 1938, established cooperative flood control regulations. As Libby Dam is a component of an extensive international flood control system, the effects of augmented outflows to Canada must be considered. However, the focus of this analysis pertains to the economic impacts within the territories of the US, including the Columbia River, and provides only brief insight to the impacts on Canada.

7.1 SOURCES OF INFORMATION AND METHODOLOGY

No primary data was collected for this analysis. The majority of this section's conclusions are drawn from to ACOE field and modeling efforts. Analysis of flood risk and damages relies heavily on Kootenai River hydrologic and hydraulic studies conducted by ACOE. Cost and damage figures were calculated by subtracting benchmark/baseline estimates (LS) from the estimates derived for the VARQ alternatives (LV1 and LV2). See Section 4 for a detailed description of LS, LV1, and LV2.

7.2 HISTORICAL IMPLICATIONS

No significant overbank flooding has occurred since Libby Dam was completed in 1973.[176] Property owners have not invested in flood abatement measures since Libby Dam's construction. No pre-designation costs or damages can be attributed before augmented sturgeon flows began in 1994.

7.3 ASSESSMENT OF FLOOD RISK

The 2000 Service Biological Opinion of the Kootenai River White Sturgeon recommended that Libby Dam perform a spill test to assess the channel capacity, dissolved gas concentrations

176 ACOE, September 30, 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report". Seattle, WA. p.6.

downstream of Libby Dam, and "spillway maintenance needs associated with spilling water more frequently than under operations of the past 15 years."[177] On June 25, 2002, ACOE initiated the recommended spill test and observed the channel capacity between Libby Dam and the Idaho/Montana border. The test was scheduled to last three days, but Lake Koocanusa (Libby Dam's reservoir) experienced unusually high inflows and was reaching capacity quickly.[178] The test was aborted one day later, on June 26, for involuntary release operations. To mitigate the rising level of the reservoir, flows of 40,000 cfs (15,000 cfs over the spillway and 25,000 through the powerhouse) were released from Libby Dam between June 25 and July 17.[179] Although the spill test was intended to simulate sturgeon flows, the involuntary releases allowed ACOE to monitor the potential impacts of the VARQ alternatives to downstream structures in a higher risk environment.

During the 23 day spill, ACOE recorded Libby Dam outflow and relative stage change at twelve locations. For example, ACOE estimated the channel capacity at Libby, Montana and Troy, Montana to be 42,000 cfs and 45,000 cfs respectively. ACOE also noted that river stages rose 1¼-1¾ inches for every flow increase of 1,000 cfs.[180]

Utilizing the data collected from the spill test and a 2004 ACOE assessment of levee integrity, ACOE employed a Monte Carlo simulation modeling program, HEC-FDA (Flood Damage Analysis), to evaluate the risk of releasing sturgeon flows from Libby Dam. ACOE's model incorporates stage-frequency curves, levee stage-failure probability data, and depth-damage functions to compute levee performance parameters and expected annual damages (EAD) for baseline and VARQ outflows.

ACOE's modeling results indicate that the only area to experience significant flood risk is the Kootenai National Wildlife Refuge near the Canadian border. Baseline flows (LS) were not considered in the ACOE modeling, so a measurement of increased risk cannot be assigned. However, under LV1 the Wildlife Refuge will experience an 18 percent annual probability of flooding and a 22 percent annual probability of flooding under LV2.[181] All other areas in the

177 ACOE, December 20, 2000, "Biological Opinion: Effects to Listed Species from Operations of the Federal Columbia River Power System". p.11.

178 ACOE, September 30, 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report, Appendix D: Kootenai River Channel Capacity Study Report". Seattle, WA. p.66.

179 ACOE, September 30, 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report, Appendix D: Kootenai River Channel Capacity Study Report". Seattle, WA. p.D-12.

180 ACOE, September 30, 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report, Appendix D: Kootenai River Channel Capacity Study Report". Seattle, WA. p.D-13 and vi.

181 ACOE, September 30, 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report. p.63.

Kootenai River basin are estimated to experience less than or equal to a one percent annual probability of flooding under the VARQ alternatives.[182] Therefore, with the exception of the Kootenai National Wildlife Refuge, the Kootenai River basin will experience a negligible flood risk under the VARQ alternatives.

ACOE modeling of Kootenay Lake, Canada, indicated that in comparison to LS, the VARQ alternatives would slightly raise lake levels during May, June, and July. The lake is estimated to rise 0.5 to 2.2 feet between May and July.[183] Comparing LS to LV2, Kootenay Lake could rise 0.5 to 2.4 feet between May and July.[184] Table 7-1 compares Kootenay Lake's median elevations during the spring months.

Table 7-1:
Kootenay Lake Median Elevation (feet)
During Spring Fish Flows[185]

Baseline	May	June	July
LS	1,743.8	1,746.2	1,744.5
Alternatives			
LV1	1,745.0	1748.5	1,745.2
LV2	1,745.0	1,748.6	1,745.0

Recent ACOE surveys of the West Arm of Kootenay Lake show that damage commences when the lake reaches an elevation of 1,750 feet.[186] Exact probabilities of annual flooding are not presented in this analysis. However, with the rise of lake elevation resulting from the implementation of the VARQ alternatives, it follows that the risk of flooding also increases, particularly during the month of June when inflows produce the highest average lake elevation.

ACOE assessed the potential for increased flood risk under the VARQ alternatives along the Columbia River using the same modeling techniques as for the Kootenai River basin. Three locations along the Columbia River were evaluated: Birchbank, BC, The Dalles, Oregon and the Portland/Vancouver harbor of Oregon/Washington. The modeling results indicated that the

182 ACOE, September 30, 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report". Seattle, WA. p.63.

183 ACOE, November 2002, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS". Seattle, WA. p.108.

184 ACOE, November 2002, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS". Seattle, WA. p.108.

185 ACOE, November 2002, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS". Seattle, WA. p.108.

186 ACOE, October 1972, Columbia River Treaty Flood Control Operating Plan.

difference of flood risk between the baseline and VARQ alternatives at each location was negligible.[187, 188]

7.4 POTENTIAL DAMAGES

Agricultural damages incurred from groundwater seepage are not evaluated in this section (see Section 5), rather only the impacts from overbank flooding on residential, commercial/industrial, and public structures are considered.

Each day of the 2002 spill test, twelve structures of concern were monitored for potential damages between Libby Dam and Troy, Montana. ACOE reported minimal damages during the spill test to the structures: "During the peak outflow of 40,000 cfs, no homes were inundated, although a few experienced erosion of their landscaping and were especially sensitive to wave action from boats."[189]

The negligible flood risk to the Kootenai River basin is reflected in a 2005 Tetra Tech study. Accounting for stage-damage relationships, discharge-stage relationships, and discharge-frequency relationships, Tetra Tech's modeling indicates no increase in EAD between baseline and either VARQ alternative estimate. LS, LV1, and LV2 each computed a total of $9,700 in annual structural damages.[190] Therefore, no social welfare loss to structural properties below Libby Dam is anticipated as result of adopting VARQ alternatives.

This analysis attributes no damages to a flood event at Kootenay Lake, Canada. However, it is worth noting that recent surveys of the West Arm of the lake (near Nelson, BC) "estimate damages of $5 to $15 million (CDN) ($4.3 to $13.0 million USD) at a lake level of 1,755 feet, $2 to $5 million ($1.7 to $4.3 million USD) at a lake level of 1,752 feet, and up to $2 million ($1.7 million USD) at a lake level of 1,750 feet."[191]

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187 ACOE, January 1999, "Kootenai River Flood Control Study: Analysis of Local Impacts of the Proposed VARQ Flood Control Plan". Seattle, WA. p.ii.

188 Tetra Tech, May 2005, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS, Appendix F: Socioeconomic Impact Analysis". Seattle, WA. p.F-82.

189 ACOE, September 30, 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report, Appendix D: Kootenai River Channel Capacity Study Report". Seattle, WA. p.D-13.

190 Tetra Tech, May 2005, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS, Appendix F: Socioeconomic Impact Analysis". Seattle, WA. p.F-54.

