Cutler Hydroelectric Project

FERC Project No. 2420

Resource Management Plan
Five-Year Monitoring Report
2003-2007

PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

Cutler Hydroelectric Project
FERC Project No. 2420
Box Elder and Cache Counties, Utah

Resource Management Plan
Five-Year Monitoring Report
2003-2007

Prepared for:
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TABLE OF CONTENTS

Page

Cover photo: Cutler Marsh by Roger Banner

LIST OF FIGURES

LIST OF TABLES

.

LIST OF APPENDICES

LIST OF ABBREVIATIONS

COE	United States Army Corps of Engineers
CRP	Conservation Reserve Program
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
GPS	Global Positioning Satellite
HCS	(PacifiCorp's) Hydro Compliance Staff
NGO	Non-Governmental Organization
NRCS	Natural Resources Conservation Service
NTO	(PacifiCorp's) North Temple Office, Salt Lake City, Utah
O&M	Operation and Maintenance
RMP	Resource Management Plan
RR	Railroad
TMDL	Total Maximum Daily Load
UDWR	Utah Division of Wildlife Resources

Executive Summary

This Five-Year Monitoring Report for Cutler Hydro Project No. 2420 was prepared by PacifiCorp to meet Federal Energy Regulatory Commission (FERC) licensing requirements for Cutler Reservoir in Cache and Box Elder Counties, Utah. The project boundaries cover approximately 9,550 acres and surround Cutler Reservoir, as well as the areas of confluence with its major tributaries: the Bear, Little Bear, and Logan rivers; Spring Creek; and Clay Slough.

This report covers the period between 2003 and 2007, inclusive. During this time, implementation of the Cutler Hydro Project Resource Management Plan (RMP) (PacifiCorp 1995) was largely complete, and the project had entered the operations and maintenance (O&M) and monitoring phase as stipulated by Article 402 of the FERC license order. This O&M and monitoring phase will continue for the remainder of the 30-year license period, until 2024.

The report is organized into three main report sections: Section 1) RMP Project Summary To Date, which presents a summary of the original RMP requirements and completed project implementation activities, as well as a summary of the previous five-year report monitoring results; Section 2) Monitoring Results, which summarizes the current report period (2003-2007) RMP monitoring results; and Section 3) Plan and Schedule, which outlines future project monitoring, including proposed plan changes.

RMP Project Summary To Date

Five goals were documented in the PacifiCorp's 1995 RMP:

- Improve water quality
- Improve wildlife habitat
- Improve scenic resources
- Retain and improve traditional agricultural uses
- Improve recreational access to the project area

The following programs were developed to meet these goals, and this report is structured to address each one individually:

- Vegetation Enhancement Program, with the following program sub-components:
    - Shoreline buffer establishment
    - Shrub planting (woody vegetation pockets and buffer shrub plots)
    - Bank stabilization
    - Fencing (buffer/boundary fencing)
    - Erosion control sediment basins
    - Sensitive/unique wildlife habitats

- Agricultural Lease Program, with the following program sub-components:
    - Grazing leases
    - Farming leases
    - Wildlife food/cover leases
    - Cattle management fences
    - Property coordination
- Recreation Site Development Program
- Wetland Mitigation Program
- Fish Habitat Enhancement Program
- Water Quality Monitoring
- Water Level Monitoring

At the time of the 2002 Cutler Five-Year Monitoring Report (PacifiCorp 2002), the implementation phase for the programs listed above was largely complete, although several property negotiations undertaken to resolve boundary issues with adjacent landowners were still incomplete due to pending legal actions. These issues were resolved during the 2003-2007 report period, and related implementation activities undertaken during this time included marking the new property boundary and integrating the resulting new buffer segments into on-going monitoring activities. Also, the completion of the new project boundary line allowed for the drafting of a new Cutler Project Exhibit G, submitted concurrently with this report.

Outstanding implementation activities include development of one primitive recreation site—delayed until 2010 by FERC order, and installation of two new woody vegetation pocket sites to compensate for two failed sites. These are scheduled for completion during the upcoming five-year monitoring period.

Monitoring Results

The RMP required monitoring to gauge the success and stability of the seven programs. A Monitoring Plan was developed (PacifiCorp 2002), and monitoring proved to be a good mechanism for tracking the condition of the RMP components over time. Findings and recommendations are summarized in Table ES-1.

Plan and Schedule

Monitoring during 2008-2012 will follow protocols established in the 2002 Cutler Five-Year Report. Only minor changes are suggested to the monitoring protocols, including adjusting the frequency of wildlife food and cover plot monitoring from semi-annual to annual, and—per agreement with Utah Division of Wildlife Resources—monitoring fish habitat structures only during major reservoir drawdowns. Water quality monitoring will continue to be conducted quarterly every fifth year. Monitoring of the wetland mitigation has been discontinued as this program is now complete.

Table ES-1. Summary of Work Completed To Date and Recommendations for Cutler Hydro Project No. 2420.

RMP Program/ Component	Implementation Required	Implementation Completed	Findings/ Recommendations
Vegetation Enhancement			
Shoreline Buffer	Establish 125 acres of shoreline buffer. Of this, a minimum of 50 acres should be converted from tilled land to permanent grass buffer.	Approximately 1225 acres of buffer covering 45 miles of shoreline have been established, including 610 acres of tilled land converted to permanent grass buffer (necessary to improve water quality). Implementation complete.	Annual monitoring will continue as present on 54 total buffer segments. Nine buffers rated as at-risk and poor have been prioritized for corrective action. Thirty-one of the buffers (57 percent) were rated good or excellent.
Woody Vegetation Pockets	Establish 10-15 pockets 0.5-2.0 acres in size.	Planted 12 pockets at a density of 5000 shrubs/acre. Goal is at least 10 sites established. Implementation complete.	Annual monitoring will continue as present. Seven sites (58%) rated as established or good. Two new sites will be added to compensate for two failed sites.
Bank Stabilization	Stabilize 3.5 miles of shoreline	Stabilized 3.96 miles of shoreline. An additional 1.1 miles stabilized at RR Trail as part of the Recreation program. Implementation complete.	Annual monitoring will continue as present. All bank sites are rated in good condition. GIS database will be updated for banks restabilized during this monitoring period.

Table ES-1. Summary of Work Completed To Date and Recommendations for Cutler Hydro Project No. 2420.

RMP Program/ Component	Implementation Required	Implementation Completed	Findings/ Recommendations
Boundary/Buffer Fence	Construct 6 miles of additional fence to create/protect the boundary or buffer	Constructed 62 miles of fence (necessary to protect project boundary from unauthorized uses). Implementation complete.	Annual monitoring will continue as present. Several segments of fence or posts will need to be repaired or replaced during upcoming monitoring period. Project boundary at the south side of Cutler Canyon scheduled to be surveyed and delineated in 2008.
Erosion Control Sedimentation Basins	Build erosion control catch basins where needed in North Marsh and Reservoir Units.	Constructed 13 erosion control catch basins. Implementation complete.	Annual monitoring will continue as present. All sites in good condition. Monitoring following an average water year, as opposed to the recent period of drought, will be important.
Sensitive/Unique Wildlife Habitats	Protect sensitive wildlife habitats.	Fenced colonial nesting bird habitats, provided artificial nest structures for osprey and owls, implemented Recreation Use Policy and new state regulations, and planted roses and other shrubs along RR dike. Implementation complete.	Annual monitoring will continue as present. Additional studies of water quality and the decline in macroinvertebrates in areas of the north marsh near the historic white-faced ibis rookery are being considered by Utah DEQ; PacifiCorp will participate in the study and TMDL process.
Agricultural Lease			
Land Use Practices (monitored & managed as part of leases, below)	Evaluate lease practices on 4500 acres and incorporate new conditions into new leases.	Complete for grazing, farming, and wildlife food/cover leases. Reduced current leases to 2022 acres. Implementation complete.	

Table ES-1. Summary of Work Completed To Date and Recommendations for Cutler Hydro Project No. 2420.

