Attachment 1
CUTLER PROJECT
Agency, Tribe, and Non-Governmental Organization Authorized Representatives

Organization	**Authorized Representatives**	**Contact Information**
CUTLER		
Utah Division of Wildlife Resources, Northern Region	Craig J Schaugaard, Regional Aquatic Program Manager	515 East 5300 South Ogden, UT 84405 Phone (office): 801-476-2770 Phone (cell): 801-791-3675 Email: craigschaugaard@utah.gov
Utah Department of Environmental Quality	Mike Allred	PO Box 144810 Salt Lake City, Utah 84114-4810 Phone: 435-512-0278 Email: mdallred@utah.gov
Bridgerland Audubon Society	Val Grant, President	Phone: 435-757-9519
Bridgerland Audubon Society	Bryan Dixon, Past President	Phone: 435-760-0691 Email: bdixon@xmission.com

Attachment 2
CUTLER PROJECT
Overview of the Bear River Basin and Project Facilities

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2.0 OVERVIEW OF THE BEAR RIVER BASIN

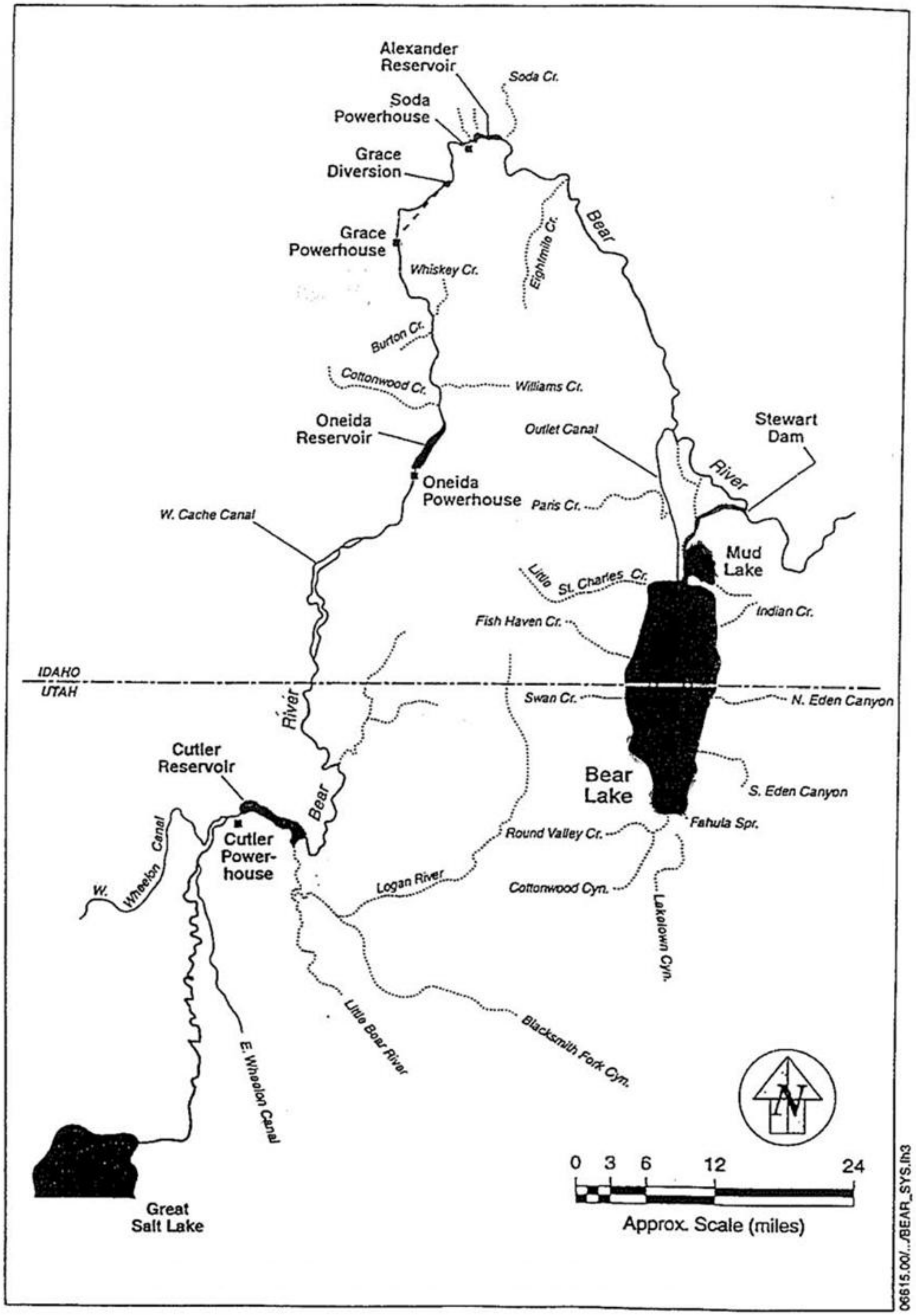
The Bear River Basin is located in northeastern Utah, southeastern Idaho, and southwestern Wyoming. It comprises approximately 7,500 square miles of mountain and valley lands (2,700 in Idaho, 3,300 in Utah, and 1,500 in Wyoming). The Bear River begins in the Uinta Mountains in Utah and extends 500 miles, crossing state boundaries five times before ending in the Great Salt Lake. It is the largest tributary to the Great Salt Lake and the largest stream in the western hemisphere that does not empty into an ocean. The Bear River ranges in elevation from over 13,000 to 4,211 feet and is unique in that it is entirely enclosed by mountains, thus forming a huge basin with no external drainage outlets.

Developed and undeveloped agricultural lands throughout the basin, as well as urban areas, are concentrated in valleys along the main stem of the river and its tributaries. The Bear River watershed also includes vast amounts of federal lands (Bureau of Land Management and Forest Service), private lands, and state lands that serve a range of natural and agricultural functions. The Bear River is a highly regulated system. The major headwater storage facility is Bear Lake, the discharges from which are primarily for irrigation and flood control.

2.1 PROJECT DESCRIPTION

This application for Low Impact Hydropower Certification pertains to the Cutler project on the Bear River. PacifiCorp operates five hydroelectric developments in the Bear River Basin. Three of the upstream developments—Soda, Grace, and Oneida—are operated under the FERC license for the Bear River Hydroelectric project No. 20 in Idaho. The Last Chance development, also located upstream in Idaho, was granted an exemption from FERC licensing in 1981 due to the project’s small size. The Cutler hydroelectric project is operated under FERC license No. 2420 in Utah. A sixth facility on the Bear River, the Cove development, was decommissioned in 2006. The Cutler project is located 44 miles downstream of the Oneida development in Utah, near the confluence of several major tributaries. Figure 2.1-1 provides a map of the project locations.

Figure 2.1-1. Map of PacifiCorp's Bear River hydroelectric projects



The Cutler project includes a 545-foot-long, 109-foot-high concrete gravity arch dam built in 1927. The dam has a spillway containing four 30-foot-wide by 14-foot-high radial gates. A 7-foot-diameter low-level sluiceway is located near the base of the dam and controlled by a slide gate. Irrigation canal intake gates are located at each abutment of the dam and are an integral part of the structure. The project is operated seasonally and at full pool (4407.75 feet msl) the reservoir active storage capacity fluctuates from approximately 5,800 acre feet from March 1 through December 1 to about 7,800 acre feet from December 2 through February 28. Much of the reservoir has the characteristics of a shallow-water emergent marsh; the southern portion of the reservoir has a mean depth of 1.8 feet, while the deeper section of the reservoir to the north has a mean depth of 3.6 feet. The flowline intake is a concrete tower located in the reservoir approximately 60 feet upstream of the dam. It connects to an 18-foot-diameter steel-lined conduit that passes through the dam (Figure 2.2-2). A 1,160 foot-long, 18-foot-diameter steel penstock carriers water to an 81-foot-high, 45-foot-diameter steel surge tank. Two 112-foot-long steel penstocks bifurcate from the surge tank and lead to the powerhouse. The powerhouse is a 60-foot by 123-foot brick building containing appurtenant facilities and two vertical Francis generating units with a total installed capacity of 30 MW. The Cutler project has an average annual generation of 93,287 MWh.

2.2 PROJECT PHOTOGRAPHS

Figure 2.2-1 Cutler Reservoir

Figure 2.2-2 Cutler Dam

2.3 PROJECT OPERATIONS

The Cutler hydroelectric project operates seasonally in normal and low-water years, generally from fall through early summer, based on the availability of flows after irrigation commitments are met (during high-water years there may be additional available flow). During the normal operation period, the facility is operated as a daily peaking project. When inflows to the reservoir are too low to keep an efficient load level on the generating units, water is stored on a daily basis until it reaches a level appropriate for power generation, then the water is released. Typically, the project suspends normal operation during low summer flows (July through September), but the facility remains available to provide short-duration emergency generation (spinning reserve). During normal operation periods, the project is operated in a semi-automatic mode whereby the generators are started and synchronized to the system manually by the local operator. Once on-line, the units are controlled remotely by the System Dispatcher to control the load on the generators to meet system requirements and to stay within the reservoir elevation guidelines. Substations containing step-up transformers and circuit breakers are located adjacent to the Cutler powerhouse. The substation serves as the point of interconnection to the transmission grid system.

Attachment 3
CUTLER PROJECT
FERC License and Environmental Assessment

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

PacifiCorp Electric Operations — Project No. 2420-001
Utah

ORDER ISSUING NEW LICENSE
(Major Project)
(ISSUED APRIL 29, 1994)

PacifiCorp Electric Operations (PacifiCorp) filed a license application under Part I of the Federal Power Act (FPA) for the continued operation and maintenance of the 30-megawatt (MW) Cutler Project located on the Bear River, in Cache and Box Elder Counties, near Logan, Utah. 1 The project would produce about 106 gigawatthours (GWh) of electricity annually.

Notice of the application has been published. No agency or intervenor objected to issuance of this license. Comments received from interested agencies and individuals have been fully considered in determining whether to issue this license.

The staff issued a draft environmental assessment (EA) for this project on January 27, 1994. The staff analyzed and considered all the comments filed pursuant to the draft EA. The staff issued a final EA on April 7, 1994, which is attached to and made part of this license order. The staff also prepared a Safety and Design Assessment (S&DA), which is available in the Commission's public file for this project.

The American Whitewater Affiliation and American Rivers, Inc. filed a timely joint motion to intervene seeking to protect the nondevelopmental values of the Bear River. They believe there are significant opportunities on the Bear River for enhancing fish, wildlife, and recreation resources.

The Bear River Canal Company (BRCC) filed a late motion to intervene which was granted by a notice issued on June 17, 1993. BRCC is concerned that operational changes at the project could affect water delivery for irrigation.

Mr. Paul Stewart also filed a late motion to intervene which was granted by a notice issued on September 7, 1993. Mr. Stewart is a local farmer and owns land adjacent to the project

1 The original license was issued on December 23, 1968, and expired on December 31, 1993. 40 FPC 1494. The project is currently operating under an annual license that went into effect when the original license expired, per Section 15(a)(1) of the FPA.

reservoir. He is concerned about impacts to landowners that may occur from PacifiCorp's plans to enhance public access and wildlife habitat.

The concerns raised in these motions are addressed in appropriate sections of the EA.

PROJECT DESCRIPTION

The existing project consists of a 109-foot-high concrete gravity arch dam with a spillway containing four 14-foot-high radial gates, a reservoir with a surface area of about 5,459 acres and a storage capacity of about 13,200 acre-feet, an 18-foot-diameter steel-lined conduit passing through the dam, a 1,160 foot-long steel penstock, an 81-foot-high steel surge tank, two 112-foot-long steel penstocks, a powerhouse with a total installed capacity of 30 MW, and appurtenant facilities. See a detailed project description in ordering paragraph B(2).

PACIFICORP'S PLANS AND CAPABILITIES

PacifiCorp's Record as a Licensee

In accordance with Sections 10 and 15 of the FPA, the staff evaluated PacifiCorp's record as a licensee for these areas: (1) conservation efforts; (2) compliance history and ability to comply with the new license; (3) safe management, operation, and maintenance of the project; (4) ability to provide efficient and reliable electric service; (5) need for power; (6) transmission line improvements; and (7) project modifications. I accept the staff's findings in each of these areas.

Here are their findings:

1. Section 10(a)(2)(C): Conservation Efforts

The staff reviewed PacifiCorp's efforts to conserve electricity and found that it: (1) uses all the energy generated by the project in its system; (2) encourages conservation by its customers; and (3) maintains extensive ongoing programs to reduce system peak demand.

Its plans and activities to promote and achieve conservation of electric energy and to reduce the peak demand for generating capacity include: (1) energy audits; (2) water heater insulation; (3) implementation of demand-side management programs; and (4) making loans available for residential weatherization.

PacifiCorp's plans meet the statutory requirements of the

Public Service Commission of Utah. Its efforts also conform to the development plans and programs of the Pacific Northwest Electric Power and Conservation Planning Council and its Regional Energy Plan.

Therefore, PacifiCorp is making a good faith effort to conserve electricity.

2. Sections 15(a)(3)(A) and 15(a)(2)(A): Compliance History and Ability to Comply with the New License

The staff reviewed PacifiCorp's compliance with the terms and conditions of the existing license and found that PacifiCorp's overall record of making timely filings and compliance with its license is satisfactory.

Based on past performance, PacifiCorp has the ability to comply with terms of the new license.

3. Section 15(a)(2)(B): Safe Management, Operation, and Maintenance of the Project

PacifiCorp's proposal wouldn't adversely affect the project's operation and safety.

Under Part 12 of the Commission's regulations, PacifiCorp filed the fourth Part 12 Safety Inspection Report on December 20, 1985. PacifiCorp also has an emergency action plan (EAP) on file in the plant office. PacifiCorp-East, regional office for the licensee, conducts annual unannounced tests of the EAP and all personnel receive annual scheduled training. The staff found that the report and plan are adequate.

PacifiCorp shows regard for public safety by: (1) installing fences and gates at the powerhouse and dam to deter unauthorized access; (2) placing warning signs at dangerous areas; and (3) installing safety barriers at the dam to keep boaters away from the spillway.

Therefore, the project is safe for continued use and operation.

4. Section 15(a)(2)(C): Ability to Provide Efficient and Reliable Electric Service

The staff examined PacifiCorp's record of lost generation due to unscheduled outages and found that the outages have been minimal and lost generation was not significant compared to the total annual generation for this project.

Therefore, PacifiCorp is operating in an efficient and reliable manner.

5. Section 15(a)(2)(D): Need for Power

The project is located in the Northwest Power Pool area of the Western Systems Coordinating Council. Utah Power and Light Company (UP&L) is an operating utility system owned by PacifiCorp. The Cutler Project is part of UP&L's system operating in the state of Utah.

PacifiCorp's operation of electrical systems, including the operation of the project, is coordinated using guidelines prescribed by the region's Northwest Power Planning Council (Council). The Council forecasts that the region will need new resources sometime between 1995 and 2004 in the most likely medium scenario.

The Bonneville Power Agency places a somewhat higher probability on the medium forecast than the Council does. Its forecast shows that additional resources would be needed by 1994. The Pacific Northwest Utilities Conference Committee's 1993 regional firm energy loads and resources projections show resource deficits occurring sometime in 1993.

The project's average annual generation of 106 GWh, which is a small part of UP&L's total requirement, helps to lower system deficits, reduces costs to ratepayers, and reduces emission of noxious byproducts caused by the combustion of fossil fuels.

Therefore, the Cutler Project provides a necessary source of power for PacifiCorp.

6. Section 15(a)(2)(E): Transmission Line Improvements

PacifiCorp proposes no changes to the existing transmission system of the project.

The existing transmission system is sufficient, and no changes to the service affected by the project operation would be necessary whether the Commission issues a license for the project or not.

7. Section 15(a)(2)(F): Project Modifications

PacifiCorp is not proposing any major modifications to the project.

The staff looked at installing more capacity at the site and determined that it is not feasible at this time. Therefore, no other project modifications are necessary.

WATER QUALITY CERTIFICATION

On August 13, 1991, PacifiCorp applied to the Utah Department of Environmental Quality (DEQ) for a water quality certification for the project, as required by section 401 of the Clean Water Act. On November 20, 1991, the DEQ accepted PacifiCorp's application, certified compliance to applicable state water quality standards, and granted the certificate (letter from Don A. Oster, Executive Secretary, Utah State Water Quality Board to Jim Burruss, Senior Environmental Analyst, Utah Power, November 20, 1991).

RECOMMENDATIONS OF FISH AND WILDLIFE AGENCIES

Section 10(j)(1) of the FPA requires the Commission to include license conditions based on recommendations of federal and state fish and wildlife agencies submitted pursuant to the Fish and Wildlife Coordination Act for the protection, mitigation, and enhancement of fish and wildlife. No fish and wildlife agency recommendations were filed for the project in response to our notice that the application was ready for environmental analysis.

COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, or conserving waterways affected by the project. Federal and state agencies have filed 5 plans that address various resources in Utah. Four plans are relevant to this project. 2 No conflicts were found.

2 (1) Whooping Crane recovery plan, Fish and Wildlife Service, 1986, Albuquerque, New Mexico; (2) North American Wildlife Management Plan, Fish and Wildlife Service and Canadian Wildlife Service, 1986, Department of the Interior, Twin Cities, Minnesota: (3) North American Waterfowl Management Plan, 1986, Fish and Wildlife Service and Canadian Wildlife Service, Department of the Interior; (4) Statewide Comprehensive Outdoor Recreation plan, 1985, Utah Department of Natural Resources, Division of Parks and Recreation, Salt Lake City, Utah.

COMPREHENSIVE DEVELOPMENT

Sections 4(e) and 10(a)(1) of the FPA, 16 U.S.C. §§ 797(e) and 803(a)(1), respectively, require the Commission to give equal consideration to all uses of the waterway on which the project is located. When the Commission reviews a hydropower project, the recreational, fish and wildlife, and other nondevelopmental values of the involved waterway are considered equally with its electric energy and other developmental values. In determining whether, and under what conditions, a hydropower license should be issued, the Commission must weigh the various economic and environmental tradeoffs involved in the decision.

To protect, mitigate continuing project impacts to, and enhance the environmental resources of the project area, PacifiCorp proposes to:

- Conduct a Bear River Basin study to aid in the development of new operating procedures for stabilizing reservoir elevations at the Cutler Project in order to enhance waterfowl nesting, fish spawning, and recreational use.

- Establish a permanent vegetated buffer strip, up to 200 feet wide, on project lands adjacent to the reservoir between State Highway 30 and the State Highway 23 bridge to limit shoreline erosion, remove sediments and nutrients from runoff, and enhance wildlife habitat. Under its buffer proposal, within 3 years of issuance of a new license, PacifiCorp would: (1) install up to 1.5 miles of gabions or riprap along the reservoir shoreline in this area; (2) stabilize an additional 2.0 miles of shoreline by planting deep-rooted shrubs and willows to reestablish vegetation; (3) reseed about 50.0 acres of tilled ground to create a grassland buffer strip; and (4) construct about 6.0 miles of fence to control cattle.

- Install four fish cover structures in the reservoir.

- Reduce impacts to spawning fish and waterfowl nesting by limiting reservoir water level fluctuations as an interim measure until completion of the above Bear River Basin study.

- Modify existing leases and land use practices on about 4,500 acres of currently leased project lands. Leases would be rewritten on about 300 acres of currently tilled ground to provide food and cover for migratory waterfowl, and up to an additional 6 miles of fence to enhance wildlife habitat would be installed.

- Notify the Utah State Historic Preservation Officer (SHPO) if any historic sites are discovered during any maintenance or construction activities within the project area, and work with the SHPO to develop and install interpretive signs to describe the historical significance of the Cutler hydroelectric facilities.

ù Enhance recreational opportunities by improving and enlarging the existing Benson marina, establishing seven new public access areas, constructing a walking trail, providing additional parking for hunters, and conducting a user survey.

ù Mitigate impacts on wetlands due to the development of new recreation facilities.

ù Incorporate the above proposals into a single resource management plan (RMP) for all project lands.

In addition to PacifiCorp's proposed environmental enhancement measures, the staff recommended that PacifiCorp prepare and implement a cultural resources management plan.

Based on the staff's independent review and evaluation of PacifiCorp's proposal, PacifiCorp's proposal with staff's additional recommendation, and the no-action alternative, I am issuing this license for the continued operation of the project as proposed with staff's additional recommendation.

Several elements of the the proposed project with staff's recommended cultural resources management plan would involve tradeoffs between environmental resources or would substantially affect project economics. The fish cover structures, the buffer zone and related wildlife habitat enhancements, and the enhancements to the recreational facilities would all involve significant costs. The staff's basis for our recommending these measures is as follows.

Fish Cover Structures

The four structures proposed by PacifiCorp would provide cover for game and forage fish in an area where cover is needed. The staff believes that the increase in fish habitat that would result would lead to increased public use of the reservoir fishery such that the $8,000 to $10,000 cost would be balanced by at least as much public benefits over the term of the license. Therefore, PacifiCorp should prepare a plan for installing the proposed fish cover structures in consultation with the Utah Division of Water Resources and the Fish and Wildlife Service.

Vegetative Buffer Zone, Wildlife Habitat Enhancement, and Management Plans

PacifiCorp has proposed to develop a RMP to protect and enhance wildlife habitat, recreation, and for the continuation of managed agricultural uses at the project. PacifiCorp has proposed a number of specific measures to enhance riparian areas and wildlife habitat north of State Highway 30. The RMP would also contain the same kind of enhancement measures for all project lands south of State Highway 30.

PacifiCorp's proposed measures for lands north and south of State Highway 30 would enhance wildlife habitat. The buffer strip and seeded areas would provide food and cover for waterfowl and other wildlife. Also, the buffer strip would assist in reducing shoreline erosion and removing sediment and nutrients from sheet runoff, which would improve water clarity and may ultimately increase duck production. Including similar management techniques in the RMP, as PacifiCorp proposes, would enhance wildlife habitat south of State Highway 30. Enhancing project wildlife habitat would offset, in part, the cumulative impacts that agriculture, irrigation, hydroelectric projects, and industry have had on waterfowl in the Bear River Basin.

The staff believes that the public benefits that would accrue over the term of a new license through increased public use of the project area as a result of these measures (buffer zone - $200,000; habitat enhancements - $50,000; RMP - $50,000) justifies their cost. Therefore, PacifiCorp should prepare a final RMP that includes the location and final design of the proposed measures for the buffer zone and wildlife habitat enhancements.

Recreation Enhancements

There is an obvious need for additional, designated public access on the project reservoir. The lake is large, and is a significant recreation resource that is very near to a major population center. Further, this area of Utah has a growing population and many other lakes in this region are being used at near-capacity levels. Because PacifiCorp's proposed recreation developments would greatly enhance public access to the Cutler reservoir, and should lead to significantly greater use of the project area, the $440,000 cost is justified.

Conclusion

Fish and wildlife resources, water quality, and recreation would be enhanced under PacifiCorp's proposal. This order generally adopts, as have the resource agencies, PacifiCorp's proposal. The only change that is required is that a cultural resources management plan be prepared and implemented for the project. This measure wouldn't add a significant cost to PacifiCorp's proposal.

The combined cost for PacifiCorp's proposed enhancement measures for the project is $751,000, plus $55,000 per year for operation and maintenance. This equates to an average annual net cost, over the term of a 30-year license, of $221,600.

With these measures, the project would continue to have net benefits to ratepayers based on the cost of power from alternative sources over the new license period.

I believe that the benefits explained above justify the cost to PacifiCorp. With these measures, the project would provide 106 GWh of energy annually helping to meet a part of the projected power need in the area. The clean energy that would be produced by the project would continue to displace fossil-fueled power generation, thereby conserving nonrenewable energy resources and reducing the emissions of noxious gases that contribute to atmospheric pollution and global warming.

LICENSE TERM

In 1986, the Electric Consumers Protection Act (ECPA) modified section 15 of the FPA to specify that any license issued shall be for a term that the Commission determines to be in the public interest, but not less than 30 years, nor more than 50 years. The Commission's policy, which establishes 30-year terms for those projects that propose little or no redevelopment or new construction, 40-year terms for those projects that propose moderate redevelopment or new construction, and 50-year terms for those projects that propose extensive redevelopment or new construction, is consistent with the FPA as modified by ECPA.

Since PacifiCorp does not propose any changes in the existing project works for the Cutler Project, I am issuing the new license for a term of 30 years.

SUMMARY OF FINDINGS

Background information, analysis of impacts, support for related license articles, and the basis for a finding of no significant impact on the environment are contained in the attached EA. Issuance of the license is not a major federal action significantly affecting the quality of the human environment.

The project will be safe if operated, and maintained in accordance with the requirements of this license. Analysis of related issues is provided in the S&DA.

I conclude that the Cutler Project does not conflict with any planned or authorized development, and is best adapted to the comprehensive development of the Bear River for beneficial public use.

The Director orders:

(A) This license is issued to the PacifiCorp Electric Operations (licensee) for a period of 30 years, effective the first day of the month in which it is issued, to operate and maintain the Cutler Project. This license is subject to the terms and conditions of the FPA, which is incorporated by reference as part of this license, and to the regulations the Commission issues under the provisions of the FPA.

(B) The project consists of:

(1) All lands, to the extent of the licensee's interests in those lands, as shown on exhibits G-1 through G-5 (FERC Drawing Numbers 18 through 22) of the application.

(2) The project consists of: (1) a 545-foot-long, 109-foot-high concrete gravity arch dam, with a spillway containing four 30-foot-wide by 14-foot-high radial gates; (2) a reservoir with a surface area of about 5,459 acres and storage capacity of about 13,200 acre-feet at an elevation of 4,407.5 feet mean sea level; (3) a 7-foot-diameter low-level sluiceway located near the base of the dam controlled by a slide gate; (4) an intake tower and cylinder gate with a maximum opening of 10 feet; (5) an 18-foot-diameter steel-lined conduit passing through the dam; (6) a 1,160 foot-long, 18-foot-diameter steel penstock; (7) an 81-foot-high, 45-foot-diameter steel surge tank; (8) two 112-foot-long, 14-foot-diameter steel penstocks that bifurcate from the surge tank; (9) a brick 60-foot by 123-foot powerhouse containing 2 generating units with a total installed capacity of 30 MW; and (10) appurtenant facilities.

The project works generally described above are more specifically described in exhibit A of the license application and shown by exhibit F:

Exhibit F-	FERC No. 2420-	Title
F-1	12	location of principal project works
F-2	13	plan and profile of flowline
F-3	14	plan, elevations, and sections of Cutler Dam
F-4	15	plan and sections of flowline intake

F-5	16	cross section and elevation of powerhouse
F-6	17	plan of powerhouse

(3) All of the structures, fixtures, equipment, or facilities used to operate or maintain the project and located within the project boundary, all portable property that may be employed in connection with the project and located within or outside the project boundary, and all riparian or other rights that are necessary or appropriate in the operation or maintenance of the project.

(C) Exhibits A, F and G of the license application are approved and made part of the license.

(D) This license is subject to the articles set forth in Form L-10, (October 1975), entitled "TERMS AND CONDITIONS OF LICENSE FOR CONSTRUCTED MAJOR PROJECT AFFECTING THE INTERESTS OF INTERSTATE OR FOREIGN COMMERCE"" and the following additional articles:

Article 201. The licensee shall pay the United States an annual charge, effective the first day of the month in which this license is issued, for the purpose of reimbursing the United States for the cost of administration of Part I of the FPA, as determined by the Commission. The authorized installed capacity for that purpose is 40,000 horsepower.

Article 202. (a) In accordance with the provisions of this article, the licensee shall have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee shall also have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for, any interests that it has conveyed, under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the licensee shall take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The type of use and occupancy of project lands and water for which the licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 watercraft at a time and where said facility is intended to serve single-family type dwellings; (3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline; and (4) food plots and other wildlife enhancement. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee shall require multiple use and occupancy of facilities for access to project lands or waters. The licensee shall also ensure, to the satisfaction of the Commission's authorized representative, that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee shall: (1) inspect the site of the proposed construction, (2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site, and (3) determine that the proposed construction is needed and would not change the basic contour of the reservoir shoreline. To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights-of-way across, or leases of, project lands for: (1) replacement, expansion, realignment, or maintenance of bridges or roads where all necessary state and federal approvals have been obtained; (2) storm drains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69 kV or less); and (8) water intake or pumping facilities that do not extract more than one million gallons per day from a project reservoir. No later than January 31 of each year, the licensee shall file three copies of a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained; (2) sewer or effluent lines that discharge into project waters, for which all necessary federal and state water quality certification or permits have been obtained; (3) other pipelines that cross project lands or waters but do not discharge into project waters; (4) non-project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary federal and state approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 watercraft at a time and are located at least one-half mile (measured over project waters) from any other private or public marina; (6) recreational development consistent with an approved Exhibit R or approved report on recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is five acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year. At least 60 days before conveying any interest in project lands under this paragraph (d), the licensee must submit a letter to the Director, Office of Hydropower Licensing, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked exhibit G or K map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Director, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the licensee shall consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the licensee shall determine that the proposed use of the lands to be conveyed is not inconsistent with any approved exhibit R or approved report on recreational resources of an exhibit E; or, if the project does not have an approved exhibit R or approved report on recreational resources, that the lands to be conveyed do not have

recreational value.

(3) The instrument of conveyance must include the following covenants running with the land : (i) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; (ii) the grantee shall take all reasonable precautions to insure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner that will protect the scenic, recreational, and environmental values of the project; and (iii) the grantee shall not unduly restrict public access to project waters.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised exhibit G or K drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project shall be consolidated for consideration when revised exhibit G or K drawings would be filed for approval for other purposes.

(g) The authority granted to the licensee under this article shall not apply to any part of the public lands and reservations of the United States included within the project boundary.

Article 203. Pursuant to Section 10(d) of the FPA, a specified reasonable rate of return upon the net investment in the project shall be used for determining surplus earnings of the project for the establishment and maintenance of amortization reserves. The licensee shall set aside in a project amortization reserve account at the end of each fiscal year one half of the project surplus earnings, if any, in excess of the specified rate of return per annum on the net investment. To the extent that there is a deficiency of project earnings below the specified rate of return per annum for any fiscal year, the licensee shall deduct the amount of that deficiency from the amount of any surplus earnings subsequently accumulated, until absorbed. The licensee shall set aside one-half of the remaining surplus earnings, if any, cumulatively computed, in the project amortization reserve account. The licensee shall maintain the amounts established in the project amortization reserve account until further order of the Commission.

The specified reasonable rate of return used in computing amortization reserves shall be calculated annually based on current capital ratios developed from an average of 13 monthly balances of amounts properly includible in the licensee's long-term debt and proprietary capital accounts as listed in the Commission's Uniform System of Accounts. The cost rate for such ratios shall be the weighted average cost of long-term debt and preferred stock for the year, and the cost of common equity shall be the interest rate on 10-year government bonds (reported as the Treasury Department's 10 year constant maturity series) computed on the monthly average for the year in question plus four percentage points (400 basis points).

Article 204. The Commission reserves authority, in the context of a rulemaking proceeding or a proceeding specific to this license, to require the licensee at any time to conduct studies, make financial provisions, or otherwise make reasonable provisions for decommissioning of the project. The terms of this article shall be effective unless the Commission, in Docket No. RM93-23, finds that the Commission lacks statutory authority to require such actions, or otherwise determines that the article should be rescinded.

Article 401. Within 6 months from the date of issuance of this license, the licensee shall file with the Commission, for approval, a plan for conducting a 3-year Bear River Basin Study as proposed in the license application on pages 7 and 8, Exhibit B.

The study plan shall include, but not be limited to:

(1) the development of a basin-wide irrigation call system that includes irrigation companies and individual irrigators;

(2) the development of an operational model to provide a statistical method for improving the operation of the Bear River system;

(3) an assessment of reservoir levels at specific locations at Cutler reservoir to develop a reservoir level relationship between each location;

(4) the testing of a 1-year operational plan to control reservoir fluctuations from mid-reservoir (near Benson Marina) to the south end of the reservoir while maintaining the current irrigation supply;

(5) the development of a final Cutler reservoir operating plan that best meets the needs of wildlife, recreation, power generation, and irrigation based on meteorology, runoff and seasonal power requirements;

(6) a schedule for implementing the study, consulting with the appropriate agencies and interested parties, and filing the results in a final report.

The licensee shall prepare the plan and final report after consultation with the Utah Division of Wildlife Resources, the U.S. Fish and Wildlife Service, and area irrigators including the Bear River Canal Company. The licensee shall include with the plan and study report documentation of consultation, copies of comments and recommendations on the completed plan and study report after it has been prepared and provided to the agencies and irrigators, and specific descriptions of how the agencies' and irrigators' comments are accommodated. The licensee shall allow a minimum of 30 days for the agencies and irrigators to comment and to make recommendations before filing the plan and study report with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Article 402. Within 1 year after issuance of this license, the licensee shall file with the Commission, for approval, a Resource Management Plan (RMP) for project lands.

The plan shall include maps, final design drawings, an implementation schedule, provisions for the plan's periodic review and revision, and identify the entity responsible for operation and maintenance and shall provide for, but not be limited to, the following measures:

(1) A plan to establish a permanent vegetated buffer strip, up to 200 feet wide, on project lands adjacent to the reservoir between State Highway 30 and the State Highway 23 bridge to limit shoreline erosion, remove sediments and nutrients from runoff, and enhance wildlife habitat. The buffer plan shall include a schedule for: (a) installing up to 1.5 miles of gabions or riprap along the reservoir shoreline; (b) stabilizing an additional 2.0 miles of shoreline by planting deep-rooted shrubs and willows to reestablish vegetation; (c) reseeding about 50.0 acres of tilled ground to create a grassland buffer strip; and (d) constructing about 6.0 miles of fence to control cattle, within 3 years of issuance of a new license.

(2) The modification of existing leases and land use practices

on about 4,500 acres of currently leased project lands. Leases would be rewritten on about 300 acres of currently tilled ground to provide food and cover for migratory waterfowl, and up to an additional 6 miles of fence would be installed.

(3) A final recreation plan that includes the public recreation enhancements detailed on pages 5-28 through 5-36, and page 43 of the licensee's application for new license, Exhibit E, plus measures to ensure that the public uses only designated access areas.

(4) The final design of measures to replace the wetlands affected by recreational facility construction on a 1:1 acreage ratio; including a plan for monitoring the effectiveness of the measures to replace wetlands affected by recreational facility construction, and steps to be taken in the event that the measures are not effective in replacing the wetlands, including, but not necessarily limited to, modifying the measures or establishing or enhancing additional wetlands; a proposal to provide recommendations to the agencies and the Commission for alternative wetland mitigation if monitoring indicates that the implemented wetland establishment or enhancement is not successful; and schedules for establishing or enhancing wetlands, for filing the results of the monitoring program, and for filing recommendations for alternative wetland mitigation.