191 H. Brownlow, BC Hydro, personal communication, August 10, 2005. Found in: ACOE, May 2005, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS". Seattle, WA. p.85

As stated previously, ACOE modeling resulted in a negligible increase of flood risk to the main-stem of the Columbia River. This analysis attributes no damages to structural properties along the Columbia River as result of implementing VARQ sturgeon flow alternatives.[192]

Local wells and septic systems may be potentially impacted by VARQ alternatives as increased discharge volumes subsequently raise the water table. ACOE performed a field study in August 2004 that tested for potential contamination in drinking water wells and saturation of onsite wastewater treatment and disposal systems on properties adjacent to the Kootenai River.[193] ACOE concluded, "Water quality in the drinking water wells sampled was good and was not degraded by high flow volumes in the Kootenai River."[194] The study also determined that no damages to septic facilities were caused by increased flows.[195] Based on these results, this analysis attributes no potential damage costs to wells or septic systems as result of implementing VARQ alternatives at Libby Dam.

7.5 LEVEE INTEGRITY AND REHABILITATION COSTS

As noted previously, property owners along the Kootenai River generally ceased private flood control abatement measures when Libby Dam began operations in 1973. Since this time, the condition of the levees has steadily declined.[196] Three factors contribute to the erosion (at both toe and crest) of the levees: neglected maintenance, hydropower flows, and fish flows. In 1996, ACOE and the National Weather Service lowered the Bonners Ferry flood stage elevation from 1,770 to 1,764 feet, due to the weakening state of the levee system.[197] This section assesses the impacts of the flow alternatives on the levees between Libby Dam and the international border.

In general, the levees that protect the town of Bonners Ferry are in good condition and are well maintained.[198] The high integrity of the levees at Bonners Ferry indicated that the town would not incur higher structural EAD as result of augmented fish flows. In contrast, the levees downstream of Bonners Ferry are deteriorating. However, the extent of levee erosion cannot be

192 Tetra Tech, May 2005, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS, Appendix F: Socioeconomic Impact Analysis". Seattle, WA. p.F-82.

193 ACOE, August 2004, "Assessment of Increased River Flows on Ground Water Quality in Wells Adjacent to the Kootenai River, Montana". (Kent Easthouse) Seattle, WA. p.1.

194 ACOE, August 2004, "Assessment of Increased River Flows on Ground Water Quality in Wells Adjacent to the Kootenai River, Montana". (Kent Easthouse) Seattle, WA. p.18.

195 ACOE, August 2004, "Assessment of Increased River Flows on Ground Water Quality in Wells Adjacent to the Kootenai River, Montana". (Kent Easthouse) Seattle, WA. p.18

196 ACOE, January 1999, "Status Report: Work to Date on the Development of the VARQ Flood Control Operation at Libby Dam and Hungry Horse Dam". Portland, OR. p.43.

197 ACOE, September 30, 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report". Seattle, WA. p.8.

198 Tetra Tech, May 2005, "Upper Columbia Alternative Flood Control and Fish Operations Draft EIS, Appendix F: Socioeconomic Impact Analysis". Seattle, WA. p.F-52.

entirely attributed to fish flows. Furthermore, the modeling from a 1999 ACOE Kootenai River Flood Control Study concluded, "[t]he VARQ flood control plan does not significantly impact the rate of deterioration of the levees below Bonners Ferry, Idaho."[199]

ACOE has investigated the integrity of the Kootenai River basin levee system many times since the listing of the sturgeon in 1994. In general, with each investigation, the rehabilitation cost estimates increase. Cost estimates to rehabilitate the levees varies from $10.5 to $51.1 million (see Table 7-2).

ACOE's 2005 "Bonners Ferry Flood Level Study Report" is the product of ten years of boat trips on the Kootenai River and a series of 1995 aerial cross-section photographs. In the report, ACOE estimates $51.1 million in rehabilitation costs and considers this report to provide the most accurate levee rehabilitation cost estimates. Of the 26 storage areas surveyed, 14 were found to be susceptible to failure under a flood elevation of 1,770 feet with an additional inflow of 10,000 cfs of local runoff, a "very major" flood event.[200] ACOE's rehabilitation cost estimate of $51.1 million applies to this "very major" flooding scenario at 1,170 feet and is not a reflection of the levee system's integrity to hold at the managed river level of 1,764 feet. *Therefore, this analysis does not include the cost of levee repair under the VARQ alternatives as a cost of sturgeon conservation.* However, the cost estimates are provided for information purposes in Table 7-2 below.

Table 7-2
Levee Rehabilitation Cost Estimates

	Kootenai River Flood Control Study (Jan. 1999) [201]		**Bonners Ferry Flood Level Study (Sept. 2005)** [202]
	200 Year Event Protection	Full Protection under any Alternative	
Total	$10.5 million	$21.5 million	$51.1 million

* These estimates assume $60 per cubic yard of riprap materials and a 40% incidental construction cost rate.

199 ACOE, "January 1999, "Kootenai River Flood Control Study: Analysis of Local Impacts of the Proposed VARQ Flood Control Plan." Seattle, WA. p.ii, 47.

200 ACOE, September 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report, Appendix E: Estimated Costs of Damaged Levee Repair, Memorandum for Record". (Monte Kaiser) p.E3-E4.

201 ACOE, January 1999, "Kootenai River Flood Control Study: Analysis of Local Impacts of the Proposed VARQ Flood Control Plan". Seattle, WA. p.46.

202 ACOE, September 2005, "Bonners Ferry Flood Level Study Report – Including Kootenai River Channel Capacity Study Report, Appendix E: Estimated Costs of Damaged Levee Repair, Memorandum for Record". (Monte Kaiser) p.E3-E4.

This appendix contains an examination of the extent to which the analytic results presented in the main report reflect impacts to small entities. The analysis of the effect on small entities is conducted pursuant to the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996. The appendix also contains an analysis of the effects of the rulemaking on energy markets, as required by Executive Order No. 13211.

POTENTIAL EFFECTS ON SMALL ENTITIES

Under the RFA (as amended by SBREFA), whenever a Federal agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities. However, no regulatory flexibility analysis is required if the head of an agency certifies that the rule will not have a significant economic impact on a substantial number of small entities.[203] SBREFA amended the RFA to require Federal agencies to provide a statement of the factual basis for certifying that a rule will not have a significant economic impact on a substantial number of small entities. To assist in this process, the following represents a screening level analysis of the potential effects of conservation efforts for the sturgeon on small entities due to the rulemaking. This analysis is intended to facilitate the determination of (1) whether this CHD potentially affects a "substantial number" of small entities in counties and/or supporting critical habitat areas; and (2) the probable number of small entities that are likely to experience a "significant effect."

DEFINITION OF SMALL ENTITIES

Small entities include small businesses, small governments, or small organizations, as defined by the U.S. Small Business Administration (SBA) size standards for small businesses established for different types of economic activity or industry within the North American Industry Classification System (NAICS), and are commonly expressed in terms of the number of employees or annual receipts. For most industries, the size standard is based upon annual revenue for the business. The SBA publishes a table of current small business size standards on their website (www.sba.gov/size).[204] These size standards were most recently published by the SBA in "Table of Small Business Size Standards Matched to North American Industry Classification System

203 Thus, for a regulatory flexibility analysis to be required, impacts must exceed a threshold for "significant impact" *and* a threshold for a "substantial number of small entities." See 5 U.S.C. § 605(b).

204 U.S. Small Business Administration, "Small Business Size Standards Matched to North American Industry Classification System," effective December 6, 2005, http://www.sba.gov/size/sizetable2002.html, accessed December 15, 2005.

Codes," effective December 6, 2005. Small organizations are defined as "any non-profit enterprise … which is independently owned and operated and not dominant in its field."[205] These may include organizations such as irrigation districts, water associations, public utilities, or agricultural co-ops. A small government is defined as any government serving populations of 50,000 or less, and might include county, city, town, or school district governments.

Federal courts have held that an RFA analysis should be limited to impacts on entities subject to the requirements of the regulation (i.e., participants in the section 7 consultation process).[206] These entities include participants in the section 7 consultation process, but not entities suffering the downstream effects of consultation outcomes. In spite of these rulings, in its guidance to Federal agencies on conducting screening analyses, the SBA recommends considering impacts to entities that may be indirectly affected by the proposed regulation.[207]

IDENTIFICATION OF ACTIVITIES THAT MAY INVOLVE SMALL ENTITIES

The analysis in the main report determined that costs involving conservation efforts for the sturgeon would be incurred for farming activities.[208] This section considers the extent to which the costs presented in the main report reflect impacts to small entities.