RMP Program/ Component	Implementation Required	Implementation Completed	Findings/ Recommendations
Grazing	Evaluate practices and incorporate new conditions into grazing leases.	Incorporated new practices into leases affecting 1582 acres (of which 345 acres are grazing for wildlife food/cover plots). Leases reconfigured to improve practices. Implementation complete.	Annual monitoring will continue as present. Additional qualitative data will be collected during next monitoring period to more closely correlate pasture health with grazing practices.
Farming	Evaluate practices and incorporate new conditions into farming leases.	Incorporated new practices into leases affecting 440 acres. Implementation complete.	Annual monitoring will continue as present. Additional buffer post markers will be installed as needed.
Wildlife Food/Cover	Evaluate practices and incorporate new conditions into wildlife food/cover leases.	Currently managing eight fields for wildlife food/cover. Implementation complete.	Replace semi-annual monitoring with annual spring monitoring only.
Cattle Management Fence	Construct 6 miles of fence to control cattle/conflicting uses (an additional 6 miles was required in a separate category).	Constructed 15.1 miles of fencing (necessary to control grazing impacts to shoreline and pastures). Implementation complete.	Annual monitoring will continue as present.
Property Coordination	Resolve property and boundary issues.	Boundary issues noted in 2002 5-year report resolved. New Exhibit G filed. Implementation complete.	Annual monitoring will continue as present. On-going trespass issues will be monitored.

Table ES-1. Summary of Work Completed To Date and Recommendations for Cutler Hydro Project No. 2420.

RMP Program/ Component	Implementation Required	Implementation Completed	Findings/ Recommendations
Recreation Site Development	Establish: 8 day-use sites (4 developed, 4 primitive) 2 boat-in picnic sites 1 pedestrian loop trail and bridge 2 canoe trails Conduct a visitor use survey	Completed: 7 day-use sites (4 developed, 3 primitive) 2 boat-in picnic sites 1 pedestrian loop trail and bridge 3 canoe trails Interpretive signage and information provided, recreation use policy instituted, visitor use survey completed. Implementation complete, with the exception of one primitive day-use site.	Annual monitoring will continue as present. Development of one primitive recreation site delayed until 2010 by FERC order. Canoe trail marker buoy system scheduled for replacement during the next monitoring period.
Wetland Mitigation Area	Construct a 6-acre wetland complex on state land in South Marsh to serve as mitigation for recreation sites developed.	Completed in spring 2001, approved by COE, and turned over to Utah Division of Wildlife Resources for permanent management.	No future monitoring proposed.
Fish Habitat Structures	Install 4-6 fish habitat structures at two sites.	Installed 30 structures at three sites. Implementation complete.	Future annual monitoring proposed only during major reservoir drawdowns, per agency agreement. Agency notification and consultation recommended for early 2008, as next major drawdown is tentatively scheduled for fall 2008.

Table ES-1. Summary of Work Completed To Date and Recommendations for Cutler Hydro Project No. 2420.

RMP Program/ Component	Implementation Required	Implementation Completed	Findings/ Recommendations
Water Quality Monitoring	Conduct quarterly sampling 1996-98. After that, quarterly sampling every 5th year, beginning in 2003. Analysis and results in five-year reports.	As required; summary of 2003 monitoring is included.	Monitoring will continue per the current quarterly, five-year intervals, as prescribed by the license. Next water quality data collection period is scheduled to occur in 2008 and will be expanded per recommendations of the 2003 data analysis and review.
Water Level Monitoring	Conduct reservoir elevation study. File results of proposed operating plan with FERC	As required. FERC order with modified operating plan received 2002. New order requires annual submission of average elevation data.	Annual monitoring will continue as present. Water level data will be filed with FERC annually and summarized in the five-year report.

INTRODUCTION

This report summarizes the work completed during the 2003-2007 operations and maintenance (O&M) and monitoring phase of the Cutler Hydro Project No. 2420 Resource Management Plan (RMP) (PacifiCorp 1995), stipulated by Article 402 of the Federal Energy Regulatory Commission (FERC) license order. This O&M and monitoring work will continue for the remainder of the 30-year license period, until 2024. Details regarding project implementation and initial monitoring activities were presented in the 2002 Cutler Five-Year Monitoring Report (PacifiCorp 2002).

The project is located in northern Utah, along the west side of Cache Valley, mostly in Cache County although the dam itself is located in Box Elder County (Figure i-1). The RMP project boundaries cover approximately 9,550 acres and surround Cutler Reservoir, as well as the areas of confluence with its major tributaries: the Bear, Little Bear, and Logan rivers; Spring Creek; and Clay Slough.

Management and monitoring actions summarized herein were conducted to meet a combination of requirements from the FERC license, and the FERC-required and approved RMP. Although most project implementation actions were completed prior to the first project five-year report (PacifiCorp 2002), several property negotiations, undertaken to resolve boundary issues with adjacent landowners, were still incomplete at the end of the last report period. As a result, some minor implementation work related to the final resolution of these property boundary issues was completed during the current report period (2003-2007). These activities included marking the new property boundary and integrating the resultant new buffer segments in the on-going monitoring activities. Finally, the completion of the new project boundary line allowed for the drafting of a new Cutler Project Exhibit G; submittal of the new Exhibit G will occur simultaneously with this report to the FERC. This report also summarizes activities related to the on-going reservoir water level and water quality monitoring activities. As required by the FERC, this report was submitted to relevant federal, state and local agencies for review prior to submittal to the FERC. Agency correspondence is included in Appendix G.

This report is organized into three main sections:

Section 1.0 – RMP Project Summary To Date (Implementation phase [1995-2002] through 2007) - A summary of the original RMP requirements and completed project implementation activities, as well as a summary of the previous five-year report monitoring results.

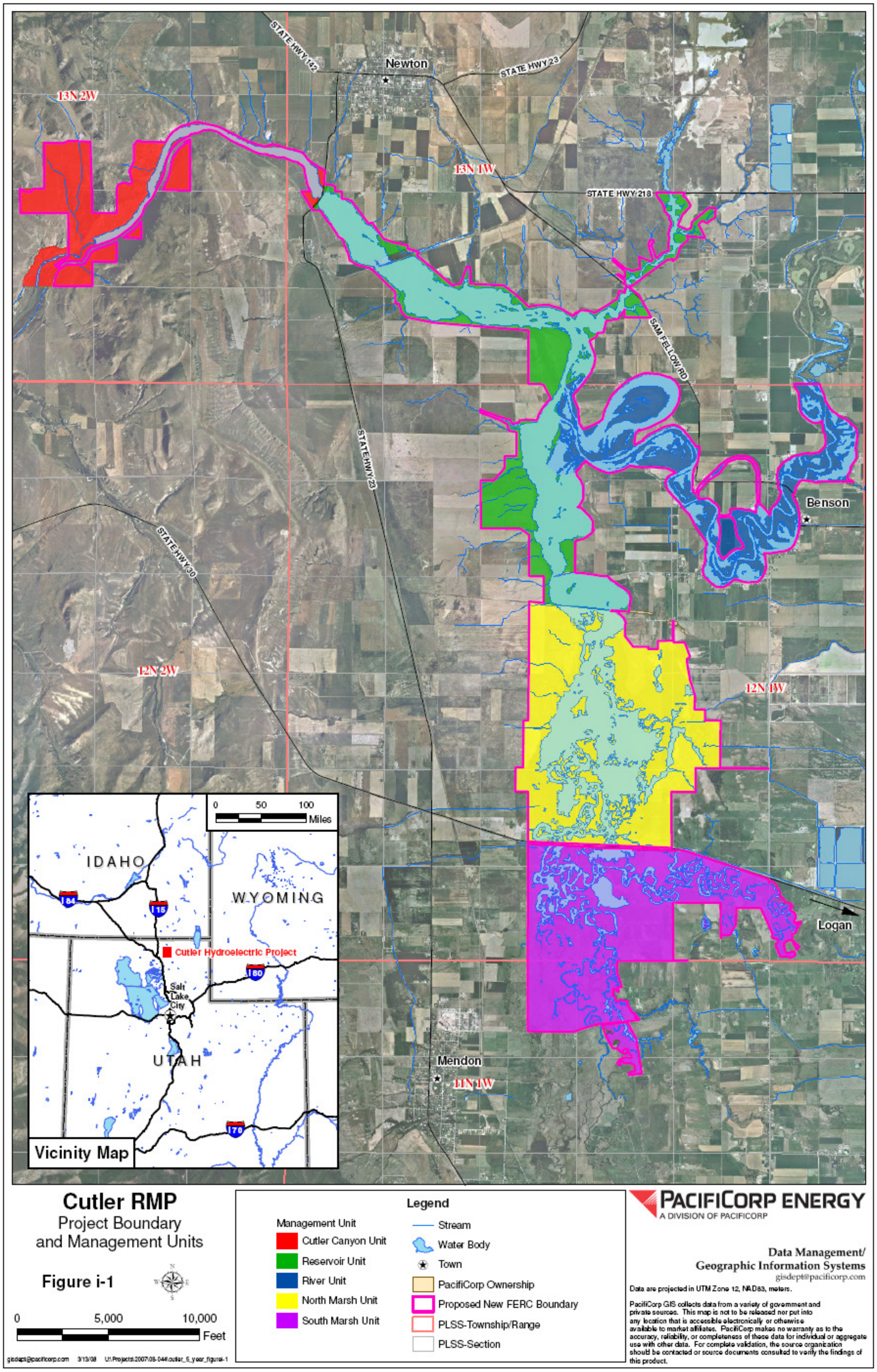
Section 2.0 – Monitoring Results - A summary of current report period (2003-2007) RMP monitoring results.