(5) Final plans for installing fish habitat enhancement structures in the reservoir; including a map of the structures' location; detailed descriptions and design drawings of the structures; a plan to manage, monitor, and maintain the structures; and an implementation schedule.

The licensee shall prepare the plan after consultation with the U.S. Fish and Wildlife Service, the Utah Divisions of Wildlife, Water Resources, and Parks and Recreation, the National Park Service, current leaseholders and neighboring landholders, and the Bear River Canal Company. The licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the consulted entities, and specific descriptions of how the plan accommodates the consulted entities' comments. The licensee shall allow a minimum of 30 days for the entities to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. No land-disturbing activities shall occur until the licensee is notified that the plan has been approved. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Article 403. The licensee shall consult with the Utah State Historic Preservation Officer (SHPO) and develop and implement a cultural resources management plan to avoid and mitigate any impacts to the historical integrity of the Cutler Project dam and powerhouse from maintenance and repair work conducted during project operation.

The licensee shall file within 1 year after the date of issuance of this license: (1) a copy of the cultural resources management plan for Commission approval; and (2) the written comments of the SHPO on the plan. The plan shall be based on the recommendations of the SHPO and adhere to the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation.

The Commission may require revisions to the plan based on the filing. The licensee shall not implement the cultural resources management plan until informed by the Commission that the requirements of this article have been fulfilled.

Article 404. If archeological or historic sites are discovered during project operation, the licensee shall: (1) consult with the Utah State Historic Preservation Officer (SHPO); (2) prepare a cultural resources management plan and a schedule to evaluate the significance of the sites and to avoid or mitigate any impacts to any sites found eligible for inclusion in the National Register of Historic Places; (3) base the plan on the recommendations of the SHPO and the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation; (4) file the plan for Commission approval, together with the written comments of the SHPO on the plan; and (5) take the necessary steps to protect the discovered sites from further impact until notified by the Commission that all of these requirements have been satisfied.

The Commission may require a cultural resources survey and changes to the cultural resources management plan based on the filings. The licensee shall not implement a cultural resources management plan or begin any land-clearing or land-disturbing activities in the vicinity of any discovered sites until informed by the Commission that the requirements of this article have been fulfilled.

Article 501. If the licensee's project was directly benefitted by the construction work of another licensee, a permittee, or the United States on a storage reservoir or other headwater improvement during the term of the original license (including extensions of that term by annual licenses), and if those headwater benefits were not previously assessed and reimbursed to the owner of the headwater improvement, the licensee shall reimburse the owner of the headwater improvement for those benefits, at such time as they are assessed, in the same manner as for benefits received during the term of this new license.

(E) The licensee shall serve copies of any Commission filing required by this order on any entity specified in this order to be consulted on matters related to the Commission filing. Proof of service on these entities must accompany the filing with the Commission.

(F) This order is issued under authority delegated to the Director and constitutes final agency action. Request for rehearing by the Commission may be filed within 30 days of the date of this order, pursuant to 18 C.F.R. 385.813. The filing of a request for rehearing does not operate as a stay of the effective date of this order or of any other date specified in this order, except as specifically ordered by the Commission. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

Fred E. Springer
Director, Office of

ENVIRONMENTAL ASSESSMENT
FOR HYDROPOWER LICENSE

Cutler Hydroelectric Project

FERC Project No. 2420

Utah

ENVIRONMENTAL ASSESSMENT
FOR HYDROPOWER LICENSE

Cutler Hydroelectric Project

FERC Project No. 2420

Utah

Federal Energy Regulatory Commission
Office of Hydropower Licensing
Division of Project Review
825 N. Capitol Street, NE
Washington, D.C. 20426
April 5, 1994

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SUMMARY

PacifiCorp Electric Operations (PacifiCorp) has applied for a new license for its existing, operating, Cutler Hydroelectric Project located on the Bear River in Utah. PacifiCorp is proposing to improve fish and wildlife habitat and public access at the project reservoir by installing new access facilities, adjusting current land use practices, and providing a reservoir buffer zone. They would also study ways of permanently limiting Cutler Reservoir water level fluctuations via a Bear River Basin Study.

In this Environmental Assessment (EA) we analyze the effect that continued project operation, under a new license, would have on the environment and on developmental resources, and make recommendations for conditions that would be included in any new license that may be issued. Under the no-action alternative, there would be no change to the existing environment, nor would any environmental enhancement measures be implemented. We found that this alternative would not be in the public interest.

Action alternatives that we analyzed included licensing the project as proposed by PacifiCorp, and with additional enhancement measures. We agree, as do the agencies, with PacifiCorp's proposal for the project, which includes conceptual plans for new public access facilities, water quality, and fish and wildlife habitat enhancements, all of which would be included in a single Resource Management Plan (RMP) for the project. We recommend that PacifiCorp prepare, and file for Commission approval, a final RMP for the project based on the measures proposed in their application.

We've concluded that, under our recommended alternative, issuing a new license for the project wouldn't result in a significant adverse environmental impact, and that an Environmental Impact Statement is not required.

ENVIRONMENTAL ASSESSMENT

FEDERAL ENERGY REGULATORY COMMISSION
OFFICE OF HYDROPOWER LICENSING, DIVISION OF PROJECT REVIEW

Cutler Hydroelectric Project
FERC Project No. 2420-001

Utah
April 7, 1994

INTRODUCTION

The Federal Energy Regulatory Commission issued the Cutler Draft Environmental Assessment (DEA) for comments on January 27, 1994. In response, we received 3 comment letters. The commentors are listed in the Comments on the Draft EA section (Section IV.C.). All comment letters were reviewed by the staff. Sections of the DEA that were modified as a result of the comments received are shown in the staff responses to the right of the comment letters in Appendix A.

I. APPLICATION

On December 23, 1991, PacifiCorp Electric Operations (PacifiCorp) filed a new license application for the existing 30 megawatt (MW) Cutler Project. The original license for the project expired on December 31, 1993. The project is currently operating under an annual license that went into effect when the original license expired, per Section 15 (a)(1) of the Federal Power Act (Act).

PacifiCorp proposes to continue operating the project and to provide a number of environmental enhancement measures. The project is located on the Bear River, in Cache and Box Elder counties, near Logan, Utah. The project does not occupy any federal lands.

II. PURPOSE AND NEED FOR ACTION

A. Purpose of Action

The Commission must decide whether or not to issue a new license, and if any conditions should be placed on the new license to protect or enhance existing environmental resources and/or to mitigate for any continuing adverse environmental impacts that occur due to project operation. Issuing a new license would allow PacifiCorp to continue using the project as a source of electricity for its customers.

In this Environmental Assessment (EA), we assess the impacts of: (1) issuing a new license for the project with measures proposed by PacifiCorp; (2) issuing a new license with various measures recommended by other interested entities - federal and state resource agencies, the public, and the Commission staff; and (3) the no-action alternative.

B. Need for Power

The project is located in the Northwest Power Pool area of the Western Systems Coordinating Council. To consider the need for power, we looked at both PacifiCorp's need and the regional need for power. We've considered the short and long-term need for power generated by the project and the cost of alternative power if a new license is not issued. Our conclusions are as follows:

ù Project power helps meet a small part of PacifiCorp's overall power needs.

ù The project produces about 106 gigawatthours (GWh) of energy annually. Replacing project power would cost PacifiCorp about $4.33 million annually or 40.8 mills per kilowatthour (kWh), including dependable capacity credit for 3 months of each year.

Utah Power and Light Company (UP&L) is an operating utility system owned by PacifiCorp. The Cutler Project is part of UP&L's system, operating in the state of Utah. PacifiCorp's operation of electrical systems, including the operation of the project, is coordinated using guidelines prescribed by the regions' Northwest Power Planning Council (Council).

UP&L provides electric service to about 586,000 retail customers in a service area of about 63,000 square miles in parts of Utah, Wyoming, and Idaho. UP&L has an average annual energy requirement of about 55,603 GWh with net resources of 46,950 GWh - a deficit of 8,753 GWh. With an annual average generation of 106 GWh, the project meets a small part of UP&L's total requirement, helps to lower system deficits, reduces costs to ratepayers, and displaces some fossil-fueled generation.

To forecast the need for more resources, the Council subtracted existing resources (adjusted for any known additions or reductions) from the range of future electricity demand.

The Council forecasts that the region will need new resources sometime between 1995 and 2004 in the most likely medium scenario. The regional load and resource analysis is based on average conditions and doesn't represent any particular power supply sector or individual utility.

To see how other planning bodies in the region view load projections and the need for more resources, we looked at the latest load projections and needs analyses of the Bonneville Power Authority (BPA) and the Pacific Northwest Utilities Conference Committee (PNUCC). BPA shows that additional resources would be needed by 1994. PNUCC's 1993 regional firm energy loads and resources projections show resource deficits occurring sometime in 1993.

III. PROPOSED ACTION AND ALTERNATIVES

A. Applicant's Proposal

1. Project Description

The Cutler Project has been in continuous use since 1927. Figures 1 and 2 show the Cutler Project's principal features, including a view of the entire reservoir.

The existing features of the project include:

ù A reservoir with a surface area of about 5,459 acres and storage of about 13,200 acre-feet at an elevation of 4,407.5 feet, mean sea level (msl).

ù A concrete gravity arch dam, 545-foot-long by 109-feet-high with a spillway containing four 30-foot-wide by 14-foot-high radial gates, a 7-foot diameter low-level sluiceway located near the base of the dam controlled by a slide gate, an intake tower and cylinder gate with a maximum opening of 10 feet, and an 18-foot-diameter steel-lined conduit passing through the dam.

Figure 1. Principal Features of the Cutler Hydroelectric Project - Source (PacifiCorp, 1991).

Figure 2. View of Cutler Reservoir - Source (PacifiCorp, 1991)

ù Two irrigation canal intakes, one located on each abutment of the dam, each controlled by 8-foot by 8-foot gates, two on the west intake and two on the east intake (one of which is not functional).

ù A 1,160 foot-long by 18-foot-diameter steel penstock.

ù An 81-foot-high by 45-foot-diameter steel surge tank.

ù Two 112-foot-long by 14-foot-diameter steel penstocks that bifurcate from the surge tank into the powerhouse.

ù A brick 60-foot by 123-foot powerhouse containing two generating units with a total installed capacity of 30 megawatts (MW), and appurtenant facilities.

ù A 115 kilowatt (kW) emergency generator installed next to the surge tank.

PacifiCorp proposes to continue operating the project by diverting flows from the Bear River, and to use some of the storage capacity of the reservoir for peaking purposes when flow is available. The project produces about 106 GWh of electric energy annually which is used to serve customers in Utah. PacifiCorp owns and operates a system on the Bear River that includes the Cutler Project and five other hydroelectric projects.

2. Proposed Environmental Measures

To protect, mitigate continuing project impacts to, and enhance the environmental resources of the project area, PacifiCorp proposes to:

ù Conduct a Bear River Basin study to aid in the development of new operating procedures for stabilizing reservoir elevations at the Cutler

Project in order to enhance waterfowl nesting, fish spawning, and recreational use.

ù Establish a permanent vegetated buffer strip, up to 200 feet wide, on project lands adjacent to the reservoir between State Highway 30 and the State Highway 23 bridge to limit shoreline erosion, remove sediments and nutrients from runoff, and enhance wildlife habitat. The buffer proposal includes, within 3 years of issuance of a new license, to: (1) install up to 1.5 miles of gabions or riprap along the reservoir shoreline in this area; (2) stabilize an additional 2.0 miles of shoreline by planting deep-rooted shrubs and willows to reestablish vegetation; (3) reseed about 50.0 acres of tilled ground to create a grassland buffer strip; and (4) construct about 6.0 miles of fence to control cattle.

ù Install four fish cover structures in the reservoir.

ù Reduce impacts to spawning fish and waterfowl nesting by limiting reservoir water level fluctuations as an interim measure until completion of the above Bear River Basin Study.

ù Modify existing leases and land use practices on about 4,500 acres of currently leased project lands. Leases would be rewritten on about 300 acres of currently tilled ground to provide food and cover for migratory waterfowl, and up to an additional 6 miles of fence to enhance wildlife habitat would be installed.

ù Notify the Utah State Historic Preservation Officer (SHPO) if any historic sites are discovered during any maintenance or construction activities within the project area, and work with the SHPO to develop and install interpretive signs to describe the historical significance of the Cutler hydroelectric facilities.

ù Enhance recreational opportunities by improving and enlarging the existing Benson marina, establishing seven new public access areas, constructing a walking trail, providing additional parking for hunters, and conducting a user survey.

ù Incorporate the above proposals into a single resource management plan for all project lands.

3. Mandatory Requirements

There are no mandatory requirements, such as Section 18 fishway prescriptions, for this project.

B. Staff's Modification of Applicant's Proposal

In addition to PacifiCorp's proposed enhancement measures, we are recommending that a cultural resources management plan be developed and implemented for the project. The basis for this recommendation is in Section V.

C. No-action Alternative

Under the no-action alternative, the project would continue to operate under the terms and conditions of the existing license, and no environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives. The alternative of license denial and project decommissioning is discussed below.

D. Alternatives Considered but Eliminated from Detailed Study

We considered several other alternatives to the applicant's relicensing proposal but eliminated them from detailed study because they are not reasonable in the circumstances of this case. They are: (1) federal takeover and operation of the project; (2) issuing a nonpower license; and (3) decommissioning the project.

We don't consider Federal takeover to be a reasonable alternative. Federal takeover and operation of the project would require Congressional approval. While that fact alone wouldn't preclude further consideration of this alternative, there is no evidence to indicate that Federal takeover should be recommended to Congress. No party has suggested Federal takeover would be appropriate and no federal agency has expressed an interest in operating the project.

Issuing a nonpower license wouldn't provide a long-term resolution of the issues presented. A nonpower license is a temporary license which the Commission will terminate whenever it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the nonpower license. In this case, no agency has suggested its willingness or ability to do so. No party has sought a nonpower license, and we have no basis for concluding that the project should no longer be used to produce power. Thus, a nonpower license is not a realistic alternative to relicensing in these circumstances.

Project decommissioning could be accomplished with or without dam removal. Either alternative would involve denial of the relicense application and surrender or termination of the existing license with appropriate conditions. No participant has suggested that dam removal would be appropriate in this case, and we have no basis for recommending it. Further, the reservoir is an important recreation resource, and would be needed for irrigation even if the project was not used to produce power. Thus, dam removal is not a reasonable alternative to relicensing the project with appropriate mitigation and enhancement measures.

The second decommissioning alternative would involve retaining the dam and disabling or removing equipment used to generate power. Project works would remain in place and could be used for historic or other purposes. This would require us to identify another government agency willing and able to assume regulatory control and supervision of the remaining facilities. No agency has stepped forward, and no participant has advocated this alternative. Nor have we any basis for recommending it. Because the power supplied by the project is needed, a source of replacement power would have to be identified. In these circumstances, we don't consider removal of the electric generating equipment to be a reasonable alternative.

IV. CONSULTATION AND COMPLIANCE

A. Agency Consultation

Commission regulations require applicants to consult with the appropriate resource agencies before filing a license application. Prefiling consultation initiates compliance with the National Environmental Policy Act, the Fish and Wildlife Coordination Act, the Endangered Species Act, the National Historic Preservation Act, and other federal statutes.

Prefiling consultation must be complete and documented for the application to be accepted 3. After acceptance, the Commission issues public notices and seeks formal comments in accordance with these statutes 4. All comments become part of the record and are considered during the staff's analysis of the proposed project. The following entities filed final comments on the application subsequent to the public notice that the application was Ready for Environmental Analysis. We address the environmental concerns raised in these letters in appropriate sections of the EA.

Commenting Entities	Date of Letter
Bear River Canal Company	September 10, 1993
U.S. Department of the Interior	September 9, 1993

B. Interventions

The American Whitewater Affiliation (AWA) and American Rivers (AR), Inc. filed a joint motion to intervene on August 17, 1992. The AWA and AR seek to protect the nondevelopmental values of the Bear River. They believe there are significant opportunities on the Bear River for enhancing fish, wildlife, and recreation resources. They are not opposing issuance of a new license.

The Bear River Canal Company (BRCC) filed an untimely motion to intervene on April 5, 1993. BRCC's motion was granted in a June 17, 1993, Commission notice. BRCC is concerned that operational changes at the project could affect water delivery for irrigation. The BRCC does not oppose relicensing the project.

3 The application for the Cutler Project was accepted on May 28, 1992.

4 On June 9, 1992, a public notice was issued setting a deadline of August 17, 1992, for filing motions to intervene. On July 13, 1993, a notice was issued setting a deadline for filing final comments and recommendations.

Mr. Paul Stewart filed an untimely motion to intervene on July 7, 1993, which was granted in a September 7, 1993, Commission notice. Mr. Stewart is a local farmer and owns land adjacent to the project reservoir. He is concerned about impacts to landowners that may occur from PacifiCorp's plans to enhance public access and wildlife habitat. Mr. Stewart does not oppose relicensing the project.

We address the environmental concerns raised in these motions to intervene in appropriate sections of the EA.

C. Comments on the Draft Environmental Assessment

Commenting Entities	Date of Letter
Bear River Canal Company	February 25, 1994
PacifiCorp	February 25, 1994
Mr. Paul Stewart	February 28, 1994

D. Water Quality Certification

On August 13, 1991, PacifiCorp applied to the Utah Department of Environmental Quality (DEQ) for a water quality certification for the project, as required by section 401 of the Clean Water Act. On November 20, 1991, the DEQ accepted PacifiCorp's request for a 401 water quality certification, certified compliance to applicable state water quality standards, and granted the certificate (letter from Don A. Oster, Executive Secretary, Utah State Water Quality Board to Jim Burruss, Senior Environmental Analyst, Utah Power, November 20, 1991).

V. ENVIRONMENTAL ANALYSIS

In this section, we describe the project setting and the river basin where it is located (the Affected Environment), and discuss impacts on individual environmental resources that would be affected by: (1) PacifiCorp's proposal; (2) alternatives for continued operation of the project; and (3) no-action. In addition to project-specific impacts, we analyze the potential for significant cumulative impacts to resources affected by the project and by other past, present, and reasonably foreseeable activities in the basin.

We focus our analysis on the Bear River Basin - the mainstem Bear River in particular, and have prepared a single-project EA in this case because: (1) the Cutler Project is the most downstream hydro project on the Bear River - dependent, to a great degree, on water releases from an unlicensed upstream storage reservoir (Bear Lake); (2) there are no other pending projects in this river basin; (3) there are no Threatened and Endangered (T&E) species or anadromous fish issues; and (4) the level of controversy on the proposed project is low. Unless specifically cited, the source of our information is PacifiCorp's application for a new license (PacifiCorp, 1991) and additional information filed on the application (PacifiCorp, 1993).

A. General Description of the Bear River Basin

The Bear River Basin is located in northern Utah, southeast Idaho, and southwest Wyoming. The basin drains about 6,900 square miles at its outlet on the Great Salt Lake.

The basin has an intermountain climate that is largely driven by topography. Mean annual precipitation varies with elevation; from about 40 inches in the mountains to around 10 inches at the lowest elevations. Most precipitation during October through April falls as snow. Summer thunderstorms are also very common in the basin and produce intense, flashy rainfall. Temperature variation is extreme, ranging from 40èF to 108èF. The mean annual temperature is about 45èF (Harza, 1983).

The Cutler Project is located in the Cache Valley of Utah between the Wasatch and Wellsville mountains. The dam is in Box Elder County, while most of the reservoir is in Cache County. The reservoir sits at the confluence of the Bear, Logan, and Little Bear Rivers.

Farming and grazing are the main land uses in Cache County. Hence, the County is rural in nature and as of the 1990 census had a population of about 70,000. The largest single employer is Utah State University in Logan. Cache County has the second highest birth rate in the state and its population is expected to increase significantly into the next century.

The Bear River is a managed system that includes storage reservoirs, diversion dams, canals, and hydroelectric plants. The river has historically been controlled for irrigation, power generation, recreation, fish and wildlife, and flood control.

There are six hydroelectric developments on the mainstem Bear River. From upstream to downstream, they are: Soda (FERC No. 20) - Last Chance (FERC No. 4580) - Grace (FERC No. 2401B) - Cove (FERC No. 2401A) - Oneida (FERC No. 472) - and Cutler (FERC No. 2420). All of these projects are licensed to PacifiCorp, and use flows supplemented by water releases from Bear Lake, a large, unlicensed, upstream storage reservoir.

There are an additional seven hydroelectric developments located on the Logan River, Blacksmith Fork, Mink Creek, and Paris Creek; Bear River tributaries. Figure 3 shows the spatial distribution, licensee, generating capacity, and license expiration year for each of the above projects.

From mid-June to mid-October, nearly all natural flow in the Bear River is diverted for irrigation. Supplemental flow comes from water stored in Bear Lake. About 118 entities have consumptive water rights on the mainstem Bear River between Bear Lake and the Great Salt Lake.

Overall, throughout the basin, about a third of the river flow is consumed for offstream uses, mostly for irrigation. About 10 percent of the total land area in the basin (420,000 acres) is irrigated by about 500 separate systems

(Harza, 1983). These systems are owned and operated by a variety of individuals and groups. Other land uses in the basin include: mining (0.5 percent); wetlands, lakes, and streams (5.0 percent); non-irrigated cropland (9.0 percent), and urban areas (1.0 percent). The balance of the land area, nearly 85 percent, is either National Forest or range (Harza, 1983).

B. Proposed Action and Action Alternatives

In the individual resource sections below, recommendations are made when the measure would not have a significant cost or impact on other resources. For those measures involving significant costs, or that would significantly impact other developmental or nondevelopmental resources, our recommendation is found in Section VII. We have not included a specific section on geology and soils since no significant new construction is being proposed. However, runoff, soil erosion and sedimentation control are addressed in several other resource sections. Likewise, aesthetic resources are discussed in the Recreation section.

1. Water Resources

Affected Environment: The Bear River is regulated for multiple uses including irrigation, power generation, recreation, fish and wildlife enhancement, and flood control. Flows in the Bear River are seasonally influenced by: (1) controlled releases from Bear Lake, a large, upper-basin storage reservoir; (2) hydropower projects; (3) the removal of large quantities of water for irrigation demands; and (4) entry of uncontrolled runoff from tributaries.

Figure 3. Existing FERC-licensed and exempted projects in the Bear River Basin.

Streamflow. The drainage area above the project is about 6,200 square miles. A USGS gaging station, near Collinston, Utah, (Station No. 10118000), located about 800 feet downstream from the Cutler powerhouse, was used to determine streamflow data for the project.

Based on historical flow records, the average annual flow downstream of the project is 1,674 cubic feet per second (cfs). The minimum recorded flow was 10 cfs on October 4, 1905, and the maximum flow of 12,700 cfs was recorded on February 20, 1986. Average historic monthly flows passing through the power plant range from about 400 cfs to 3,100 cfs and are lowest during August. Summer flows (July, August and September) in the project's 1,700-foot-long bypass reach vary widely with mean August flow in the bypass reach typically around 27 cfs. The minimum recorded leakage flow below the dam is 13 cfs.

A number of physical features impede the free flow of water through the Cutler reservoir. First, the lake is shallow - only about 25 percent of it is deeper than three feet. There are also bridges that cross it, sandbars in its lower reaches, a narrow canyon just above the dam, and marshy areas at various locations. In addition, an old dam, Wheelon dam, located about 1/2 mile upstream from the Cutler dam, was inundated when the Cutler Project was built.

These restrictions create a lag time which delays or dampens water level fluctuations between the upper end of the reservoir and the dam. In the upper or southern reach of the reservoir from the Benson Marina area (mid-reservoir) to the marshy areas at the upper end of the reservoir, water elevations are especially difficult to control and predict. This is due to periodic high inflows from natural tributaries and because of hard-to-anticipate increases in direct irrigation draws from the reservoir.

Project Operation. The Cutler Project operates as a peaking project based on the availability of flows. When inflows to the reservoir are too low to keep an efficient load level on the generating units, water is stored, then released. However, only about the top 2.5 feet of the reservoir (measured at the dam) are used for storage. PacifiCorp manages the project in a semi-automatic mode. The generators are started and synchronized to the system manually by a local project operator. Once on line, the units are controlled remotely by a System Dispatcher in Salt Lake City. Operation of the project is affected by seasonal constraints as described below. There is currently no minimum flow required or provided in the bypass reach.

Irrigation Season. The irrigation season is from May 1 through October 31. During the season, the reservoir is held to within 1.5 feet of the 4,407.5-foot normal maximum pool elevation 90 percent of the time to facilitate direct pumping for irrigation from the reservoir and to accommodate sudden increases in irrigation demand that occur due to unexpected weather conditions or unexpected irrigation needs. Any extra inflow above that needed for irrigation is stored to maintain water elevations in the reservoir, and to permit efficient generation when water is available for release. During this period, the reservoir can drop below maximum pool because there is a 2 to 5-day time lag until upstream water releases, generally from Bear Lake, reach the project.

Winter Season. From late-December to mid-February, ice can form on the reservoir and in the river downstream of the project. During this period, the reservoir is held as constant as possible to prevent plugging of intakes and to prevent sudden increases in flow that can cause ice breakups and jams downstream.

Spring Runoff and Flood Season. Spring run-off can occur at the project anytime from mid-February to the end of June. It generally happens in two waves - when low elevation snow melts, and later when the high snowpack melts.

High flows also occur when there are heavy releases from Bear Lake concurrent with natural runoff upstream. The highest recorded flows have occurred from low-elevation snowmelts combined with heavy rains. During the spring, as much as 70 percent of the inflow into the project comes from uncontrolled flows from the Logan, Blacksmith Fork, Little Bear, Spring Creek, and Cub River tributaries. When inflows exceed irrigation demands and the plant capacity (3,900 cfs), the spillway gates at the dam are used to pass water.

Water Rights. Operation of the Bear River System is complex and is governed by two court decrees in Idaho and Utah; an interstate compact between Wyoming, Idaho, and Utah; state water rights laws; and long-standing irrigation contracts in Idaho and Utah. Major contract users are Bear River Canal Company, West Chache Irrigation Company, Cub River Irrigation Company, and Last Chance Canal. PacifiCorp must supply water upon demand to irrigators to meet seasonal irrigation requirements governed by these contractual agreements. Contractual agreements bind PacifiCorp to supply 900 cfs upon demand to the Bear River Canal Company from May 1 to October 31 and 150 cfs from November 1 to April 30.

Water Quality. The water quality of Cutler reservoir is poor primarily due to land use practices on agricultural lands along the Bear River and surrounding the reservoir. The reservoir is rich in nutrients with high levels of phosphorus and nitrogen. The nutrient loading indicates that the reservoir has the capacity to be eutrophic. Sources of phosphorus and nitrogen include watershed runoff, non-point source pollution, and point source pollution (e.g. crop fields, pasture fields, feedlots, dairy barns, and the city of Logan Sewage Treatment Facility). Trace metals have also been found in reservoir water. The U.S. Fish and Wildlife Service (FWS) indicated during prefiling consultation that the concentration values of unionized ammonia with warm water conditions and pH values greater than 8.0 could be a limiting factor on the fishery (letter from Clark D. Johnson, Assistant Field Supervisor, Fish and Wildlife Service, Salt Lake City, Utah, November 4, 1991).

Physical parameters of the reservoir water are also affected by watershed runoff and extended water storage. PacifiCorp reports that a 1990 Ecosystems Research Institute study of reservoir water quality indicated very high total dissolved solids (ranging above 650 milligrams per liter (mg/l)) causing poor water clarity and limiting light penetration to about 1.5 meters throughout the reservoir. Low oxygen levels at times were also reported in the mid 1960's in the reservoir, but oxygen levels improved in water samples collected in 1990.

Environmental Impacts and Recommendations:

Irrigation Demands. The Bear River Canal Company is concerned that PacifiCorp's plan to stabilize reservoir elevations could affect its ability to supply water for irrigation. The Canal Company is responsible for the distribution of Bear River water for irrigation of lands in the Bear River Valley.

PacifiCorp is planning to stabilize reservoir levels, in part, to enhance the fishery by limiting reservoir fluctuations to 0.5 feet during the spring spawning season. Spawning season overlaps with the irrigation season during May and June. Irrigation needs, releases from Bear Lake, and tributary runoff make it difficult, however, for PacifiCorp to reduce reservoir fluctuations. Therefore, PacifiCorp proposes to conduct a 3-year Bear River Basin Study to develop new operating procedures for stabilizing reservoir elevations to benefit fish and wildlife resources, reduce shoreline erosion, and improve recreation opportunities.

Reservoir levels at the Cutler Project and various locations would be studied to develop a reservoir level relationship between several reservoir locations. The study would address the following water use demands: (1) irrigation; (2) flood control; (3) fish and wildlife; (4) recreation; and (5) power generation as well as the constraints of water rights, hydrologic variability, irrigation contracts, maintenance activities, and ice conditions.

The complex water demands at the Cutler Project make it uncertain whether, especially during dry years, reservoir levels could be further stabilized while maintaining enough water for irrigation. However, by law, PacifiCorp is bound by contractual agreements with irrigators to meet their water needs before using water for project purposes. PacifiCorp's proposed Bear River Basin Study would include developing a basin-wide irrigation call system to better anticipate changes in irrigation demand along the Bear River.

The Bear River Basin Study is further discussed in the Fishery Resources section, below.

Water Quality. Land use practices and shoreline management adjacent to and upstream of the reservoir have affected reservoir water quality. PacifiCorp proposes to establish an up to 200-foot-wide permanent vegetative buffer strip on project lands adjacent to the reservoir between State Highway 30 and the State Highway 23 bridge. As part of the buffer, PacifiCorp proposes, within 3 years of issuance of the license, to: (1) install up to 1.5 miles of gabions or riprap along the reservoir shoreline in this area; (2) stabilize an additional 2.0 miles of shoreline by planting deep-rooted shrubs and willows to reestablish vegetation; (3) reseed about 50.0 acres of tilled ground to create a grassland buffer strip; and (4) construct about 6.0 miles of fence to control cattle.

The FWS (letter from Clark D. Johnson, Assistant Field Supervisor, Fish and Wildlife Service, Salt Lake City, Utah, November 4, 1991) and the Utah Division of Water Resources (UDWR) (letter from Timothy H. Provan, Director, Utah Division of Wildlife Resources, Salt Lake City, Utah, November 7, 1991) support PacifiCorp's proposal to stabilize the shoreline.

PacifiCorp's proposed buffer zone would help reduce shoreline erosion and reduce the runoff of sediments and nutrients into the reservoir. We discuss the economic impact of providing the buffer zone in Section VI, and make our recommendation on this measure in Section VII.

Unavoidable Adverse Impacts: None

2. Fishery Resources

Affected Environment: Construction of the Cutler dam in the 1920's was a further alteration of the already regulated nature of the Bear River from its original, free-flowing nature; perpetuating a long-term change in river habitat. In the mid-1960's, fishery habitats in the Bear River and the lower reaches of the tributaries near Cutler reservoir were of poor quality from silt loads and pollution. Algae blooms were common and invertebrates were scarce. Cutler reservoir in 1962-1965 was described as a shallow silted reservoir with low production. The establishment of a recreational fishery was limited because of the reduction of habitat caused by water level fluctuations and dewatering from extensive irrigation withdrawals. Carp was the most abundant species in the reservoir along with some largemouth bass, black crappie, and black bullhead.

More recently, UDWR angler surveys conducted from 1986-88 found the black bullhead the primary species caught and also confirmed the presence of brown and rainbow trout (letter from Timothy H, Provan, Director, Utah Division of Wildlife Resources, Salt Lake City, Utah, April 28, 1989). PacifiCorp also conducted fish sampling on Cutler reservoir and major tributaries to the reservoir during the spring and summer of 1990. The survey found Cutler reservoir supporting a recreational warmwater fishery comprised primarily of carp, green sunfish, black bullhead, black crappie, largemouth bass, and channel catfish. PacifiCorp also found one brown trout in the reservoir in their studies. These fish represent migrants from upstream sources. Carp are still the most abundant species in number and biomass. The bulk of the recreational fishery is maintained by natural recruitment. There are no known endangered or rare fish species in the Cutler reservoir, nor are there any anadromous or migratory species present in the Bear River.

The fishery appears to be marginal - reflecting years of seasonal flow fluctuations. There is some fishing for carp and catfish in the tailrace area, but fishing is limited there because: (1) irrigation demands on the reservoir can cause situations when the project shuts down and no flow is released below the dam or powerhouse; and (2) over the years, the minimum leakage flow from the dam plus seasonal fluctuations in flows have reduced habitat in the stream below the project.

Environmental Impacts and Recommendations:

Minimum flows below the powerhouse. Irrigation has priority over all other water use at the Cutler Project. Irregular wet and dry weather cycles affecting control of water available for irrigation has precluded the requirement of continuous discharge of a minimum flow into the Bear River below the powerhouse. During some dry years, there is not enough flow available for generation during the summer irrigation season. Hence, PacifiCorp is not proposing a minimum flow below the project.

The resource agencies recognized the constraints placed on the project and did not request any instream flow study during prefiling consultation nor have they requested a minimum flow release below the project.

We, likewise, because of irrigation's priority and the need to stabilize reservoir fluctuations (discussed further below) don't recommend that a minimum flow be established downstream of the project powerhouse. We, instead, recommend that PacifiCorp concentrate their fish habitat improvement efforts on the reservoir.

Minimum Flows in the Bypass reach. PacifiCorp doesn't propose, nor does any party or agency recommend that a minimum flow be provided for the 1,700 foot-long bypass reach.

We realize that under the current operating scenario, except when the project spills, this reach receives only leakage flows from the dam. However, we have no evidence that the bypass has any unique or outstanding characteristics for fish habitat compared to other reaches nearby, or that the resource agencies give it any special consideration in management plans for the region. There is, however, interest in stabilizing reservoir fluctuations. Providing a continuous minimum flow in the bypass is not feasible without drawing down the reservoir because of the dependence of available water on wet and dry weather cycles and the priority that irrigation use has. We, therefore, are not recommending that a minimum bypass flow be established. As we've said, we are recommending that PacifiCorp concentrate their fish habitat improvement efforts on the reservoir.

Reservoir Fluctuations. Reservoir fluctuations occur as a result of irrigation draws and power production. Such fluctuations have historically, and continue to impair fishery productivity in the reservoir. Fluctuating reservoir levels can cause stranding, loss of spawning sites, abandonment of nesting fish, and desiccation of fish spawn; all factors that can limit natural recruitment (Hunter, 1992). Fluctuations can also disrupt the aquatic invertebrate community, a prime food base for fish. Further, fluctuations can increase turbidity, erosion, and resuspension of sediments in the reservoir.