Agriculture

Based on the results reported in the economic analysis, activities undertaken by small business that are potentially affected by conservation measures to protect the sturgeon and/or its habitat include agriculture production. SBA's small business size standard for farming and ranching is annual sales of $750,000.[209] Recent county-level farm sales data from the NASS 2002 Agriculture Census is used to determine the number of small agri-businesses operating within the

205 5 U.S.C. § 601 *et seq*.

206 U.S. Small Business Administration, Office of Advocacy, May 2003, "A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act," pp. 69-70.

207 U.S. Small Business Administration, Office of Advocacy, May 2003, "A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act."

208 As discussed in Section 6, data to support a possible reduction in annual recreation visitation/use are inconclusive. However, it is possible that certain small recreation-related businesses in the areas surrounding Lake Koocanusa and the Kootenai River in Idaho and Montana may experience impacts. For example, approximately seven fishing outfitters operate on the Kootenai River in Montana. One outfitter indicated that there are no impacts to his business from sturgeon flows as the fish flows mimic natural runoff and flood flows. A second outfitter indicated that fish flows decrease his clients by a total of five percent, while a third outfitter estimated that he is unable to book one and one half months worth of guiding trips each year because of sturgeon flows.

209 U.S. Small Business Administration, "Small Business Size Standards matched to North American Industry Classification System," effective December 6, 2005, http://www.sba.gov/size/sizetable2002.html, accessed December 15, 2005.

proposed critical habitat designation.[210] Unfortunately, the largest reported category of sales information in the 2002 Agriculture Census data is for the number of operations with annual farm sales greater than $500,000, less than the SBA small business threshold. Nevertheless, the 2002 Agriculture Census data does indicate that 98 percent of the farmers and ranchers operating within Boundary County, Idaho, have annual sales less than $500,000; the remaining two percent (i.e., seven farmers and/or ranchers) account for 54 percent of the County's annual sales, or $1.9 million per operation on average (see Table A-1). These data indicate that ranching operations in the area surrounding the proposed designation tend to be small.

Approximately $13 million in crops are grown annually in the Kootenai River Valley (see Section 2.5.3.1). The value of the Valley's annual production represents almost 60 percent of the market value of agriculture products sold in the County annually ($22.8 million in 2002). Hops grown by Elk Mountain Farms, a subsidiary of the Anheuser-Busch Company, represent the highest valued crop in the valley, approximately $7 million annually.[211] Thus, excluding Elk Mountain Farms, the remaining 30 agriculture operations in the Kootenai River Valley generate approximately $6 million in farm sales annually, or $200,000 per operation.[212] For the purpose of this small business analysis, all agriculture operations forecast to be impacted by species conservation efforts for the sturgeon, except for Elk Mountain Farms (a subsidiary of the Anheuser-Busch Company), are considered small.

The 30 small agriculture operations in the Kootenai River Valley represent approximately seven percent of the number of small farms operating within the County (see Table A-1). The total annualized costs of species conservation activities (approximately $1.8 to $2.1 million in total, or $59,000 to $71,000 per operator) is approximately 16 to 19 percent of annual small farm sales in the County, and 30 to 35 percent of a Kootenai River Valley farmer's annual sales (see Table A-1). Thus, the conservation measures for the sturgeon are expected to impact the profitability of these 30 small agriculture operations.[213]

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210 Quick Stats: Agricultural Statistics Data Base, 2002 Census of Agriculture - Volume 1 Geographic Area Series Census, State - County Data, Table 2. Market Value of Agricultural Products Sold Including Direct and Organic: 2002 and 1997, Boundary County, Idaho, http://151.121.3.33:8080/QuickStats/, accessed November 9, 2005.

211 Elk Mountain Farms grows hops on two farms, Backwoods Farm (approximately 1,200 acres) and Tavern Farm (approximately 550 acres). Source: "Kootenai River Valley Agriculture Seepage Study, Summary Report, Boundary County Idaho," U.S. Army Corps of Engineers, Seattle District, September 2005.

212 Data was collected from 25 growers in the Kootenai River Valley to assess seepage impacts on agriculture for various sturgeon and flood control flows for the Columbia River EIS. This effort represents approximately 90 percent of the acreage being farmed in the valley (about 30,000 acres), and approximately 90 percent of the growers. Source: HDR Engineering, Inc., August 2003, "Upper Columbia Basin Alternative Flood Control EIS, Kootenai Flats Seepage Analysis, Bonners Ferry, Idaho," for U.S. Army Corps of Engineers, Seattle District.

213 County-level data in the 2002 Agriculture Census indicate that more than half of farms (approximately 52 percent) within the county operate at a net cash loss (see Section 2.5.3.1). By definition, net cash

Table A-1
Boundary County, Idaho, Agriculture Statistics and Small Business Analysis
(2005$ [d/])

Item	Low	High
Number of farms	432	
Total sales [a/]	$24,646,000	
Farms with sales <$500,000 [a/]	425	
Percent of farms with sales <$500,000	98%	
Total sales from farms with sales <$500,000 [a/]	$11,314,000	
Percent of sales from farms with sales <$500,000	46%	
Average sales per farm with sales <$500,000	$26,622	
Farms with sales >$500,000 [a/]	7	
Percent of farms with sales >$500,000	2%	
Total sales from farms with sales >$500,000 [a/]	$13,332,000	
Percent of sales from farms with sales >$500,000	54%	
Average sales per farm with sales >$500,000	$1,904,539	
Approximate number of small farms in the Kootenai River Valley impacted by conservation activities	30	
Percent of small farms impacted	7%	
Total annualized costs of conservation activities to small farms in the Kootenai River Valley [b/]	$1,780,000	$2,120,000
Annualized cost as a percent of total sales in Boundary County from farms with sales <$500,000	15.7%	18.7%
Annual sales, excluding hops, from small farms in the Kootenai River Valley [c/]	$6,000,000	
Annual sales for a small farm in the Kootenai River Valley impacted by conservation activities	$200,000	
Annualized cost of conservation activities per operator impacted	$59,352	$70,553
Annualized cost of conservation activities as a percent of average farm sales per operator impacted	30%	35%

a/ Quick Stats: Agricultural Statistics Data Base, 2002 Census of Agriculture - Volume 1 Geographic Area Series Census, State - County Data, Table 2. Market Value of Agricultural Products Sold Including Direct and Organic: 2002 and 1997, Boundary County, Idaho, http://151.121.3.33:8080/QuickStats/, accessed November 9, 2005.

b/ Excluding impacts to hops farming as the two hops farms, Backwoods Farm and Tavern Farm, are owned by Elk Mountain Farms, a subsidiary of the Anheuser-Busch Company, which exceeds the small business threshold. The hops are expected to account for approximately $1.8 to $2.0 million of the estimated $3.5 to $4.1 million in annualized impacts to agriculture.

c/ See Table 2-7 in Section 2.5.3.1

d/ 2002 Agriculture Census data converted to 2005$ U.S. Department of Labor, Bureau of Labor Statistics, "Consumer Price Index – All Urban Consumers," (Series ID: CUUROOOOSAO Not Seasonally Adjusted).

Note that the impact to small agriculture operations may be overstated. As mentioned previously, the geographic area of analysis includes the unit proposed for CHD (Unit 1: Braided Reach) and the unit previously designated as critical habitat in 2001 (Unit 2: Meander Reach). However, the flow-related agriculture impacts are joint costs; the sturgeon flows and resulting impacts will

income is cash sales less cash expenses (ignoring non-cash expenses, such as depreciation), a net cash loss means many of the small farm operators in the county are operating below break-even (i.e., cash expenses exceed cash income).

occur whether or not the proposed unit (Unit 1), or a portion thereof, is added to the existing designation. Considering these conservation-related impacts are also co-extensive with the listing, there are unlikely to be incremental burdens to small agricultural operations from the designation of Unit 1, Braided Reach.

Other Small Entities

Four small local governments, Libby, Montana (population 2,626), Bonners Ferry, Idaho (population 2,515), Troy, Montana (population 957), and Moyie Springs, Idaho (population 656), are located either adjacent to, or in the vicinity of the existing and proposed critical habitat.[214] All four of the local governments have populations that fall within the criteria (fewer than 50,000 residents) for "small entity." There is one record of a section 7 consultation between Bonners Ferry and the Service since the sturgeon was listed in 1994. This was an informal consultation on the installation of residential water meters. The proposed work will not occur within waterways or riparian areas and will not affect the sturgeon. Indeed, it is not likely that these cities would be involved in projects involving a section 7 consultation.