Section 3.0 – Plan and Schedule - An outline for future project monitoring, including proposed plan changes.

The organization of this report will follow that presented in the initial Cutler five-year report (PacifiCorp 2002), generally by program heading and management unit; as previously noted in that report, the organization is necessarily different from that of the initial RMP due to the focus on project monitoring that will continue through the license term (2024).

Maps (Figure i-1 and 1-1) show locations of the RMP components and management units.[1]

[1] The series of maps included in this report are best in print as 11 x 17s.



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Logan
Mendon
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IDAHO
WYOMING
84
15
Cutler Hydroelectric Project
80
Salt Lake City
UTAH
70
Vicinity Map
Cutler RMP
Project Boundary
and Management Units
Figure i-1
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Legend
Management Unit
Cutler Canyon Unit
Reservoir Unit
River Unit
North Marsh Unit
South Marsh Unit
Stream
Water Body
Town
PacifiCorp Ownership
Proposed New FERC Boundary
PLSS-Township/Range
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1.0 RMP PROJECT SUMMARY

This section summarizes the completed project implementation activities conducted to meet the original RMP requirements, as well as a summary of the 2002 monitoring results, for ease of comparison with the current (2003-2007) monitoring period results. This report provides on-going assurance of compliance with the FERC's license order requiring the development and implementation of the Cutler RMP, and the resultant monitoring reports at five-year intervals through the license period. Subsequent reports will be submitted in 2013, 2018, 2023, and 2025 (for the 2008-2012, 2013-2017, 2018-2022, and 2023-2024 periods, respectively). Initial implementation activities were conducted from 1993-2001, with the exception of final resolution of several property boundary determinations that required either continuing negotiations or legal actions to resolve at the end of the first five-year reporting period; these initial implementation actions are now complete.

These property boundary activities, as well as the resultant property boundary marking and completion of the new buffer monitoring segments were completed during the 2003-2007 period, and are detailed in Section 1.1.1. Monitoring activities were initiated once project implementation was complete. Monitoring plans are summarized in Section 1.2. Initial monitoring results are included in Section 1.3, for comparison with current monitoring results.

1.1 RMP Implementation Summary

The original RMP established five goals set as part of the re-licensing process at Cutler. The new license stipulated development and implementation of the RMP (PacifiCorp 1995), which included descriptions of the five programs undertaken to achieve the goals for the project, set goals for defined management units, and provided the framework for the series of annual reports that detailed work completed to meet project requirements. The RMP also included a preliminary and relatively conceptual set of maps that detailed possible site locations for achieving the required mitigation measures as described in the new license and the RMP. Those maps were included in Appendix A of the 2002 report, along with a set of maps that depict the project 'as built.' Most differences between the conceptual plans and those actually implemented were a result of findings during actual on-site reconnaissance, as many areas were simply not suitable for the activities proposed in the conceptual plans. Further, as a result of extensive property trades undertaken to straighten boundaries and maximize buffer ownership as well as minimize ownership of lands unnecessary to the project, the boundaries of many land parcels identified in the conceptual plans for implementation activities were altered once detailed project planning began.

Five goals were documented in the 1995 RMP:

1) Improve water quality
2) Improve wildlife habitat
3) Improve scenic resources

4) Retain and improve traditional agricultural uses
5) Improve recreational access to the project area

Five programs were developed in order to meet the goals of the RMP:

- Vegetation Enhancement Program
- Agricultural Lease Program
- Recreation Site Development Program
- Wetland Mitigation Area Program
- Fish Habitat Structure Program

Two additional programs were added to meet the overall goals for the RMP and related license articles, bringing the final program list to seven:

- Water Quality Monitoring
- Water Level Monitoring

This section summarizes work completed for implementation during the current report period (2003-2007) for each of the seven RMP programs listed above. The implementation requirements are described for each component, as defined by the license or RMP guideline from which each was derived. There are no exceptions or proposed modifications to the RMP; the management unit in which the activity was performed is listed. Table 1-1 indicates overall compliance with the license and RMP requirements, and summarizes all the work carried out to meet the various commitments.

1.1.1 Vegetation Enhancement Program

The Vegetation Enhancement Program emphasizes re-establishing shoreline buffer vegetation to improve water quality, wildlife habitat, recreation opportunities, and scenic quality. The main components of this program consist of the establishment of vegetated areas to act as shoreline conservation buffers between the reservoir and adjacent farming activities, and shrub planting and bank stabilization activities within this buffer. Historically, much of the shoreline was farmed down to the water's edge, which contributed significantly to soil erosion and associated negative water quality, as well as increasing the ongoing rate of bank loss in some areas. Erosion control basins have been created in the buffers to minimize sheet flow erosion from agricultural lands and reduce sediment loading into the reservoir. Fencing or marking the RMP project boundary (see Figure 1-1) is another important component of the Vegetation Enhancement Program, in that it helps to protect buffers and associated habitats. Sensitive wildlife habitats (e.g., osprey nest platforms, burrowing owl nest boxes, blue heron rookery, and heron, gull, and ibis colonies) have been either created or protected through lease practices, fencing, and access regulations.

Table 1-1. Summary of Implementation and Work Completed for Cutler Hydro Project No. 2420.			
RMP Program/ Component	**Implementation Required**	**Work Completed**	**Initial Implementation Complete?**
Vegetation Enhancement			
Shoreline Buffer	Establish 125 acres of shoreline buffer. Of this, a minimum of 50 acres should be converted from tilled land to permanent grass buffer.	Approximately 1225 acres of buffer covering 45 miles of shoreline have been established, including 610 acres of tilled land converted to permanent grass buffer (necessary to improve water quality).	**Yes**
Woody Vegetation Pockets	Establish 10-15 pockets 0.5 – 3.0 acres in size.	Planted 12 pockets at a density of 5000 shrubs/acre. Goal is at least 10 sites established.	**Yes** Note: Two new sites will be added to compensate for two failed sites.
Bank Stabilization	Stabilize 3.5 miles of shoreline	Stabilized 3.96 miles of shoreline. An additional 1.1 miles stabilized at RR Trail as part of the Recreation program	**Yes**
Boundary/Buffer Fence	Construct 6 miles of additional fence to create/protect the boundary or buffer	Constructed 62 miles of fence (necessary to protect project boundary from unauthorized uses. Project boundary on the south side of Cutler Canyon scheduled to be surveyed and delineated in 2008.	**Yes**
Erosion Control Sedimentation Basins	Build erosion control catch basins where needed in North Marsh and Reservoir Units.	Constructed 13 erosion control catch basins.	**Yes**
Sensitive/Unique Wildlife Habitats	Protect sensitive wildlife habitats.	Fenced colonial nesting bird habitats, provided artificial nest structures for osprey and owls, implemented Recreation Use Policy, and planted roses and other shrubs along RR dike.	**Yes**