As we've said, PacifiCorp proposes to study ways, basinwide, to reduce fluctuation in Cutler reservoir. In the meantime, PacifiCorp would test a reservoir operation plan that would limit drawdowns during certain times of the year. The test would provide actual experience from which a final reservoir operating plan would be developed. The test would include the following water surface elevation ranges and time periods to enhance not only fish spawning, but waterfowl nesting, water quality, and waterfowl hunting.

Time Period	Reservoir Elevation (Feet)	Tolerance (Feet)	Percent of Time Goal Met
March 1 - June 15	4407.5 - 4407.0	ñ 0.25	95
June 15 - Sept. 30	4407.5 - 4406.5	ñ 0.25	95
Oct. 1 - Dec. 1	4407.5 - 4407.0	ñ 0.25	95
Dec. 2 - Feb. 28	4407.5 - 4406.0	+ 0.25 to - 0.50	90

Both the UDWR (letter from Timothy H, Provan, Director, Utah Division of Wildlife Resources, Salt Lake City, Utah, April 28, 1989) and the FWS (letter from Robert G. Ruesink, State Supervisor, Fish and Wildlife Service, Salt Lake City, Utah, April 25, 1989) support PacifiCorp's proposed measures to review project operations to reduce water level fluctuations and to enhance the fishery.

PacifiCorp's interim proposal to maintain reservoir water levels from March 1 to June 15, part of their proposed Bear River Basin study, would enhance the fishery, and seems reasonable provided it does not interfere with irrigation needs. The proposed Bear River Basin Study would be valuable in determining basin-wide measures that could be taken to permanently reduce fluctuation in Cutler Reservoir, and should be required. Since they are such a large water user, the Bear River Canal Company should be consulted during the study's planning and implementation.

Fish Cover and Food Sources. PacifiCorp conducted fish habitat suitability studies in the reservoir in 1990. The studies indicated that a shortage of suitable cover and available fish food sources were limiting the fishery. Low macroinvertebrate densities in conjunction with poor water quality, and depth may limit the numbers and sizes of gamefish and undoubtedly affect the entire food chain in the reservoir.

To enhance fish habitat in Cutler reservoir, PacifiCorp proposes a number of activities. As previously discussed in the water quality section, PacifiCorp proposes shoreline erosion control measures that would also benefit the fishery by reducing sedimentation. To enhance the amount of open water fish cover, PacifiCorp proposes to cooperate with the UDWR in establishing four fish cover structures in the open water portion of the reservoir in the Benson Area.

The UDWR, (letter from Timothy H, Provan, Director, Utah Division of Wildlife Resources, Salt Lake City, Utah, April 28, 1989) indicates that open water cover is a limiting factor on the fishery in certain parts of the reservoir.

Fish cover provides protection and prey entrapment sites for fish as well as providing habitat for invertebrates and other fish food sources. There is little fish cover in the reservoir partially because the poor water quality limits light penetration and the development of submerged aquatic plants. The four structures proposed by PacifiCorp would provide cover for game and forage fish in an area where cover is needed. We discuss the economic impact of providing the fish cover structures in Section VI, and make our recommendation on this measure in Section VII.

Carp Control. During prefiling consultation, local anglers and conservation groups requested that something be done to reduce the number of carp in the reservoir. This issue was not, however, raised later during the consultation period, nor has it been raised since the application was filed.

The UDWR acknowledges that the large number of carp in the reservoir decrease rooted macrophytes and increase turbidity, but believe it would be infeasible to eradicate them from the reservoir (letter from Timothy H, Provan, Director, Utah Division of Wildlife Resources, Salt Lake City, Utah, April 28, 1989).

Shallow, turbid and nutrient-enriched water, conditions found in the Cutler reservoir, are the preferred habitat conditions for carp. These conditions are a result of water level fluctuations from irrigation, project operation, and pollution sources upriver. Therefore, the presence of carp is not solely due to project operation. However, PacifiCorp's proposed fish habitat enhancements (increasing the amount of fish cover, and stabilizing reservoir fluctuations to decrease the resuspension of sediments and reduce impacts to spawning fish) would promote the growth of non-carp species.

Unavoidable Adverse Impacts: The lack of a minimum flow requirement would perpetuate a lasting reduction in river productivity below the project.

3. Terrestrial Resources

Affected Environment:

Vegetation. Construction of Cutler dam in the 1920's created a large, shallow reservoir with extensive emergent wetlands. Irrigation water supplied by the reservoir supports nearby agricultural land, in which birds and other wildlife forage.

The most prevalent vegetation type in the project area is bulrush/cattail emergent wetland, growing in up to 2 feet of water. Emergent wetland occupies 1,735 acres. Pasture is the second most prevalent vegetation type (1,314 acres), and cultivated fields of alfalfa or grains are the third most prevalent (653 acres).

Riparian vegetation along the reservoir consists of four vegetation types: (1) wet meadows; (2) mesic shrubs; (3) a willow/small tree association; and (4) a few stands of cottonwoods or other trees. Wet meadows, making up 421 acres of the project area, include reed canary grass, sedges, rushes, and pale spike rush. The mesic shrub vegetation type is made up of red-osier dogwood, Wood's rose, chokecherry, skunkbush, golden currant, and occasionally Rocky Mountain bigtooth maple. The willow/small tree vegetation type, making up 108 acres, is composed primarily of small willows, such as coyote willow, with other small trees such as Russian olive, green ash, and river hawthorn also present. There are a few large stands of Fremont cottonwood or Lombardy poplar.

Other vegetation types in the project area include xeric uplands on 11 acres of the slopes in and above the canyon in which Cutler dam is located. This upland vegetation is made up of juniper woodland or sagebrush and grasses.

Riparian vegetation in the Bear River Basin has been cumulatively impacted by hydroelectric projects, irrigation, agriculture, and industry. Before Cutler dam was built, the project area consisted of the floodplain for the Bear River and its tributaries, the Little Bear River, the Blacksmith Fork River, and the Logan River. Each river supported riparian vegetation. As we've said, constructing the dam created a large, irregularly shaped reservoir with a shoreline capable of supporting extensive riparian vegetation. Grazing and crop production, however, have prevented the growth of riparian vegetation on 2 miles of reservoir shoreline and have degraded riparian vegetation on 35 miles of shoreline (see table 3-14 of exhibit E).

Wildlife. Mule deer use portions of the project area in low numbers. Other mammal species are coyote, bobcat, red fox, porcupine, badger, mountain cottontail, striped skunk, beaver, muskrat, and mink. Upland parts of the project area support small populations of ring-necked pheasant. The sandhill crane, an important nongame bird, feeds and nests in project wetlands.

Cutler reservoir and adjoining lands provide important habitat for waterfowl and other birds. The UDWR counted as many as 5,777 waterfowl in its 1983 mid-winter survey. Many bird species use the project area during their fall and spring migrations, while few species are permanent residents. Redheads, cinnamon teal, mallards, gadwalls, northern shovelers, pintails, and ruddy ducks are the most common breeding waterfowl. The reservoir's high turbidity, however, limits submerged aquatic vegetation and macroinvertebrate production, so duck breeding is low. The reservoir's Canada goose population has been increasing and has caused some crop damage. Besides waterfowl, there are colonies of white-faced ibis, black-crowned night heron, great blue heron, snowy egret, cattle egret, Forster's tern, and Franklin's gull.

Waterfowl in the Bear River Basin have been cumulatively impacted by agriculture, irrigation, hydroelectric projects, and industry. Construction of the reservoir and subsequent siltation resulted in a great increase in emergent wetland habitat for waterfowl. Production of ducks that feed on submerged aquatic vegetation and macroinvertebrates, however, is lower than would be expected because the quality of the water flowing into the reservoir has been degraded by agriculture and other uses.

Environmental Impacts and Recommendations:

Impact of Recreational Enhancement on Wetlands. PacifiCorp delineated wetlands that would be affected by eight proposed recreational developments. PacifiCorp found that the total area of impacted wetlands would be 0.98 acre. PacifiCorp proposes to mitigate this loss of wetlands. PacifiCorp says its mitigation measures could include bank stabilization, vegetation plantings, and cattle fences to enhance or create wetlands in the project area (PacifiCorp, 1993).

The FWS concurs with PacifiCorp's proposal to mitigate wetland losses. The UDWR says that the impacts to wildlife would be minimal and could be mitigated by enhancing lands within the project boundary. The UDWR asks to be involved in developing site plans and mitigative measures.

Wetland vegetation provides food and cover for birds, and other wildlife. Recreational enhancements would result in the permanent loss of 0.98 acre of wetland vegetation. PacifiCorp should replace any wetland vegetation removed due to construction of new recreational facilities.

The plan should include the following: (1) details of the final design of measures to replace the wetland habitat affected by recreational development, and to ensure that no more such vegetation is destroyed than is necessary to build the recreational facilities; and (2) a plan for monitoring the effectiveness of the measures to replace wetland habitat affected by the construction of the recreational facilities, which includes steps to be taken in the event the measures are not effective in protecting the wetland habitat, including, but not necessarily limited to, modifying the measures or establishing or enhancing additional wetland habitat. Implementing this plan would ensure that the site-specific and cumulative impacts of wetland habitat loss on deer, birds, and other wildlife are minimized.

Wildlife enhancement. PacifiCorp proposes to develop a Resource Management Plan (RMP) to protect and enhance wildlife habitat, recreation, and the continuation of managed agricultural uses.

PacifiCorp has already developed specific proposals for the RMP for enhancing riparian areas and wildlife habitat north of State Highway 30. These measures include providing a vegetative buffer strip around parts of the reservoir, installing 6.0 miles of fence to keep livestock out of the buffer strip, and reseeding or replanting parts of the shoreline. PacifiCorp also proposes to reseed 300 acres of currently tilled land and install up to 6.0 miles of fence within 3 years after issuance of a new license.

The RMP would also contain the same kind of enhancement measures for project lands south of State Highway 30 that PacifiCorp has proposed for lands north of the highway. PacifiCorp would evaluate project lands that are currently farmed or grazed, and may take some lands out of production. PacifiCorp would install fences to exclude cattle during the growing season to allow pasture vegetation to grow and to provide cover for wildlife. PacifiCorp would seed currently tilled areas with native grasses to improve wildlife cover. In the RMP, PacifiCorp would identify lands of current or potential value to wildlife to be acquired, either through fee simple purchase or exchange, and included in the project boundary.

The UDWR supports PacifiCorp's proposal to develop the Resource Management Plan.

Unavoidable Adverse Impacts: Enhancement of project recreational facilities would result in the short-term loss of 0.98 acre of wetland habitat.

4. Threatened and Endangered Species

Affected Environment: The FWS says that the endangered bald eagle, peregrine falcon, and whooping crane, and the threatened Ute ladies'-tresses may occur in the project area (U.S. Fish and Wildlife Service, 1991).

Bald eagles winter in the Bear River Valley from November 15 through March 25. A 1987 survey found 16 eagles in the vicinity of Cutler reservoir (PacifiCorp, 1991). In the project area, eagles feed on waterfowl in the project's wetlands and roost in large cottonwoods near the reservoir.

Peregrine falcons have been seen around the reservoir (PacifiCorp, 1991). Most are probably falcons migrating through the area. Year-round observations of peregrine falcons, however, suggest that breeding pairs may reside year-round in Cache County. The canyon section of the reservoir near Cutler dam may provide suitable nesting habitat for falcons. Significant falcon activity, however, hasn't been observed in the canyon section.

Whooping cranes may use the project area during migration. One or two unverified sightings of whooping crane flyovers have been made in Cache County (PacifiCorp, 1991). Cranes haven't been seen in the project area.

Ute ladies'-tresses (Spiranthes diluvialis) may grow in the project area. The plant grows in seasonally moist soils and wet meadows near springs, lakes, or perennial streams and their associated flood plains. PacifiCorp did a survey for this plant in the riparian areas that would be disturbed by its proposed recreational enhancements (PacifiCorp, 1993). PacifiCorp found no Ute ladies'-tresses.

Environmental Impacts and Recommendations:

Bald eagle. Bald eagles forage in and around Cutler reservoir and perch in cottonwoods next to the reservoir during the winter. Relicensing the project wouldn't affect wintering bald eagle use of the project area. PacifiCorp's proposed fish and wildlife enhancements may slightly increase the amount of fish and waterfowl available as eagle prey. Cottonwoods grow at the Benson and Upper Bear River access sites, which PacifiCorp would enhance, but further development of these recreation sites wouldn't entail removing any cottonwoods (PacifiCorp, 1993). Bald eagles use the project during the winter when recreational use is low, so increased recreational use shouldn't disturb eagles.

Peregrine falcon. Peregrine falcon use of the project area is limited. Relicensing the project wouldn't affect falcon use of the project area. PacifiCorp's proposed wildlife enhancements may slightly increase the amount of birds available as falcon prey.

Whooping crane. No use of the project area by whooping cranes has been documented.

Finally, the project doesn't include an above-ground transmission line that could be a collision hazard to bald eagles, peregrine falcons, or whooping cranes. Therefore, relicensing the project wouldn't affect bald eagles, peregrine falcons, or whooping cranes.

The FWS concurs with PacifiCorp's determination of no effect for the Ute ladies'-tresses and all other federally listed threatened or endangered species (U.S. Fish and Wildlife Service, 1993).

Unavoidable Adverse Impacts: None

5. Cultural Resources

Affected Environment: In 1989, the Cutler dam and powerhouse were listed in the National Register of Historic Places (Register). The facility was constructed between 1924 and 1927, and has been in continuous use since 1927.

The facility has been subject to repairs and upgrading, but not enough to alter its historical integrity. Repairs and upgrading include overhauls and repairs of turbines and generators, rewinding of the generators, installation of remote controls, replacement of original transformers, and rehabilitation of the spillway.

Several archeological sites are located in the general project vicinity. No sites have been recorded in the immediate project area (Martin, 1989; PacifiCorp, 1991; Schirer, 1991).

Environmental Impacts and Recommendations: The SHPO says the project would not have an effect on the historical integrity of the Cutler dam and powerhouse or other cultural resources in the project area (Schirer, 1991).

We agree with this "no effect" determination, but not without more definitive consultation procedures and cultural resources management plans to:

(a) ensure that project maintenance and repair work does not affect the historical integrity of the Cutler dam and powerhouse; and (b) specify how archeological and historic sites discovered during project operation would be evaluated and protected.

Therefore, we recommend as a condition of any license issued for the project that PacifiCorp: (1) notify the SHPO of specific maintenance and repair work procedures at Cutler dam and powerhouse; (2) develop a cultural resources management plan for implementation of these procedures; (3) base the plan on the SHPO's recommendations and the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation; and (4) file the plan with the Commission for approval, together with a copy of a letter from the SHPO commenting on the plan, within 2 years after the date of any license issued for the project.

To protect any archeological or historic sites discovered during project operation, we recommend PacifiCorp: (1) consult with the SHPO; (2) prepare a cultural resources management plan and a schedule to evaluate the significance of the sites and to avoid or mitigate any impacts to Register eligible sites; (3) base the plan on recommendations of the SHPO and the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation; (4) file the plan for Commission approval, together with the written comments of the SHPO; and (5) take the necessary steps to protect the discovered archeological or historic sites from further impact until notified by the Commission that all of these requirements have been satisfied.

The Commission may require changes to the cultural resources management plans based on the filings. PacifiCorp would not be allowed to implement a cultural resources management plan or begin any land-clearing or land-disturbing activities in the vicinity of any discovered sites until informed by the Commission that the requirements have been fulfilled.

Unavoidable Adverse Impacts: None.

6. Recreation

Affected Environment: Recreation resources have been cumulatively affected by hydropower development, irrigation, agriculture and industrial and residential development in the Bear River Basin. The construction of dams and diversions in the basin in the late 1800's and early 1900's resulted in the inundation of many miles of free-flowing river that once provided paddling and, probably, some whitewater boating opportunities. The impoundments, however, have also provided many lake-oriented recreation opportunities that would not exist otherwise. Lakes in the basin currently receive high use for a variety of activities.

Farming practices and a gradual increase in population throughout the basin have contributed to water quality problems which, as we've said, limit potential waterfowl production and, therefore, hunting and wildlife viewing opportunities. However, the increase in emergent vegetation in the basin from dam construction has probably been an overall benefit to waterfowl-based recreation. Today, the wetlands at the Cutler Project are the focal point for much of the recreation that occurs, as waterfowl hunting, and wildlife watching are important activities.

The most recent recreational use data for Cutler reservoir was collected in 1973. At that time, about 5,000 people were using the lake per year. PacifiCorp believes that the total number of visitors has increased since then, but that the proportion of use among the various activities has remained fairly stable.

Waterfowl hunting reportedly represents about half of the total use of the reservoir. Various species of ducks, geese, and swans are sought, with the best hunting areas being the southern reservoir and along the Bear, Little Bear, and Logan tributaries. Upland hunting for pheasants occurs on land currently in grain production. The number of hunters who use the reservoir each year has been estimated at somewhere between 930 and 3,660 since 1979. In addition to the migratory game species, birds such as the great blue heron, white-faced ibis, and snowy plover provide bird watching opportunities.

Although it's not considered a prime fishing resource, fishing does occur year-round on the reservoir. Largemouth bass, black crappie, and channel catfish are the main species sought. Some bow fishing for carp also occurs. Total fishing use is estimated at about 100 anglers per month. The reservoir is also used for water skiing and powerboating, but such use is limited to the deeper sections.

There is currently only one developed access facility on the impoundment, the Benson Marina site, which consists of a concrete boat launch, a picnic shelter, gravel parking lot, and portable toilet. PacifiCorp says this area is inadequately sized and in disrepair. Because of the lack of designated access facilities, visitors often park in and use areas on PacifiCorp property leased for agriculture, or on other private property. There are no permanent sanitary facilities on the reservoir. Hence, unauthorized use of private and leased lands by recreationists has created some conflicts with local landowners and leaseholders in the past.

Environmental Impacts and Recommendations: PacifiCorp is proposing a major recreation access project at the reservoir that involves constructing seven new public boat access sites, canoe trails, signage, a loop trail, and interpretive facilities (see Figure 4). Two of the new boat access sites would be designed for powerboats, the rest for small boats and canoes. In addition, the existing Benson Marina site would be enlarged and upgraded, and an interpretive sign would be installed at the powerhouse.

Under PacifiCorp's plan, the Cutler Canyon, Cutler Marsh and Benson sites would have the most developed facilities and would be the focal points for recreation in the upper, middle and lower sections of the impoundment. Each of these areas would have a concrete boat launch, parking for from 15 to 40 vehicles, docks, and picnic and restroom facilities. The Benson area would be the largest and would include a loop trail for hiking, fishing, and wildlife viewing. Other sites (upper and Lower Benson, Little Bear River, Logan River, plus several small access areas) would be designed to accommodate non-motorized boating, hunting, and picnicking. Canoe trails in the southern, marshy areas of the reservoir would facilitate wildlife viewing and waterfowl hunting. Finally, to establish baseline data on recreational use of the lake, PacifiCorp would conduct a user survey.

Figure 4. Conceptual Plan for PacifiCorp's Proposed Recreation Facilities - Source (PacifiCorp, 1991)

All of the above recreation enhancements would be in place within 2 to 4 years of issuance of a new license for the project per the following schedule:

RECREATION AREA	COMPLETION SCHEDULE
Benson	2 years after license
Cutler Marsh	2 years after license
Cutler Canyon	2 years after license
Upper and Lower Benson	3 years after license
Clay Slough	3 years after license
User Survey	4 years after license

None of the agencies commented on PacifiCorp's recreation plan in response to the Commission's final notice on the application. However, comments from the agencies during prefiling, and in response to our additional information request, indicate that they support the plan. For instance, the Utah Department of Natural Resources, Division of Parks and Recreation (UDPR) states, in a November 5, 1991, letter, commenting on the draft application - "In conclusion, we feel the analysis was very well done, and conforms to the objectives and professional planning processes recommended in the Utah State Comprehensive Outdoor Recreation Plan (SCORP); and has used the most recent SCORP data for the thorough analysis achieved". They also ask to be involved in the final design of the facilities.

The Utah Department of Natural Resources, Division of Wildlife Resources (UDWR), also commenting on the draft application, in a November 7, 1991, letter, states "We generally concur with PacifiCorp's proposals to develop and enhance recreational opportunities in the project area." They go on to emphasize that they are especially interested in a new access site being developed in the Cutler Canyon area, and that this should be a top priority. PacifiCorp subsequently included a Cutler Canyon access area in their final application as a priority item.

The FWS, in a May 28, 1993, letter, states that they believe the proposed recreational developments would have minor impacts on fish and wildlife, and that they would provide substantial recreational benefits.

The American Whitewater Affiliation requests, in an October 26, 1992, letter, that PacifiCorp allow the public to access the bypass reach for boating during naturally occurring high-flow periods.

Mr. Paul Stewart, an adjacent landowner and farmer, has the following requests regarding PacifiCorp's recreation proposals: (1) wants PacifiCorp to assume liability, where applicable, for damage to private property adjacent to Cutler reservoir caused from wildlife and sportsmen, including but not limited to damage to crops, vandalism, theft, fire, increased risk of accidental shootings resulting in fatalities or serious injury at or near private residences; (2) opposes the development of the "Potential Recreation Access" adjoining his property including fences, and also opposes the development of the "Potential for Improved Pheasant Hunting" at the property to the south of his home; and (3) wants PacifiCorp to locate nature trails away from private lands where negative impacts would be lessened.

Mr. Wayne Cardon, also a local farmer, supports PacifiCorp's proposal to upgrade boat launching facilities at the Benson Marina site, and to construct a new boat access area at Cutler Marsh. However, Mr. Cardon does not believe a nature trail is a good idea at the Benson site. He's concerned about: (1) potential cropland fires caused by careless users; and (2) increased traffic on narrow roads frequented by agricultural equipment.

Conclusion. Absent a current recreation use study, it is quite difficult to say how much use Cutler reservoir is attracting. However, long-term estimates of water-based recreation in the United States predict a compound annual growth rate of about 1.5% from 1977 through 2030 (Walsh, 1986). Applying this growth rate to Cutler from 1973 to 1993 would show use of the lake to currently be around 13,266 visitors. However, considering its size compared to other lakes in the region and the number of visitors they are attracting, Cutler could accommodate a much higher level of use. The only apparent impediment to public use of the reservoir is the lack of adequate access facilities. We believe the new facilities that PacifiCorp is proposing would encourage significant additional public use of the project area. Table

1 below shows current annual visitation at lakes with public access facilities within 50 miles of Cutler. As expected, the larger lakes, with more recreational development are attracting the most people. Average annual visitation per surface acre of water for these five lakes is 139.38. Assuming the proposed recreation facilities were developed at Cutler and using this regional average rate of participation per surface acre, the Cutler impoundment could attract about 167,2565 visits. In addition, PacifiCorp's proposed buffer zone, habitat enhancements, and reservoir management plan, discussed above in Sections 1-4 would enhance the lake's aesthetics by limiting drawdowns, reducing soil erosion and sedimentation, and controlling grazing.

Table 1. Visitation levels at reservoirs within a 50 to 60 mile radius of the Cutler Project.

NAME	SURFACE ACRES	PROXIMITY	RECREATION FACILITIES AREA	ANNUAL VISITATION	CAPACITY USAGE
Causey	140	40 miles southeast	2 acres	20,248	Unknown
Bear	78,800	35 miles northeast	377 acres	300,000+	Unknown
Hyrum	475	15 miles south	40 acres	166,704	Reservoir use is at or near capacity.
Pineview	2,870	50 miles south	200 acres	440,675	Reservoir use is at capacity and exceeded on some weekends.
Newton	280	5 miles north	2 acres	12,300	Reservoir use is near capacity.
Cutler	5,500 (1,200) 6		2 acres	unknown	Used under capacity.

5 139.38 x 1,200 (surface acres at Cutler with a greater than three-foot depth) = 167,256.

6 Only 1,200 surface acres have a depth of greater than 3 feet.

The number, location, and variety of facilities proposed by PacifiCorp is reasonable given the size and branched nature of the lake and the different water depths and experiences available.

Regarding Mr. Stewart's concerns, there should actually be fewer instances of public encroachment on private land if the new facilities are constructed. Providing specific, designated areas for parking and access by foot or boat should effectively steer recreationists away from private lands. We do recommend, however, that PacifiCorp include in their plans, measures to ensure that the public uses only designated areas, and monitoring of use to address the concerns of adjacent landowners. However, there undoubtedly are some people who would still trespass. As long as they've been properly informed, which we see is the responsibility of PacifiCorp and private landowners, it's the individual who should be held responsible for his/her own actions. We're also reluctant to assign any liability to PacifiCorp for crop damage from waterfowl. We understand that waterfowl crop damage is a concern, and the proposed RMP would include measures to steer waterfowl away from croplands. Although we don't anticipate an increase, it's likely that there would still be some damage. However, whatever crop damage occurs due to waterfowl around the reservoir is probably minor when compared to the benefit of the crops being so close to irrigation water.

Regarding his concern about the areas of potential recreation enhancements, the nearest area to his home (about 0.5 mile away) is a proposed 5-car parking area for hunting access (see Figure 4 of the EA). No facility is currently planned for the potential access area that he is concerned about, nor is any facility proposed for the area on the opposite side of the lake from his home. We also note that all of the proposed recreation areas and access points are located within the project boundary. With proper management, the Benson access area and trail could be compatible with adjacent land uses. We do recommend, however, that final design drawings for the proposed facilities be prepared in consultation with the agencies and interested parties before filing the final recreation plan for Commission approval. We discuss the economic impact of providing the recreation enhancements in Section VI, and make our final recommendation on these measures in Section VII.

PacifiCorp's plan includes a policy of continuing to allow general public access to PacifiCorp land at the project area. Regarding allowing access to the bypass reach, PacifiCorp would maintain the existing locked gate and would provide limited public access upon request only. This should address the AWA's concern for access to the bypass reach since no specific facilities are being requested.

Unavoidable Adverse Impacts: Constructing PacifiCorp's proposed recreation facilities would impact 0.98 acres of wetlands. These impacts are discussed above in Section 3.

7. Land Use

Affected Environment: Primary land uses in the Bear River Multi-County Planning District (MCD), which includes Cache, Box Elder, and Rich counties, are agriculture, range, and forest. About 40 percent of the MCD is public land under state or federal ownership. This includes three national forests (Wasatch-Cache, Caribou, and Bridger), several state parks, national wildlife refuges on Great Salt and Bear Lakes, plus land under Bureau of Land Management or Department of Defense control. Cache Valley, however, where the project is located, is almost entirely under private ownership.

The regional economy is based on a mix of agriculture, manufacturing, government, and trade. In Cache and Box Elder counties, agriculture is the driving force, supporting food processing, dairying, and related industries. About 310,000 acres or 60 percent of Cache Valley is native vegetation that is used to graze sheep and cattle. The main cultivated crops include alfalfa, small grains, sugar beets, silage corn, and pasture.

PacifiCorp owns about 9,700 acres at the project site, mostly around the reservoir. Of this, about 5,500 acres consist of the reservoir itself. The balance includes about five square miles of wetlands on the south side of State Highway 30; upstream parcels along Clay Slough, and along the Bear, Logan, and Little Bear Rivers; plus land along the Bear River to a point about 3,500 feet downstream of the dam.

Of the land owned by PacifiCorp, about 5,107 acres are leased to 32 different parties. Just over 900 acres of this land is actually within the reservoir at normal high water. About a third of the total leased land is pasture, most of which is located around the southern shoreline. Fifteen percent is used for alfalfa and cereal grains. The remaining land is not currently being used for any specific purpose other than conservation. Land leases are renewed annually, and some have been held by the same party for 60 years. Most of the leases are either entirely or partially within the project boundary, but a few are entirely outside.

There are apparently few controls currently placed on leased lands as cattle have been allowed to graze and cultivation occurs up to the water's edge. This has adversely impacted native shoreline vegetation, wildlife habitat, and the reservoir fishery. A growing population of Canada geese has also caused some crop damage. Other land uses affecting the reservoir include dairies and stockyards along the Bear River upstream, and the city of Logan sewage treatment facility, which releases treated wastewater into the reservoir.

Environmental Impacts and Recommendations: Mr. Paul Stewart, an adjacent landowner and farmer, has the following additional concerns and requests regarding PacifiCorp's proposals: (1) he wants reservoir banks repaired and stabilized or purchased or traded without diminishing the private landowners' privacy or land values; and (2) he's concerned that efforts to maintain lake levels for the benefit of the fish will adversely affect the ability of farmers to water their crops.

PacifiCorp's proposed RMP would affect land use and would involve setting goals and policies for managing the project area, along with specific measures for individual management units - geographic areas of the reservoir with similar terrain, wildlife habitat, and hydrological and land use conditions. The RMP would identify specific lands to be excluded or added to the project boundary either through fee simple purchase or exchange, and possibly condemnation. Lease fees and lengths of leases would be subject to change, and the recreation plan would be finalized in the RMP. Further, certain land use practices would be limited, such as pesticide and herbicide application. The result would be a shift away from the more intensive agricultural practices along the reservoir edge to habitat management, and recreation.

Regarding Mr. Stewart's concerns; conceptually, PacifiCorp's proposal includes stabilizing the reservoir shoreline via the buffer zone, and purchase or exchange of lands to be included in the project boundary. Specific concerns about particular parcels of land adjacent to the reservoir, however, should be addressed when the final RMP is being prepared. All interested entities should have the opportunity to participate in preparing the final RMP. No information has been presented that indicates that PacifiCorp's proposed reservoir fluctuation limits would adversely affect farmers' ability to water their crops. In fact, a more stable water regime should make it easier to draw water directly from the lake.

Current leaseholders would, however, be adversely affected if lease fees are increased, and if certain lands are no longer available for agriculture. However, if lease periods are lengthened, leasees would benefit from more operational certainty and would be better able to use long-term planning. Those who own land adjacent to the reservoir should benefit from PacifiCorp's plans for stabilizing reservoir fluctuations, stabilizing the shoreline, and purchasing some shoreline lands. We don't, however, find any justification for condemning any non-project lands.

Unavoidable Adverse Impacts: There could be some loss of agricultural productivity on lands adjacent to the reservoir.

C. No-action Alternative

Under the no-action alternative, the project would keep operating under an annual license. None of PacifiCorp's proposed enhancement measures would be required, unless voluntarily implemented. Public access to project waters would continue to be very limited, and the benefits of the shoreline buffer zone and RMP would not be realized. In effect, there would be no resulting changes to the existing environment. We do not believe this alternative is in the public interest.

VI. DEVELOPMENTAL ANALYSIS

The 30-MW project produces about 106 GWh of energy annually. With no minimum flow proposal for the bypass reach, the project would continue to produce about 106 GWh of energy annually. From our analysis, we find this annual energy generation for the project reasonable for the available flows in the Bear River.

In our economic analysis, we used PacifiCorp's assumptions of $6,500,000 net investment cost in 1991 dollars, $603,000 levelized annual operations and maintenance (O&M) costs, and 37.7 mills/kWh levelized energy value in 1991 dollars.

Due to the irrigation water rights of the Bear River Canal Company, which has its intakes above and below the Cutler dam, the project's dependable capacity of 30 MW is available only three months out of the year. In calculating the capacity value for the project, we used PacifiCorp's estimate of $92.56/kW per year (1991 dollars) and gave PacifiCorp credit for 25 percent of the dependable capacity value for the year.

Staff and the resource agencies have agreed with PacifiCorp's proposal and have proposed no other enhancement measures that would add significant costs to the project. Our analysis shows that the project would be economically beneficial over a new 30-year license period.

PacifiCorp estimates that their proposed environmental enhancement measures in section V.B. would cost about $751,000 with an additional cost of $55,000 a year for O&M. Individual costs for these measures are as follows:

MEASURE	CAPITAL COST	ANNUAL O&M
Fish Cover structures	$8,000 to $10,000	None
Buffer Zone	$200,000	$3,000 to $5,000
Wildlife Habitat	$50,000	$5,000 to $10,000
Resource Management Plan	$50,000	None
Recreation Facilities	$440,000[7]	$35,000 to $40,000

The total translates to a loss from the current 30-year levelized net annual benefits of about $221,600 or 2.1 mills/kWh. Even with this cost, the project would still be economical over a 30-year license.

VII. COMPREHENSIVE ANALYSIS AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a)(1) of the Act require the Commission to give equal consideration to all uses of the waterway on which the project is located. When deciding whether, and under what conditions, a hydropower license should be issued, the Commission must weigh the various economic and environmental tradeoffs involved for these uses. When possible, the benefits and costs of the various alternative uses of the project area are quantified.

7 The cost of the interpretive sign is estimated to be $500 to $1,000 dollars. No schedule has been proposed for its construction.

Based on our independent review and assessment of the proposed project, additional recommendations, and the no-action alternative, we have selected the proposed project with some minor additional measures as the preferred alternative. We recommend this alternative because: (1) issuing a new license would allow PacifiCorp to continue to make electric power from this renewable resource available to their customers while conserving nonrenewable fossil fuels; and (2) the recommended environmental enhancement measures would improve fish and wildlife habitat and increase public use of the project area.

Our recommended alternative includes the following environmental enhancement measures:

ù Conduct a Bear River Basin study to aid in the development of new operating procedures for stabilizing reservoir elevations in Cutler Reservoir.

ù Enhance fish spawning, waterfowl nesting, water quality, and waterfowl hunting by limiting reservoir water level fluctuations via a test reservoir operating plan. This would be an interim measure as a part of the Bear River Basin Study.

ù Install four fish cover structures in the reservoir.

ù Replace the 1.0 acre of wetlands that would be lost from new recreation facility impacts.

ù Combine PacifiCorp's proposed buffer zone, wildlife habitat and recreation enhancements, and resource management plan (RMP) into a single RMP for the project, and require consultation with local leaseholders and landowners when preparing the RMP to lessen or avoid impacts on agriculture and landowners.

ù Install an interpretive sign at the powerhouse.

ù Prepare and implement a cultural resources management plan.

The fish cover structures, the buffer zone and related wildlife habitat enhancements, and the recreation facilities would all involve significant costs. The basis for our recommending these measures is as follows.

Fish Cover Structures

The four structures proposed by PacifiCorp would provide cover for game and forage fish in an area where cover is needed. We believe that the increase in fish habitat that would result would lead to increased public use of the reservoir fishery such that the $8,000 to $10,000 cost would be balanced by at least as much public benefits over the term of the license. Therefore, we recommend that PacifiCorp prepare a plan for installing the proposed fish cover structures in consultation with the UDWR and the FWS.