POTENTIAL EFFECTS ON ENERGY SUPPLY

Executive Order No. 13211, "Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use," issued May 18, 2001 requires Federal agencies to submit a "Statement of Energy Effects" for all "significant energy actions" in order to present consideration of the impacts of a regulation on the supply, distribution, and use of energy.[215] Significant adverse effects are defined in the EO by the OMB according to the following criteria:

1. Reductions in crude oil supply in excess of 10,000 barrels per day;
2. Reductions in fuel production in excess of 4,000 barrels per day;
3. Reductions in coal production in excess of five million tons per year;
4. Reductions in natural gas production in excess of 25 million mcf (one thousand cubic feet) per year;
5. Reductions in electricity production in excess of one billion kilowatt-hours (kWh) per year or in excess of 500 megawatts (MW) of installed capacity;

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214 All of these local governments exceed the criteria (fewer than 50,000 residents) for "small entity." Source: Geographic Data Technology, Inc. (GDT), Department of Commerce, Census Bureau, Geography Division, and ESRI, 20040301, U.S. Populated Place Areas: ESRI ® Data & Maps 2004, ESRI, Redlands, California, USA.

215 Daniels, Mitchel E., July 13, 2001, "Memorandum for Heads of Executive Departments and Agencies, and Independent Regulatory Agencies," M-01-27, http://www.whitehouse.gov/omb/memoranda/m01-27.html.

6. Increases in energy use required by the regulatory action that exceed any of the thresholds above;
7. Increases in the cost of energy production in excess of one percent;
8. Increases in the cost of energy distribution in excess of one percent; or
9. Other similarly adverse outcomes.

Two of these criteria are relevant to this analysis: (1) reductions in electricity production in excess of one billion kWh per year or in excess of 500 MW of installed capacity and (2) increases in the cost of energy production in excess of one percent. Below, the analysis determines whether the electricity industry is likely to experience "a significant adverse effect" as a result of sturgeon conservation activities.

Based on components of the February 2006 BO, including the relaxed ramping rates and the increased lake levels at Kootenay Lake, the modeled hydropower generation numbers will differ from those presented in the February 2006 DEA. The relaxation of ramping rates at Libby Dam will enable quicker decision making responses to the market conditions, while the management of Kootenay Lake at higher elevations during June and July will result in the availability of water used to generate power downstream in the Columbia River Power System later in the summer when energy prices are typically higher. However, the actual impact of the February 2006 BO on power generation cannot be estimated without additional modeling by ACOE. While the power generation results cannot be adjusted without additional modeling efforts, the impact of the February 2006 BO on power generation is expected to be less than the power generation impacts presented in the February 2006 DEA. Considering the results of the energy impacts analysis in the February 2006 DEA were below the thresholds suggested by OMB, and that the power generation impacts are expected to be less under the February 2006 BO, the power generation impacts resulting from the February 2006 BO are also expected to be below OMB thresholds. The original energy impacts analysis from the February 2006 DEA is presented below.

Evaluation of Whether the Designation will Result in Reductions in Electricity Production in Excess of One Billion kWh per Year or in Excess of 500 MW of Installed Capacity

Installed capacity is "the total manufacturer-rated capacity for equipment such as turbines, generators, condensers, transformers, and other system components" and represents the maximum rate of flow of energy from the plant or the maximum output of the plant. As noted in Section 4 of this report, modifying dam operations to provide sturgeon flows in late spring and early summer would result in the release of water from Libby Dam that otherwise would have been stored for release in the winter. If run through the powerhouse, the water would be used to generate electricity during months when the value of electricity is generally lower. If spilled, the water spilled over the dam would be lost to use for power generation. After Libby, these sturgeon flows would then work their way down the Columbia River Basin, through other hydro facilities.

Depending on the situation at a particular dam, the water would either be lost to use for power generation or used to generate electricity during months when the value of electricity is generally lower. However, these are power production issues as installed capacity at Libby Dam and at other hydro facilities downstream from Libby remain unchanged. Therefore, the screening level analysis focuses on changes in energy production. Considering the energy production is impacted at Libby Dam and at hydro facilities downstream from Libby, the screening level analysis will look at changes in energy production system-wide.

As reported in Section 4, the ACOE models the impacts of sturgeon flows on system-wide electricity production. While model results show a slight increase in power production at Libby Dam following sturgeon flows, the system-wide impact is a net loss in power generation. The net loss of 274 GWh (the greatest energy production impact under the alternative sturgeon flow scenarios), or 274 million kWh,[216] is less than 27 percent of the one billion kWh threshold suggested by OMB.[217]

Evaluation of Whether the Designation will Result in an Increase in the Cost of Energy Production in Excess of One Percent

The ACOE and the BOR are the owners and operators of the 31 federally owned hydro projects on the Columbia and Snake Rivers (the ACOE is the owner of Libby Dam). Bonneville Power Administration (BPA), a federal agency under the Department of Energy (DOE), markets and distributes the power generated from these federal dams and from the Columbia Generating Station. The dams and the electrical system are known as the FCRPS.[218] While BPA is part of the DOE, it is not tax-supported through government appropriations. Instead, BPA recovers all its costs through sales of electricity and transmission and repays the U.S. Treasury in full with interest for any money it borrows.[219] Revenues collected through power rates cover the costs of operation of the hydro projects and the transmission system, the debt service required to repay the capital investment in the system, and contributes to other costs associated with these projects, such as the conservation efforts to protect fish and wildlife in the Columbia River Basin.[220]

BPA's service territory covers all of Washington, Oregon, Idaho, and western Montana, as well as small portions of California, Nevada, Utah, Wyoming and eastern Montana. BPA provides about half the electricity used in the Northwest and operates over three-fourths of the region's

216 VARQ with 35,000 cfs of sturgeon flows (alternative LV2).

217 1 GWh = 1,000,000 kWh.

218 BPA, Federal Columbia River Power System (FCRPS) Hydro Projects, available at http://www.bpa.gov/power/pgf/hydrPNW.shtml

219 BPA, Who Are We?, available at http://www.bpa.gov/corporate/About_BPA/

220 BPA, Federal Columbia River Power System (FCRPS) Hydro Projects, available at http://www.bpa.gov/power/pgf/hydrPNW.shtml

high-voltage transmission.[221] BPA is also a participant in the Northwest Power Pool (hereafter "Pool"), an organization comprised of major generating utilities serving the Northwestern U.S. (which comprises Oregon, Washington, Idaho, and Montana, as well as Nevada, Utah, and part or California and Wyoming), British Columbia, and Alberta. The Pool was established to more effectively coordinate operations to "achieve reliable operations of the electrical power system, coordinate power system planning, and assist in transmission in the Northwest Interconnected Area."[222] For the purpose of this screening level analysis, the increase in the cost of energy production due to designation will be compared to the cost of energy production in the Northwest Interconnected Area.

The following analysis considers the probability that: (1) a reduction of approximately 274 GWh of hydroelectric production (the greatest energy production impact under the alternative sturgeon flow scenarios); (2) the cost of BPA funded sturgeon-related conservation projects (e.g., studies, monitoring, and fish hatchery); and (3) the capital cost of modifying Libby Dam to allow passage of an additional 10,000 cfs of sturgeon flows (above the 25,000 cfs powerhouse capacity) through the powerhouse and/or over the spillway without violating Montana water quality standards, will lead to an increase in the cost of energy production of one percent or more. Because 274 GWh represents a small amount of the regional generating capacity (31 average MW),[223] the screening level analysis assumes the electricity will be purchased from an alternative source, and that the most likely source of replace energy is electricity from a gas turbine peaking facility. Reductions in power value (i.e., revenues) due to changes in the timing of power production are not considered in the screening level analysis as lost revenues do not represent an increase in energy production costs.

First, total annual electricity generation is estimated, by fuel type, for the region (i.e., Northwest Interconnected Area). As shown in Table A-2, the region produced 364,648 GWh of electricity in 2004.