Table 1-1. Summary of Implementation and Work Completed for Cutler Hydro Project No. 2420.			
RMP Program/ Component	**Implementation Required**	**Work Completed**	**Initial Implementation Complete?**
Agricultural Lease			
Land Use Practices (monitored & managed as part of leases, below)	Evaluate lease practices on 4500 acres and incorporate new conditions into new leases.	Complete for grazing, farming, and wildlife food/cover leases. Reduced current leases to 2022 acres.	**Yes**
Grazing	Evaluate practices and incorporate new conditions into grazing leases.	Incorporated new practices into leases affecting 1582 acres (of which 345 acres are grazing for wildlife food/cover plots). Leases reconfigured to improve practices.	**Yes**
Farming	Evaluate practices and incorporate new conditions into farming leases.	Incorporated new practices into leases affecting 440 acres.	**Yes**
Wildlife Food/Cover	Evaluate practices and incorporate new conditions into wildlife food/cover leases.	Currently managing 8 fields for wildlife food/cover.	**Yes**
Cattle Management Fence	Construct 6 miles of fence to control cattle/conflicting uses (an additional 6 miles was required in a separate category).	Constructed 15.1 miles of fencing.	**Yes**
Property Coordination	Resolve property and boundary issues.	Resolved previous issues with adjacent landowners.	**Yes**
Recreation Site Development	Establish: 8 day-use sites (4 developed, 4 primitive) 2 boat-in picnic sites 1 pedestrian loop trail and bridge 2 canoe trails Conduct a visitor use survey	Completed: 7 day-use sites (4 developed, 3 primitive) 2 boat-in picnic sites 1 pedestrian loop trail and bridge 3 canoe trails Interpretive signage and Information provided Recreation use policy instituted Completed visitor use survey	**Yes** Note: One primitive day-use site deferred until 2010 per FERC order

Table 1-1. Summary of Implementation and Work Completed for Cutler Hydro Project No. 2420.			
RMP Program/ Component	**Implementation Required**	**Work Completed**	**Initial Implementation Complete?**
Wetland Mitigation Area	Construct a 6-acre wetland complex on state land in South Marsh to serve as mitigation for recreation sites developed.	Completed in spring 2001, approved by COE, and turned over to Utah Division of Wildlife Resources for permanent management.	**Yes**
Fish Habitat Structures	Install 4-6 fish habitat structures at 2 sites.	Installed 30 structures at 3 sites.	**Yes**
Water Quality Monitoring	Conduct quarterly sampling 1996-98. After that, quarterly sampling every 5^{th} year, beginning in 2003. Analysis and results in five-year reports.	As required; summary of 2003 monitoring is included. Next monitoring will be conducted in 2008.	**Yes**
Water Level Monitoring	Conduct reservoir elevation study. File results of proposed operating plan with FERC	As required. FERC order with modified operating plan received 2002. New order requires annual submission of average elevation data.	**Yes**

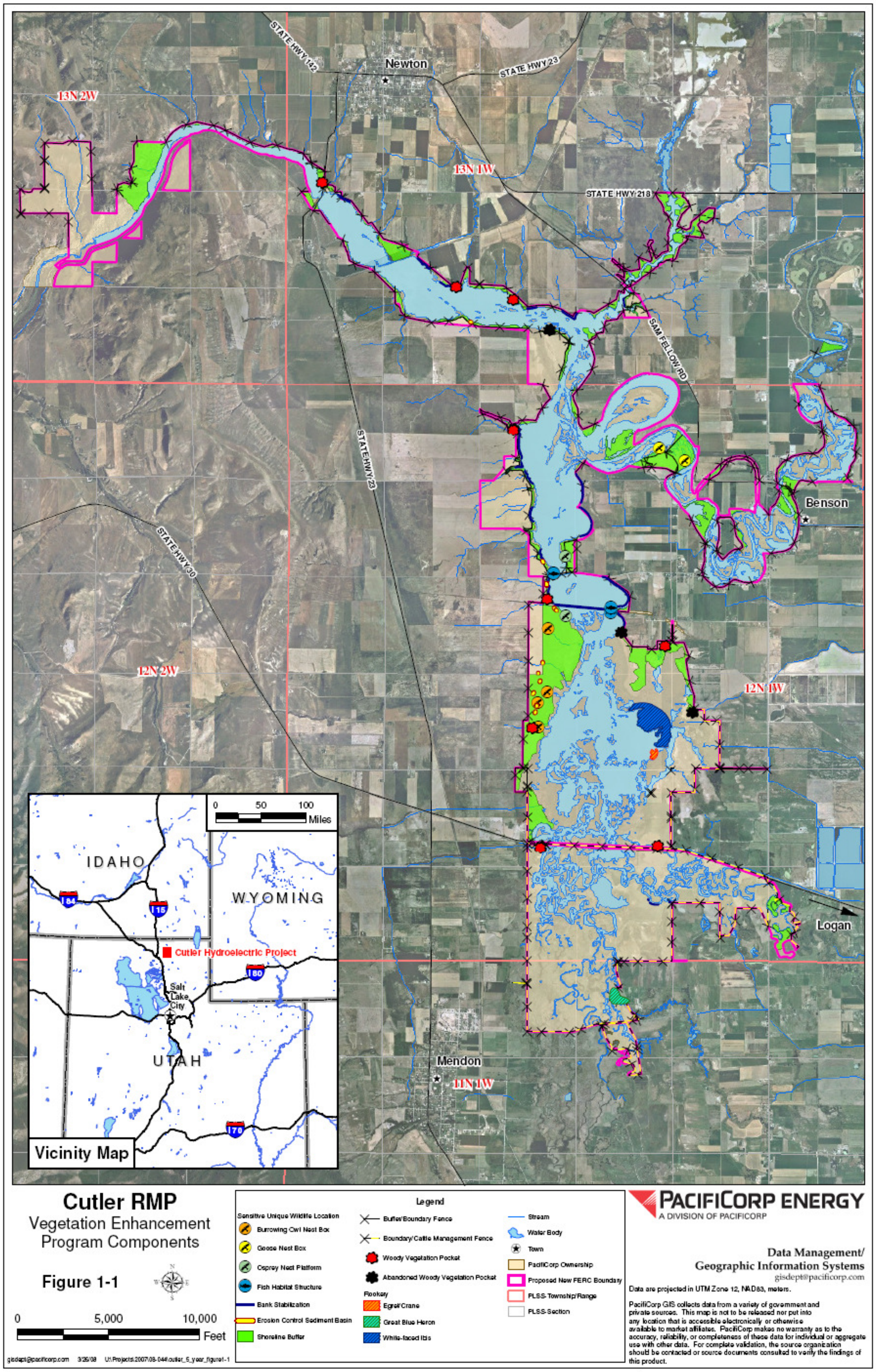
All management units are represented to some degree. This program covers the following components:

- Shoreline buffer establishment
- Shrub planting (woody vegetation pockets and buffer shrub plots)
- Bank stabilization
- Fencing (buffer/boundary fencing)

Two additional components were added to this program as part of the previous five-year report structuring:

- Erosion control sediment basins
- Sensitive/unique wildlife habitats

Most components in this program were previously completed (see Table 1-1 for specific requirements and the 2002 five-year monitoring report for additional details) and have been monitored throughout the current report period (see Section 2.0 for current monitoring results). Monitoring results also guided necessary O&M work completed during the current report period.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Benson
12N 2W
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Logan
Mendon
11N 1W
IDAHO
WYOMING
UTAH
Cutler Hydroelectric Project
Salt Lake City
0 50 100 Miles
Vicinity Map
Cutler RMP
Vegetation Enhancement Program Components
Figure 1-1
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Legend
Sensitive Unique Wildlife Location
Burrowing Owl Nest Box
Goose Nest Box
Osprey Nest Platform
Fish Habitat Structure
Bank Stabilization
Erosion Control Sediment Basin
Shoreline Buffer
Buffer/Boundary Fence
Boundary/Cattle Management Fence
Woody Vegetation Pocket
Abandoned Woody Vegetation Pocket
Rookery
Egret/Crane
Great Blue Heron
White-faced Ibis
Stream
Water Body
Town
PacifiCorp Ownership
Proposed New FERC Boundary
PLSS-Township/Range
PLSS-Section
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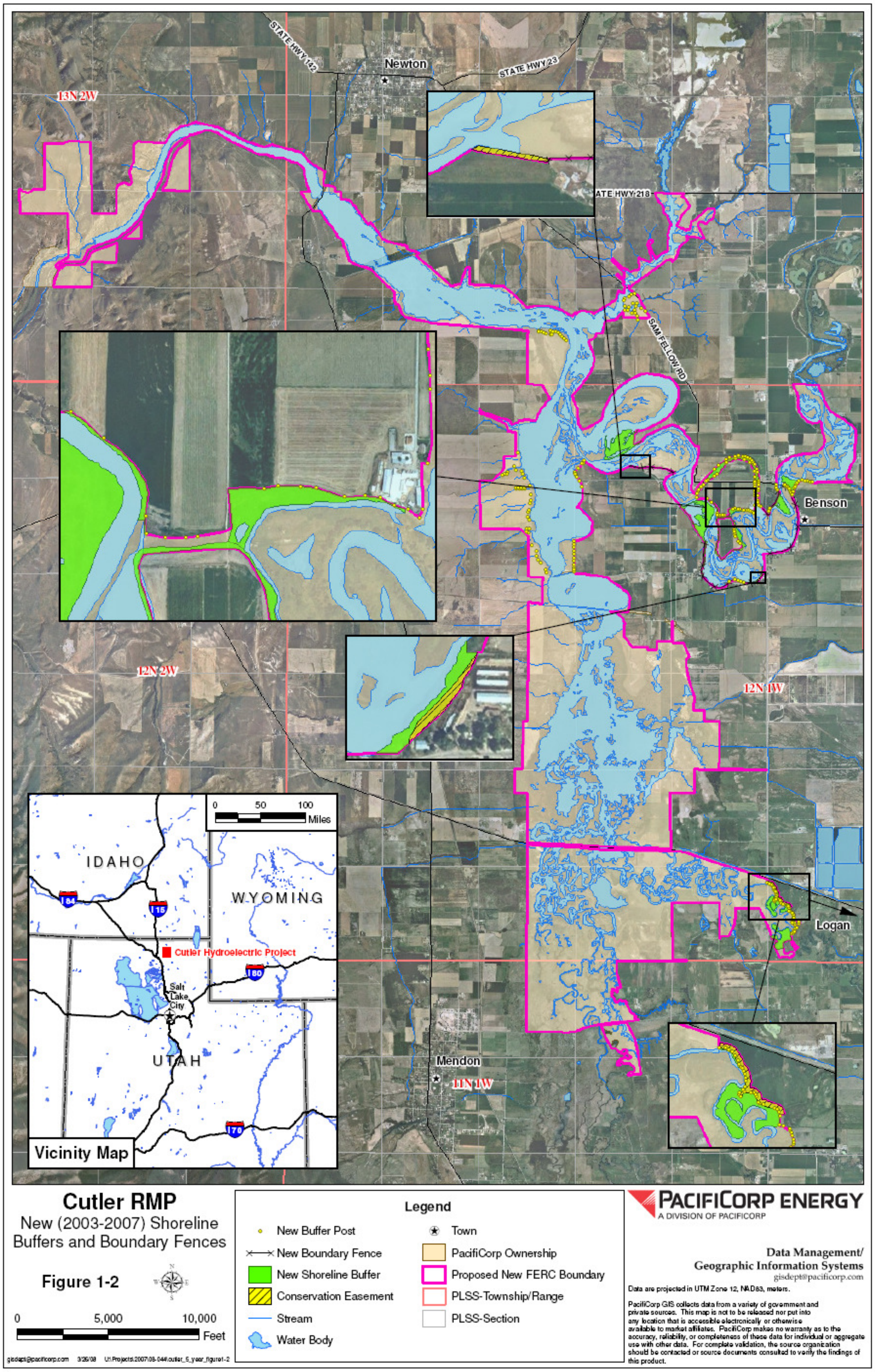
The only exceptions to previous project implementation included the five property boundary negotiations completed during the current report period. Each of these property boundary negotiations resulted in new buffers that were added to the overall acreage of buffers and miles of shoreline protected by the project. Updated totals are reflected in Table 1-1 for both shoreline buffers (6.9 miles and 127 acres of new buffer, for a total project shoreline buffer length of 45 miles and 1225 acres) and boundary/buffer fences (4.3 miles of new boundary/buffer fences, for a total of 62 miles of this type of fence).

New buffers were established for each of the previously unresolved property boundary issues (see Figure 1-2). Completed new buffer segments were marked with either fence or posts at the property boundary, seeded as necessary, and monitoring points were established at each (see also Section 2.1.1). O&M work was conducted as indicated, generally weed control and perennial grass establishment at some sites. Two property negotiations involved establishing deeded perpetual conservation easements on formerly disputed areas, and the recording of a property boundary line agreement with the adjacent landowner. The new buffer segments include:

Kunzler (Bear River Management Unit) - A new boundary line agreement was signed in 2004 with Mr. Kunzler after many years of negotiation. Because of discrepancies in the described property line on the ground, encroachments were a chronic concern. By agreeing upon a boundary line, PacifiCorp was also able to secure a conservation easement that will prevent any future development of the land along the river that PacifiCorp ceded an interest in. The new boundary line created 712 feet (0.1 miles) and 0.6 acres of of new PacifiCorp shoreline buffer, as well as a new 0.4 acres of an adjacent conservation easement.

Lundberg (South Marsh Management Unit) - This boundary line agreement, recorded in 2007 after almost 10 years of negotiations with the landowner and his heirs, helped secure the proper shoreline buffer necessary to meet the goals of the RMP, while also securing a perpetual conservation easement along adjacent land that will provide additional buffer between company lands and future residential development of this farmland along the Logan River. Similar to the Kunzler agreement, PacifiCorp agreed to cede its interest in land that was also claimed by the adjacent owner, in return for a perpetual easement being placed on the land in contention. Additionally, an access agreement was secured, giving PacifiCorp a much needed land route to other PacifiCorp RMP lands along the Logan River. The new boundary line created 11,143 feet (2.4 miles) and 30.1 acres of new PacifiCorp shoreline buffer, as well as 5.5 acres of an adjacent conservation easement and 6,297 feet (1.2 miles) of new boundary/buffer fence.

H. Falslev (Bear River Management Unit) - This boundary line agreement, completed in 2003, finalized an arrangement between the two parties which increased the PacifiCorp shoreline buffer acreage by trading the buffer for land formerly owned by PacifiCorp but historically farmed by Falslev. The new boundary line created 8,578 feet (1.6 miles) and 20.7 acres (10.3 acres on the peninsula, and 10.4 acres northeast of the peninsula, respectively) of new PacifiCorp shoreline buffer, as well as 8,578 feet (1.6 miles) of new buffer/boundary fence.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Cutler Hydroelectric Project
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Cutler RMP
New (2003-2007) Shoreline Buffers and Boundary Fences
Figure 1-2
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New Buffer Post
New Boundary Fence
New Shoreline Buffer
Conservation Easement
Stream
Water Body
Town
PacifiCorp Ownership
Proposed New FERC Boundary
PLSS-Township/Range
PLSS-Section
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L. Falslev (Bear River Management Unit) - Similarly, this boundary line agreement, completed in 2003, allowed mutual benefits to both parties. Shoreline buffer was created or increased in the areas where it had been lacking, and new fences were constructed to prevent cattle from accessing the river bottoms and wintering in the sensitive riparian zone. The new boundary line created 11,347 feet (2.1 miles, 1.0 mile near oxbow and 1.1 mile at peninsula) and 13.7 acres and 34.0 acres of new PacifiCorp shoreline buffer near the rose oxbow, and Falslev peninsula, respectively, as well as 4,961 feet (0.9 miles) of new buffer/boundary fence.