Vegetative Buffer Zone, Wildlife Habitat Enhancement, and Management Plans

PacifiCorp would develop a Resource Management Plan (RMP) to protect and enhance wildlife habitat, recreation, and the continuation of managed agricultural uses at the project. PacifiCorp has proposed a number of specific measures to enhance riparian areas and wildlife habitat north of State Highway 30. The RMP would also contain the same kind of enhancement measures for all project lands south of State Highway 30.

PacifiCorp's proposed measures for lands north of State Highway 30 and south of the highway (RMP) would enhance wildlife habitat. The buffer strip and seeded areas would provide food and cover for waterfowl and other wildlife. Also, the buffer strip would assist in reducing shoreline erosion and removing sediment and nutrients from sheet runoff, which would improve water clarity and may ultimately increase duck production. Including similar management techniques in the RMP, as PacifiCorp proposes, would enhance wildlife habitat south of State Highway 30. Enhancing project wildlife habitat would offset, in part, the cumulative impacts that agriculture, irrigation, hydroelectric projects, and industry have had on waterfowl in the Bear River Basin.

We believe the public benefits that would accrue over the term of a new license through increased public use of the project area as a result of these measures (buffer zone - $200,000; habitat enhancements - $50,000; RMP - $50,000) justifies their cost. Therefore, PacifiCorp should prepare a final RMP that includes the location and final design of the proposed measures for the buffer zone and wildlife habitat enhancements.

Recreation Enhancements

There is an obvious need for additional, designated public access on the project reservoir. The lake is large, and is a significant resource very near a major population center. Further, this area of Utah has a growing population and many other lakes in this region are being used at near-capacity levels. PacifiCorp's proposed recreation developments would greatly enhance public access to the Cutler reservoir, and should lead to significantly greater use of the project area such that the $440,000 cost is justified. We discuss the expected increase in use below, and in Section V.

Conclusion

As we've said, fish and wildlife resources, water quality, and recreation would be enhanced under PacifiCorp's proposal. We've generally adopted, as have the resource agencies, PacifiCorp's proposal. The only changes that we would make is to require that a cultural resources management plan be prepared and implemented for the project.

Because this measure wouldn't add a significant cost to PacifiCorp's proposal, we haven't added any extra cost to our analysis. Finally, we have used PacifiCorp's cost estimates for their proposed enhancement measures in our analysis. Where a range was provide (for example $5,000-$10,000), we have used the higher number. We have dismissed the no-action alternative, because it would not allow for any environmental enhancement measures.

The combined cost for PacifiCorp's proposed enhancement measures for the project is $751,000, plus $55,000 per year for O&M. This equates to an average annual net cost, over the term of a 30-year license of $221,600. The table below shows the impact that this cost would have on the project's economics.

Table 1. Impact of the recommended alternative on project economics.

	Net Annual Benefit in Dollars	Net annual Benefit in mills/kWh
Current Project	$4,326,300	40.81
Recommended Alternative	$4,104,700	38.72

We believe the public benefits from our recommended alternative justify the cost to the project. First, over 50 percent of the annual cost would be from the proposed recreation enhancements. The potential exists for the lake to attract over 150,000 annual recreation visits, based on current use data from other lakes in the region. The majority of these users would be viewing wildlife, hunting waterfowl, fishing, and boating.

Walsh (1986), reviewed 62 studies that estimated the economic value of a range of outdoor recreation activities. The average value of a recreation day over all activities was $13.00. In order to justify the additional annual cost of $221,600 for all of our recommended enhancement measures, just over 17,000 additional people per year would have to use the Cutler project over the term of a 30-year license (17,046 x $13.00 = $221,598). We believe that this level of growth is attainable and could go much higher. We, therefore, find that issuing a new license for the Cutler project, with PacifiCorp's proposed enhancements, and our minor additions, would be in the public interest. This alternative, which allows for the continued production of a renewable energy resource, would best adapt the project to a comprehensive plan for improving, developing, or conserving the Bear River.

VIII. RECOMMENDATIONS OF FISH AND WILDLIFE AGENCIES

No fish and wildlife agency recommendations were filed for the project in response to our notice that the application was ready for environmental analysis.

IX. CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the Act requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project.

Under Section 10(a)(2), federal and state agencies filed five plans that address various resources in Utah. Four plans are relevant to this project 8. No conflicts were found.

X. FINDING OF NO SIGNIFICANT IMPACT

In this EA, we find that issuing a new license for the project would not significantly adversely affect the resources identified for analysis, and would enhance fish, terrestrial, wildlife, water quality, aesthetics, and recreation resources. The only unavoidable adverse impacts would be an adverse impact on 0.98 acres of wetlands due to the proposed recreation facilities, and a probable loss of agricultural productivity on some lands adjacent to the project reservoir. We conclude that issuing a new license for the project would not be a major federal action significantly affecting the human environment. Therefore, an Environmental Impact Statement is not required.

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XII. LIST OF PREPARERS

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APPENDIX A - Comments on the Draft Environmental Assessment and Staff Responses

Hydropower Licensing

Attachment 4
CUTLER PROJECT
FERC Order Approving Operational Plan

UNITED STATES OF AMERICA 99 FERC ¶ 62,085
FEDERAL ENERGY REGULATORY COMMISSION

Pacificorp | Project No. 2420-018

ORDER MODIFYING AND APPROVING PROJECT OPERATION PLAN
PER ARTICLE 401

(Issued April 30, 2002)

On October 4, 1999 and supplemented on April 11, 2002, Pacificorp (licensee) filed a "Three Year Bear River Basin Study" and an "Operational Plan" for the Cutler Hydroelectric Project (FERC No. 2420) per license article 401. The Cutler Project is located on the Bear River in Cache and Box Elder Counties, Utah. This order discusses the licensee's study and plan and approves the operation plan with minor modifications.

LICENSE REQUIREMENT

Article 401 requires the licensee to submit for Commission approval, a plan for conducting a three-year Bear River Basin Study as proposed in the license application. The study plan is required to include: (1) the development of a basin-wide irrigation call system that includes irrigation companies and individual irrigators; (2) the development of an operational model to provide a statistical method for improving the operation of the Bear River system; (3) an assessment of reservoir levels at specific locations to develop a reservoir level relationship between each location; (4) the testing of a one-year operational plan to control Cutler Reservoir fluctuations from mid-reservoir (near Benson Marina) to the south end of the reservoir while maintaining the current irrigation supply; (5) the development of a final Cutler Reservoir operating plan that best meets the needs of wildlife, recreation, power generation, and irrigation based on meteorology, runoff and seasonal power requirements; and (6) a schedule for implementing the study, consulting with the appropriate agencies and interested parties, and filing the results in a final report.

The licensee developed and filed with the Commission, a Bear River study plan per article 401. The licensee's study was approved March 30, 1995 by Order Modifying And Approving Three-Year Bear River Basin Study Plan.[1] The licensee's filings of the results of the Bear River Study indicates that it has adequately fulfilled the requirements of article 401. The licensee used the information learned in the Bear River study to develop its Operation Plan, which is the focus of this order.

[1] 70 FERC ¶ 62,209 (1995).

BACKGROUND

The Cutler reservoir is located at the confluence of the Bear, Logan, and Little Bear Rivers in northern Utah. There are six hydroelectric projects on the mainstem Bear River. Of the six projects, the Cutler Project is the farthest development downstream. From mid-June to mid-October, nearly all the natural flow in the Bear River is diverted for irrigation. Supplemental flows come from water releases from Bear Lake, a large storage reservoir.

The Cutler reservoir has a surface area of approximately 5,500 acres. At the time of relicensing in the early 1990's, comments from the resource agencies suggested that minimizing reservoir fluctuations in the area south of Benson Marina would benefit fish and wildlife resources, reduce soil and shoreline erosion and improve recreational opportunities. Irrigation needs, releases from Bear Lake, and runoff from large tributaries complicate management of the lake levels. As a result of the agencies' comments, the licensee proposed in its license application as adopted in article 401, a three-year study to determine the feasibility of new operating procedures that would help stabilize the reservoir elevations. The licensee completed its three-year study and developed a final operating plan for the project.

THE LICENSEE'S PROPOSED OPERATION PLAN

The licensee stated that the project is operated in a semi-automatic mode whereby the generators are started and synchronized to the system manually by the local hydro operator. The licensee added that once on-line, the units are controlled remotely by the System Dispatcher, located in Salt Lake City, who controls the load on the generators to meet system requirements and to stay within the reservoir elevation guidelines.

The licensee identified a number of sources of inflow to the reservoir such as flows from the upstream projects on the Bear River, the Cub, Logan, Black Smith and Little Bear Rivers, plus precipitation and irrigation returns. Outflow sources from the Cutler reservoir include generation, evaporation, irrigation and pumping. Of these, the licensee stated that it controls only the outflow at the dam, and only reservoir inflow from the upstream project which has a lag time of 36 hours. In order to minimize Cutler reservoir elevation fluctuations, the licensee developed an operation plan that proposes to maintain the reservoir elevation within target ranges as measured at the Cutler dam.

The licensee stated that the reservoir elevation monitoring equipment located at the dam does not necessarily depict the water surface elevation throughout the reservoir. The licensee stated that there are a number of physical restrictions in the reservoir that impede the flow of water through the reservoir such as highway and railroad bridges across the reservoir, sandbars in the lower reach of the reservoir, marshy areas, a narrow canyon just above the dam, and the submerged Wheelon Dam located approximately « mile upstream of the Cutler Dam. The Wheelon Dam was constructed for power generation and to divert water for irrigation, but was never breached when the Cutler Dam was built. It is completely inundated by the Cutler impoundment; however it does effect water surface elevations between the upper end of the reservoir and the dam.

The licensee explained that drawing down the reservoir four feet at the dam for a sustained period results in approximately a four foot drawdown in most areas of the reservoir. However, if the reservoir is drawdown more than four feet at the dam (ie. for maintenance purposes), the impact on the upper reaches of the reservoir is less because of the submerged Wheelon Dam.

The licensee stated that the principle area of environmental concern with respect to water level fluctuation is the upper reach of the reservoir, from the Benson Marina (mid-reservoir) to the marshy areas in the south end of the reservoir. The licensee added that the water elevation in this area is difficult to control due to inflow from the tributaries or sudden increases in irrigation demands from the tributaries and Bear River. The licensee stated that these factors are beyond their control and difficult to predict. The licensee, therefore, proposed the following operating ranges, as measured and recorded at the Cutler Dam.

Table 1. Proposed Reservoir elevation operating range as measured at the Cutler Dam

Time Period	Operating Range (Elevation in feet)	Tolerance (feet)	Target Percentage
March 1 through June 15	4407.5 to 4406.5	+.25, -.25	95%
June 15 through September 30	4407.5 to 4406.5	+.25, -.25	95%
October 1 through December 1	4407.5 to 4406.5	+.25, -.25	95%
December 2 through February 28	4407.5 to 4406.0	+.25, -.50	90%

The licensee proposed to monitor the operation of the project and annually file a report, with the Commission, concerning compliance with the daily average elevation requirements. The licensee indicated that exceptions to the target ranges may be necessary during times of project maintenance or when flood conditions exist.

CONSULTATION

Article 401required the licensee to prepare the operating plan after consultation with the Utah Division of Wildlife Resources, the U.S. Fish and Wildlife Service (FWS), and area irrigators, including the Bear River Canal Company. By letter dated July 12, 1999, the licensee provided the "Three-Year Bear River Basin Study" and the "Operation Plan" to the resource agencies and local irrigators for their review and comments. The licensee received comments from the FWS by letter dated August 2, 1999.

The FWS commended the licensee for their work. The FWS highlighted the studies and stated that through monitoring and annual reporting, the project will benefit fish and wildlife resources, reduce soil and shoreline erosion, and improve recreational opportunities. No other comments were received.

DISCUSSION

As part of the three-year Bear River study, the licensee developed a basin wide irrigation call system to help schedule and coordinate water deliveries, a hydrologic operational model to improve the predictive capabilities of available water, an assessment of reservoir levels to determine reservoir responses to seasonal changes at various locations around Cutler reservoir, and a test operating plan that encompassed four time periods associated with varying demands by water users.

The results of the study and the test operating plan indicate that the licensee has limited control of both inflow to the project and outflow from the reservoir. Because of the hydraulic limitations, the licensee indicated that the only way to minimize reservoir fluctuations is to limit the reservoir elevation range at the Cutler dam. The licensee's tests show that there is no predictable relationship between the dam and Benson Marina elevations making it unfeasible to operate the dam based on real time data from the Benson Marina. Based on the results of the Bear River Study and the test operating plan, the licensee modified the reservoir elevation ranges.

Since filing of the proposed operation plan, the licensee has operated the project using the proposed reservoir ranges. Supplemental data from 1999 to 2001 indicate that the licensee has been capable of complying with the operating plan. In fact, during water year 2000-2001, the data indicate that the licensee kept fluctuations of the reservoir elevation to less than one foot.

Although Table 1 depicts four time periods (which are repeated from the test operating plan), the proposed reservoir elevation operating plan essentially has two time periods: March 1 through December 1; and December 2 through February 28. The operational range for March 1 through December 1 is one foot (4406.5 feet to 4407.5 feet) and the operating range for December 2 through February 28 is one foot, six inches (4406. feet to 4407.5 feet).

The licensee explained that the "tolerance range" is an area above and below the operating range where the licensee would still be considered to be in compliance with the requirement as the licensee continue to work to bring the reservoir level back within the operating range. Thus, for the March 1 through December 1 period, the total operating range would be one foot, six inches, and for December 2 through February 28, the operating range would be two feet, three inches. Table 2 illustrates the licensee's proposed operating range.

Table 2. Licensee's condensed reservoir elevation operating range table

Time Period	Operating Range (Elevation in feet)	Tolerance (feet)	Target Percentage
March 1 through December 1	4407.5 to 4406.5	+.25, -.25	95%
December 2 through February 28	4407.5 to 4406.0	+.25, -.50	90%

The heading, "Target Percentage" represents the percentage of time the licensee anticipates maintaining the reservoir level within the operating range including the tolerance band. The licensee explained that various factors, within and not within its control (such as maintenance and irrigation returns), may occasionally contribute to exceedances of the requirement.

If the Cutler reservoir elevation, as measured by the Cutler dam gage, exceeds the total, upper or lower operating range (operating range plus tolerance range) as approved in this order under article 401, the licensee should file a report with the Commission within 30 days of the incident. The report should, to the extent possible, identify the cause, severity, and duration of the incident, and any observed or reported adverse environmental impacts resulting from the incident. The report should also include: 1) operational data necessary to determine compliance with the operating range requirement; 2) a description of any corrective measures implemented at the time of the occurrence and the measures implemented or proposed to ensure that similar incidents do not recur; and 3) comments or correspondence, if any, received from the resource agencies or other interested parties regarding the incident. Based on the report and the Commission's evaluation of the incident, the Commission should reserve the right to require modifications to project facilities and operations to ensure future compliance.

If the licensee draws down the reservoir for project maintenance, license compliance work or when flood conditions exists, the licensee is still responsible to file a report with the Commission. Any intentional reservoir drawdown should be in accordance with all Commission rules and regulations governing such actions.

The licensee indicated that it would file daily average elevations from the Cutler dam gage with the Commission annually. The licensee, however, did not identify a date by which it would file its reports. Since the licensee collects the data on a wateryear basis (October 1 through September 30), the licensee should file its report by December 31 (three months after completing the collection of the data). The data may be in chart form, and the report should minimally include explanations of any previously unreported deviations, a summary of compliance with the operating range, and any problems or proposed changes regarding the operating plan. The licensee should also make the data and report available to the resource agencies upon request.

The licensee's plan should also be modified to specify the operating range during leap years. Since the change in the operating range occurs at the end of February each year, the "time period" of December 2 through February 28 should be modified to include February 29 during the years when there are 29 days in February.

CONCLUSION

In order to meet the needs of wildlife, recreation, power generation and irrigation through operation of the project, the licensee had numerous inflow and outflow factors to consider when developing an operating plan. After completing a three year Bear River basin study, the licensee developed an operating plan that should minimize fluctuations of the Cutler reservoir. The plan attempts to balance the various demands of the different user groups.

Generally, from December through February, there are no operating constraints such as irrigation, spawning, nesting, or hunting that restrict the licensee's use of the reservoir for generation. Therefore, the licensee proposed a wider operating range to increase generating options while keeping fluctuations to a minimum for management of ice conditions. The licensee's Operating Plan meets the needs of wildlife, recreation, power generation, and irrigation based on meterology, runoff and seasonal power requirements, as stipulated in article 401, and should, as modified, be approved.

The Director Orders:

(A) Pacificorp's Operational Plan for the Cutler Hydroelectric Project (FERC No. 2420), filed October 4, 1999 and supplemented on April 11, 2002, as modified in paragraphs (B) through (D), is approved.

(B) The licensee shall file an annual report of the daily average reservoir elevations for the Cutler Project, with the Commission, by December 31 (three months after completing the collection of wateryear data). The licensee shall make the report available to the resource agencies upon request.

(C) The operating range during the time period of December 2 through February 28 shall be modified to include February 29 during leap years.

(D) If the Cutler reservoir elevation, as measured by the Cutler dam gage, exceeds either the total, upper or lower operating range (operating range plus tolerance range) as approved in this order under article 401, the licensee shall file a report with the Commission within 30 days of the incident. The report shall, to the extent possible, identify the cause, severity, and duration of the incident, and any observed or reported adverse environmental impacts resulting from the incident. The report shall also include: 1) operational data necessary to determine compliance with the operating range requirement; 2) a description of any corrective measures implemented at the time of the occurrence and the measures implemented or proposed to ensure that similar incidents do not recur; and 3) comments or correspondence, if any, received from the resource agencies or other interested parties regarding the incident. Based on the report and the Commission's evaluation of the incident, the Commission reserves the right to require modifications to project facilities and operations to ensure future compliance.

(E) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance of this order, pursuant to 18 C.F.R. § 385.713.

George H. Taylor
Chief, Biological Resources Branch

Division of Hydropower Administration and Compliance

Attachment 5
CUTLER PROJECT
FERC Approval of Reservoir Operating Levels

FEDERAL ENERGY REGULATORY COMMISSION
Washington D.C. 20426

OFFICE OF ENERGY PROJECTS

Project No. 2420-045—Utah
Cutler Hydroelectric Project
PacifiCorp Energy

JAN 29 2009

Mr. R. A. Landolt
PacifiCorp Energy
825 N.E. Multnomah, Suite 1500
Portland, OR 97232

Subject: Water Year 2008 Annual Reservoir Elevation Report per license article 401

Dear Mr. Landolt:

This acknowledges receipt of your Water Year 2008 Annual Reservoir Elevation Report, filed December 19, 2008, for the Cutler Hydroelectric Project. The annual report was filed pursuant to the Order Modifying and Approving Project Operation Plan.[1] The plan specifies reservoir elevations for the project to operate within. The plan also specifies tolerance ranges that allow for project operation slightly outside of the approved range as operators work to return the reservoir level to within the operating range. The project is located on the Cutler Reservoir at the confluence of the Bear, Logan, and Little Bear Rivers in Cache and Box Elder Counties, Utah.

In your report you indicated that during the 2008 water year, defined as the period from October 1, 2007 to September 30, 2008, Cutler reservoir elevations were maintained within the combined tolerance and approved reservoir operating range 100 percent of the time. Included with your filing was a chart of the Cutler reservoir daily average elevations for water year 2008.

Review of your seventh report, together with the reservoir elevation chart, indicates that it adequately fulfills the reporting requirements approved in the Operations

[1] Order Modifying and Approving Project Operation Plan. 99 FERC ¶ 62,085 (issued April 30, 2002).

Plan for the Cutler Project. As a reminder, your annual reservoir elevation report for water year 2009 is due by December 31, 2009.

Thank you for your cooperation. If you have any questions regarding this issue, please feel free to call me at (202) 502-6760.

Sincerely,

Joy M. Jones

Joy M. Jones
Aquatic Ecologist
Division of Hydropower Administration and Compliance

c: Mr. Paul Abate
U.S. Fish and Wildlife Service
2369 West Orton Circle, Suite 50
West Valley City, UT 84119

Mr. Rod Hodson
Utah Division of Water Resources
515 East 5300 South
Ogden, UT 84405

FEDERAL ENERGY REGULATORY COMMISSION
Washington, D. C. 20426

OFFICE OF ENERGY PROJECTS

Project No. 2420-046-Utah
Cutler Hydroelectric Project
PacifiCorp Energy

Mr. R. A. Landlot
PacifiCorp Energy
825 NE Multnomah, Suite 1500
Portland, OR 97232

August 3, 2009

Subject: Article 401 Reservoir Elevation Variance Report

Dear Mr. Landlot:

This is in response to your letter filed on July 14, 2009, reporting a deviation from the minimum elevation requirement in the project license of the Cutler Hydroelectric Project No. 2420. Article 401 of the "Order Modifying and Approving Project Operation Plan"[1] requires that the licensee operate to maintain the reservoir's elevation between 4407.5' and 4406.5' with a tolerance range of plus or minus 0.25', ninety-five percent of the time from March 1 to December 1. The reservoir elevation limits were instituted primarily to protect nesting waterfowl in the middle portions of the reservoir, and the water levels are monitored at the Benson Marina gage. The Order acknowledges that there may be variations from the target elevations due to flooding and other factors, but requires the licensee to file a report with the Commission when the reservoir elevation falls below the lower tolerance level of 4406.25 feet, or exceeds the high operating range of 4407.75' as measured at the Cutler dam gage. The report is to be filed within 30 days of the exceedance event.

You reported that on June 16, 2009, the variance occurred when an extended period of abnormally high rainfall produced locally high water tables and standing water on project lands and on private agricultural lands surrounding Cutler Reservoir. You reported that in an effort to ameliorate the local high water conditions, you chose to lower the reservoir elevation slightly below the Order's lower tolerance level (4406.25'). This operational procedure continued through June 22, 2009. You stated that during this seven-day period, the water elevations at the Benson Marina gage remained within the Order's target elevations established for nesting water fowl. Notification of this event has been sent to the Commission, U.S. Fish and Wildlife Service, and Utah Division of Wildlife Resources.

[1] 99 FERC ¶ 62, 085 (2002)

Based on the available information, we will not consider the reported water surface elevation deviation from June 16, 2009 to June 22, 2009 to be a violation of your license. We acknowledge that you have taken the necessary precautions to restore flows.

Thank you for your cooperation in this matter. If you have any questions regarding this letter, please contact Alyssa Dorval at (212)273-5959, or at alyssa.dorval@ferc.gov.

Sincerely,

Alyssa Dorval for

William Guey-Lee
Chief, Engineering & Jurisdiction Branch
Division of Hydropower Administration
and Compliance

Attachment 6a
CUTLER PROJECT
UDEQ Section 401 Water Quality Certification

State of Utah

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WATER QUALITY

Norman H. Bangerter
Governor
Kenneth L. Alkema
Executive Director
Don A. Ostler, P.E.
Director

288 North 1460 West
Salt Lake City, Utah
(801 538-6146
(801) 538-6016 Fax

Reply to: State of Utah
Division of Water Quality
Department of Environmental Quality
Salt Lake City, Utah 84114-4870

November 20, 1991

RECEIVED
DEC 02 1991
Environmental Services

Jim Burruss, Senior Environmental Analyst
Environmental Services
Utah Power
1407 West North Temple
Salt Lake City, Utah 84140

RE: Water Quality Certification
FERC Project No. 2420
State I.D. No. UT 890822-050
Cutler Reservoir Hydroelectric Project

Dear Mr. Burruss:

We have reviewed the draft application to the Federal Energy Regulatory Commission (FERC) to relicense the Cutler Hydroelectric Project on the Bear River in northern Utah. State water quality certification is required in order to obtain a license, construct the facility, and operate the facility.

Based on our review it is our opinion that, with the implementation of applicable Best Management Practices in order to minimize the erosion-sediment load to the affected waters during project activities, the adverse environmental impact on the existing water quality of the Bear River will be minimal. We strongly support and encourage Utah Power's plans to develop a buffer strip up to 200 feet wide adjacent to Cutler Reservoir. This buffer strip will aid in reduction of shoreline erosion and removal of sediments and nutrients resulting from spring snowmelt and surrounding land management activities.

Therefore, pursuant to Section 401(a)(1) of the *Federal Water Pollution Control Act*, as amended 1987 (33 U.S.C. 466 et seq.) it is hereby certified that any discharge resultant from the Cutler Hydroelectric Project, as proposed, will comply with applicable State water quality standards and to the best of our knowledge will comply with applicable provisions of Section 301, 302, 303, 306, 307, and 311 of said *Act*.

Sincerely,

Utah Water Quality Board

Don A. Ostler, P.E.
Executive Secretary

cc: Carolyn Wright, Office of Planning and Budget
S.A. deSousa, Director of Hydro Resources, Pacific Power

DAO:MKR:ph

Attachment 6b
CUTLER PROJECT
UDEQ Compliance Letter

State of Utah

GARY R. HERBERT
Governor

GREG BELL
Lieutenant Governor

Department of
Environmental Quality

Amanda Smith
Executive Director

DIVISION OF WATER QUALITY
Walter L. Baker, P.E.
Director

December 8, 2009

Eve Davies
Pacificorp Energy
1407 W. North Temple
Salt Lake City, Utah 84116

Subject: Low Impact Hydropower Certification

Dear Ms. Davies:

This letter is submitted in support of PacifiCorp Energy's application to obtain low impact hydro certification for the Cutler Hydroelectric Project (FERC No. 2420) from the Low Impact Hydropower Institute (LIHI). PacifiCorp Energy has shown leadership as an environmental steward and has been a strong supporter of the Utah Division of Water Quality's (DWQ) TMDL for the Bear River and Cutler Reservoir. My letter addresses conditions related to questions B1, B2, B3, and D1 on the Cutler LIHI Questionnaire.

The Utah DWQ issued a 401 water quality certification for the Cutler Hydroelectric Project on November 20, 1991. This is the most recent water quality certification issued for the facility from DWQ. The Cutler Hydroelectric Project is in compliance with the conditions of that 401 certification.

Pursuant to section 303(d) of the Clean Water Act, the DWQ has identified Cutler Reservoir as impaired due to not meeting water quality standards for dissolved oxygen and excessive total phosphorus (TP) loads. The Bear River also has a TMDL for total phosphorus from the Idaho border to the outlet at the Great Salt Lake. Flow augmentation from the Cutler Hydroelectric Project may contribute to stream bank erosion but as of this letter it has not been identified as the major cause of the low dissolved oxygen or high phosphorus impairments. Eroded soils contain TP that can become available to algae over time but not to the degree as other sources such as animal manure and wastewater effluent. Agricultural runoff, effluent from municipal waste water treatment plants, industrial discharges, and other pollutant sources have been identified as the primary sources into the Bear River system.

Pacificorp Energy is actively managing the Cutler Reservoir through their Cutler Resource Management Plan and is taking key steps to improve water quality in the Bear River and the Cutler Reservoir via modifications to their agricultural lease program and shoreline buffers. By managing grazing leases, erecting fencing to restrict cattle access to the shoreline, and restoring vegetation along the shoreline per the Cutler Resource Management Plan, PacifiCorp has created a buffer around the reservoir that aids in the reduction of nonpoint source contributions to water quality impairment (e.g., cattle, shoreline erosion).

Utah DWQ supports PacifiCorp Energy in their effort to obtain LIHI certification. Please feel free to contact me if you have any questions about the facility's status with the Utah Division of Water Quality.

Sincerely,

Carl Adams
Division of Water Quality/TMDL Manager
Utah Department of Environmental Quality

Attachment 7
CUTLER PROJECT
Awards and Recognition

PacifiCorp has been honored by the following organizations for stewardship of natural resources at the Cutler Hydroelectric Project:

- **National Audubon Society:** ***2008 Important Bird Area***
  The Cutler Marsh was distinguished as an Important Bird Area for providing significant habitat for avian species that are a conservation priority. The Cutler Marsh has also been nominated for "Global Status" that will be conferred in 2010 after final data confirmation that over 5% of the global population of White-faced Ibis nest at Cutler.

- **Utah Non-Point Source Task Force:** ***2007 Non-Point Source Water Quality Award***
  Given in recognition of PacifiCorp's work to reduce non-point source pollution at Cutler reservoir and on the Bear River.

- **The Nature Conservancy:** ***2006 Conservation Partnership Award***
  Awarded for PacifiCorp's efforts "to achieve biodiversity conservation" through implementation of the Cutler Resource Management Plan and other projects in Utah.

- **American Society of Landscape Architects:** ***2005 Award of Honor in Analysis and Planning***
  Given in recognition of PacifiCorp's contributions to the creation of the Bear River Greenway Master Plan and Bear River Ecological Corridor Restoration.

- **Society for Range Management:** ***2001 Rangeland Excellence Award***
  Awarded for "Innovative Management and Stewardship for Cutler Reservoir Resource Area."

- **Bridgerland Audubon Society:** ***2000 Allen Stokes Conservation Award***
  PacifiCorp was honored with the organization's highest land conservation award for implementation of the Cutler Resource Management Plan.

The Cutler project has also been previously nominated by third parties for the United States Fish and Wildlife Service's *Wetland Reclamation Award* and the Ecological Society of America's *Corporate Stewardship Award.*

Attachment 8
CUTLER PROJECT
Water Quality Analysis and Summary for Cutler Reservoir

WATER QUALITY ANALYSIS AND SUMMARY FOR CUTLER RESERVOIR, UTAH

Prepared for
PacifiCorp

Prepared by
SWCA Environmental Consultants
237 East 200 South
Salt Lake City, Utah 84111

January 2008

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EXECUTIVE SUMMARY

The water quality monitoring dataset collected by PacifiCorp around Cutler Reservoir covers a wide range of tributaries and reservoir locations and a variety of physical and chemical water quality constituents. Sample locations included the Little Bear River, Spring Creek, Logan River, Bear River, Cutler Reservoir at Benson Marina, and the outflow from Cutler Reservoir. Chemical parameters include nutrient concentrations of phosphorus (total and orthophosphate), nitrogen as NO_3, NO_2, and NH_3 and physical parameters include temperature, total suspended solids (TSS), and dissolved oxygen (DO) values. The samples were collected quarterly during two monitoring periods (1996–1998 and 2000–2003). These two monitoring periods are characterized by varied hydrologic conditions, based on water releases from Cutler Reservoir to the Bear River during these time periods. The monitoring period between 1996 and 1998 was characterized by wet conditions and high flows, while 2000–2003 was characterized by dry conditions with low flows.

Differences in water quality parameters between the two monitoring periods are most likely related to the marked difference in hydrologic conditions. Data collected between 2000 and 2003 generally indicate increased temperature, reduced coliform bacteria, reduced turbidity, and increased concentrations of phosphorus throughout the Cutler Reservoir system compared to the earlier monitoring period from 1996 through 1998. Only small differences in pH, inorganic nitrogen, and dissolved oxygen were noted between the two monitoring periods.

Water quality varied by season for most parameters analyzed during the 2000 to 2003 monitoring period, however this variation appears to be site specific with different patterns emerging in the Bear River and Cutler Reservoir system compared to the southern tributaries. Turbidity is generally highest during the summer season while nutrient concentrations at some sites, including Cutler Reservoir, are highest during winter season. This could be associated with discharge from the Logan Wastewater Treatment Plant which occurs throughout the winter but only during a portion of the summer.

Data collected between 2000 and 2003 indicate that water quality in southern tributaries, specifically Spring Creek, the Little Bear River, and the Bear River have dramatic impacts on water quality throughout Cutler Reservoir. A similar pattern was identified in the earlier monitoring period (1996–1998). Spring Creek continues to have a significantly higher tributary nutrient concentration value as compared to the other sampling locations within the watershed. Water quality in the Southern and Northern sections of the reservoir remains markedly different with the south being characterized by higher nutrient concentrations, higher turbidity, and lower dissolved oxygen. High nutrient loads to the southern reservoir result in part from point source discharges in Spring Creek (JBS Swift and Company) and Swift Slough (Logan City and Service Area Wastewater Treatment discharge). Due to slow moving water and the shallow nature of the Southern Reservoir (0.55 meters mean depth), reservoir sediments are likely to exert a greater influence on water quality than in the faster flowing and deeper Northern Reservoir (1.1 meters mean depth). Nutrient values within the southern portion of the reservoir are significantly higher with high total phosphorus levels far exceeding levels within the northern portion of the reservoir. The tributary of Spring Creek, which drains directly to the southern portion of the reservoir, contributes a very high concentration level of nutrients directly to the Southern Reservoir.

1 INTRODUCTION

Cutler Reservoir is located six miles west of Logan, Utah, at an elevation of 4,407 feet. Cutler Dam impounds water from the main stem of the Bear River, as well as the flow from the Cub, Blacksmith Fork, Logan, and Little Bear rivers. The dam was constructed in 1927 by Telluride Power and is currently operated by PacifiCorp Energy to provide water for agricultural use and power generation. The Federal Energy Regulatory Commission (FERC) license for Cutler Dam as a hydropower facility was renewed in 1999 and amended with a supplement in 2002. It included the establishment of an operational elevation range at which the reservoir would be maintained to support fish and wildlife in the reservoir. Cutler Reservoir has a maximum storage capacity of 15,386 acre-feet of water with a large surface area and shallow depth (averaging three feet deep), resulting in approximately 10,000 acres of open water and associated wetlands and uplands.

The Cutler Reservoir watershed (2,201 square miles) lies within the larger Bear River basin (6,900 square miles), which drains portions of northeastern Utah, southwestern Wyoming, and southeastern Idaho. The Cutler Reservoir watershed consists of a stream network that extends 2,022 linear miles, 16% of which consist of ditches or canals. Steep terrain (with slopes as high as 85°) characterizes the mountains surrounding the relatively flat Cache Valley, where soils are made up of alluvium and ancient lacustrine sediments. The dominant land uses in the Cutler Reservoir watershed are forest and shrubland in the mountains, and agricultural land in the Cache Valley. The most common crops include irrigated pasture, hay, alfalfa, and corn, which are used locally to feed cattle and dairy cows. Developed land uses also occupy a portion of Cache Valley, primarily along the U.S. Highway 89 corridor.

Under section 303(d) of the Clean Water Act (CWA), Cutler Reservoir has been identified as water quality limited due to low dissolved oxygen (DO) and excess phosphorus loading to the river and reservoir from the surrounding watershed. Specifically, the Designated Beneficial Uses (DBU) designated by the State of Utah for Cutler Reservoir are secondary contact recreation (2B); warm-water game fish and their associated food chain (3B); waterfowl and shorebirds and their associated food chains (3D); and agricultural water supply (4). The warm-water game fish designated use (3B) was identified as partially impaired on Utah's 2006 303(d) list. Secondary contact recreation (2B) and agricultural water supply (4) DBUs were deemed fully supported in Cutler Reservoir in 2006.