221 BPA, Who Are We?, available at http://www.bpa.gov/corporate/About_BPA/

222 Northwest Power Pool, available at http://www/nwpp.org.

223 One average megawatt (aMW) is equal to one MW of capacity produced continuously over a period of one year. 1 aMW = (1 MW x 8,760 hours/year) ÷ 1,000 = 8.8 GWh.

Table A-2
Regional Net Energy Generation by Fuel Type, 2004 (GWh)

Fuel Type	Total
Hydro	175,131
Gas (including combustion turbine and combined cycle)	26,711
Petroleum (undefined thermal)	427
Coal	130,281
Nuclear	8,960
Other (co-generation and other)	23,138
Total	**364,648**

Source: Northwest Power Pool, Monthly Summaries, Historical Energy Data, Historical Energy Data for 2004, http://www.nwpp.org/weekly.html

Next, the average operating expense is calculated for each fuel type. In this screening level analysis, the average, in mills per kWh, is determined for 2004 and then converted into dollars per kWh (Table A-3).

The energy reduction portion of total sturgeon-related impacts to energy costs for the region is then calculated assuming (1) no change in power operations at Columbia River Basin dams (baseline) and (2) the replacement of 274 GWh of system power with power from a gas turbine facility (Table A-4). This reduction in hydroelectric output is not expected to reduce the total cost of hydroelectric power production since hydroelectric production costs are largely fixed. Therefore, the estimated cost of annual hydroelectric energy production under the sturgeon conservation activities (alternative) remains the same as annual production costs under baseline operations. The cost of purchasing the 274 GWh of lost system hydro power from a gas turbine facility is estimated at $13.7 million annually.

Last, the cost of BPA and ACOE funded sturgeon-related conservation and the capital cost of modifying Libby Dam to allow passage of an additional 10,000 cfs of sturgeon flows (above the 25,000 cfs powerhouse capacity) through the powerhouse and/or over the spillway without violating Montana water quality standards is added to the cost of purchasing 274 GWh of energy[224] from the gas turbine facility and compared to the total regional energy production costs assuming no change in power operations at Columbia River Basin hydro facilities to determine impact. As illustrated in Table A-4, the additional cost of sturgeon-related conservation efforts is 0.80 percent of the estimated annual baseline cost of regional energy production, less than the one percent threshold suggested by OMB.

224 The net loss of 274 GWh is the greatest energy production impact under the alternative sturgeon flow scenarios (VARQ with 35,000 cfs of sturgeon flows, or alternative LV2).

Table A-3
Average Operating Expenses for
Major U.S. Investor-Owned Electric Utilities (Mills per kWh)

Expense	2004
Operating	
Nuclear	8.30
Fossil Steam	2.68
Hydroelectric	5.05
Gas Turbine and Small Scale	2.73
Maintenance	
Nuclear	5.38
Fossil Steam	2.96
Hydroelectric	3.64
Gas Turbine and Small Scale	2.16
Fuel	
Nuclear	4.58
Fossil Steam	18.21
Hydroelectric	0.00
Gas Turbine and Small Scale	48.20
Total, mills/kWh	
Nuclear	18.26
Fossil Steam	23.85
Hydroelectric	8.69
Gas Turbine and Small Scale	50.10
Total, $/kWh	
Nuclear	**$0.0183**
Fossil Steam	**$0.0239**
Hydroelectric	**$0.0087**
Gas Turbine and Small Scale	**$0.0501**

Note: Operating expenses do not include capital or transmission costs.

Source: Energy Information Administration, November 2005. "Electric Power Annual 2004," Table 8.2 Average Operating Expenses for Major U.S. Investor-Owned Electric Utilities 1993 through 2004.

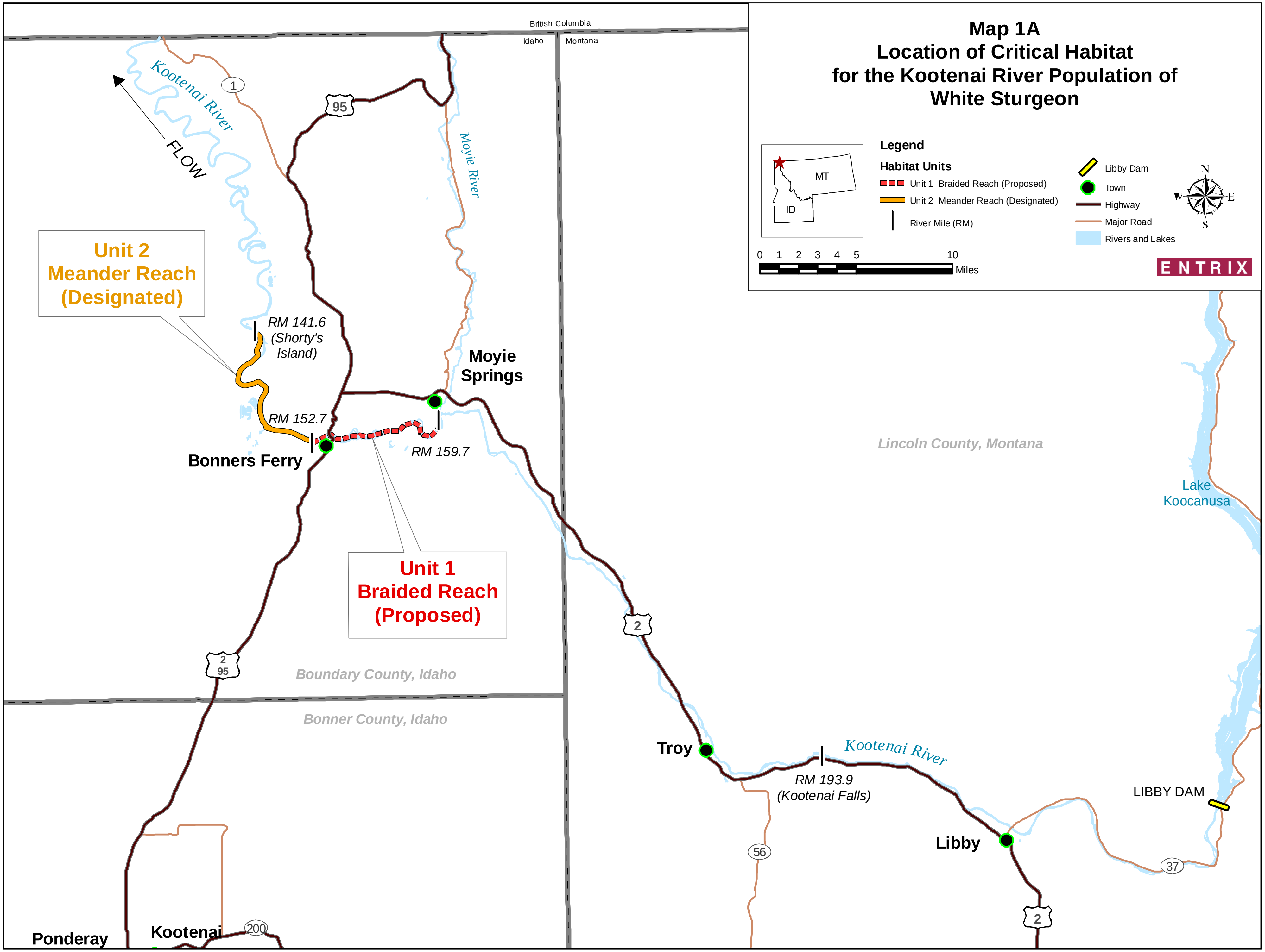
Table A-4
Increase in Regional Cost of Energy Production