Cardon (Reservoir Management Unit) - After decades of unlimited cattle access to the reservoir shoreline and adjacent marsh in this area, a boundary line agreement between the adjacent landowner and PacifiCorp was reached. With that agreement, a fence was installed to protect PacifiCorp property, with minimal cattle access for the adjacent owner to support his stock watering rights. Since the agreement and fence installation, the buffer has improved in some areas, although additional recent encroachments have occurred since the adjacent landowner removed a part of the fence to accommodate his irrigation pivot, allowing renewed cattle access to the shoreline. A description of this latest trespass is included below and in the Property Coordination sections of this report (Section 2.5). The new boundary line created 4,161 feet (0.8 miles) and 28.5 acres of new PacifiCorp shoreline buffer, as well as 3,465 feet (0.6 miles) of new buffer/boundary fence.

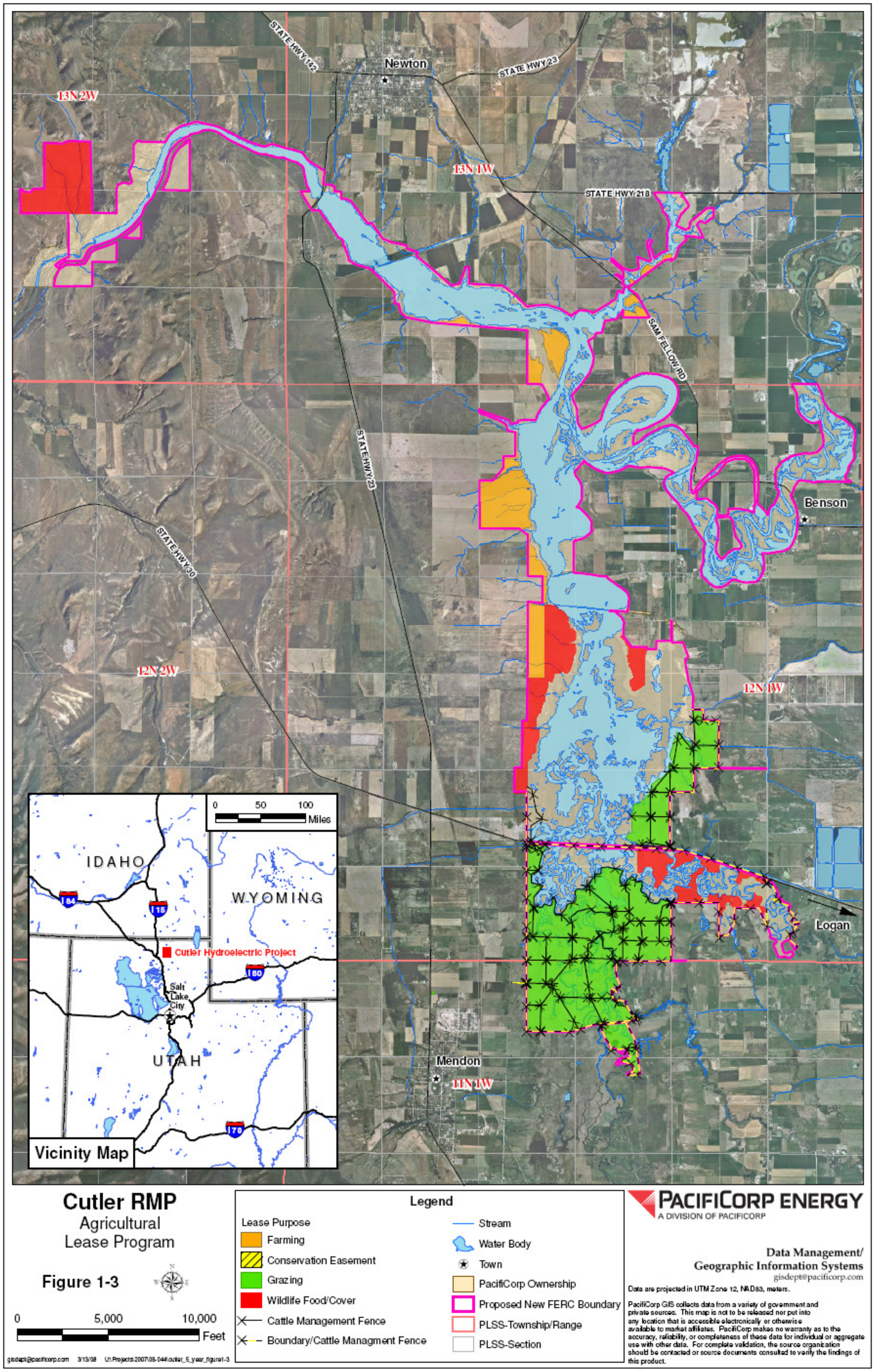
Monitoring has also indicated that two additional buffer sites have been subject to such chronic buffer encroachments that PacifiCorp has decided to file lawsuits with the responsible adjacent landowners. These two sites (Lindley and Cardon/Church Farm) will likely result in additional O&M work on buffer and fence re-establishment; this work will commence in 2008 once the lawsuits are concluded (see Section 2.1.1 for additional detail regarding these buffers), and will be reported in the 2013 Five-Year Monitoring Report.

One small property boundary section, on the south side of Cutler Canyon, still needs to be surveyed so that corners can be marked, property lines posted, and buffer areas delineated; this work is scheduled for fall of 2008.

1.1.2 Agricultural Lease Program

As part of the FERC application filed in 1991, PacifiCorp proposed to modify its agricultural leasing program, which consisted of modifying land use and lease practices on 4500 acres to accomplish land use changes and managing the new leases under three main program components (Figure 1-3):

- Grazing leases
- Farming leases
- Wildlife food/cover leases


STATE HWY 142
Newton
STATE HWY 23
13N 2W
13N 1W
STATE HWY 218
SAM FELLOW RD
STATE HWY 23
Benson
STATE HWY 30
12N 2W
12N 1W
Logan
Mendon
11N 1W
0 50 100 Miles
IDAHO
WYOMING
Cutler Hydroelectric Project
Salt Lake City
UTAH
Vicinity Map
Cutler RMP
Agricultural
Lease Program
Figure 1-3
0 5,000 10,000 Feet
Legend
Lease Purpose
Farming
Conservation Easement
Grazing
Wildlife Food/Cover
Cattle Management Fence
Boundary/Cattle Managment Fence
Stream
Water Body
Town
PacifiCorp Ownership
Proposed New FERC Boundary
PLSS-Township/Range
PLSS-Section
PACIFICORP ENERGY
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Geographic Information Systems
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Two other components were reassigned to this program as part of the previous five-year report structuring:

- Cattle management fences
- Property coordination

Note that cattle management fences (Figure 1-3) address a second required category of fence, distinct from buffer/boundary fences covered in the previous section of this report, to delineate leases and to control grazing. Improvements in land use resulting from implementation of this program have been widespread across all five management areas.