PacifiCorp is actively working to improve wildlife habitat, water quality, and recreational uses on and around Cutler Reservoir through wetland mitigation, erosion control, grazing management, agricultural land management, and shoreline restoration. As part of this effort, and in compliance with the current FERC license, PacifiCorp monitors water quality at the mouth of tributaries to Cutler Reservoir and in the reservoir itself every 5 years (for 3 years). Water quality monitoring was conducted quarterly from 1996 through 1998 and again from 2000 through 2003. The data cover a wide range of watershed locations and a variety of physical and chemical water quality constituents. PacifiCorp will initiate a third round of monitoring in spring 2008.

In this report, data collected during the first two monitoring periods (1996–1998 and 2000–2003) are summarized and compared spatially, seasonally, and across time. Explanations for data anomalies are presented where appropriate. Several recommendations to improve the utility of water quality sampling procedures in the future are described in the final section of this report.

2 ANALYTICAL METHODS

2.1 WATER QUALITY DATA COLLECTION

Water quality samples were collected for PacifiCorp by Ecosystems Research Institute (ERI) using standard collection procedures. Samples were preserved and shipped to an ERI laboratory for analysis using standard EPA methods for each specific water quality parameter (Table 1).

Table 1. PacifiCorp Water Quality Monitoring Parameters with Total Sampling Frequency

Parameter	Sample fraction	Number of data points	Analytical method
Depth	Total	8	--
Dissolved oxygen (DO)	Total	90	--
Dissolved oxygen saturation	Total	72	Calculated
Fecal Coliform	Total	60	NELAP approved
Nitrogen, ammonia as N	Total	90	EPA Method No 350.3
Nitrogen, Nitrate (NO3) as NO3	Total	89	EPA Method No 353.3
Nitrogen, Nitrite (NO2) as NO2	Total	90	EPA Method No 354.1
pH	Total	90	--
Phosphorus as P	Total	90	EPA Method No 365.2
Phosphorus, orthophosphate as P	Dissolved	90	EPA Method No 365.2
Solids, Total Suspended (TSS)	Total	84	EPA Method No 160.2
Specific conductance	Total	90	--
Temperature, water	Total	90	--
Total Coliform	Total	89	NELAP approved
Total Inorganic Nitrogen	Total	89	Calculated
Turbidity	Total	64	EPA Method No 180.1

2.1.1 TEMPORAL COVERAGE

Water quality monitoring was completed from 1996 through 1998 and again from 2000 through 2003. Samples were generally collected quarterly; however results are missing for some collection sites during several sample periods. Coverage is generally better during fall and winter months than spring and summer. It should be noted that much of the data from 2000 through 2003 were collected under moderate to extreme drought conditions. Physical water quality characteristics (e.g., temperature and DO concentrations) measured during these water years will be representative of critical watershed conditions, as drought generally exacerbates impaired conditions within a watershed.

Table 2. Water Quality Sampling Over Time

	Winter			Spring			Summer			Fall		
Year	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**
1996												X
1997	X			X						X		
1998					X				X		X	
2000	X									X		
2001			X			X						
2003	X		X				X			X		

2.1.2 SPATIAL COVERAGE

Water quality samples were collected from tributary sites entering Cutler Reservoir as well as in the reservoir itself (Figure 1, Table 3). Surface water quality data for the reservoir system are available from the main stem of the Bear River near the confluence with Summit Creek, Cutler Reservoir at mid-lake, and the Bear River below the reservoir dam. Three additional sites include the Logan River, Little Bear River, and Spring Creek which are tributaries to the southern portion of Cutler Reservoir. These tributaries are sampled near the confluence with the southern portion of Cutler Reservoir, and are indicative of land management and point sources of nutrients in their associated watersheds.

Table 3. Summary of Sampling Sites around Cutler Reservoir

Site ID	Site Name	Site Key	Segment Location
490198	Bear River below Cutler Reservoir at UP&L Bridge.	Bear River below dam	Cutler Reservoir outflow
490340	Bear River below confluence with Summit Creek.	Bear River at Summit Creek	Bear River
490490	Spring Creek at CR 376 (Mendon) Crossing.	Spring Creek	Southern tributary
490500	Little Bear River at CR376 Crossing (Mendon Road).	Lower Bear River	Southern tributary
490504	Logan River above confluence with Little Bear River at CR376 Crossing.	Logan River	Southern tributary
590100	Cutler Reservoir north of Bridge 04.	Cutler Reservoir	Southern reservoir

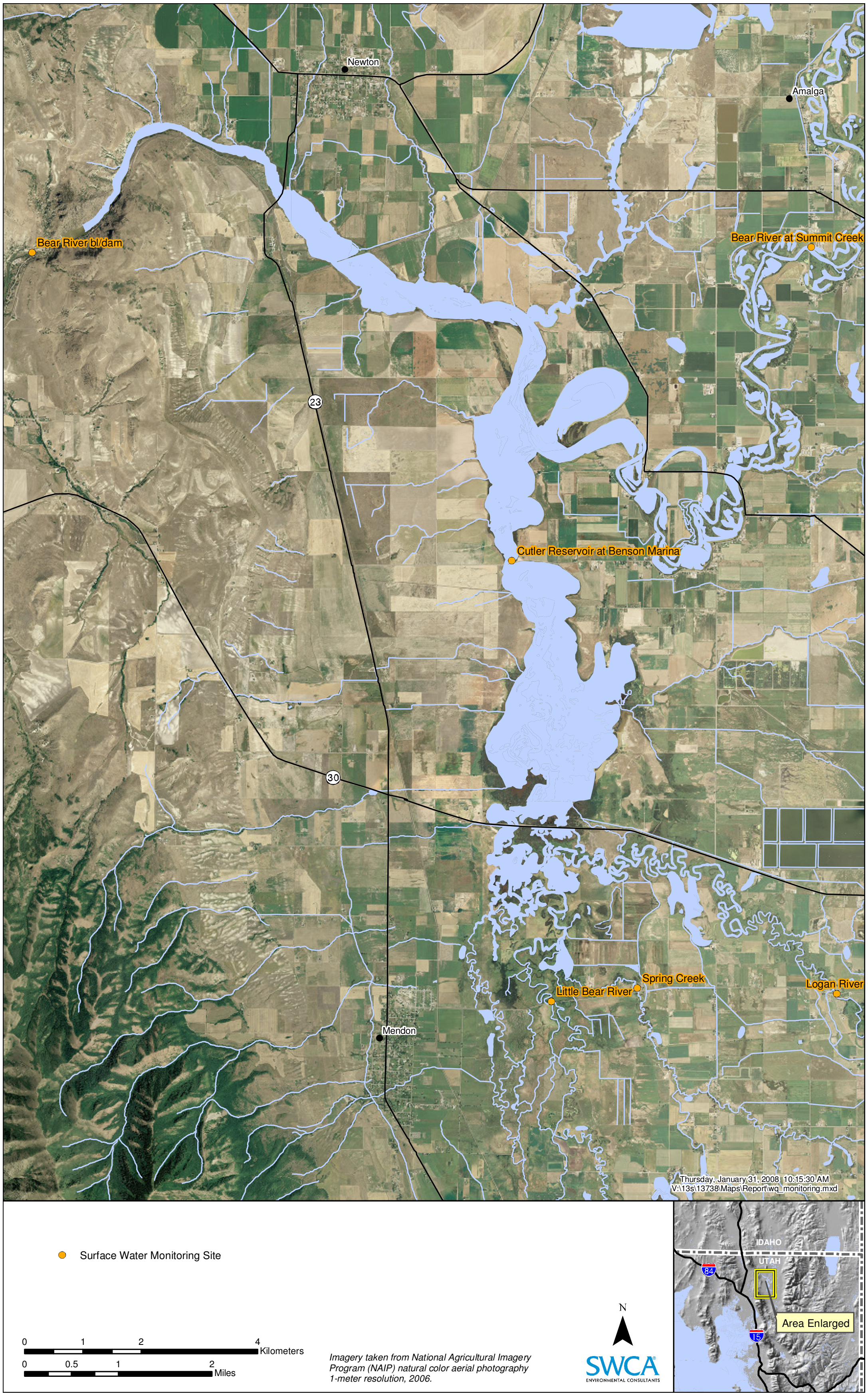


Figure 1. Cutler Reservoir surface water monitoring sites.

2.1.3 HYDROLOGIC COVERAGE

The Bear River/Cutler Reservoir system is highly modified. Flow patterns observed in the Bear River are influenced by impoundments and diversions upstream of Cutler Reservoir. These structures reshape the hydrograph, decreasing the intensity and increasing the duration of spring runoff flows, while extending summer flows.

The Bear River represents the majority of the water flowing into Cutler Reservoir at 75% of the annual average inflow. The Logan River supplies 17% of the average annual flow to Cutler Reservoir while the Little Bear River and Spring Creek supply 3% and 2%, respectively. These three tributaries supply the majority of flow to the southern portion of Cutler Reservoir.

The water quality data collected by PacifiCorp from 1996 to 1998 and 2000 to 2003 were paired with hydrologic data available for the same periods. Discharge data for Cutler Reservoir is available during this period as is flow data collected by the United States Geological Survey (USGS) along the Bear River near the Utah–Idaho state line. Hydrologic data for the Cutler Reservoir system provide one variable of explanation for patterns in water quality data.

2.2 STATISTICAL ANALYSIS

2.2.1 QUALITY ASSURANCE AND QUALITY CONTROL

The data were assessed to ensure that they were of sufficient quality for purposes of this analysis. At least one duplicate sample was collected for QA/QC purposes during each sampling trip from 2000 to 2003. Basic descriptive statistical analyses used for data characterization consisted of the number of data points; mean, median, maximum, and minimum values; and seasonality (Appendix A).

2.2.2 NON-DETECT TREATMENT

Several data points for ammonia, phosphorus, orthophosphate, nitrate, total phosphorus, and fecal coliform, were identified as *below detection limits*. In accordance with commonly used methods at the Utah Division of Water Quality (UDWQ), a value that is one-half of the detection limit reported for the method used in the analysis was assigned to each non-detect entry. Non-detect entries accounted for a total of 29 data points representing 2% of the total dataset.

2.2.3 TREATMENT OF OUTLIERS

To identify non-representative data or outliers in the dataset, the PacifiCorp dataset was combined with a larger dataset collected by UDWQ and available on-line from the USEPA STORET database. A threshold of plus or minus three standard deviations from the mean was applied to these datasets to determine those data that should be excluded from the analysis. Using this methodology, 28 data points in the PacifiCorp dataset were identified as outliers including 7 nitrate samples, 4 ammonia samples, 3 nitrite samples, 5 orthophosphate samples, 2 specific conductance measurements, 1 total coliform value, and 3 turbidity readings. All of these samples were collected in Spring Creek, Cutler Reservoir, or the Bear River.

3 WATER QUALITY ANALYSIS

3.1 HYDROLOGY

The PacifiCorp water quality monitoring data were collected over a wide range of hydrologic conditions present in the watershed. Reservoir release flows during the two distinct sampling periods (1996–1998 and 2000–2003) had very different flow yields based upon the total average for the 1996–2005 water years. A high flow average 160% greater than the period average occurred during the 1996-98 monitoring period. During the 2000–2003 monitoring period, the reservoir release flows were 43% of the average release flow. During wet years (1996–1998), the spring season carries the most flow with the remaining flow distributed relatively evenly throughout the rest of the year. However, during dry years (2000–2003) the winter season accounts for the most discharge, presumably through groundwater recharge of streams and mid-winter melt events; very little discharge occurs in the summer.

Table 4. Cutler Reservoir Water Yield for Monitoring Periods and Seasons

	Annual	Winter	Spring	Summer	Fall
Average Water Year (1996-2005)					
Mean Daily Discharge (cfs)	1,228	1,203	2,106	816	785
Water Years 1996-1998					
Mean Daily Discharge (cfs)	1,962	1,664	3,373	1,686	1,125
% of Average	160%	138%	160%	207%	143%
Water Years 2000-2003					
Mean Daily Discharge (cfs)	534	846	796	48	446
% of Average Water Year	44%	70%	38%	6%	57%

Average daily flow (cfs), recorded at Cutler Reservoir by PacifiCorp, were plotted on individual hydrographs (Figure 2). These hydrographs represent reservoir discharge flows during each monitoring period. The difference in water yield from Cutler Reservoir during each monitoring period between 1996 and 1998 was characterized by wet conditions and high flows, while 2000–2003 was characterized by dry conditions with low flows. This is clearly indicated on the hydrographs in Figure 2. The years identified as wet versus dry years, based on discharge from Cutler Reservoir, are paired with the annual flow in the Bear River above Cutler Reservoir. In the past 20 years 1997, 1998, and 1999 have been the wettest years with historically wetter years occurring only in 1983, 1984, and 1986. Since 1971, the years of 2001, 2002, and 2003 have been the driest years. This is reflective of drought conditions which could influence water quality parameters.

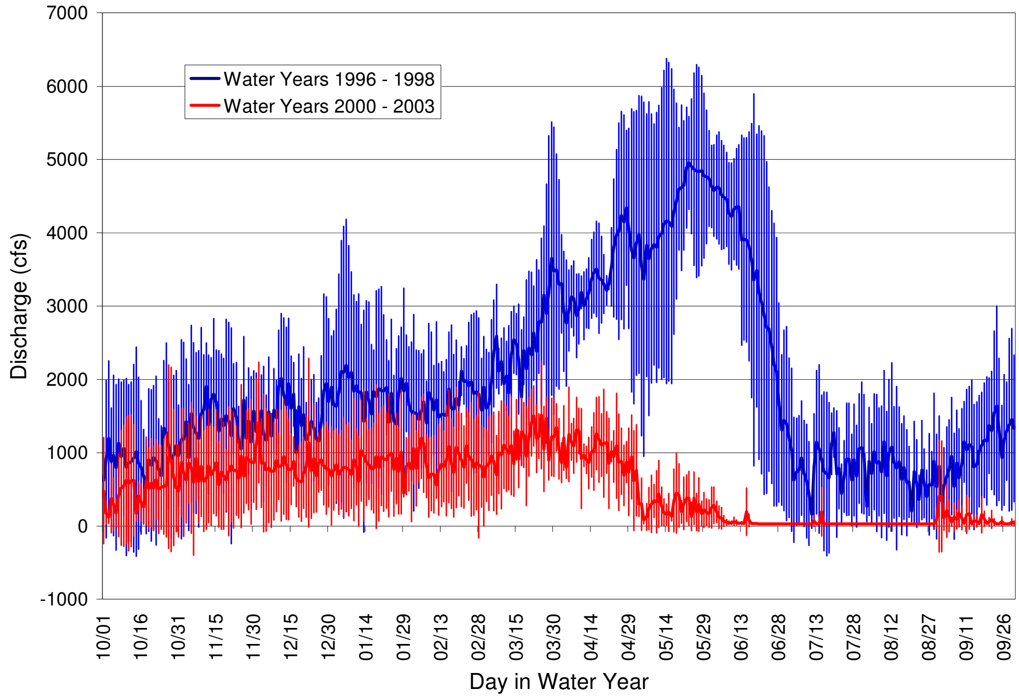


Figure 2. Hydrograph for average daily releases from Cutler Reservoir (cfs) during two monitoring periods. Solid line shows average discharge surrounded by standard deviation in shaded bars.

The hydrographs for discharge from Cutler Reservoir water show an annual trend of increasing water delivery rates during the summer and a general trend downward of water releases throughout the late summer and fall. This reflects the reduced delivery of water to the reservoir from the watershed during the dry part of the season. This seasonal pattern tends to replicate itself over the monitoring period. The water release tends to change dramatically during drought years (2000–2003) which reflects both the reduced water delivery to the reservoir and PacifiCorp's maintenance of reservoir water levels even during dry seasons. The water year 2000 hydrograph did not demonstrate the normal late fall/early spring gradual average water discharge that is present within the other years of the hydrographs.

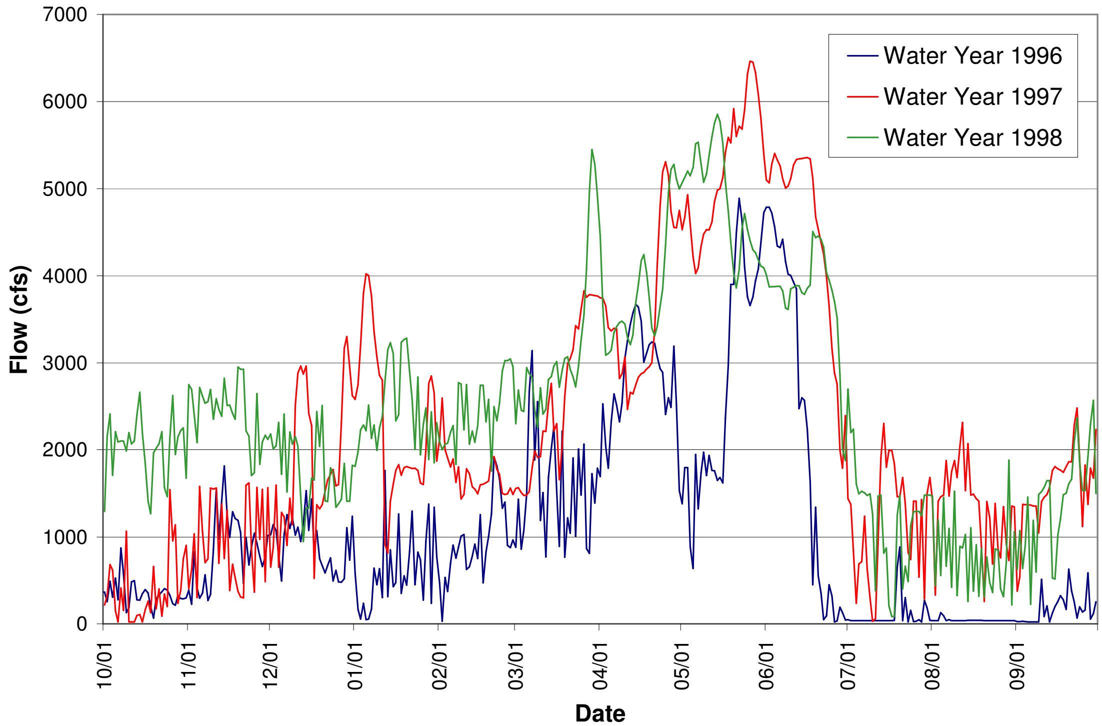


Figure 3. Hydrograph of discharge from Cutler Dam by water year (1996–1998)

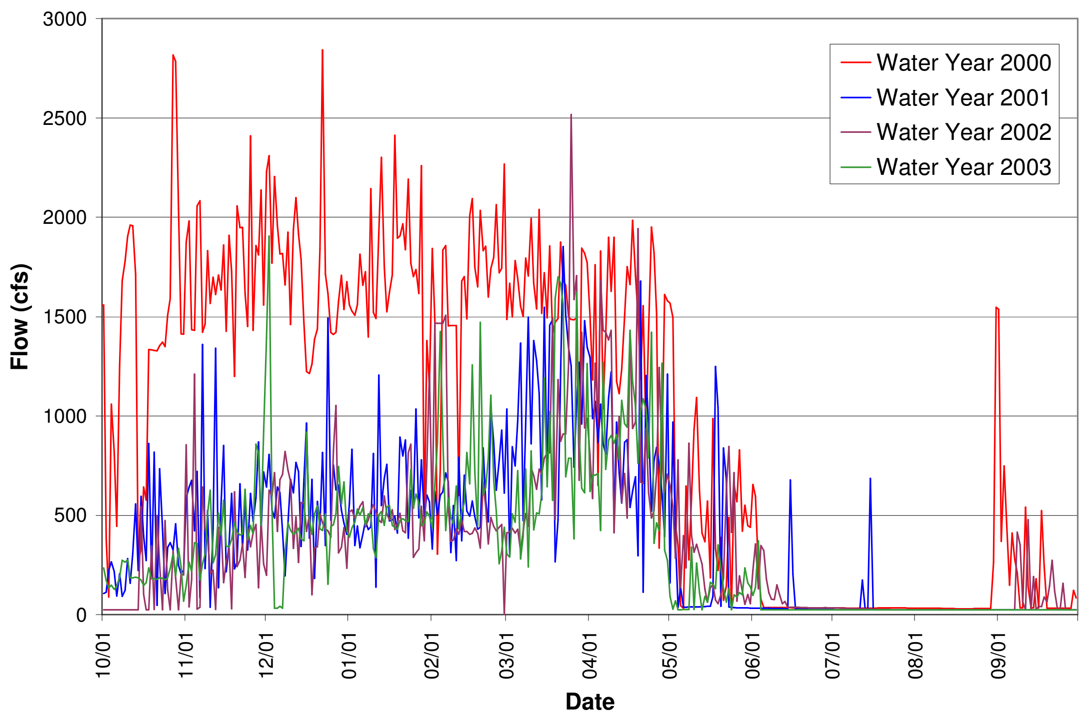


Figure 4. Hydrograph of discharge from Cutler Dam by Water Year (2000–2003)

3.2 TEMPERATURE

Water temperature determines whether or not a water body can support warm- or cold-water aquatic species. High water temperatures can be harmful to fish at all life stages, especially if they occur in combination with other habitat limitations such as low DO or poor food supply. Elevated water temperatures can result in lower body weight, poor oxygen exchange, and reduced reproductive capacity of adult fish. Extremely high temperatures can result in death if they persist for an extended length of time. Juvenile fish are more sensitive to temperature variations and duration than adult fish and can experience negative impacts at a lower threshold value than the adults. Temperature is an important indicator of water and wetland habitat quality. Water temperature is affected by vegetative cover, thermal inputs, flow alterations, ambient air temperatures, groundwater recharge, and direct sunlight.

Table 5. Summary of Temperature Data (degrees C) for Cutler Reservoir System

	Fall	Spring	Summer	Winter	Annual Average	Annual Max	Annual Min	Annual Standard Deviation
1996–1998								
Logan River	7.9	5.2	13.3	5.0	7.5	13.3	3.3	3.4
Little Bear River	9.8	5.4	17.2	7.1	9.2	17.2	3.0	4.8
Spring Creek	9.5	6.8	18.1	6.1	9.5	18.1	4.2	4.8
Cutler Reservoir @ Benson Marina	10.9	7.2	27.5	7.2	11.7	27.5	4.7	8.3
Bear River @ Summit Creek	9.8	5.4	23.3	5.9	9.9	23.3	3.3	7.3
Bear River bl/dam	10.3	5.8	24.2	5.9	10.4	24.2	3.5	7.4
2000–2003								
Logan River	14.1	10.8	11.9	2.7	7.7	14.5	1.8	5.5
Little Bear River	15.1	15.9	20.2	2.6	9.6	20.2	1.7	7.7
Spring Creek	14.4	15.7	18.2	3.9	9.8	18.2	3.1	6.4
Cutler Reservoir @ Benson Marina	20.7	21.5	21.2	1.8	11.4	21.5	0.3	10.3
Bear River @ Summit Creek	17.9	17.8	20.9	1.0	9.8	20.9	--	9.5
Bear River bl/dam	19.5	20.8	22.0	2.2	11.3	22.0	1.2	9.9

As would be, expected temperature values fluctuate with the seasons throughout the Cutler Reservoir system. Temperatures were slightly higher during the second monitoring period (2000–2003) than the first monitoring period (1996–1998), which is likely related to the drought conditions occurring during this time period. Also, as expected, the Logan River is the coolest of the sites sampled as it represents the most intact riparian habitat in the study area and directly drains a high-elevation watershed. The warmest water occurs in Cutler Reservoir itself followed by the Bear River which is a slow moving valley river with less riparian cover than the Logan River. During the first monitoring period (1996–1998), temperature measurements for the fall season were taken in November, whereas fall measurements were taken in September during the second monitoring period (2000–2003). Although both occur in same season, the different sampling months accounts for sharp differences in fall temperatures recorded for the two monitoring periods.

3.3 PH

The pH of a water body is a measure of its acidity or alkalinity. A pH value of 7 is neutral, while values 0–7 are acidic and 7–14 are alkaline. Extremely acidic or alkaline waters can be problematic to fisheries. Extreme levels of pH can be directly toxic to aquatic life. Each species of fish has a distinct range of pH preference, and levels outside of this range will cause health problems such as damage to skin, gills, and eyes. Prolonged exposure to these conditions can cause stress, increase mucus production, and encourage thickening of the skin or gill epithelia, sometimes with fatal consequences. Substantial diurnal shifts in pH that result mainly from photosynthesis are stressful and damaging to the health of aquatic organisms. Changes in pH also affect the toxicity and availability of dissolved compounds such as heavy metals. pH values in the 6.5 to 9 range are generally supportive of aquatic life.

pH values observed in the Cutler Reservoir system are generally slightly basic (alkaline). No extreme pH values were recorded in the system indicating that there are no pH related threats to aquatic life (Table 6).

Table 6. Summary of pH Data for Cutler Reservoir System

	Fall	Spring	Summer	Winter	Annual Average	Annual Max	Annual Min	Annual Standard Deviation
1996–1998								
Logan River	8.2	7.7	7.9	7.8	8.0	8.3	7.5	0.3
Little Bear River	8.1	8.0	7.7	8.2	8.0	8.2	7.7	0.2
Spring Creek	8.0	7.7	7.6	8.0	7.9	8.1	7.6	0.2
Cutler Reservoir @ Benson Marina	8.3	8.2	8.4	8.4	8.3	8.4	8.0	0.2
Bear River @ Summit Creek	8.2	8.0	8.0	8.3	8.1	8.3	7.9	0.2
Bear River bl/dam	8.2	8.0	8.0	8.3	8.1	8.3	7.9	0.2
2000–2003								
Logan River	7.8	8.1	8.1	8.2	8.1	8.3	7.6	0.2
Little Bear River	7.9	8.0	7.8	8.1	8.0	8.3	7.8	0.2
Spring Creek	7.6	7.8	7.8	8.0	7.9	8.1	7.6	0.2
Cutler Reservoir @ Benson Marina	8.5	8.3	8.4	8.1	8.2	8.7	7.7	0.3
Bear River @ Summit Creek	7.9	8.1	7.9	8.1	8.0	8.4	7.7	0.3
Bear River bl/dam	7.9	8.1	7.9	8.1	8.0	8.4	7.7	0.3

3.4 COLIFORM BACTERIA

Coliform bacteria serve as an indicator of contamination of a water body with fecal material. Although coliform bacteria themselves do not cause disease, they are in much higher abundance and easier to sample than disease-causing microorganisms and therefore are good indicators of the presence of disease-causing microorganisms from the same fecal source. High concentrations of coliform bacteria in surface waters indicate improper animal or human waste disposal, as well as improper grazing or livestock management practices, and can result in health risks to individuals using the water for recreation or other activities. Based on the previous coliform standards established by the State of Utah in assessing water quality, high total coliform and fecal coliform values are those greater than 5,000 and 200 coliform-forming units per 100 mL (cfus/100 mL), respectively. There are noteworthy differences for coliform bacteria in Cutler Reservoir between monitoring periods and between seasons for the 2000–2003 monitoring period. These differences are discussed in sections 3.4.1 and 3.4.2, below.

3.4.1 COLIFORM DIFFERENCES BETWEEN MONITORING PERIODS

A comparison of coliform bacteria between the first monitoring period (1996–1998) and the second monitoring period (2000–2003) indicates significant reductions in both fecal coliform concentration and total coliform concentration at all sites sampled expect for the Logan River where concentrations were already quite low (Figure 5). Concentrations of fecal coliform bacteria in Spring Creek and the Little Bear River exceeded the 200 cfus/100 mL threshold during both sampling periods despite the observed reductions.

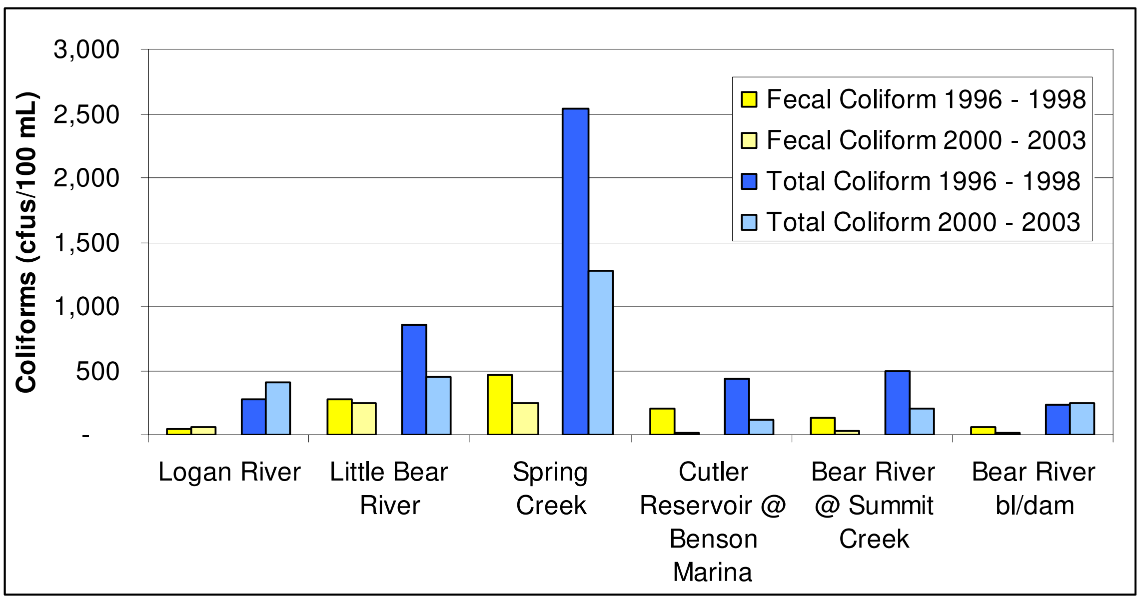


Figure 5. Change in coliform bacteria in Cutler Reservoir system between first monitoring period (1996–1998) and second monitoring period (2000–2003).

3.4.2 Seasonal Variation of Coliform Bacteria During the 2000–2003 Monitoring Period

Total coliform concentrations are generally lowest during winter months which is expected since surface runoff, the process that transports coliform bacteria to surface waters, is generally not a significant contributor to flow during this time period (Figure 6). High concentrations of coliform throughout the year in Spring Creek indicate a discharging source of bacteria rather than one related to surface runoff. High concentrations of coliform bacteria in the Little Bear and Bear rivers during summer and fall could be reflective of livestock concentrating in streams (for watering purposes) or other nonpoint sources in the watershed during this period.

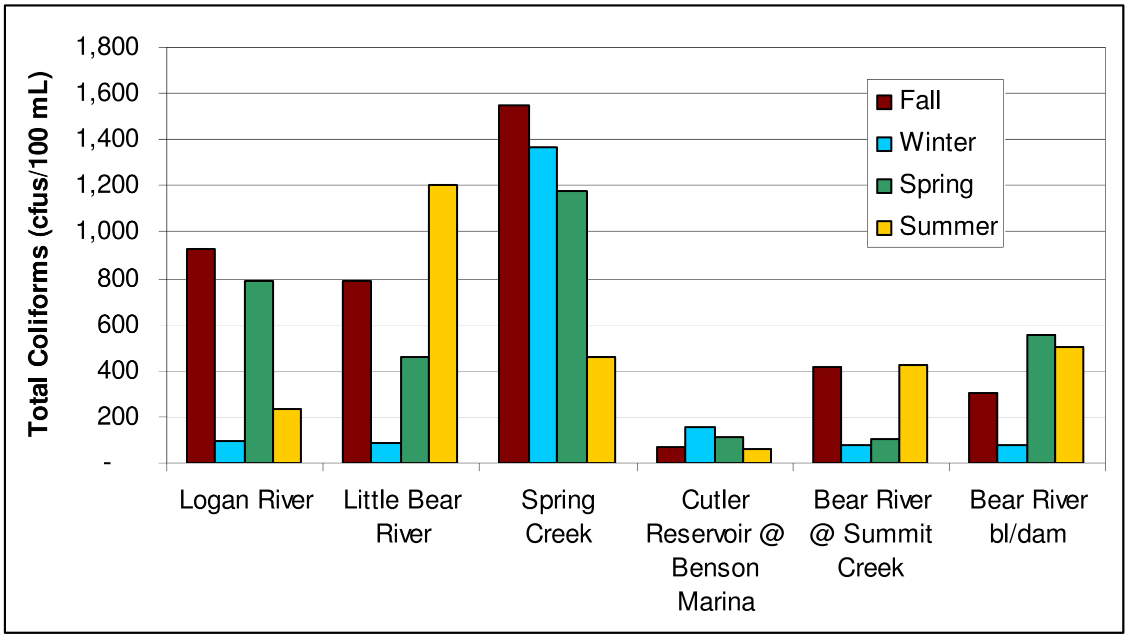


Figure 6. Total coliform bacteria (cfus/100 mL) for sampling sites by season during the 2000–2003 monitoring period

3.5 Nutrients

General concerns associated with excessive nutrient concentrations relate to both direct and indirect effects. Direct effects include nuisance algae and periphyton growth. Indirect effects include low dissolved oxygen, increased methylmercury production, elevated pH, cyanotoxins from cyanobacteria (blue-green algae) production, trihalomethane production in drinking water systems, and maintenance issues associated with domestic water supplies.

Nuisance aquatic growth, algae (phytoplankton, or water column algae, and periphyton, or attached algae), and rooted plants (macrophytes) can adversely affect both aquatic life and recreational water uses. Algal blooms occur where nutrient concentrations (nitrogen and phosphorus) are sufficient to encourage excessive growth. Levels necessary for growth may occur at concentrations well below the identified water quality thresholds and criteria. Available nutrient concentrations, flow rates, velocities, water temperatures, and sunlight penetration in the water column are all factors that influence algae (and macrophyte) growth. When conditions are appropriate and nutrient concentrations exceed the quantities needed to support algal growth, excessive blooms may develop. Commonly, these blooms appear as extensive layers or algal mats on the surface of the water.

Algal blooms often create objectionable odors in water used for recreation and can produce intense coloration of both the water and shorelines. Water bodies demonstrating sufficient nutrient concentrations to cause excessive algal growth are said to be eutrophic. Algae is not always damaging to water quality, however. The extent of the effect is dependent on both the type(s) of algae present and the size, extent, and timing of the bloom. In many systems, algae provide a critical food source for many aquatic insects, which in turn serve as food for fish.