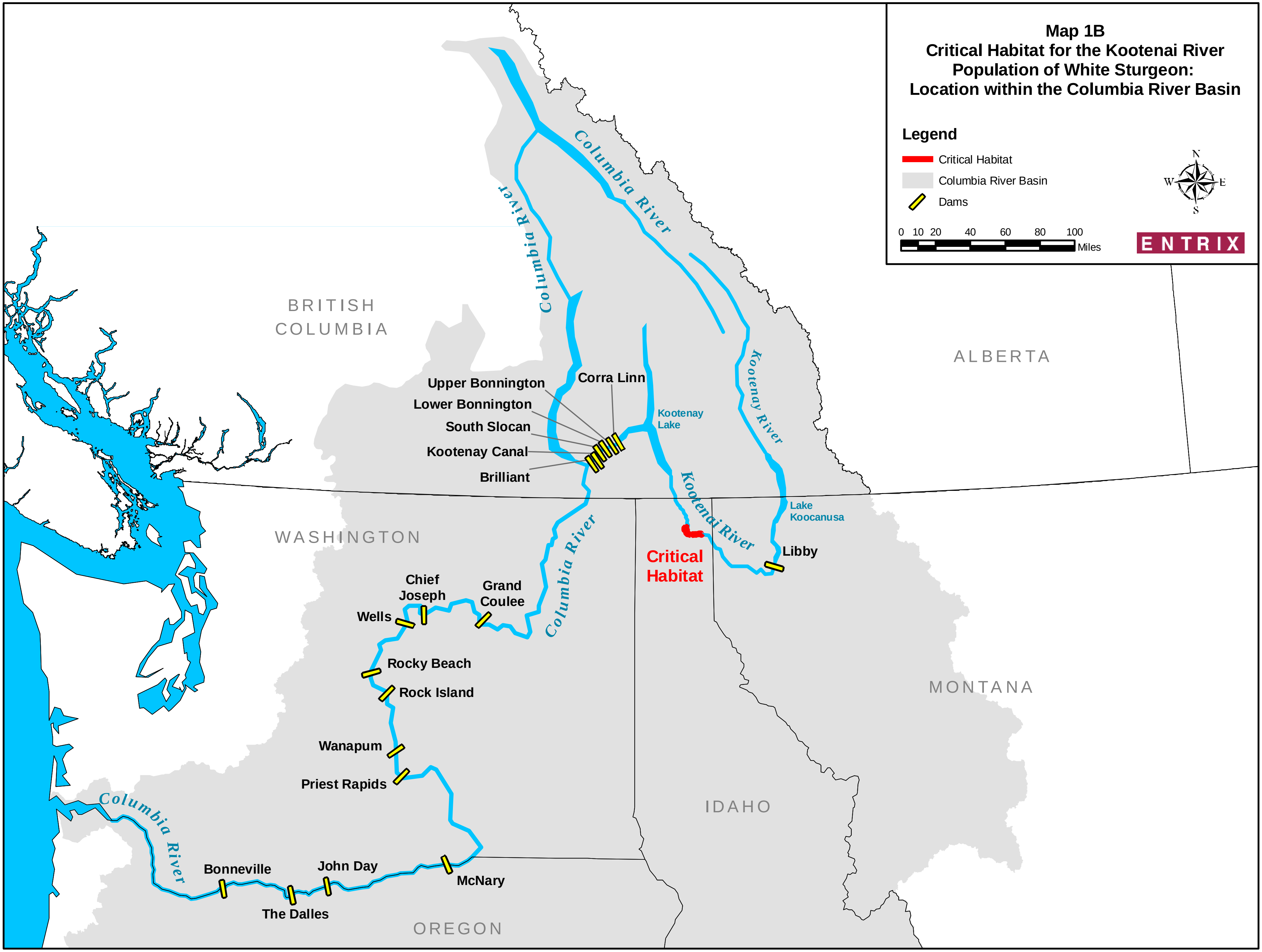
Fuel Type	Actual Regional Energy Production in 2004,GWh (Baseline)	Moving 274 GWh from Hydroelectric to Gas, GWh (Alternative)	Average Operating Cost 2004, $/kWh	Estimated Cost of Energy Production in Baseline, $	Estimated Cost of Energy Production in Alternative, $
Hydro	175,131	174,857	0.00869	1,521,888,390	1,521,888,390
Gas	26,711	26,985	0.05009	1,337,953,990	1,351,678,650
Petroleum	427	427	0.02385	10,183,950	10,183,950
Coal	130,281	130,281	0.02385	3,107,201,850	3,107,201,850
Nuclear	8,960	8,960	0.01826	163,609,600	163,609,600
Other	23,138	23,138	0.05009	1,158,982,420	1,158,982,420
Total	364,648	364,648	-	7,299,820,200	7,313,544,860
Incremental cost of displacing 274 GWh from hydroelectric to gas [a/]					$13,724,660
BPA funded sturgeon-related conservation projects [b/]					$5,770,000
Capital Costs [a/]					$38,700,000
Total Economic Impact					**$58,194,660**
Percent increase from baseline energy production costs					**0.80%**

a/ The net loss of 274 GWh represents the greatest energy production impact under the alternative sturgeon flow scenarios (VARQ with 35,000 cfs of sturgeon flows, or alternative LV2).

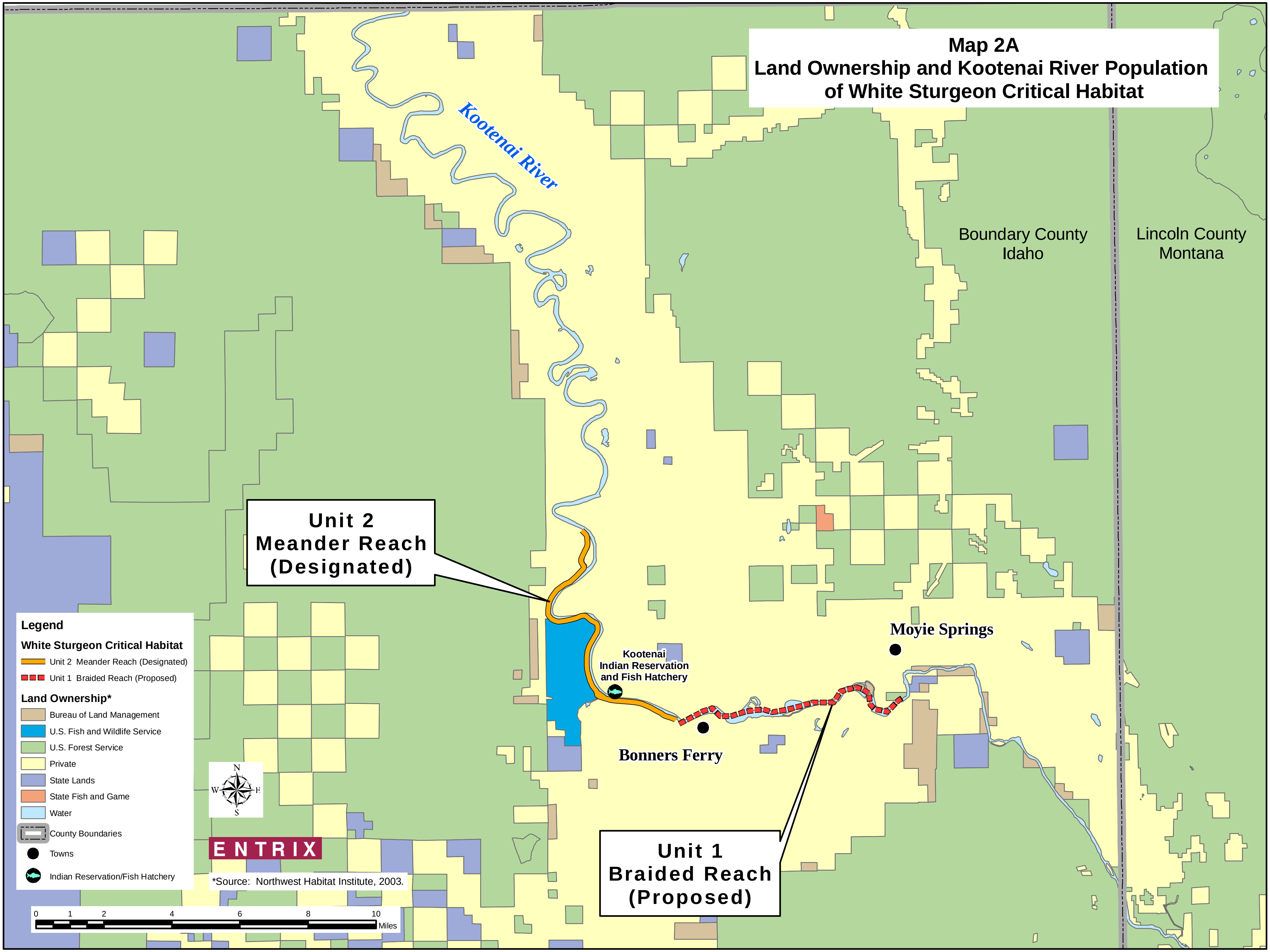
b/ Analysis uses the high end of the cost range to estimate maximum energy impacts.