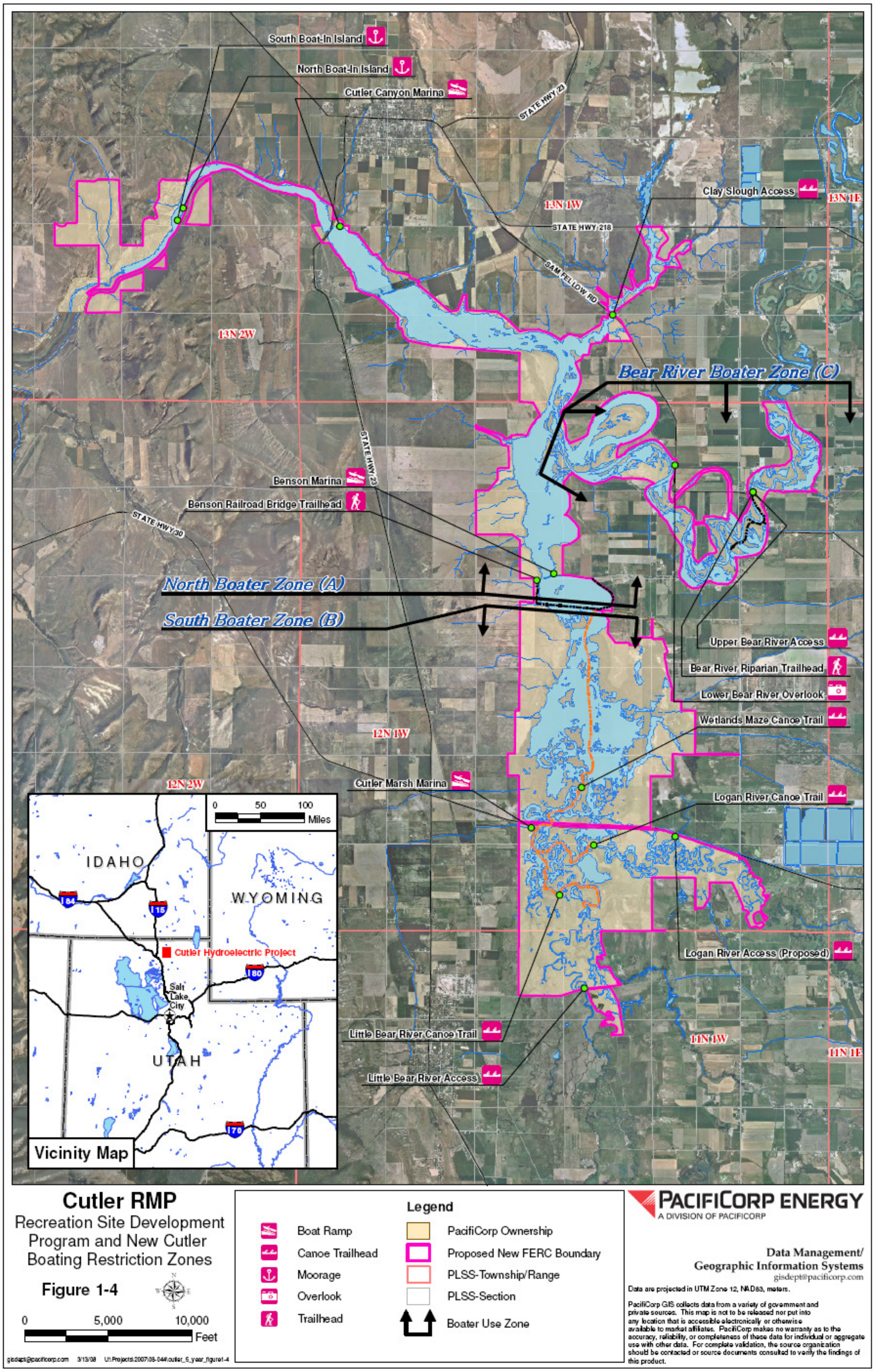
Most components in this program were previously completed (see Table 1-1 for specific requirements and the 2002 five-year monitoring report for additional details) and have been monitored throughout the current report period (see Section 2.0 for current monitoring results). Monitoring results also guided necessary O&M work (primarily fence maintenance and weed control) completed during the current report period. With the exception of one (the Hoopes lease is no longer being utilized for grazing), the table presented in the PacifiCorp 2002 report is identical, and will therefore not be listed again here.

The only exceptions to previous completion of implementation for this program include the several intensive property boundary negotiations completed during the current report period, as well as the associated property coordination work detailed in the previous section to resolve these boundary determinations. Final property boundary resolution was necessary in order to ensure adequate control of conflicting uses of company land. Because the initial implementation property boundary work has now been completed (the final piece was recorded in 2007), a new Exhibit G to the license has also been completed and will be submitted concurrently with this report.

O&M work for this overall program is similar currently to that laid out in the previous five-year report; major O&M work completed in support of this license component is detailed in Section 2.0 of this report.

1.1.3 Recreation Site Development Program

The RMP stipulates that the Recreation Site Development Program improve public access and develop recreation facilities at a number of facilities around the reservoir (Figure 1-4). These include a wide range of developed uses, from major (with boat ramps and permanent restroom facilities) to more primitive sites (allowing canoe or other small boat launch only and seasonal restroom facilities). Additional recreation developments included construction and/or installation of two boat-in sites, three canoe trails, and two pedestrian trails. Interpretive signing and recreational use regulations are also described as part of this program.


South Boat-In Island
North Boat-In Island
Cutler Canyon Marina
STATE HWY 23
Clay Slough Access
13N 1E
13N 1W
STATE HWY 218
DAM FELLOW RD
13N 2W
Bear River Boater Zone (C)
Benson Marina
Benson Railroad Bridge Trailhead
STATE HWY 30
North Boater Zone (A)
South Boater Zone (B)
Upper Bear River Access
Bear River Riparian Trailhead
Lower Bear River Overlook
Wetlands Maze Canoe Trail
12N 1W
12N 2W
Cutler Marsh Marina
Logan River Canoe Trail
Logan River Access (Proposed)
Little Bear River Canoe Trail
Little Bear River Access
11N 1W
11N 1E
0 50 100 Miles
IDAHO
WYOMING
UTAH
Cutler Hydroelectric Project
Salt Lake City
Vicinity Map
Cutler RMP
Recreation Site Development Program and New Cutler Boating Restriction Zones
Figure 1-4
0 5,000 10,000 Feet
Legend
Boat Ramp
Canoe Trailhead
Moorage
Overlook
Trailhead
PacifiCorp Ownership
Proposed New FERC Boundary
PLSS-Township/Range
PLSS-Section
Boater Use Zone
PACIFICORP ENERGY
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Most components in this program were previously completed (see Table 1-1 for specific requirements and the 2002 five-year monitoring report for additional details) and have been monitored throughout the current report period (see Section 2.3 for current monitoring results). Monitoring results also guided necessary O&M work (primarily fence maintenance and weed control) completed during the current report period.

The only exception to previous completion of implementation of this program was the construction of the Logan River recreation site, proposed as a primitive canoe access area off the Valley View Highway (State Hwy 30), which has been postponed until Utah Department of Transportation (UDOT) widens Hwy 30, as planned (estimates from UDOT have changed over the intervening years, but are now given as occurring no earlier than 2010). PacifiCorp originally proposed to provide a turnout from the highway to access the new site; however, UDOT indicated that a deceleration/acceleration lane would be required for public safety. Because of the narrowness of the highway, UDOT would not consider a variance. Further, UDOT expressed an interest that PacifiCorp wait to construct this site with the required lanes until the UDOT engineers could determine the proper road configuration along this very busy stretch of state highway during their proposed highway expansion (UDOT, pers. comm. 2004). As a result, it has been infeasible to move forward with this site to date.

The FERC previously issued an order deferring the construction of the Logan River day-use recreation site (FERC 2005). Per this latest order, this site must be constructed by the end of 2010. Given UDOT's current timeline, PacifiCorp has also been investigating alternative sites that may still meet the original project intent, which was to provide a canoe launch access in the lower Logan River reach that will fit into the already-constructed canoe trail and launch site network in the South Marsh system. This alternative recreation site construction should be completed by December of 2010.

General O&M work for this program consists of recreation site maintenance per the PacifiCorp 2002 five-year monitoring report, and therefore will not be further detailed here. Major O&M work, some guided by monitoring results, and some by other actions in the area (e.g., a new power line that necessitated trail resurfacing), completed during the current report period included new trail surfacing for the railroad (RR) bridge trail, new fixed boat docks for the boat-in islands, and new recreation and other FERC-required signage at all the developed recreation sites, as well as at the Cutler Plant road entrance. See Section 2.3 for additional details regarding monitoring activities for recreation sites.