Algal growth also has indirect effects on water quality. When algae die, they sink slowly through the water column, eventually collecting on the bottom sediments. As the algae decompose, the biochemical processes that occur remove oxygen from the surrounding water. Because most of the decomposition occurs within the lower levels of the water column, dissolved oxygen concentrations near the bottom of lakes and reservoirs can be substantially depleted by a large algal bloom. Low dissolved oxygen in these areas can lead to decreased fish habitat and even fish kills if there are not other areas of water with sufficient dissolved oxygen available where the fish can take refuge.

3.5.1 Nutrient Differences between Monitoring Periods

A comparison of nutrients between the first monitoring period (1996–1998) and the second monitoring period (2000–2003) indicates little change in nutrient concentrations in the Logan River, the site which represents the most pristine subwatershed in the area (Figures 7 and 8). Slight decreases in total phosphorus and total nitrate are evident in the Bear River both above and below Cutler Reservoir. A slight increase in orthophosphate in the Bear River below the dam is also evident and could reflect the longer retention time in the reservoir during the second monitoring period, due to drought, thus allowing more time for organically bound phosphorus to be released into the soluble orthophosphate form. Significant increases in total phosphorus and orthophosphate were recorded in Spring Creek. The majority of phosphorus in this creek is associated with industrial dischargers in the watershed. Loads from this point source discharge are not related to hydrologic conditions, whereas nutrient loads in the other tributaries are primarily associated with non-point sources which are intricately tied to hydrologic conditions. During the drought period of 2000–2003, less water was available in Spring Creek to dilute the discharge from industrial dischargers, while during the same period, reduced surface runoff associated with less precipitation could account for some of the nutrient concentration reductions observed in other tributaries.

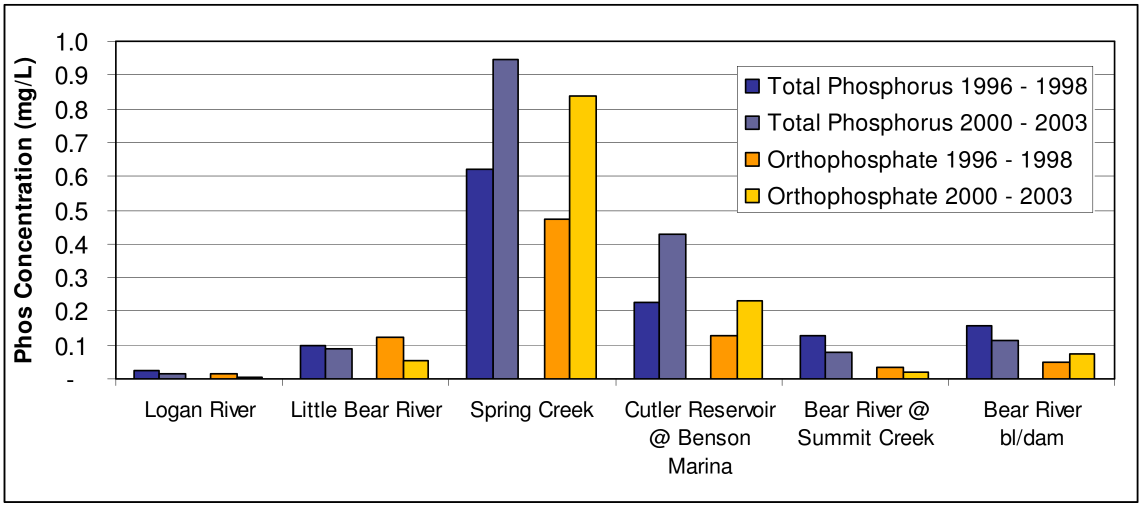


Figure 7. Change in phosphorus concentrations in Cutler Reservoir system between first monitoring period (1996–1998) and second monitoring period (2000–2003).

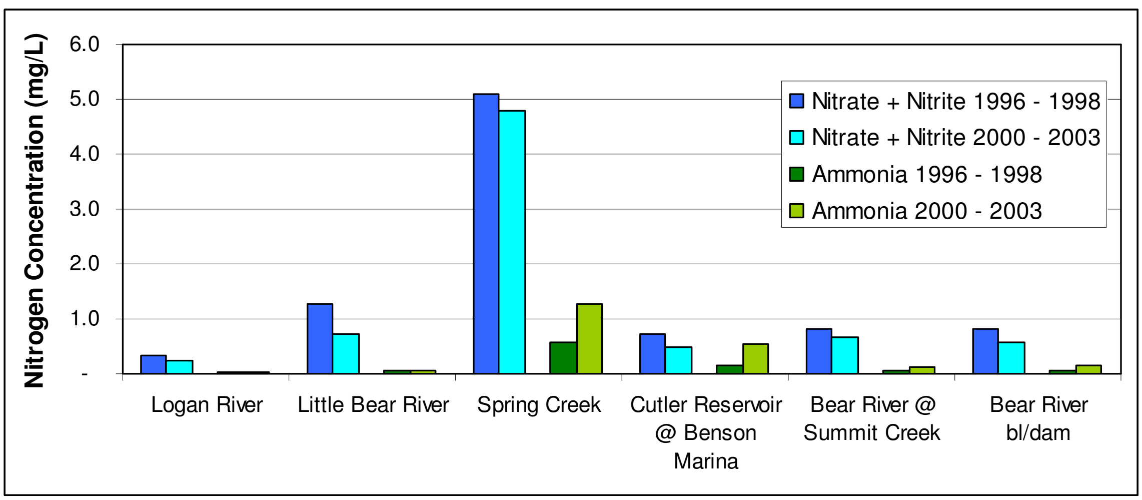


Figure 8. Change in nitrogen concentrations in Cutler Reservoir system between first monitoring period (1996–1998) and second monitoring period (2000–2003).

Data from the site within Cutler Reservoir indicate that concentrations of phosphorus (total and orthophosphate) as well as ammonia increased significantly between the two sampling periods whereas nitrate decreased slightly. Since phosphorus is relatively conservative in aquatic systems (there is no gaseous state), increased phosphorus concentrations can be explained in part by drought conditions providing less dilution water for the phosphorus in the system. In addition, longer retention times and periods of water stagnation in the southern end of the reservoir could lead to more prevalent anoxic reducing environments which can lead to the release of phosphorus from precipitated ferric phosphates when the iron is reduced from Fe (III) to Fe (II) (Young and Ross 2001). Anoxia is also a prerequisite for denitrification (Schlesinger 1997), the conversion of nitrate to nitrogen gas (N_2), which could explain the slight reduction in nitrate in the reservoir under drought conditions.

3.5.2 SEASONAL VARIATION OF NUTRIENTS DURING THE 2000–2003 MONITORING PERIOD

Nutrient concentrations in the Logan River, the highest quality river in the study area, do not vary significantly across seasons (Figures 9 and 10). There are, however, seasonal patterns in nutrient concentrations in the more impaired rivers in the area, as well as in Cutler Reservoir itself. Phosphorus concentrations are the lowest in winter whereas ammonia and nitrate concentrations are the lowest in spring and summer. In contrast, the Little Bear River and the Bear River above Cutler Reservoir both exhibit the highest concentrations of total phosphorus during the summer season with orthophosphate concentrations peaking during the winter season. Both of these tributaries drain primarily agricultural watersheds in which phosphorus loads are tightly correlated with spring runoff and storm events. The winter season also accounts for the largest concentrations of nitrogen in the Bear River, Cutler Reservoir, and Spring Creek. The City of Logan does not discharge effluent from the municipal wastewater treatment plant during the summer season, which could explain lower phosphorus and nitrogen concentrations during this season. Without more information related to hydrologic conditions at the time of sampling (i.e. storm events, spring runoff) it is difficult to compare between seasons in these watersheds since data collected during different hydrologic periods represents a significant source of variability.

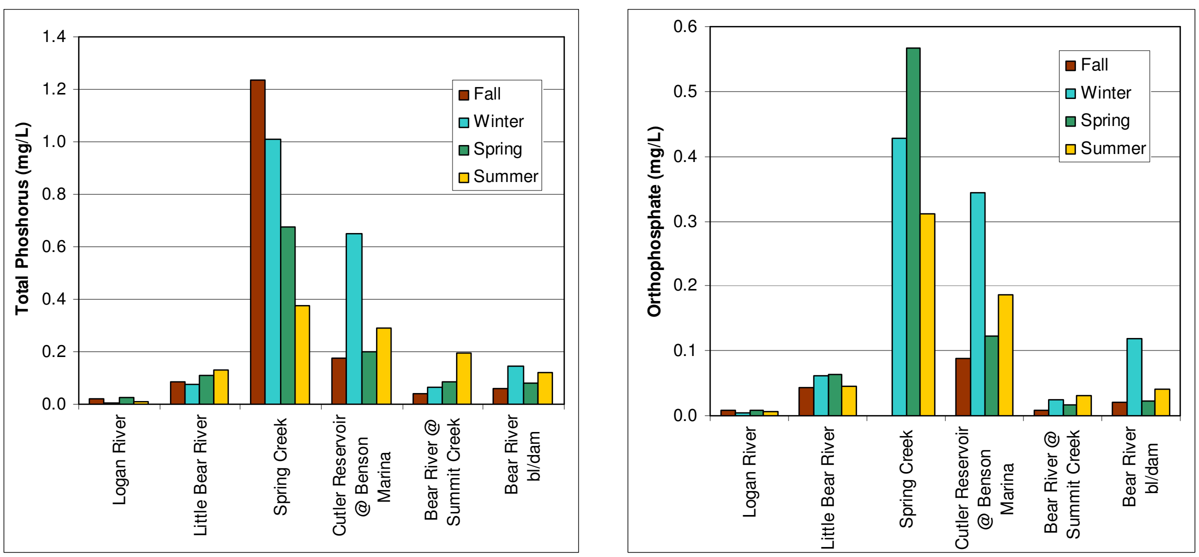


Figure 9. Phosphorus concentrations for sampling sites by season during the 2000–2003 monitoring period

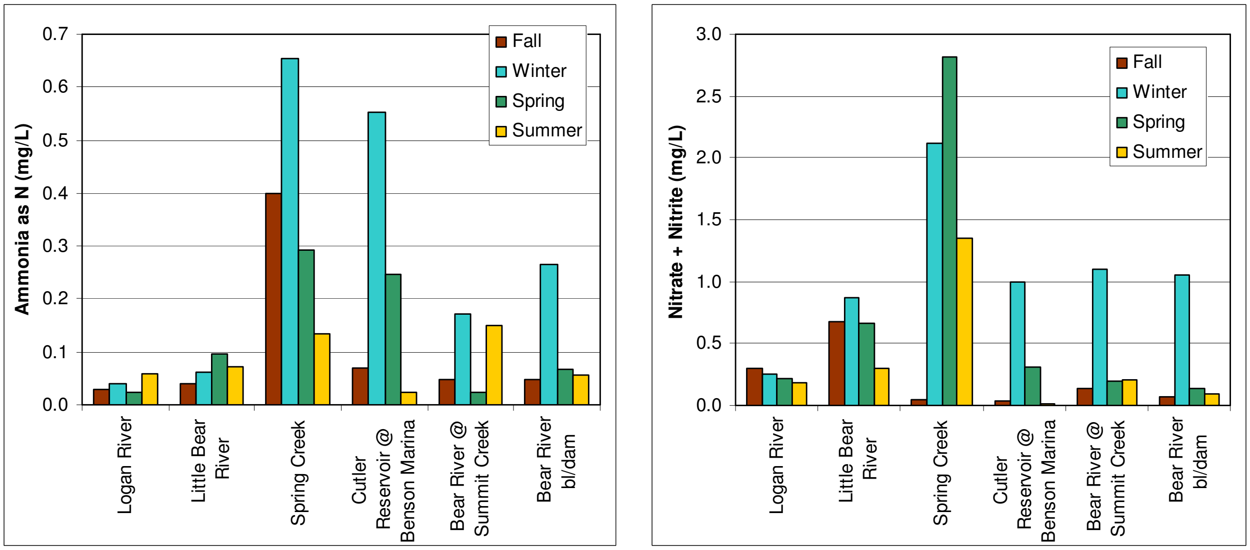


Figure 10. Nitrogen concentrations for sampling sites by season during the 2000–2003 monitoring period

3.6 DISSOLVED OXYGEN

Dissolved oxygen (DO) is important to the health and viability of fish and other aquatic life. High concentrations of DO (6–8 mg/L or greater) are necessary for the health of aquatic life. Low concentrations of DO (below 4 mg/L) can result in stress to aquatic species, lowered resistance to environmental stressors, and even death at very low levels (less than 2 mg/L). Cutler Reservoir and its associated wetland contain a diverse fish community of largemouth bass, smallmouth bass, black crappie, green sunfish, bluegill sunfish, channel catfish, walleye, black bullhead, rainbow trout, brown trout, common carp, fathead minnow, and Utah sucker (Budy et al. 2006). Thresholds of DO for fish vary by species as do a number of environmental conditions such as water temperature and hardness. Generally, fish are more tolerant to low oxygen levels at cold temperatures and low hardness.

Low DO often results from high nutrient, organic, or algal loading to a surface water system. Nutrients fuel algal growth, which in turn consumes oxygen from the water column during respiration (D'Avanzo and Kremer 1994). In slow-moving streams, lakes, and reservoirs, when algae die and settle to the bottom of the water body, aerobic decomposition of the dead algae and other detritus (non-living organic material) also depletes the oxygen supply in the overlying water. In systems where suspended solids are primarily organic in origin, low DO levels may be correlated with sediment inputs as well.

Dissolved oxygen measurements were taken at the time of water quality sampling during both sampling periods. Dissolved oxygen values are generally very high throughout the Cutler Reservoir system at all sampling times (Table 7). The lowest values were recorded in the Little Bear River and Spring Creek during the 2000–2003 sampling period. However, even these minimum values of 6 mg/L and 6.6 mg/L, respectively, are considered to be protective of fisheries. It must be noted that all of the DO sampling occurred during the daylight hours when oxygen levels would be elevated from photosynthetic activity. Dissolved oxygen levels drop during the nighttime when phytoplankton use available DO for respiration and no photosynthetic activity is occurring to replenish the oxygen supply. Thus, values of 6 mg/L during day light hours could correlate to nighttime DO concentrations that are harmful to biota. A recent assessment of stream benthic macroinvertebrates conducted by UDWQ, determined that the sections of the Little Bear River and Spring Creek near Cutler Reservoir are impaired based on biological criteria. The impairment is related to the absence of 48% and 41% of the species (for Little Bear River and Spring Creek, respectively) expected to occur at that site based on the streams natural, geomorphic, and watershed characteristics.

Table 7. Summary of Dissolved Oxygen Data for Cutler Reservoir System

	Fall	Spring	Summer	Winter	Annual Average	Annual Max	Annual Min	Annual Standard Deviation
1996–1998								
Logan River	9.5	9.6	8.2	10.5	9.5	10.5	8.2	1.8
Little Bear River	8.6	9.3	6.3	9.3	8.6	10.0	6.3	2.8
Spring Creek	8.4	8.8	5.8	10.5	8.4	10.5	5.8	1.8
Cutler Reservoir @ Benson Marina	8.6	9.8	10.0	10.2	9.4	10.6	7.4	2.7
Bear River @ Summit Creek	8.1	9.7	8.2	10.1	8.9	10.8	6.7	2.4
Bear River bl/dam	8.1	9.7	8.2	10.1	8.9	10.8	6.7	2.4
2000–2003								
Logan River	9.6	8.9	9.8	12.3	10.9	13.3	8.1	0.8
Little Bear River	8.2	7.7	6.5	11.9	9.8	13.4	6.0	1.3
Spring Creek	8.4	7.4	7.4	10.5	9.2	11.5	6.6	1.6
Cutler Reservoir @ Benson Marina	11.7	8.3	6.8	11.1	10.4	14.9	6.8	1.2
Bear River @ Summit Creek	8.5	7.0	7.1	11.7	9.8	13.0	7.0	1.3
Bear River bl/dam	8.5	7.0	7.1	11.7	9.8	13.0	7.0	1.3

3.7 TURBIDITY AND SEDIMENT

Turbidity is a measurement of the visible clarity of water. Turbidity can be caused by both inorganic particles and suspended algae. Turbidity from inorganic particles can limit algal growth due to light limitation, even if there are sufficient nutrients for algal blooms. In Cutler Reservoir, large populations of carp contribute to turbid conditions by stirring up bottom sediments, which may confound efforts to measure sediment inputs into the system. Light limitation from large amounts of suspended inorganic particles can limit algal growth; however, turbidity is correlated with phytoplankton density in very productive aquatic systems (Wetzel 2001). Approximate turbidity is measured by the depth of Secchi disk transparency. It is often reported in nephelometric turbidity units (NTU), which represent the degree to which light is scattered in the water. Algal densities, measured as chlorophyll *a* concentration, can also be used to measure turbidity.

Sediment is the most visible pollutant in freshwaters, leading to increased turbidity in water. It is usually reflected in measurements of Total Suspended Solids (TSS) (mg/L). Erosion of upland soils and stream banks are the primary causes of elevated sediment levels in rivers and reservoirs, both of which reflect land management practices in the watershed. Excessive sediment loading in receiving waters can lead to the alteration of aquatic habitat, reduced reservoir storage capacity due to sedimentation, and reduced aesthetic value of waters. Accumulation of sediments can directly harm fish and aquatic wildlife, or indirectly impact the functioning of aquatic systems by contributing to nutrient loading and eutrophication (algal overgrowth) (Novotny and Olem 1994).

3.7.1 TURBIDITY AND SEDIMENT DIFFERENCES BETWEEN MONITORING PERIODS

Sampling for turbidity and TSS occurred at the six monitoring sites during both monitoring periods. The data illustrate that the turbidity and TSS values are generally low for the watershed. A comparison of the data collected during the two monitoring periods indicates that turbidity decreased at all sites during the 2000–2003 period. Total suspended solids were also lower during this period in the Bear River (above and below the reservoir), in the Logan River, and in Cutler Reservoir itself. These findings are likely related to reduced runoff, and therefore erosion, in the basin during low water years. The increase in TSS in Spring Creek is likely related to the relatively constant industrial discharges in that subwatershed causing reduced flow for dilution. There is no obvious explanation for the slight increase in total suspended solids in the Little Bear River in 2000–2003, however this difference is small enough that it could represent variability and uncertainty in sampling (Figure 11).

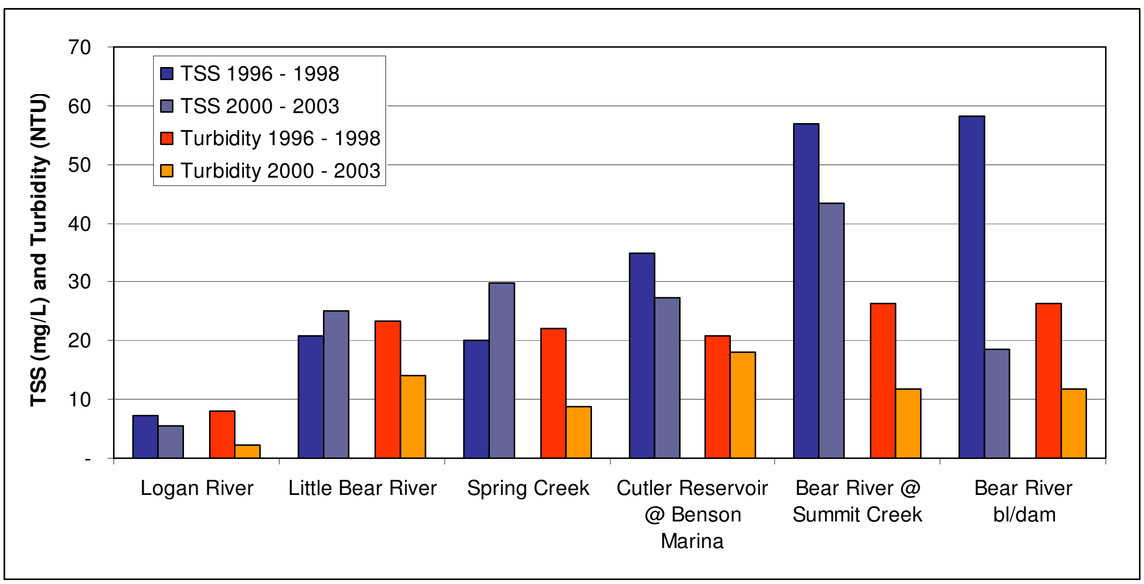
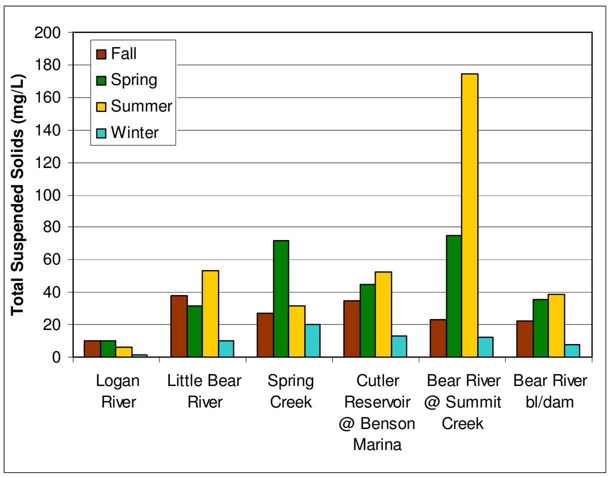


Figure 11. Change in turbidity in the Cutler Reservoir system between first monitoring period (1996–1998) and second monitoring period (2000–2003)

3.7.2 Seasonal Variation of Turbidity and Sediment During the 2000–2003 Monitoring Period

As with nutrients, sediment concentrations and turbidity do not vary significantly across seasons in the Logan River, whereas seasonal trends are apparent for most of the other sites in the Cutler Reservoir system (Figure 12). In particular, the Bear River above the reservoir exhibits significantly higher levels of turbidity and sediment during the summer season than during all other seasons. This is likely related to erosion during the irrigation season and summer storm runoff. Higher levels of turbidity in Cutler Reservoir, Spring Creek, and the Bear River below Cutler Dam, in the summer season, are not paired with higher levels of sediment (TSS). This suggests that turbidity spikes in the summer season are related to growth of suspended algae rather than increased sediment loads during this period. Unfortunately, no turbidity data were collected during the spring season between 2000 and 2003.



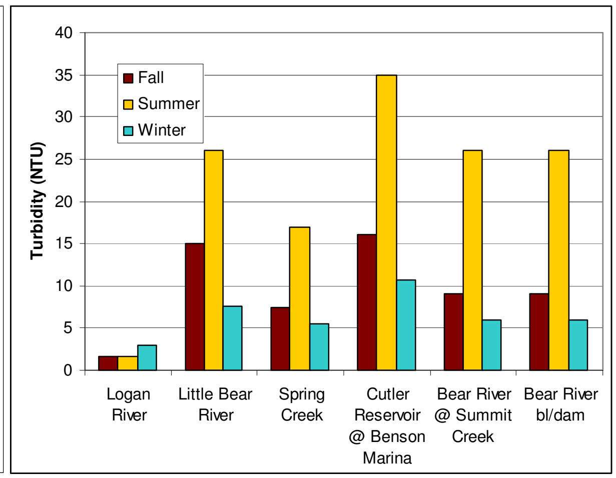


Figure 12. Average sediment concentration (TSS) and turbidity for sampling sites by season during the 2000–2003 monitoring period

3.8 Trophic State Index (TSI)

Water bodies with high nutrient concentrations (that could lead to a high level of algal growth) are said to be eutrophic. The health and support status of a water body can be assessed using a Trophic State Index (TSI). This index is a measurement of the biological productivity or growth potential of a body of water. The basis for TSI classification is algal biomass (an estimation of how much algae is present in the water body). The calculation of a TSI generally includes the relationship between chlorophyll (the green pigment in algae), transparency using Secchi depth measurements, total phosphorus, and total nitrogen (Carlson and Simpson 1996).

Since no Secchi depth, chlorophyll *a* data, or organic nitrogen is available in this dataset, the TSI analysis presented here is limited to trophic state predictions related to total phosphorus, and is calculated using the following equation:

$$\text{TSI TP} = 14.42 \text{ Ln (TP)} + 4.15$$

Table 8 identifies generally accepted TSI values derived from this relationship. In most cases, the greater the TSI value a water body has (based on collected data), the more eutrophic the water body is considered to be.

Table 8. TSI Values and Status Indicators

TSI	Trophic Status and Water Quality Indicators
<30	Highly oligotrophic, clear water, and high DO throughout the year in the entire hypolimnion.
30–40	Oligotrophic, clear water, and possible periods of limited hypolimnetic anoxia (DO=0)
40–50	Mesotrophic, moderately clear water, increased chance of hypolimnetic anoxia in summer, cold-water fisheries threatened, and supportive of warm-water fisheries.
50–60	Mildly eutrophic, decreased transparency, anoxic hypolimnion, macrophyte problems, and generally supportive of warm-water fisheries only.
60–70	Eutrophic, blue-green algae dominance, scums possible, and extensive macrophyte problems.
70–80	Hypereutrophic, heavy algal blooms possible throughout summer, and dense macrophyte beds.
>80	Algal scums, summer fish kills, few macrophytes due to algal shading, and "rough fish" dominance
Source: Carlson and Simpson 1996.	

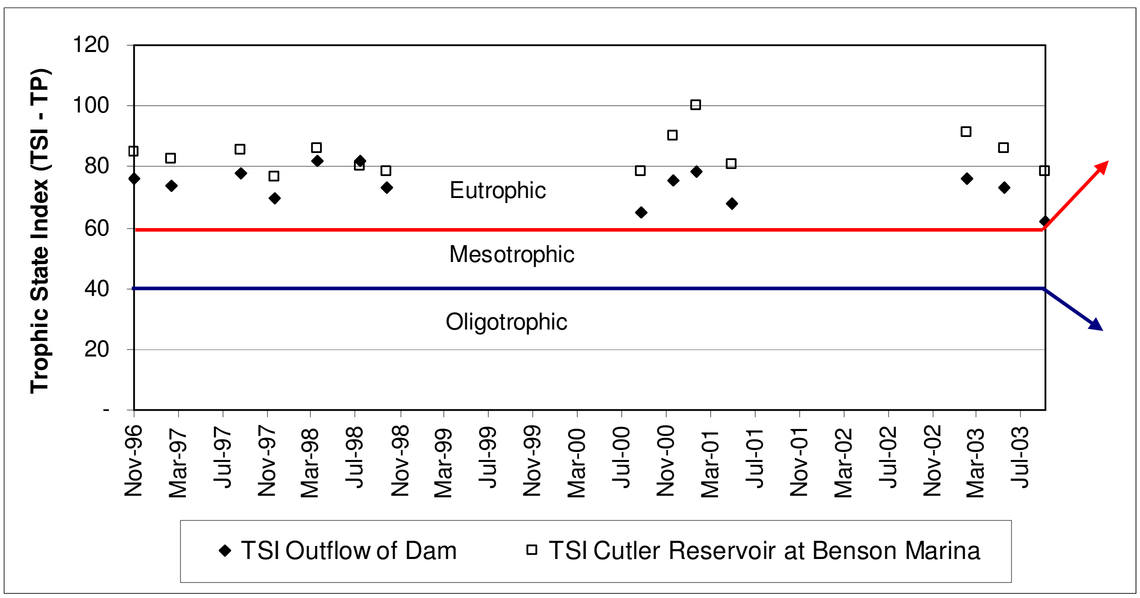


Figure 13. Trophic state index (TSI) predicted based on total phosphorus concentrations in Cutler Reservoir.

The trophic scale illustrates these general classifications, as well as the midrange conditions that occur between each major category. However, each water body is unique and will exhibit site-specific characteristics based on the water quality conditions identified within the lake or reservoir and over specific time periods, seasons, or water-flow conditions. The identification of TSI values for a specific water body allows a general classification and provides insight into overall water quality trends and seasonality.

The TSI values calculated indicate that Cutler Reservoir routinely experiences eutrophic to hypereutrophic conditions (Figure 13). Nowhere in the reservoir or its inflowing tributaries were the TSI values indicative of noneutrophic conditions. There are no general trends in trophic state change since sampling began in 1996. Periodic events of higher eutrophy are likely related to drought conditions experienced in 2000, 2001, and 2003.

4 SPATIAL SUMMARY OF DATA

Data collected between 2000 and 2003 indicate that water quality in the southern tributaries, specifically Spring Creek, the Little Bear River, and the Bear River, have dramatic impacts on water quality throughout Cutler Reservoir. A similar pattern was identified in the earlier monitoring period (1996–1998). Spring Creek continues to have significantly higher nutrient concentrations and levels of coliform bacteria as compared to the other sampling locations within the watershed. The Bear River exhibits the highest concentrations of sediment in the watershed.

Water quality in the southern and northern sections of the reservoir remains markedly different with the south being characterized by higher nutrient concentrations (Figure 14 and Figure 15), higher turbidity (Figure 16), warmer temperatures, and lower dissolved oxygen. This is due in part to the shallow nature of the reservoir and the limited flow-through that occurs. Based on the preliminary load analysis conducted for the Cutler Reservoir TMDL, the majority of phosphorus load to the southern reservoir during the algal growth period (May – October) comes from Spring Creek (approximately 25%) and the Logan City and Service Area Wastewater Treatment Plant (approximately 30%). In addition, runoff from fields near Cutler Reservoir that are irrigated with Logan City wastewater may account for an additional 15% of the load to the southern reservoir during this season. Additional load during the winter and spring season (November – April) contribute significantly to sediment phosphorus concentrations which release phosphorus during the warmer summer season. The Spring Creek TMDL is currently being implemented and will result in substantial load reductions from the JBS Swift and Company discharge which will translate into significant load reductions from Spring Creek. The load associated with the Logan City and Service Area WWTP will be incorporated into the Cutler Reservoir TMDL currently under development. The limited flow-through is caused by the numerous constriction points and prevalent stands of emergent vegetation that occur throughout the southern section of the reservoir. Due to this slow moving water and the shallow nature of the southern reservoir (0.55 meters mean depth), reservoir sediments are likely to exert a greater influence on water quality than in the faster flowing and deeper northern reservoir (1.1 meters mean depth). Nutrient values within the southern portion of the reservoir are significantly higher with high total phosphorus levels far exceeding levels within the northern portion of the reservoir. The tributary of Spring Creek, which drains directly to the southern portion of the reservoir, contributes a very high concentration of nutrients directly to the Southern Reservoir.

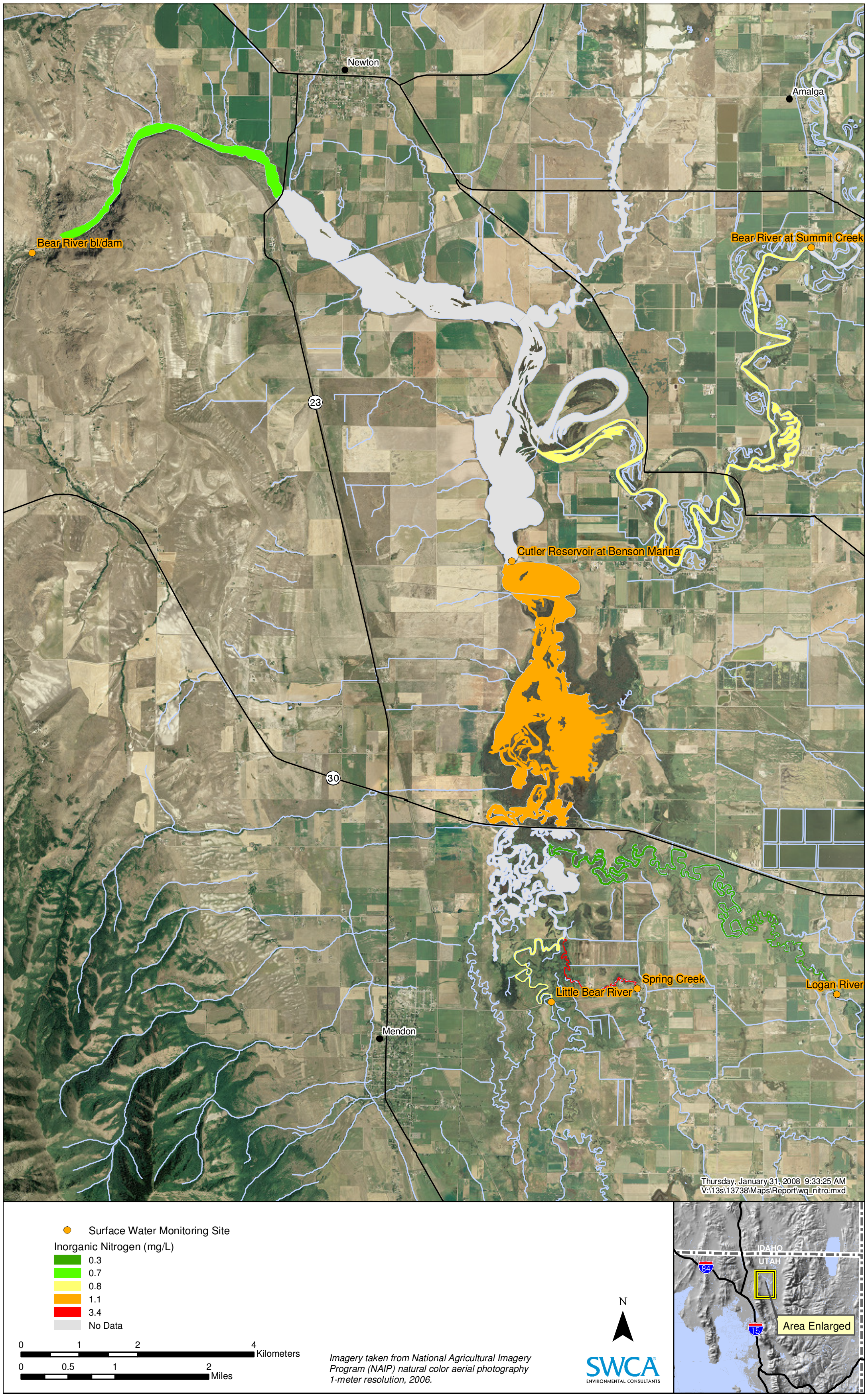


Figure 14. Inorganic nitrogen levels in the Cutler Reservoir watershed.