APPENDIX B
MAPS

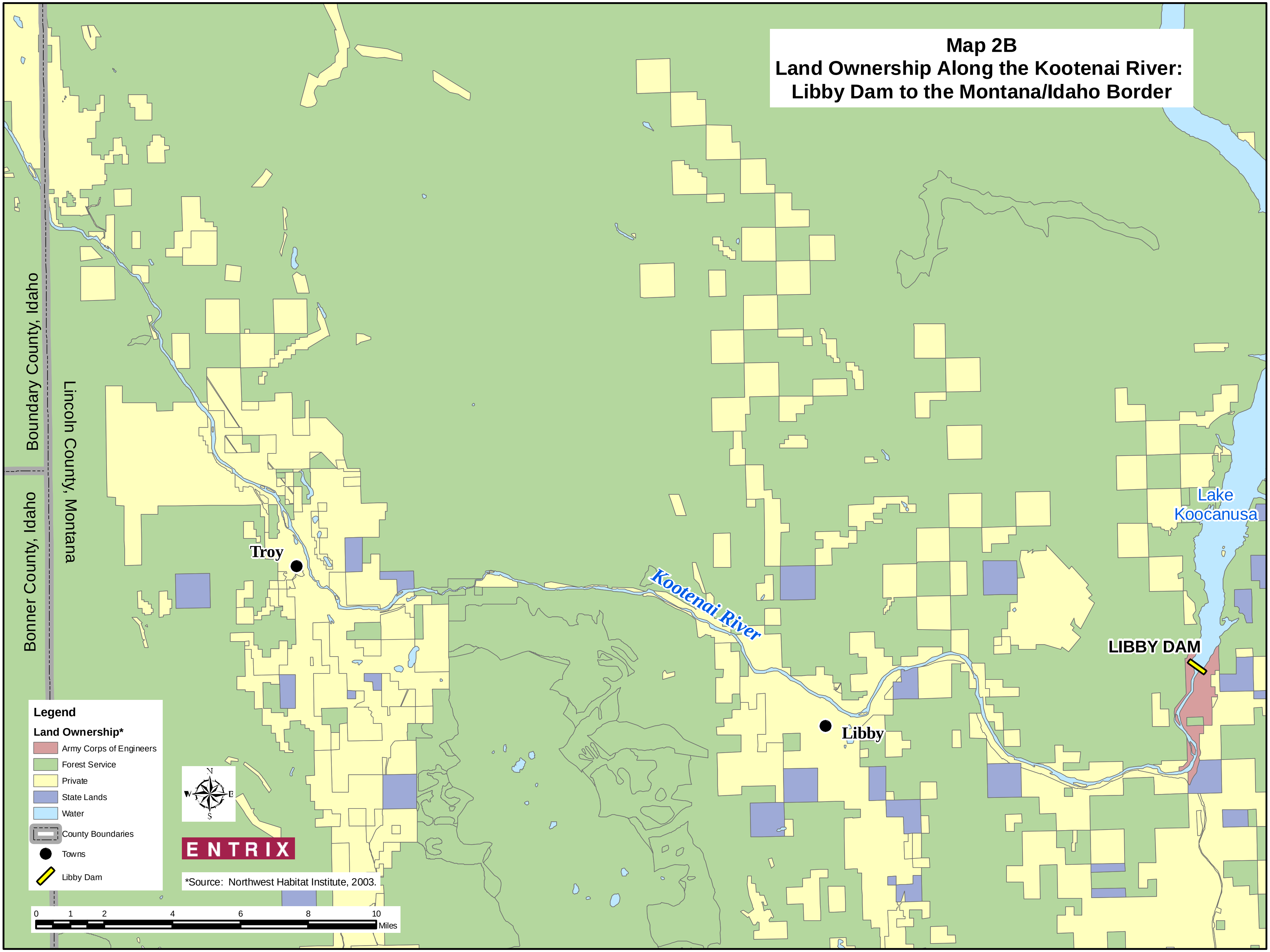

Map 1A
Location of Critical Habitat
for the Kootenai River Population of
White Sturgeon
Legend
Habitat Units
Unit 1 Braided Reach (Proposed)
Unit 2 Meander Reach (Designated)
River Mile (RM)
Libby Dam
Town
Highway
Major Road
Rivers and Lakes
MT
ID
0 1 2 3 4 5 10
Miles
N
S
E
W
ENTRIX
British Columbia
Idaho
Montana
Kootenai River
FLOW
Moyie River
Unit 2
Meander Reach
(Designated)
RM 141.6
(Shorty's
Island)
RM 152.7
Moyie
Springs
Bonners Ferry
RM 159.7
Unit 1
Braided Reach
(Proposed)
Lincoln County, Montana
Lake
Koocanusa
Boundary County, Idaho
Bonner County, Idaho
Troy
RM 193.9
(Kootenai Falls)
LIBBY DAM
Libby
Ponderay
Kootenai
1
95
2
56
37
200