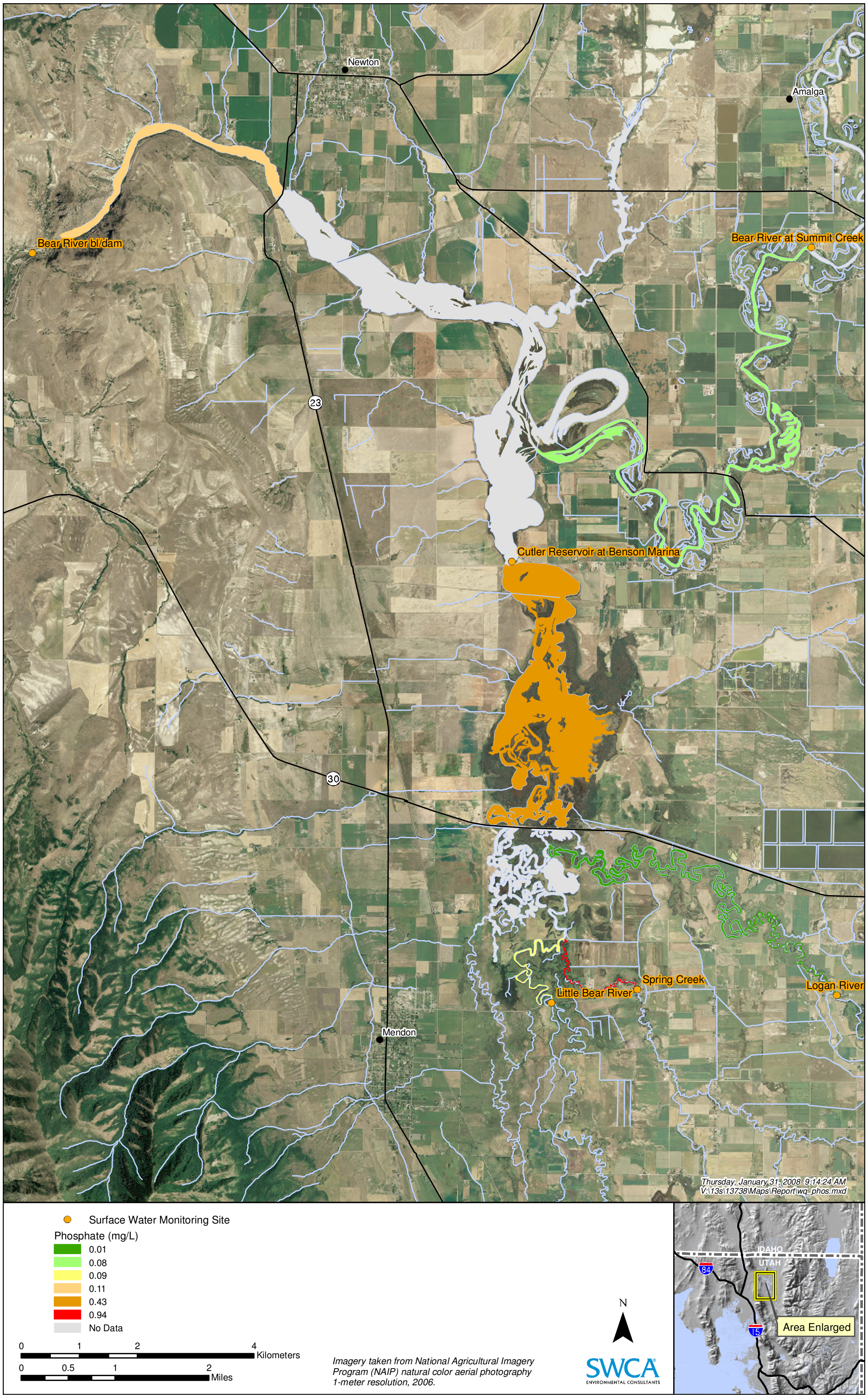


Figure 15. Phosphate levels in the Cutler Reservoir watershed.

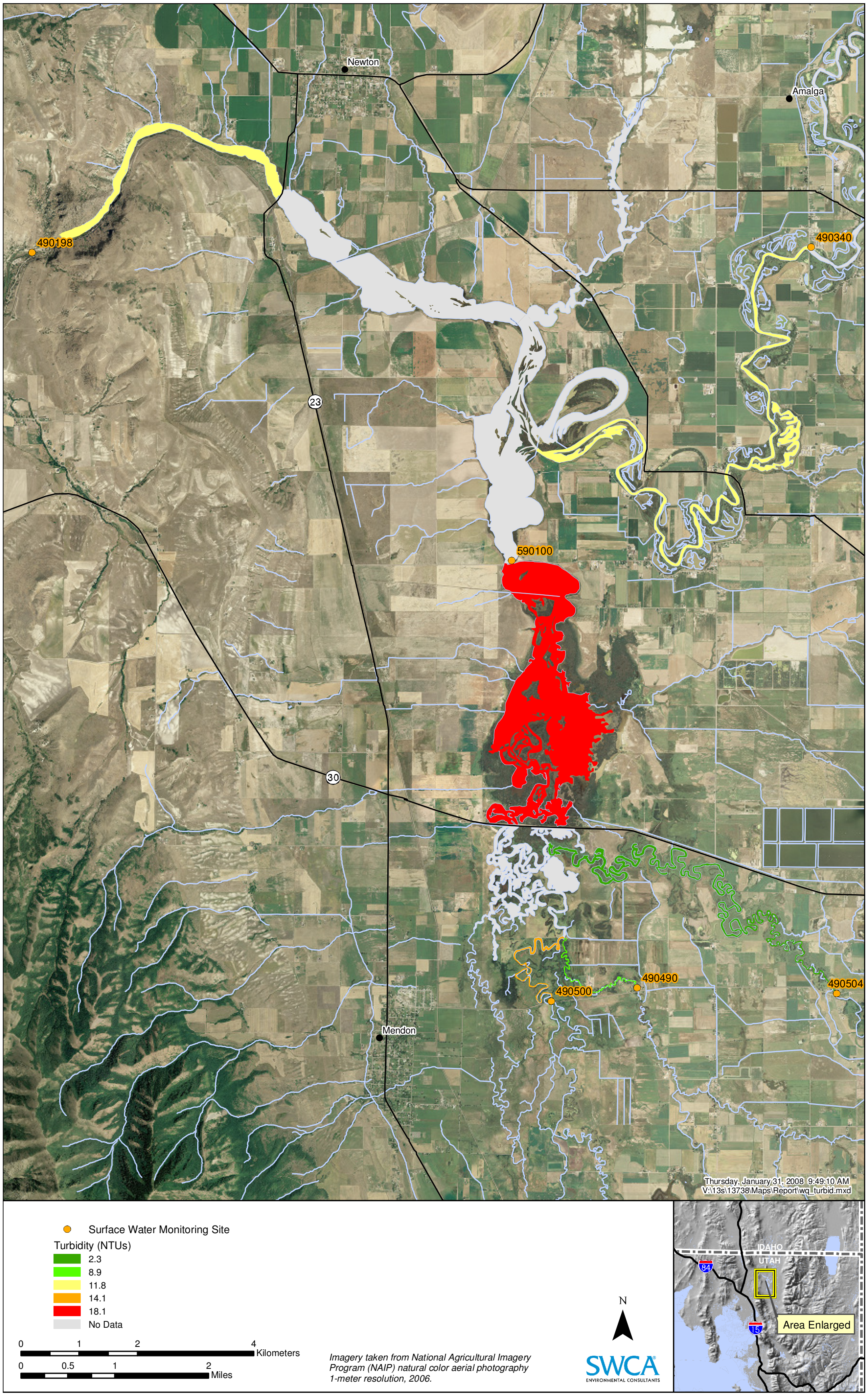


Figure 16. Turbidity levels in the Cutler Reservoir watershed.

5 CUTLER RESERVOIR RESTORATION PROJECTS

Significant best management practices (BMPs) have been planned and installed within the watershed as outlined in the Cutler Hydro Project Five-Year Implementation Plan (2002). Included within the implemented BMPs are shoreline buffers, bank stabilization, woodland plantings, fencing for livestock restrictions, grazing management practices, and fish enhancement. Initial monitoring results for the BMP implementation have rated most of the restoration work as good to excellent condition on the majority of the implementation sites. Limited sites were rated as poor, destroyed, or had failed to establish the BMP. The majority of work around Cutler Reservoir has taken place along the southern tributaries, therefore affecting water quality in the Little Bear River, Spring Creek, the Logan River, and the southern section of Cutler Reservoir.

All of the BMP projects were implemented during the 1995–2001 time period. Because of the short duration between BMP implementation and water quality sampling, along with the scale of the watershed as compared to the area of BMP implementation, it is difficult to actually measure water quality differences at the watershed scale, especially given the unique hydrologic conditions occurring in 2003. Future monitoring efforts in the same locations could provide evidence of improved water quality under more typical hydrologic conditions. Monitoring data collected at the BMP implementation scale would be beneficial to measure actual water quality improvements to the reservoir.

6 COMPARISON TO OTHER DATA FOR CUTLER RESERVOIR

Monitoring on the Cutler Reservoir/Bear River has been completed by other agencies over a 23-year period, including UDEQ, Utah State University, and the City of Logan. In some cases, data collected at the same locations as the PacifiCorp dataset are significantly different than the data summarized in this report. Table 9 provides a direct comparison of total phosphorus and nitrate + nitrite nitrogen values from the complete dataset with the PacifiCorp data summarized in this report. Mean total phosphorus in the southern reservoir and southern tributaries are 1.6 and 1.8 times higher, respectively, than the mean total phosphorus values from the compiled dataset. Similar differences are seen for nitrogen in the Bear River system. Nitrogen in the southern tributaries is lower based on the PacifiCorp dataset compared to the entire compiled dataset. There are several potential explanations for these discrepancies. First, sampling methodology and/or specific location may differ among sampling agencies. In addition, the PacifiCorp data are much smaller than the larger dataset, making it more easily influenced by single high or low values. Water quality data are generally highly variable both spatially and temporally. In the future, compilation of the PacifiCorp collected data with data collected by UDEQ would provide for a more robust water quality analysis.

Table 9. Monitoring Data–Statistic Comparison for PacifiCorp and Complete Data for Cutler Reservoir

	Bear River Inflow to Cutler	Northern Reservoir	Southern Reservoir	Southern Inflows
Total Phosphorus – All Data				
Mean	0.40	0.02	0.13	0.11
Median	0.20	0.02	0.11	0.10
Max	1.55	0.02	0.48	0.18
Min	0.03	0.02	0.03	0.04
SD	0.39	-	0.06	0.06
Total Phosphorus – Pacificorp Data				
Mean	0.10	0.13	0.34	0.31
Median	0.09	0.13	0.27	0.27
Max	0.21	0.22	1.49	0.59
Min	0.04	0.06	0.15	0.12
SD	0.06	0.05	0.33	0.15
Nitrate + Nitrite – All Data				
Mean	0.04	0.29	0.44	2.68
Median	0.05	0.29	0.20	2.53
Max	0.06	0.48	1.80	3.83
Min	0.00	0.10	0.00	1.84
SD	0.03	0.27	0.43	0.83
Nitrate + Nitrite – Pacificorp Data				
Mean	0.70	0.65	0.58	0.919
Median	0.51	0.72	0.57	0.61
Max	1.69	1.43	1.61	2.12
Min	0.11	0.01	0.01	0.28
SD	0.50	0.50	0.49	0.59

7 RECOMMENDATIONS FOR FUTURE SAMPLING

The historic sampling program by PacifiCorp for the Cutler Reservoir system provides good distribution of water quality data across space and time. To better examine seasonal and temporal trends, we recommend that future water quality sampling also be tied to hydrologic events. This is especially important in a water quality sampling program that relies on grab samples collected during specific times of the year. To maintain the quarterly sampling already established by PacifiCorp, we recommend collecting seasonal samples during baseflow conditions defined by at least 5 dry days. This provides appropriate separation between true baseflow conditions that might otherwise be clouded by small precipitation events prior to actual sampling. In addition, examination of water quality related to surface runoff would be enhanced by sampling a summer and fall storm each year as well as the initial period of spring melt runoff. This is equally important as it characterizes hydrologic periods within the system which often have the highest concentration of nonpoint source runoff pollutants, including sediment and nutrients, and in many systems account for the majority of the load to receiving waters over the course of a year. Sampling during hydrologic events introduces a level of uncertainty into the sampling procedure; however, the resulting water quality analyses are more easily compared across time. In summary, we recommend 7 annual monitoring times based on hydrologic events as follows: winter baseflow, initial spring runoff, spring baseflow (before irrigation season begins), summer baseflow (during irrigation season), summer storm (producing runoff and following a 5-day dry period), and a fall storm.

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Appendix A. Summary Statistics for PacifiCorp Water Quality Data

Monitoring Period 1996 - 1998						
BEAR R BL CUTLER RES AT UP L BRIDGE		Fall	Winter	Spring	Summer	Annual
Dissolved oxygen (DO)	Number of Samples	3	1	2	1	7
	Average	8.1	10.1	9.7	8.2	8.9
	Maximum	9.1	10.1	10.8	8.2	10.8
	Minimum	6.7	10.1	8.7	8.2	6.7
	Stanard Deviation	1.3	--	1.5	--	1.3
Dissolved oxygen saturation	Number of Samples	2	1	2		5
	Average	80	95	92		88
	Maximum	81	95	111		111
	Minimum	80	95	73		73
	Stanard Deviation	1	--	27		15
Fecal Coliform	Number of Samples	3		1	1	5
	Average	50		20	90	52
	Maximum	90		20	90	90
	Minimum	20		20	90	20
	Stanard Deviation	36		--	--	36
Nitrogen, ammonia as N	Number of Samples	3	1	2	1	7
	Average	0.08	0.02	0.12	0.01	0.07
	Maximum	0.17	0.02	0.14	0.01	0.17
	Minimum	0.03	0.02	0.11	0.01	0.01
	Stanard Deviation	0.07	--	0.02	--	0.06
Nitrogen, Nitrate (NO3) as NO3	Number of Samples	2	1	2	1	6
	Average	0.56	0.45	1.11	1.23	0.84
	Maximum	0.70	0.45	1.38	1.23	1.38
	Minimum	0.42	0.45	0.85	1.23	0.42
	Stanard Deviation	0.20	--	0.38	--	0.40
Nitrogen, Nitrite (NO2) as NO2	Number of Samples	3	1	2	1	7
	Average	0.01	0.01	0.03	0.01	0.02
	Maximum	0.02	0.01	0.05	0.01	0.05
	Minimum	0.01	0.01	0.02	0.01	0.01
	Stanard Deviation	0.01	--	0.02	--	0.02
pH	Number of Samples	3	1	2	1	7
	Average	8.2	8.3	8.0	8.0	8.1
	Maximum	8.3	8.3	8.2	8.0	8.3
	Minimum	8.0	8.3	7.9	8.0	7.9
	Stanard Deviation	0.2	--	0.3	--	0.2
Phosphorus as P	Number of Samples	3	1	2	1	7
	Average	0.14	0.10	0.17	0.22	0.16
	Maximum	0.17	0.10	0.22	0.22	0.22
	Minimum	0.12	0.10	0.13	0.22	0.10
	Stanard Deviation	0.02	--	0.07	--	0.05
Phosphorus, orthophosphate as P	Number of Samples	3	1	2	1	7
	Average	0.06	0.01	0.06	0.01	0.05
	Maximum	0.12	0.01	0.06	0.01	0.12
	Minimum	0.03	0.01	0.06	0.01	0.01
	Stanard Deviation	0.05	--	0.00	--	0.04
Solids, Total Suspended (TSS)	Number of Samples	2	1	2	1	6
	Average	64	33	43	103	58
	Maximum	74	33	75	103	103
	Minimum	54	33	11	103	11
	Stanard Deviation	14	--	45	--	33

BEAR R BL CUTLER RES AT UP L BRIDGE			Fall	Winter	Spring	Summer	Annual
	Specific conductance	Number of Samples	3	1	2	1	7
		Average	796	681	793	972	804
		Maximum	912	681	832	972	972
		Minimum	691	681	753	972	681
		Stanard Deviation	111	--	56	--	109
	Temperature, water	Number of Samples	3	1	2	1	7
		Average	10.3	5.9	5.8	24.2	10.4
		Maximum	16.7	5.9	8.1	24.2	24.2
		Minimum	5.2	5.9	3.5	24.2	3.5
		Stanard Deviation	5.9	--	3.3	--	7.4
	Total Coliform	Number of Samples	3	1	2	1	7
		Average	473	80	30	100	237
		Maximum	700	80	30	100	700
		Minimum	120	80	30	100	30
		Stanard Deviation	310	--	-	--	285
	Total Inorganic Nitrogen	Number of Samples	2	1	2	1	6
		Average	0.68	0.49	1.27	1.26	0.94
		Maximum	0.89	0.49	1.57	1.26	1.57
		Minimum	0.47	0.49	0.97	1.26	0.47
		Stanard Deviation	0.30	--	0.42	--	0.43
	Turbidity	Number of Samples	2	1	1	1	5
		Average	19	17	27	50	26
		Maximum	26	17	27	50	50
		Minimum	12	17	27	50	12
		Stanard Deviation	10	--	--	--	15

BEAR R BL CNFL / SUMMIT CK		Fall	Winter	Spring	Summer	Annual
Depth	Number of Samples	3	1	2	1	7
	Average	0.57	0.30	0.60	0.70	0.56
	Maximum	0.70	0.30	0.70	0.70	0.70
	Minimum	0.50	0.30	0.50	0.70	0.30
	Stanard Deviation	0.12	--	0.14	--	0.15
Dissolved oxygen (DO)	Number of Samples	3	1	2	1	7
	Average	8.1	10.1	9.7	8.2	8.9
	Maximum	9.1	10.1	10.8	8.2	10.8
	Minimum	6.7	10.1	8.7	8.2	6.7
	Stanard Deviation	1.3	--	1.5	--	1.3
Dissolved oxygen saturation	Number of Samples	2	1	2		5
	Average	80	95	92		88
	Maximum	81	95	111		111
	Minimum	80	95	73		73
	Stanard Deviation	1	--	27		15
Fecal Coliform	Number of Samples	3	1	2	1	7
	Average	220	10	65	130	133
	Maximum	500	10	90	130	500
	Minimum	10	10	40	130	10
	Stanard Deviation	252	--	35	--	171
Nitrogen, ammonia as N	Number of Samples	3	1	2	1	7
	Average	0.05	0.02	0.12	0.01	0.06
	Maximum	0.13	0.02	0.14	0.01	0.14
	Minimum	0.01	0.02	0.11	0.01	0.01
	Stanard Deviation	0.07	--	0.02	--	0.06
Nitrogen, Nitrate (NO3) as NO3	Number of Samples	3	1	2	1	7
	Average	0.65	0.43	1.33	0.39	0.78
	Maximum	0.95	0.43	1.67	0.39	1.67
	Minimum	0.51	0.43	0.98	0.39	0.39
	Stanard Deviation	0.26	--	0.49	--	0.46
Nitrogen, Nitrite (NO2) as NO2	Number of Samples	3	1	2	1	7
	Average	0.01	0.01	0.02	0.01	0.01
	Maximum	0.02	0.01	0.02	0.01	0.02
	Minimum	0.01	0.01	0.02	0.01	0.01
	Stanard Deviation	0.01	--	0.00	--	0.01
pH	Number of Samples	3	1	2	1	7
	Average	8.2	8.3	8.0	8.0	8.1
	Maximum	8.3	8.3	8.2	8.0	8.3
	Minimum	8.0	8.3	7.9	8.0	7.9
	Stanard Deviation	0.2	--	0.3	--	0.2
Phosphorus as P	Number of Samples	3	1	2	1	7
	Average	0.10	0.06	0.17	0.19	0.13
	Maximum	0.13	0.06	0.21	0.19	0.21
	Minimum	0.08	0.06	0.14	0.19	0.06
	Stanard Deviation	0.03	--	0.05	--	0.06
Phosphorus, orthophosphate as P	Number of Samples	3	1	2	1	7
	Average	0.04	0.00	0.05	0.02	0.03
	Maximum	0.05	0.00	0.06	0.02	0.06
	Minimum	0.03	0.00	0.05	0.02	0.00
	Stanard Deviation	0.01	--	0.01	--	0.02

BEAR R BL CNFL / SUMMIT CK			Fall	Winter	Spring	Summer	Annual
	Solids, Total Suspended (TSS)	Number of Samples	2	1	2	1	6
		Average	51	22	72	74	57
		Maximum	67	22	72	74	74
		Minimum	34	22	72	74	22
		Stanard Deviation	23	--	-	--	23
	Specific conductance	Number of Samples	3	1	2	1	7
		Average	796	681	793	972	804
		Maximum	912	681	832	972	972
		Minimum	691	681	753	972	681
		Stanard Deviation	111	--	56	--	109
	Temperature, water	Number of Samples	3	1	2	1	7
		Average	9.8	5.9	5.4	23.3	9.9
		Maximum	16.5	5.9	7.6	23.3	23.3
		Minimum	4.5	5.9	3.3	23.3	3.3
		Stanard Deviation	6.1	--	3.1	--	7.3
	Total Coliform	Number of Samples	3	1	2	1	7
		Average	967	20	220	130	499
		Maximum	2,000	20	300	130	2,000
		Minimum	200	20	140	130	20
		Stanard Deviation	929	--	113	--	697
	Total Inorganic Nitrogen	Number of Samples	3	1	2	1	7
		Average	0.72	0.47	1.46	0.42	0.86
		Maximum	1.10	0.47	1.83	0.42	1.83
		Minimum	0.53	0.47	1.10	0.42	0.42
		Stanard Deviation	0.32	--	0.51	--	0.52
	Turbidity	Number of Samples	2	1	1	1	5
		Average	19	17	27	50	26
		Maximum	26	17	27	50	50
		Minimum	12	17	27	50	12
		Stanard Deviation	10	--	--	--	15

SPRING CK @ CR 376 (MENDON) XING		Fall	Winter	Spring	Summer	Annual
Dissolved oxygen (DO)	Number of Samples	3	1	2	1	7
	Average	8.4	10.5	8.8	5.8	8.4
	Maximum	9.3	10.5	9.7	5.8	10.5
	Minimum	7.5	10.5	7.8	5.8	5.8
	Stanard Deviation	0.9	--	1.3	--	1.6
Dissolved oxygen saturation	Number of Samples	2	1	2		5
	Average	87	98	83		87
	Maximum	89	98	85		98
	Minimum	84	98	81		81
	Stanard Deviation	4	--	3		7
Fecal Coliform	Number of Samples	3	1	2	1	7
	Average	510	490	130	1,000	469
	Maximum	950	490	180	1,000	1,000
	Minimum	110	490	80	1,000	80
	Stanard Deviation	421	--	71	--	382
Nitrogen, ammonia as N	Number of Samples	3	1	1	1	6
	Average	0.10	0.02	0.48	0.04	0.14
	Maximum	0.19	0.02	0.48	0.04	0.48
	Minimum	0.05	0.02	0.48	0.04	0.02
	Stanard Deviation	0.08	--	--	--	0.18
Nitrogen, Nitrate (NO3) as NO3	Number of Samples	1	1	1	1	4
	Average	2.47	4.35	4.44	2.00	3.32
	Maximum	2.47	4.35	4.44	2.00	4.44
	Minimum	2.47	4.35	4.44	2.00	2.00
	Stanard Deviation	--	--	--	--	1.26
Nitrogen, Nitrite (NO2) as NO2	Number of Samples	3	1	1	1	6
	Average	0.05	0.02	0.07	0.04	0.05
	Maximum	0.09	0.02	0.07	0.04	0.09
	Minimum	0.02	0.02	0.07	0.04	0.02
	Stanard Deviation	0.04	--	--	--	0.03
pH	Number of Samples	3	1	2	1	7
	Average	8.0	8.0	7.7	7.6	7.9
	Maximum	8.1	8.0	7.8	7.6	8.1
	Minimum	7.9	8.0	7.6	7.6	7.6
	Stanard Deviation	0.1	--	0.1	--	0.2
Phosphorus as P	Number of Samples	3	1	2	1	7
	Average	0.64	0.40	0.80	0.34	0.61
	Maximum	0.88	0.40	0.92	0.34	0.92
	Minimum	0.45	0.40	0.68	0.34	0.34
	Stanard Deviation	0.22	--	0.17	--	0.23
Phosphorus, orthophosphate as P	Number of Samples	2	1	2	1	6
	Average	0.40	0.37	0.60	0.25	0.43
	Maximum	0.57	0.37	0.62	0.25	0.62
	Minimum	0.23	0.37	0.58	0.25	0.23
	Stanard Deviation	0.24	--	0.03	--	0.17
Solids, Total Suspended (TSS)	Number of Samples	2	1	2	1	6
	Average	19	7	25	26	20
	Maximum	20	7	31	26	31
	Minimum	18	7	18	26	7
	Stanard Deviation	1	--	9	--	8

SPRING CK @ CR 376 (MENDON) XING			Fall	Winter	Spring	Summer	Annual
	Specific conductance	Number of Samples	3	1	2	1	7
		Average	760	627	970	665	788
		Maximum	908	627	983	665	983
		Minimum	562	627	957	665	562
		Stanard Deviation	178	--	18	--	170
	Temperature, water	Number of Samples	3	1	2	1	7
		Average	9.5	6.1	6.8	18.1	9.5
		Maximum	13.3	6.1	9.4	18.1	18.1
		Minimum	6.8	6.1	4.2	18.1	4.2
		Stanard Deviation	3.4	--	3.7	--	4.8
	Total Coliform	Number of Samples	3	1	2	1	7
		Average	3,467	2,300	1,580	1,900	2,537
		Maximum	5,000	2,300	2,500	1,900	5,000
		Minimum	1,300	2,300	660	1,900	660
		Stanard Deviation	1,930	--	1,301	--	1,529
	Total Inorganic Nitrogen	Number of Samples	3	1	2	1	7
		Average	5.00	4.40	7.15	2.08	5.11
		Maximum	7.21	4.40	7.15	2.08	7.21
		Minimum	2.55	4.40	7.15	2.08	2.08
		Stanard Deviation	2.34	--	0.00	--	2.20
	Turbidity	Number of Samples	3	1	2	1	7
		Average	32	4	20	14	22
		Maximum	81	4	30	14	81
		Minimum	6	4	10	14	4
		Stanard Deviation	42	--	14	--	27

LITTLE BEAR R @ CR376 XING (MENDON RD)		Fall	Winter	Spring	Summer	Annual
Dissolved oxygen (DO)	Number of Samples	3	1	2	1	7
	Average	8.6	9.3	9.3	6.3	8.6
	Maximum	9.7	9.3	10.0	6.3	10.0
	Minimum	7.9	9.3	8.7	6.3	6.3
	Stanard Deviation	0.9	--	0.9	--	1.3
Dissolved oxygen saturation	Number of Samples	2	1	2		5
	Average	91	91	85		89
	Maximum	91	91	88		91
	Minimum	90	91	83		83
	Stanard Deviation	0	--	3		3
Fecal Coliform	Number of Samples	3	1	2	1	7
	Average	393	10	40	700	281
	Maximum	1,000	10	40	700	1,000
	Minimum	80	10	40	700	10
	Stanard Deviation	525	--	-	--	399
Nitrogen, ammonia as N	Number of Samples	3	1	2	1	7
	Average	0.05	0.02	0.05	0.05	0.04
	Maximum	0.08	0.02	0.06	0.05	0.08
	Minimum	0.02	0.02	0.04	0.05	0.02
	Stanard Deviation	0.03	--	0.01	--	0.02
Nitrogen, Nitrate (NO3) as NO3	Number of Samples	3	1	2	1	7
	Average	1.27	0.91	1.20	1.71	1.26
	Maximum	1.46	0.91	1.46	1.71	1.71
	Minimum	1.00	0.91	0.94	1.71	0.91
	Stanard Deviation	0.24	--	0.37	--	0.31
Nitrogen, Nitrite (NO2) as NO2	Number of Samples	3	1	2	1	7
	Average	0.01	0.01	0.01	0.02	0.01
	Maximum	0.02	0.01	0.01	0.02	0.02
	Minimum	0.01	0.01	0.01	0.02	0.01
	Stanard Deviation	0.01	--	0.00	--	0.01
pH	Number of Samples	3	1	2	1	7
	Average	8.1	8.2	8.0	7.7	8.0
	Maximum	8.2	8.2	8.0	7.7	8.2
	Minimum	8.0	8.2	7.9	7.7	7.7
	Stanard Deviation	0.1	--	0.0	--	0.2
Phosphorus as P	Number of Samples	3	1	2	1	7
	Average	0.09	0.04	0.35	0.14	0.16
	Maximum	0.13	0.04	0.62	0.14	0.62
	Minimum	0.05	0.04	0.09	0.14	0.04
	Stanard Deviation	0.04	--	0.37	--	0.20
Phosphorus, orthophosphate as P	Number of Samples	3	1	2	1	7
	Average	0.05	0.01	0.32	0.06	0.12
	Maximum	0.08	0.01	0.62	0.06	0.62
	Minimum	0.03	0.01	0.02	0.06	0.01
	Stanard Deviation	0.02	--	0.42	--	0.22
Solids, Total Suspended (TSS)	Number of Samples	2	1	2	1	6
	Average	19	9	23	32	21
	Maximum	21	9	32	32	32
	Minimum	17	9	14	32	9
	Stanard Deviation	3	--	13	--	9

LITTLE BEAR R @ CR376 XING (MENDON RD)			Fall	Winter	Spring	Summer	Annual
	Specific conductance	Number of Samples	3	1	2	1	7
		Average	639	490	508	691	588
		Maximum	752	490	535	691	752
		Minimum	571	490	481	691	481
		Stanard Deviation	98	--	38	--	101
	Temperature, water	Number of Samples	3	1	2	1	7
		Average	9.8	7.1	5.4	17.2	9.2
		Maximum	13.7	7.1	7.7	17.2	17.2
		Minimum	5.9	7.1	3.0	17.2	3.0
		Stanard Deviation	3.9	--	3.3	--	4.8
	Total Coliform	Number of Samples	3	1	2	1	7
		Average	857	80	185	3,000	860
		Maximum	2,000	80	290	3,000	3,000
		Minimum	170	80	80	3,000	80
		Stanard Deviation	997	--	148	--	1,163
	Total Inorganic Nitrogen	Number of Samples	3	1	2	1	7
		Average	1.33	0.95	1.26	1.78	1.32
		Maximum	1.51	0.95	1.53	1.78	1.78
		Minimum	1.03	0.95	0.99	1.78	0.95
		Stanard Deviation	0.26	--	0.38	--	0.33
	Turbidity	Number of Samples	3	1	2	1	7
		Average	37	3	16	16	23
		Maximum	102	3	16	16	102
		Minimum	3	3	16	16	3
		Stanard Deviation	56	--	0	--	35

LOGAN R AB CNFL / LITTLE BEAR R AT CR376 XING		Fall	Winter	Spring	Summer	Annual
Dissolved oxygen (DO)	Number of Samples	3	1	2	1	7
	Average	9.5	10.5	9.6	8.2	9.5
	Maximum	10.3	10.5	10.0	8.2	10.5
	Minimum	8.8	10.5	9.2	8.2	8.2
	Stanard Deviation	0.8	--	0.6	--	0.8
Dissolved oxygen saturation	Number of Samples	2	1	2		5
	Average	95	95	88		92
	Maximum	97	95	93		97
	Minimum	93	95	82		82
	Stanard Deviation	3	--	8		6
Fecal Coliform	Number of Samples	3	1	2	1	7
	Average	53	20	45	50	46
	Maximum	110	20	60	50	110
	Minimum	10	20	30	50	10
	Stanard Deviation	51	--	21	--	33
Nitrogen, ammonia as N	Number of Samples	3	1	2	1	7
	Average	0.03	0.02	0.04	0.02	0.03
	Maximum	0.05	0.02	0.06	0.02	0.06
	Minimum	0.01	0.02	0.02	0.02	0.01
	Stanard Deviation	0.02	--	0.03	--	0.02
Nitrogen, Nitrate (NO3) as NO3	Number of Samples	3	1	2	1	7
	Average	0.33	0.30	0.41	0.38	0.35
	Maximum	0.36	0.30	0.43	0.38	0.43
	Minimum	0.30	0.30	0.39	0.38	0.30
	Stanard Deviation	0.03	--	0.03	--	0.05
Nitrogen, Nitrite (NO2) as NO2	Number of Samples	3	1	2	1	7
	Average	0.00	0.00	0.00	0.00	0.00
	Maximum	0.00	0.00	0.00	0.00	0.00
	Minimum	0.00	0.00	0.00	0.00	0.00
	Stanard Deviation	0.00	--	-	--	0.00
pH	Number of Samples	3	1	2	1	7
	Average	8.2	7.8	7.7	7.9	8.0
	Maximum	8.3	7.8	8.0	7.9	8.3
	Minimum	8.1	7.8	7.5	7.9	7.5
	Stanard Deviation	0.1	--	0.4	--	0.3
Phosphorus as P	Number of Samples	3	1	2	1	7
	Average	0.03	0.02	0.02	0.03	0.03
	Maximum	0.05	0.02	0.04	0.03	0.05
	Minimum	0.02	0.02	0.01	0.03	0.01
	Stanard Deviation	0.02	--	0.02	--	0.01
Phosphorus, orthophosphate as P	Number of Samples	3	1	2	1	7
	Average	0.02	0.00	0.01	0.01	0.01
	Maximum	0.05	0.00	0.01	0.01	0.05
	Minimum	0.01	0.00	0.01	0.01	0.00
	Stanard Deviation	0.02	--	0.00	--	0.02
Solids, Total Suspended (TSS)	Number of Samples	2	1	2	1	6
	Average	6	6	10	6	7
	Maximum	6	6	15	6	15
	Minimum	5	6	5	6	5
	Stanard Deviation	1	--	7	--	4

LOGAN R AB CNFL / LITTLE BEAR R AT CR376 XING			Fall	Winter	Spring	Summer	Annual
	Specific conductance	Number of Samples	3	1	2	1	7
		Average	447	404	432	463	439
		Maximum	478	404	437	463	478
		Minimum	415	404	427	463	404
		Stanard Deviation	32	--	7	--	26
	Temperature, water	Number of Samples	3	1	2	1	7
		Average	7.9	5.0	5.2	13.3	7.5
		Maximum	10.7	5.0	7.1	13.3	13.3
		Minimum	6.0	5.0	3.3	13.3	3.3
		Stanard Deviation	2.5	--	2.7	--	3.4
	Total Coliform	Number of Samples	3	1	2	1	7
		Average	450	110	160	190	281
		Maximum	800	110	200	190	800
		Minimum	180	110	120	190	110
		Stanard Deviation	318	--	57	--	244
	Total Inorganic Nitrogen	Number of Samples	3	1	2	1	7
		Average	0.36	0.33	0.45	0.41	0.39
		Maximum	0.39	0.33	0.49	0.41	0.49
		Minimum	0.33	0.33	0.41	0.41	0.33
		Stanard Deviation	0.03	--	0.06	--	0.06
	Turbidity	Number of Samples	3	1	2	1	7
		Average	14	2	5	2	8
		Maximum	40	2	5	2	40
		Minimum	1	2	5	2	1
		Stanard Deviation	22	--	0	--	14

CUTLER RES BENSION MARINA BRIDGE 04		Fall	Winter	Spring	Summer	Annual
Dissolved oxygen (DO)	Number of Samples	3	1	2	1	7
	Average	8.6	10.2	9.8	10.0	9.4
	Maximum	10.6	10.2	10.3	10.0	10.6
	Minimum	7.4	10.2	9.3	10.0	7.4
	Stanard Deviation	1.7	--	0.7	--	1.2
Dissolved oxygen saturation	Number of Samples	2	1	2		5
	Average	83	100	95		91
	Maximum	92	100	109		109
	Minimum	74	100	81		74
	Stanard Deviation	13	--	20		14
Fecal Coliform	Number of Samples	2		1		3
	Average	145		300		197
	Maximum	190		300		300
	Minimum	100		300		100
	Stanard Deviation	64		--		100
Nitrogen, ammonia as N	Number of Samples	3	1	2	1	7
	Average	0.14	0.03	0.27	0.01	0.14
	Maximum	0.22	0.03	0.30	0.01	0.30
	Minimum	0.05	0.03	0.25	0.01	0.01
	Stanard Deviation	0.09	--	0.04	--	0.12
Nitrogen, Nitrate (NO3) as NO3	Number of Samples	3	1	2	1	7
	Average	0.71	0.56	0.71	0.00	0.59
	Maximum	1.19	0.56	1.03	0.00	1.19
	Minimum	0.40	0.56	0.39	0.00	0.00
	Stanard Deviation	0.42	--	0.45	--	0.40
Nitrogen, Nitrite (NO2) as NO2	Number of Samples	3	1	2	1	7
	Average	0.03	0.01	0.04	0.01	0.03
	Maximum	0.04	0.01	0.07	0.01	0.07
	Minimum	0.01	0.01	0.01	0.01	0.01
	Stanard Deviation	0.02	--	0.04	--	0.02
pH	Number of Samples	3	1	2	1	7
	Average	8.3	8.4	8.2	8.4	8.3
	Maximum	8.4	8.4	8.4	8.4	8.4
	Minimum	8.0	8.4	8.0	8.4	8.0
	Stanard Deviation	0.2	--	0.2	--	0.2
Phosphorus as P	Number of Samples	3	1	2	1	7
	Average	0.24	0.15	0.27	0.19	0.23
	Maximum	0.28	0.15	0.30	0.19	0.30
	Minimum	0.17	0.15	0.23	0.19	0.15
	Stanard Deviation	0.06	--	0.04	--	0.06
Phosphorus, orthophosphate as P	Number of Samples	3	1	2	1	7
	Average	0.14	0.09	0.17	0.07	0.13
	Maximum	0.18	0.09	0.19	0.07	0.19
	Minimum	0.09	0.09	0.16	0.07	0.07
	Stanard Deviation	0.05	--	0.02	--	0.05
Solids, Total Suspended (TSS)	Number of Samples	2	1	2	1	6
	Average	54	23	32	17	35
	Maximum	80	23	42	17	80
	Minimum	27	23	21	17	17
	Stanard Deviation	37	--	15	--	24

CUTLER RES BENSION MARINA BRIDGE 04			Fall	Winter	Spring	Summer	Annual
	Specific conductance	Number of Samples	3	1	2	1	7
		Average	534	457	560	543	532
		Maximum	579	457	570	543	579
		Minimum	510	457	550	543	457
		Stanard Deviation	39	--	14	--	42
	Temperature, water	Number of Samples	3	1	2	1	7
		Average	10.9	7.2	7.2	27.5	11.7
		Maximum	18.4	7.2	9.7	27.5	27.5
		Minimum	5.2	7.2	4.7	27.5	4.7
		Stanard Deviation	6.8	--	3.6	--	8.3
	Total Coliform	Number of Samples	2	1	2		5
		Average	240	20	855		442
		Maximum	400	20	1,500		1,500
		Minimum	80	20	210		20
		Stanard Deviation	226	--	912		609
	Total Inorganic Nitrogen	Number of Samples	3	1	2	1	7
		Average	0.88	0.60	1.02	0.03	0.76
		Maximum	1.46	0.60	1.40	0.03	1.46
		Minimum	0.56	0.60	0.65	0.03	0.03
		Stanard Deviation	0.50	--	0.53	--	0.50
	Turbidity	Number of Samples	2	1	2	1	6
		Average	12	14	38	11	21
		Maximum	16	14	50	11	50
		Minimum	8	14	26	11	8
		Stanard Deviation	6	--	17	--	16

Monitoring Period 2000-2003						
BEAR R BL CUTLER RES AT UP L BRIDGE		**Fall**	**Winter**	**Spring**	**Summer**	**Annual**
Dissolved oxygen (DO)	Number of Samples	2	4	1	1	8
	Average	8.5	11.7	7.0	7.1	9.8
	Maximum	9.2	13.0	7.0	7.1	13.0
	Minimum	7.9	10.0	7.0	7.1	7.0
	Stanard Deviation	1.0	1.3	--	--	2.4
Dissolved oxygen saturation	Number of Samples	2	3	1	1	7
	Average	106	102	95	100	102
	Maximum	111	114	95	100	114
	Minimum	101	93	95	100	93
	Stanard Deviation	7	11	--	--	8
Fecal Coliform	Number of Samples	1	2		1	4
	Average	1	1		30	8
	Maximum	1	1		30	30
	Minimum	1	1		30	1
	Stanard Deviation	--	-		--	15
Nitrogen, ammonia as N	Number of Samples	2	4	1	1	8
	Average	0.05	0.27	0.07	0.06	0.16
	Maximum	0.06	0.57	0.07	0.06	0.57
	Minimum	0.03	0.04	0.07	0.06	0.03
	Stanard Deviation	0.02	0.22	--	--	0.19
Nitrogen, Nitrate (NO3) as NO3	Number of Samples	2	4	1	1	8
	Average	0.07	1.00	0.13	0.08	0.54
	Maximum	0.08	1.12	0.13	0.08	1.12
	Minimum	0.05	0.70	0.13	0.08	0.05
	Stanard Deviation	0.02	0.21	--	--	0.51
Nitrogen, Nitrite (NO2) as NO2	Number of Samples	2	4	1	1	8
	Average	0.00	0.05	0.01	0.00	0.03
	Maximum	0.00	0.12	0.01	0.00	0.12
	Minimum	0.00	0.02	0.01	0.00	0.00
	Stanard Deviation	0.00	0.05	--	--	0.04
pH	Number of Samples	2	4	1	1	8
	Average	7.9	8.1	8.1	7.9	8.0
	Maximum	8.1	8.4	8.1	7.9	8.4
	Minimum	7.7	7.8	8.1	7.9	7.7
	Stanard Deviation	0.3	0.3	--	--	0.3
Phosphorus as P	Number of Samples	2	4	1	1	8
	Average	0.06	0.15	0.08	0.12	0.11
	Maximum	0.07	0.18	0.08	0.12	0.18
	Minimum	0.06	0.12	0.08	0.12	0.06
	Stanard Deviation	0.01	0.02	--	--	0.04
Phosphorus, orthophosphate as P	Number of Samples	2	4	1	1	8
	Average	0.02	0.12	0.02	0.04	0.07
	Maximum	0.02	0.15	0.02	0.04	0.15
	Minimum	0.02	0.08	0.02	0.04	0.02
	Stanard Deviation	0.00	0.03	--	--	0.05
Solids, Total Suspended (TSS)	Number of Samples	2	4	1	1	8
	Average	22	8	36	38	19
	Maximum	30	18	36	38	38
	Minimum	15	2	36	38	2
	Stanard Deviation	11	7	--	--	14

BEAR R BL CUTLER RES AT UP L BRIDGE			Fall	Winter	Spring	Summer	Annual
	Specific conductance	Number of Samples	1	4	1	1	7
		Average	1,740	1,031	1,770	1,720	1,336
		Maximum	1,740	1,288	1,770	1,720	1,770
		Minimum	1,740	889	1,770	1,720	889
		Stanard Deviation	--	176	--	--	401
	Temperature, water	Number of Samples	2	4	1	1	8
		Average	19.5	2.2	20.8	22.0	11.3
		Maximum	19.8	4.7	20.8	22.0	22.0
		Minimum	19.3	1.2	20.8	22.0	1.2
		Stanard Deviation	0.4	1.7	--	--	9.9
	Total Coliform	Number of Samples	2	4	1	1	8
		Average	305	78	550	500	246
		Maximum	330	200	550	500	550
		Minimum	280	20	550	500	20
		Stanard Deviation	35	83	--	--	207
	Total Inorganic Nitrogen	Number of Samples	2	4	1	1	8
		Average	0.12	1.32	0.20	0.14	0.73
		Maximum	0.12	1.72	0.20	0.14	1.72
		Minimum	0.12	0.78	0.20	0.14	0.12
		Stanard Deviation	0.00	0.40	--	--	0.68
	Turbidity	Number of Samples	1	2		1	4
		Average	9	6		26	12
		Maximum	9	11		26	26
		Minimum	9	1		26	1
		Stanard Deviation	--	7		--	10

BEAR R BL CNFL / SUMMIT CK		Fall	Winter	Spring	Summer	Annual
Depth	Number of Samples	1				1
	Average	1				1
	Maximum	1				1
	Minimum	1				1
	Stanard Deviation	--				--
Dissolved oxygen (DO)	Number of Samples	2	4	1	1	8
	Average	8.5	11.7	7.0	7.1	9.8
	Maximum	9.2	13.0	7.0	7.1	13.0
	Minimum	7.9	10.0	7.0	7.1	7.0
	Stanard Deviation	1.0	1.3	--	--	2.4
Dissolved oxygen saturation	Number of Samples	2	3	1	1	7
	Average	106	102	95	100	102
	Maximum	111	114	95	100	114
	Minimum	101	93	95	100	93
	Stanard Deviation	7	11	--	--	8
Fecal Coliform	Number of Samples	1	2		1	4
	Average	10	1		100	28
	Maximum	10	1		100	100
	Minimum	10	1		100	1
	Stanard Deviation	--	-		--	48
Nitrogen, ammonia as N	Number of Samples	2	4	1	1	8
	Average	0.05	0.17	0.02	0.15	0.12
	Maximum	0.08	0.28	0.02	0.15	0.28
	Minimum	0.02	0.06	0.02	0.15	0.02
	Stanard Deviation	0.05	0.11	--	--	0.10
Nitrogen, Nitrate (NO3) as NO3	Number of Samples	2	4	1	1	8
	Average	0.13	1.08	0.18	0.18	0.62
	Maximum	0.15	1.39	0.18	0.18	1.39
	Minimum	0.11	0.63	0.18	0.18	0.11
	Stanard Deviation	0.03	0.33	--	--	0.54
Nitrogen, Nitrite (NO2) as NO2	Number of Samples	2	4	1	1	8
	Average	0.00	0.02	0.01	0.03	0.01
	Maximum	0.00	0.02	0.01	0.03	0.03
	Minimum	0.00	0.01	0.01	0.03	0.00
	Stanard Deviation	0.00	0.00	--	--	0.01
pH	Number of Samples	2	4	1	1	8
	Average	7.9	8.1	8.1	7.9	8.0
	Maximum	8.1	8.4	8.1	7.9	8.4
	Minimum	7.7	7.8	8.1	7.9	7.7
	Stanard Deviation	0.3	0.3	--	--	0.3
Phosphorus as P	Number of Samples	2	4	1	1	8
	Average	0.04	0.06	0.09	0.19	0.08
	Maximum	0.04	0.09	0.09	0.19	0.19
	Minimum	0.04	0.04	0.09	0.19	0.04
	Stanard Deviation	0.01	0.02	--	--	0.05
Phosphorus, orthophosphate as P	Number of Samples	2	4	1	1	8
	Average	0.01	0.03	0.02	0.03	0.02
	Maximum	0.01	0.05	0.02	0.03	0.05
	Minimum	0.00	0.01	0.02	0.03	0.00
	Stanard Deviation	0.00	0.02	--	--	0.02

BEAR R BL CNFL / SUMMIT CK			Fall	Winter	Spring	Summer	Annual
	Solids, Total Suspended (TSS)	Number of Samples	2	4	1	1	8
		Average	23	13	75	175	43
		Maximum	33	19	75	175	175
		Minimum	14	4	75	175	4
		Stanard Deviation	14	7	--	--	57
	Specific conductance	Number of Samples	1	4	1	1	7
		Average	1,740	1,031	1,770	1,720	1,336
		Maximum	1,740	1,288	1,770	1,720	1,770
		Minimum	1,740	889	1,770	1,720	889
		Stanard Deviation	--	176	--	--	401
	Temperature, water	Number of Samples	2	4	1	1	8
		Average	17.9	1.0	17.8	20.9	9.8
		Maximum	18.6	2.0	17.8	20.9	20.9
		Minimum	17.2	-	17.8	20.9	-
		Stanard Deviation	1.0	0.8	--	--	9.5
	Total Coliform	Number of Samples	2	4	1	1	8
		Average	417	78	100	420	208
		Maximum	470	180	100	420	470
		Minimum	364	10	100	420	10
		Stanard Deviation	75	76	--	--	183
	Total Inorganic Nitrogen	Number of Samples	2	4	1	1	8
		Average	0.19	1.27	0.22	0.36	0.75
		Maximum	0.19	1.66	0.22	0.36	1.66
		Minimum	0.19	0.71	0.22	0.36	0.19
		Stanard Deviation	0.00	0.44	--	--	0.62
	Turbidity	Number of Samples	1	2		1	4
		Average	9	6		26	12
		Maximum	9	11		26	26
		Minimum	9	1		26	1
		Stanard Deviation	--	7		--	10

SPRING CK @ CR 376 (MENDON) XING		Fall	Winter	Spring	Summer	Annual
Dissolved oxygen (DO)	Number of Samples	2	4	1	1	8
	Average	8.4	10.5	7.4	7.4	9.2
	Maximum	10.3	11.5	7.4	7.4	11.5
	Minimum	6.6	9.4	7.4	7.4	6.6
	Stanard Deviation	2.6	0.9	--	--	1.8
Dissolved oxygen saturation	Number of Samples	2	3	1	1	7
	Average	96	91	86	89	91
	Maximum	117	94	86	89	117
	Minimum	75	87	86	89	75
	Stanard Deviation	29	3	--	--	13
Fecal Coliform	Number of Samples	1	2		1	4
	Average	130	260		340	248
	Maximum	130	520		340	520
	Minimum	130	1		340	1
	Stanard Deviation	--	367		--	229
Nitrogen, ammonia as N	Number of Samples	2	2	1	1	6
	Average	0.40	0.66	0.29	0.13	0.42
	Maximum	0.77	1.02	0.29	0.13	1.02
	Minimum	0.03	0.29	0.29	0.13	0.03
	Stanard Deviation	0.52	0.51	--	--	0.39
Nitrogen, Nitrate (NO3) as NO3	Number of Samples		2	1	1	4
	Average		2.01	2.69	1.31	2.00
	Maximum		2.41	2.69	1.31	2.69
	Minimum		1.61	2.69	1.31	1.31
	Stanard Deviation		0.57	--	--	0.65
Nitrogen, Nitrite (NO2) as NO2	Number of Samples	2	3	1	1	7
	Average	0.04	0.11	0.13	0.04	0.08
	Maximum	0.04	0.17	0.13	0.04	0.17
	Minimum	0.04	0.02	0.13	0.04	0.02
	Stanard Deviation	0.00	0.08	--	--	0.06
pH	Number of Samples	2	4	1	1	8
	Average	7.6	8.0	7.8	7.8	7.9
	Maximum	7.7	8.1	7.8	7.8	8.1
	Minimum	7.6	7.8	7.8	7.8	7.6
	Stanard Deviation	0.0	0.1	--	--	0.2
Phosphorus as P	Number of Samples	2	4	1	1	8
	Average	1.24	1.01	0.67	0.38	0.94
	Maximum	1.48	1.71	0.67	0.38	1.71
	Minimum	0.99	0.28	0.67	0.38	0.28
	Stanard Deviation	0.34	0.63	--	--	0.52
Phosphorus, orthophosphate as P	Number of Samples		2	1	1	4
	Average		0.43	0.57	0.31	0.43
	Maximum		0.64	0.57	0.31	0.64
	Minimum		0.22	0.57	0.31	0.22
	Stanard Deviation		0.30	--	--	0.20
Solids, Total Suspended (TSS)	Number of Samples	2	4	1	1	8
	Average	27	20	71	32	30
	Maximum	32	30	71	32	71
	Minimum	22	11	71	32	11
	Stanard Deviation	7	9	--	--	19

SPRING CK @ CR 376 (MENDON) XING			Fall	Winter	Spring	Summer	Annual
	Specific conductance	Number of Samples	2	4	1	1	8
		Average	761	789	697	639	751
		Maximum	762	868	697	639	868
		Minimum	759	702	697	639	639
		Stanard Deviation	2	75	--	--	74
	Temperature, water	Number of Samples	2	4	1	1	8
		Average	14.4	3.9	15.7	18.2	9.8
		Maximum	15.0	5.5	15.7	18.2	18.2
		Minimum	13.7	3.1	15.7	18.2	3.1
		Stanard Deviation	0.9	1.1	--	--	6.4
	Total Coliform	Number of Samples	2	4	1	1	8
		Average	1,550	1,370	1,180	460	1,278
		Maximum	2,730	3,800	1,180	460	3,800
		Minimum	370	300	1,180	460	300
		Stanard Deviation	1,669	1,650	--	--	1,299
	Total Inorganic Nitrogen	Number of Samples	1	2	1	1	5
		Average	6.31	3.16	3.11	1.48	3.44
		Maximum	6.31	4.40	3.11	1.48	6.31
		Minimum	6.31	1.92	3.11	1.48	1.48
		Stanard Deviation	--	1.76	--	--	1.96
	Turbidity	Number of Samples	1	2		1	4
		Average	8	5		17	9
		Maximum	8	6		17	17
		Minimum	8	5		17	5
		Stanard Deviation	--	1		--	6

LITTLE BEAR R @ CR376 XING (MENDON RD)		Fall	Winter	Spring	Summer	Annual
Dissolved oxygen (DO)	Number of Samples	2	4	1	1	8
	Average	8.2	11.9	7.7	6.5	9.8
	Maximum	10.4	13.4	7.7	6.5	13.4
	Minimum	6.0	10.4	7.7	6.5	6.0
	Stanard Deviation	3.1	1.3	--	--	2.8
Dissolved oxygen saturation	Number of Samples	2	3	1	1	7
	Average	95	92	94	86	92
	Maximum	120	106	94	86	120
	Minimum	70	81	94	86	70
	Stanard Deviation	35	13	--	--	16
Fecal Coliform	Number of Samples	1	2		1	4
	Average	240	75		620	253
	Maximum	240	150		620	620
	Minimum	240	1		620	1
	Stanard Deviation	--	106		--	264
Nitrogen, ammonia as N	Number of Samples	2	4	1	1	8
	Average	0.04	0.06	0.10	0.07	0.06
	Maximum	0.05	0.09	0.10	0.07	0.10
	Minimum	0.03	0.04	0.10	0.07	0.03
	Stanard Deviation	0.01	0.02	--	--	0.02
Nitrogen, Nitrate (NO3) as NO3	Number of Samples	2	4	1	1	8
	Average	0.66	0.87	0.65	0.28	0.71
	Maximum	0.78	1.16	0.65	0.28	1.16
	Minimum	0.55	0.65	0.65	0.28	0.28
	Stanard Deviation	0.17	0.21	--	--	0.26
Nitrogen, Nitrite (NO2) as NO2	Number of Samples	2	4	1	1	8
	Average	0.01	0.01	0.01	0.02	0.01
	Maximum	0.01	0.01	0.01	0.02	0.02
	Minimum	0.01	0.01	0.01	0.02	0.01
	Stanard Deviation	0.00	0.00	--	--	0.00
pH	Number of Samples	2	4	1	1	8
	Average	7.9	8.1	8.0	7.8	8.0
	Maximum	7.9	8.3	8.0	7.8	8.3
	Minimum	7.8	8.0	8.0	7.8	7.8
	Stanard Deviation	0.1	0.1	--	--	0.2
Phosphorus as P	Number of Samples	2	4	1	1	8
	Average	0.08	0.08	0.11	0.13	0.09
	Maximum	0.09	0.14	0.11	0.13	0.14
	Minimum	0.07	0.04	0.11	0.13	0.04
	Stanard Deviation	0.02	0.05	--	--	0.04
Phosphorus, orthophosphate as P	Number of Samples	2	4	1	1	8
	Average	0.04	0.06	0.06	0.05	0.06
	Maximum	0.05	0.14	0.06	0.05	0.14
	Minimum	0.03	0.03	0.06	0.05	0.03
	Stanard Deviation	0.01	0.06	--	--	0.04
Solids, Total Suspended (TSS)	Number of Samples	2	4	1	1	8
	Average	38	10	31	54	25
	Maximum	41	17	31	54	54
	Minimum	34	5	31	54	5
	Stanard Deviation	5	6	--	--	18

LITTLE BEAR R @ CR376 XING (MENDON RD)			Fall	Winter	Spring	Summer	Annual
	Specific conductance	Number of Samples	2	4	1	1	8
		Average	667	594	651	685	631
		Maximum	690	656	651	685	690
		Minimum	643	546	651	685	546
		Stanard Deviation	33	53	--	--	55
	Temperature, water	Number of Samples	2	4	1	1	8
		Average	15.1	2.6	15.9	20.2	9.6
		Maximum	15.5	4.5	15.9	20.2	20.2
		Minimum	14.8	1.7	15.9	20.2	1.7
		Stanard Deviation	0.5	1.3	--	--	7.7
	Total Coliform	Number of Samples	2	4	1	1	8
		Average	792	85	460	1,200	448
		Maximum	1,273	160	460	1,200	1,273
		Minimum	310	10	460	1,200	10
		Stanard Deviation	681	65	--	--	508
	Total Inorganic Nitrogen	Number of Samples	2	4	1	1	8
		Average	0.72	0.94	0.76	0.36	0.79
		Maximum	0.84	1.23	0.76	0.36	1.23
		Minimum	0.59	0.73	0.76	0.36	0.36
		Stanard Deviation	0.18	0.21	--	--	0.25
	Turbidity	Number of Samples	1	2		1	4
		Average	15	8		26	14
		Maximum	15	9		26	26
		Minimum	15	6		26	6
		Stanard Deviation	--	2		--	9

LOGAN R AB CNFL / LITTLE BEAR R AT CR376 XING		Fall	Winter	Spring	Summer	Annual
Dissolved oxygen (DO)	Number of Samples	2	4	1	1	8
	Average	9.6	12.3	8.9	9.8	10.9
	Maximum	11.1	13.3	8.9	9.8	13.3
	Minimum	8.1	11.4	8.9	9.8	8.1
	Stanard Deviation	2.1	0.8	--	--	1.8
Dissolved oxygen saturation	Number of Samples	2	3	1	1	7
	Average	109	97	96	106	102
	Maximum	125	104	96	106	125
	Minimum	93	88	96	106	88
	Stanard Deviation	22	8	--	--	12
Fecal Coliform	Number of Samples	1	2		1	4
	Average	150	10		60	58
	Maximum	150	20		60	150
	Minimum	150	1		60	1
	Stanard Deviation	--	14		--	66
Nitrogen, ammonia as N	Number of Samples	2	4	1	1	8
	Average	0.03	0.04	0.02	0.06	0.04
	Maximum	0.03	0.05	0.02	0.06	0.06
	Minimum	0.03	0.03	0.02	0.06	0.02
	Stanard Deviation	0.00	0.01	--	--	0.01
Nitrogen, Nitrate (NO3) as NO3	Number of Samples	2	4	1	1	8
	Average	0.29	0.25	0.21	0.18	0.25
	Maximum	0.34	0.27	0.21	0.18	0.34
	Minimum	0.25	0.23	0.21	0.18	0.18
	Stanard Deviation	0.06	0.02	--	--	0.05
Nitrogen, Nitrite (NO2) as NO2	Number of Samples	2	4	1	1	8
	Average	0.01	0.00	0.00	0.00	0.00
	Maximum	0.01	0.00	0.00	0.00	0.01
	Minimum	0.00	0.00	0.00	0.00	0.00
	Stanard Deviation	0.00	0.00	--	--	0.00
pH	Number of Samples	2	4	1	1	8
	Average	7.8	8.2	8.1	8.1	8.1
	Maximum	8.0	8.3	8.1	8.1	8.3
	Minimum	7.6	8.1	8.1	8.1	7.6
	Stanard Deviation	0.2	0.1	--	--	0.2
Phosphorus as P	Number of Samples	2	4	1	1	8
	Average	0.02	0.01	0.02	0.01	0.01
	Maximum	0.03	0.01	0.02	0.01	0.03
	Minimum	0.01	0.00	0.02	0.01	0.00
	Stanard Deviation	0.01	0.00	--	--	0.01
Phosphorus, orthophosphate as P	Number of Samples	2	4	1	1	8
	Average	0.01	0.00	0.01	0.01	0.01
	Maximum	0.01	0.01	0.01	0.01	0.01
	Minimum	0.01	0.00	0.01	0.01	0.00
	Stanard Deviation	0.00	0.00	--	--	0.00
Solids, Total Suspended (TSS)	Number of Samples	2	4	1	1	8
	Average	10	2	10	6	6
	Maximum	13	5	10	6	13
	Minimum	8	1	10	6	1
	Stanard Deviation	4	2	--	--	5

LOGAN R AB CNFL / LITTLE BEAR R AT CR376 XING			Fall	Winter	Spring	Summer	Annual
	Specific conductance	Number of Samples	2	4	1	1	8
		Average	514	426	341	348	428
		Maximum	524	435	341	348	524
		Minimum	504	420	341	348	341
		Stanard Deviation	14	6	--	--	64
	Temperature, water	Number of Samples	2	4	1	1	8
		Average	14.1	2.7	10.8	11.9	7.7
		Maximum	14.5	3.7	10.8	11.9	14.5
		Minimum	13.6	1.8	10.8	11.9	1.8
		Stanard Deviation	0.7	0.9	--	--	5.5
	Total Coliform	Number of Samples	2	4	1	1	8
		Average	927	98	785	230	407
		Maximum	1,364	220	785	230	1,364
		Minimum	490	30	785	230	30
		Stanard Deviation	618	85	--	--	463
	Total Inorganic Nitrogen	Number of Samples	2	4	1	1	8
		Average	0.33	0.29	0.24	0.24	0.29
		Maximum	0.38	0.31	0.24	0.24	0.38
		Minimum	0.28	0.27	0.24	0.24	0.24
		Stanard Deviation	0.07	0.02	--	--	0.04
	Turbidity	Number of Samples	1	2		1	4
		Average	2	3		2	2
		Maximum	2	5		2	5
		Minimum	2	1		2	1
		Stanard Deviation	--	2		--	1

CUTLER RES BENSION MARINA BRIDGE 04		Fall	Winter	Spring	Summer	Annual
Dissolved oxygen (DO)	Number of Samples	2	4	1	1	8
	Average	11.7	11.1	8.3	6.8	10.4
	Maximum	14.9	12.6	8.3	6.8	14.9
	Minimum	8.6	8.9	8.3	6.8	6.8
	Stanard Deviation	4.5	1.7	--	--	2.7
Dissolved oxygen saturation	Number of Samples	2	3	1	1	7
	Average	139	95	100	89	108
	Maximum	169	104	100	89	169
	Minimum	110	88	100	89	88
	Stanard Deviation	41	8	--	--	28
Fecal Coliform	Number of Samples	1	2		1	4
	Average	1	1		30	8
	Maximum	1	1		30	30
	Minimum	1	1		30	1
	Stanard Deviation	--	-		--	15
Nitrogen, ammonia as N	Number of Samples	2	3	1	1	7
	Average	0.07	0.55	0.25	0.02	0.30
	Maximum	0.11	1.11	0.25	0.02	1.11
	Minimum	0.03	0.06	0.25	0.02	0.02
	Stanard Deviation	0.06	0.52	--	--	0.39
Nitrogen, Nitrate (NO3) as NO3	Number of Samples	2	4	1	1	8
	Average	0.03	0.95	0.29	0.01	0.52
	Maximum	0.05	1.61	0.29	0.01	1.61
	Minimum	0.01	0.56	0.29	0.01	0.01
	Stanard Deviation	0.03	0.46	--	--	0.56
Nitrogen, Nitrite (NO2) as NO2	Number of Samples	2	3	1	1	7
	Average	0.01	0.05	0.02	0.00	0.03
	Maximum	0.02	0.09	0.02	0.00	0.09
	Minimum	0.00	0.02	0.02	0.00	0.00
	Stanard Deviation	0.01	0.04	--	--	0.03
pH	Number of Samples	2	4	1	1	8
	Average	8.5	8.1	8.3	8.4	8.2
	Maximum	8.7	8.3	8.3	8.4	8.7
	Minimum	8.2	7.7	8.3	8.4	7.7
	Stanard Deviation	0.3	0.3	--	--	0.3
Phosphorus as P	Number of Samples	2	4	1	1	8
	Average	0.18	0.65	0.20	0.29	0.43
	Maximum	0.18	1.49	0.20	0.29	1.49
	Minimum	0.17	0.29	0.20	0.29	0.17
	Stanard Deviation	0.00	0.57	--	--	0.44
Phosphorus, orthophosphate as P	Number of Samples	2	4	1	1	8
	Average	0.09	0.34	0.12	0.19	0.23
	Maximum	0.10	0.46	0.12	0.19	0.46
	Minimum	0.08	0.24	0.12	0.19	0.08
	Stanard Deviation	0.01	0.09	--	--	0.14
Solids, Total Suspended (TSS)	Number of Samples	2	4	1	1	8
	Average	35	13	45	53	27
	Maximum	38	32	45	53	53
	Minimum	32	2	45	53	2
	Stanard Deviation	5	13	--	--	18

CUTLER RES	BENSION MARINA BRIDGE 04		Fall	Winter	Spring	Summer	Annual
	Specific conductance	Number of Samples	2	4	1	1	8
		Average	593	565	460	466	546
		Maximum	598	650	460	466	650
		Minimum	587	522	460	466	460
		Stanard Deviation	8	58	--	--	65
	Temperature, water	Number of Samples	2	4	1	1	8
		Average	20.7	1.8	21.5	21.2	11.4
		Maximum	21.1	2.7	21.5	21.2	21.5
		Minimum	20.3	0.3	21.5	21.2	0.3
		Stanard Deviation	0.6	1.1	--	--	10.3
	Total Coliform	Number of Samples	2	4	1	1	8
		Average	65	155	110	60	115
		Maximum	90	220	110	60	220
		Minimum	40	80	110	60	40
		Stanard Deviation	35	62	--	--	63
	Total Inorganic Nitrogen	Number of Samples	2	4	1	1	8
		Average	0.11	2.07	0.56	0.04	1.14
		Maximum	0.18	2.79	0.56	0.04	2.79
		Minimum	0.04	0.90	0.56	0.04	0.04
		Stanard Deviation	0.10	0.84	--	--	1.15
	Turbidity	Number of Samples	1	2		1	4
		Average	16	11		35	18
		Maximum	16	19		35	35
		Minimum	16	3		35	3
		Stanard Deviation	--	12		--	13

Attachment 9
CUTLER PROJECT
FERC Order Approving Cultural Resource Management Plan

UNITED STATES OF AMERICA 71 FERC 62,121
FEDERAL ENERGY REGULATORY COMMISSION

PacifiCorp Electric Operations Project No. 2420-010
Utah

ORDER APPROVING CULTURAL RESOURCE MANAGEMENT PLAN
(Issued May 16, 1995)

On April 28, 1995, PacifiCorp Electric Operations, licensee for the Cutler Project, FERC No. 2420, filed a cultural resource management plan (CRMP) pursuant to article 403 of its license.1

Article 403 of the license requires that the licensee consult with the Utah Historic Preservation Officer (SHPO) and develop and implement a CRMP to avoid and mitigate any impacts to the historical integrity of the project dam and powerhouse from maintenance and repair work conducted during project operation.

Background

The Cutler dam and powerhouse were listed on the National Register of Historic Places (Register) in 1989. The facility was constructed between 1924 and 1927 and has been in continuous use since 1927. During the relicensing period, the SHPO stated that the project would not have an effect on the historic integrity of the dam or powerhouse or any other cultural resources in the area.

The CRMP outlines the procedures for protecting the cultural resources eligible for or listed on the Register. The licensee outlined general preservation standards (standards) which establish the overall principles for preservation and evaluation procedures (procedures) which allow the licensee to evaluate impacts of proposed changes. These standards have been adapted from the Secretary of the Interior's "Standards for Historic Preservation Projects" and apply to the interior and exterior of the powerhouse, dam, and other facilities listed on the register. The procedures outline the steps that the licensee will take to make an initial assessment of its planned activities.

The licensee will also develop and install an interpretive sign and plaque for the powerhouse, describing the historical significance of the project within one year of approval of the

CRMP. It will also donate any original equipment to local historical museums for their collections when it is no longer of use to the licensee.

1 67 FERC 62,082 (1994).

Consultation

The licensee consulted with the SHPO. In a letter dated April 5, 1995, the SHPO states that the licensee did a good job in identifying character-defining features and what effects specific work would have on the resources. The SHPO also clarified its role in the Section 106 process as defined in 36 C.F.R. 800.

Discussion and Conclusion

The licensee's procedures for protecting cultural resources at the project are adequate. In addition, article 404 of the license requires additional measures should archeological or historic sites be discovered during project operation.

We agree with SHPO regarding determinations of effect. As the Federal agency, the Commission has the responsibility to make the determination of effect and to request concurrence from the SHPO and, if necessary, the Advisory Council on Historic Preservation. Should the licensee propose any actions that would affect the National Register sites, it must file documentation with the Commission prior to undertaking any actions.

The plan adequately addresses cultural resource protection at the project and should be approved.

The Director orders:

(A) The Cultural Resource Management Plan, filed on April 28, 1995, pursuant to article 403, is approved and made part of the license.

(B) The licensee, within one year from the date of this order, shall install an interpretive sign and plaque describing the historical significance of the project.

(C) This order constitutes final Commission action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance of this order, pursuant to 18 C.F.R. 385.713.

J. Mark Robinson
Director, Division of Project
Compliance and Administration