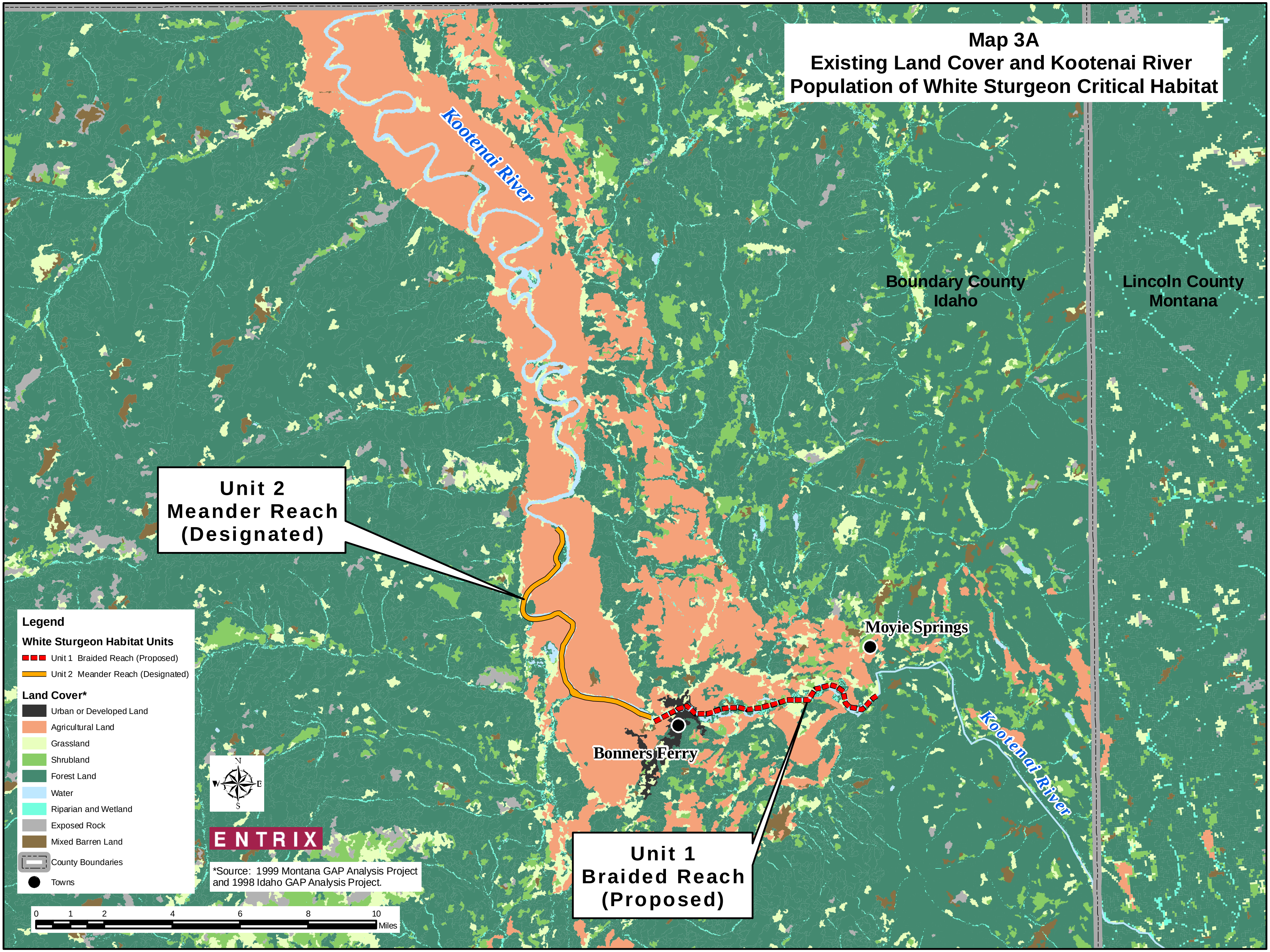


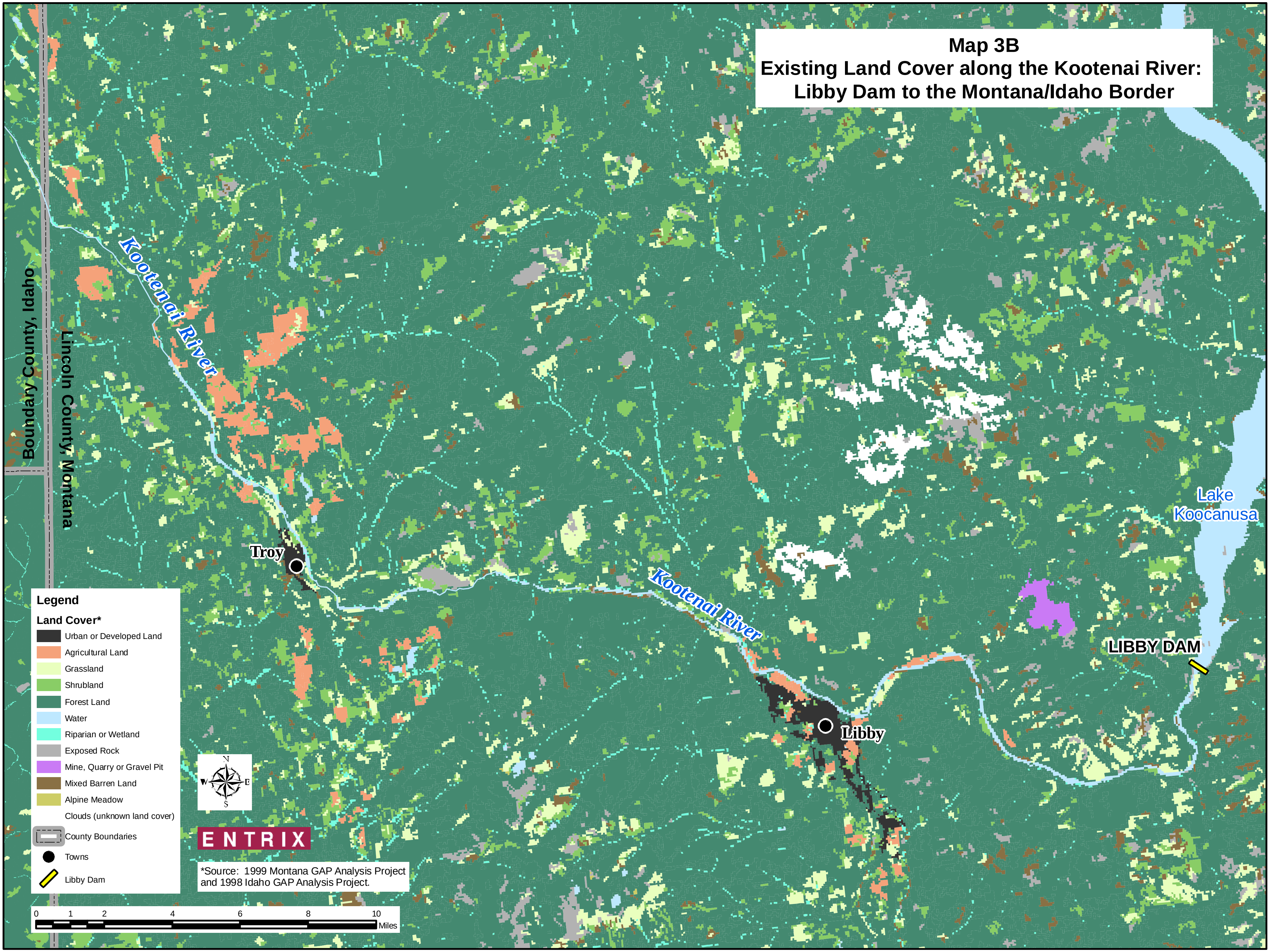
Map 1B
Critical Habitat for the Kootenai River Population of White Sturgeon: Location within the Columbia River Basin
Legend
Critical Habitat
Columbia River Basin
Dams
0 10 20 40 60 80 100
Miles
ENTRIX
N
S
E
W
BRITISH COLUMBIA
ALBERTA
WASHINGTON
MONTANA
IDAHO
OREGON
Columbia River
Kootenay River
Kootenai River
Kootenay Lake
Lake Koocanusa
Upper Bonnington
Lower Bonnington
South Slocan
Kootenay Canal
Brilliant
Corra Linn
Libby
Critical Habitat
Chief Joseph
Grand Coulee
Wells
Rocky Beach
Rock Island
Wanapum
Priest Rapids
Bonneville
John Day
McNary
The Dalles



Map 2A
Land Ownership and Kootenai River Population of White Sturgeon Critical Habitat
Kootenai River
Boundary County Idaho
Lincoln County Montana
Unit 2 Meander Reach (Designated)
Kootenai Indian Reservation and Fish Hatchery
Moyie Springs
Bonners Ferry
Unit 1 Braided Reach (Proposed)
Legend
White Sturgeon Critical Habitat
Unit 2 Meander Reach (Designated)
Unit 1 Braided Reach (Proposed)
Land Ownership*
Bureau of Land Management
U.S. Fish and Wildlife Service
U.S. Forest Service
Private
State Lands
State Fish and Game
Water
County Boundaries
Towns
Indian Reservation/Fish Hatchery
N
W
E
S
ENTRIX
*Source: Northwest Habitat Institute, 2003.
0 1 2 4 6 8 10
Miles


Map 2B
Land Ownership Along the Kootenai River:
Libby Dam to the Montana/Idaho Border
Boundary County, Idaho
Bonner County, Idaho
Lincoln County, Montana
Troy
Kootenai River
Libby
LIBBY DAM
Lake Koocanusa
Legend
Land Ownership*
Army Corps of Engineers
Forest Service
Private
State Lands
Water
County Boundaries
Towns
Libby Dam
N
S
E
W
ENTRIX
*Source: Northwest Habitat Institute, 2003.
0
1
2
4
6
8
10
Miles


Map 3A
Existing Land Cover and Kootenai River
Population of White Sturgeon Critical Habitat
Kootenai River
Boundary County
Idaho
Lincoln County
Montana
Unit 2
Meander Reach
(Designated)
Moyie Springs
Bonners Ferry
Kootenai River
Unit 1
Braided Reach
(Proposed)
Legend
White Sturgeon Habitat Units
Unit 1 Braided Reach (Proposed)
Unit 2 Meander Reach (Designated)
Land Cover*
Urban or Developed Land
Agricultural Land
Grassland
Shrubland
Forest Land
Water
Riparian and Wetland
Exposed Rock
Mixed Barren Land
County Boundaries
Towns
N
W
E
S
ENTRIX
*Source: 1999 Montana GAP Analysis Project
and 1998 Idaho GAP Analysis Project.
0 1 2 4 6 8 10
Miles


Map 3B
Existing Land Cover along the Kootenai River:
Libby Dam to the Montana/Idaho Border
Kootenai River
Boundary County, Idaho
Lincoln County, Montana
Troy
Kootenai River
Libby
Lake Koocanusa
LIBBY DAM
Legend
Land Cover*
Urban or Developed Land
Agricultural Land
Grassland
Shrubland
Forest Land
Water
Riparian or Wetland
Exposed Rock
Mine, Quarry or Gravel Pit
Mixed Barren Land
Alpine Meadow
Clouds (unknown land cover)
County Boundaries
Towns
Libby Dam
N
W
E
S
ENTRIX
*Source: 1999 Montana GAP Analysis Project
and 1998 Idaho GAP Analysis Project.
0
1
2
4
6
8
10
Miles