In 2007, a final component of the Recreation Site Development Program, a new Cutler motorized boater access plan and regulations, was completed in conjunction with Utah State Parks and Utah Division of Wildlife Resources (UDWR). This partnership was necessary to ensure adherence to state laws, PacifiCorp license obligations, and RMP direction. Note that only State Parks can regulate boating access in the state, and input from PacifiCorp and UDWR was vital to ensure that the interests of boat recreationists, water skiers, duck hunters, wildlife enthusiasts, canoers, and protection of several sensitive species' nesting areas were balanced to the degree possible. In November of 2007 the proposed new regulation was adopted by the State Boating Council and State

Parks Board; it became part of Utah State Regulations in early 2008 when the legislature reconvened.

The new regulations, which went into effect March 10, 2008, specifically identify three areas of the reservoir that each have different motor-size and speed restrictions. The area south of the RR Trail and Bridge now has a season-long restriction on motor size (35hp limit) and speed (wakeless throughout); the Bear River area (confluence of the Bear River with the reservoir) has the same restrictions, but only seasonally, and the remainder of the reservoir is open to all boat motor sizes and safe speeds, year round (Figure 1-4). See Appendix C for copies of the regulation, and the text and maps posted at the Cutler recreation sites regarding this new policy. State Parks and UDWR have agreed to help enforce this new regulation; PacifiCorp will be responsible for the buoys and associated markings delineating the southern area zone; UDWR will be responsible for the buoys and associated markings delineating the Bear River zone.

1.1.4 Wetland Mitigation Area Program

Implementation of the Recreation Site Development Program resulted in some unavoidable impacts to wetlands and other special aquatic sites located at the edge of the reservoir where recreation sites were constructed. Although the original construction plans would have affected approximately 2 acres of wetlands, additional avoidance measures were incorporated by altering the site designs, which decreased total wetland impacts to less than 0.25 acres. In order to mitigate these impacts, PacifiCorp proposed construction of a 6.0-acre wetland complex on land adjacent to the project owned by the UDWR, and the removal of an old road adjacent to the Upper Bear River Recreation Site.

The created wetland is located just outside PacifiCorp ownership in the South Marsh Management Unit on lands owned by UDWR (see Figure 2-2). PacifiCorp monitored this site as required on an annual basis through 2000. The year 2000 was the end of the final required monitoring season for wetland establishment; management of this wetland was then returned to the land owner, UDWR. The final monitoring report was submitted to, and accepted by, the U.S. Army Corps of Engineers (COE) in the fall of 2000. In the spring of 2001, a site visit was held with UDWR to ensure an appropriate transition following completion of PacifiCorp's project. The final wetland monitoring was included with the 2002 PacifiCorp report, as required by the FERC license.

This program is considered complete; there are no future plans for monitoring or O&M work at this site, as the landowner (UDWR) now has responsibility for the area.

1.1.5 Fish Habitat Structure Program

Implementation of this program was proposed to help increase the number of game fish in the reservoir and provide improved recreational angler opportunities at Cutler Reservoir. Fish habitat structure was noted to be lacking, so artificial habitats were designed, constructed, and installed in cooperation with UDWR (see Figure 1-1).

All components of this program were previously completed (see Table 1-1 for specific requirements and the 2002 five-year monitoring report for additional details). The only exceptions to the original RMP were that more fish habitat structures than originally proposed were installed, and that the monitoring plan and schedule were changed per agreement with UDWR (1996; see Appendix C, PacifiCorp 2002 for more detail), allowing PacifiCorp to suspend additional fish habitat structure monitoring until the next major drawdown, and angler surveys until angler use increases to a point where adequate data can be collected. There were no opportunities to conduct a major drawdown during the current report period, and therefore no O&M nor monitoring activities for this program have taken place to date.

Currently, a major reservoir drawdown is proposed for late fall of 2008; visual inspection of the structures will be attempted during the drawdown, if access to the three habitat structure areas is possible. UDWR concurs that reservoir turbidity precludes adequate visual inspection of the structures underwater.

1.1.6 Water Quality Monitoring Program

The goal of this project component was to monitor the effect on water quality of the operational and RMP changes that were designed to ensure water quality in Cutler was not further degraded, and so that improvements to water quality resulting from land management practices on project lands could be tracked. For that to occur, baseline data on water quality had to be established in order to determine if water quality improvements are occurring and what contributions the tributaries to Cutler, most of which are located away from project lands or influence, are making to water quality in Cutler.

Quarterly sampling was originally required by the license annually for three years, ending with the previous report period, and was previously completed (see Table 1-1 for specific requirements and the 2002 five-year monitoring report for additional details). Since then, the required frequency for quarterly monitoring shifted to a five-year cycle; 2003, the first year of the current report period, was also the first year of this new monitoring regime. Those results are summarized in Section 2.6 of this report. The next water quality data collection and analysis cycle to fulfill the water quality monitoring requirements will occur quarterly in 2008; thereafter in 2013, 2018, and 2023. Analysis and results will be submitted with each future Cutler Five-Year Monitoring Report.

1.1.7 Water Level Monitoring Program (Cutler Operational Plan)

The original license requirement for this program included the FERC-required Three-Year Bear River Basin Study (PacifiCorp 1999), which was designed to evaluate the ability of the project to operate within the proposed mid-reservoir elevation ranges described in the RMP. PacifiCorp submitted a report to FERC in 1999 which revised the proposed operating elevation range targets; FERC replied with a final modified license article in 2002 that indicated their acceptance of our revised operations plan and water level targets, as well as specifying the dates by which annual monitoring data, comprised of average daily reservoir levels, should be submitted to FERC. Results of the water level monitoring were incorporated into the Three-Year Bear River Basin Study and the Operational Plan for the Cutler Project (see Table 1-1 for specific requirements and the five-year monitoring report, Section 1.6.5 and Appendix H for additional detail).

No O&M work is necessary for this program; PacifiCorp monitors the operation of the project and reports annually on compliance with the target ranges at Cutler Dam. As these monitoring reports are submitted separately, they are not included with this report. See also Section 2.7 of this report. Copies of the daily average elevation data and relevant details regarding any deviations from the normal operating ranges are stored in digital format, and are available upon request from the PacifiCorp Energy Hydrologist, Salt Lake City NTO.

1.1.8 Summary of Project Implementation (Implementation Phase through 2007)

Implementation of each of these programs and program components is now generally complete (Table 1-1). The development of one proposed primitive recreation site has been delayed until 2010, by FERC order (FERC 2005). All property boundary issues noted in the previous five-year monitoring report are now resolved, and a new Exhibit G has been prepared to document the changes in the project boundary. On-going property trespass issues continue to be monitored and dealt with as they are identified, per the Cutler Monitoring Plan (PacifiCorp 2002). Note that table figures were updated from previous report to include new implementation activities conducted during the current monitoring period, 2003-2007.

1.2 RMP Monitoring Plan Summary

The RMP also required development of a monitoring plan for each of the implementation activities carried out at Cutler. The FERC stipulated that monitoring results be reported at five-year intervals over the life of the license. Results of monitoring activities are used to gauge the success and stability of implementation, but also help frame on-going O&M needs for the project that result in continual improvement. Monitoring protocols were established by adopting the seven implementation programs presented above in Section 1.1 as the basis for monitoring activities:

- Vegetation Enhancement Program
- Agricultural Lease Program
- Recreation Site Development Program
- Wetland Mitigation Program
- Fish Habitat Enhancement Program
- Water Quality Monitoring
- Water Level Monitoring

The monitoring plans consist of a description of the protocols, tasks, and schedule required for monitoring each of the programs and are detailed in Section 2.0 of the previous Cutler Five-Year Report (PacifiCorp 2002). A summary and schedule of proposed monitoring activities for the Cutler project is shown in Table 1-2. Monitoring takes place annually or bi-annually, with the exception of water quality monitoring, which is conducted quarterly every fifth year. In addition, some aspects of fish habitat structure monitoring have been deferred until after the next major reservoir drawdown, currently scheduled for fall 2008, by agreement with UDWR.

Table 1-2. Monitoring Plan Components for Cutler Hydro Project No. 2420.

Task	Start Date	End Date
Vegetation Enhancement Program Monitoring		
Shoreline Buffer	May 1	July 31
Woody Vegetation	May 1	May 31
Bank Stabilization	June 1	June 30
Buffer/Boundary Fence	May 1	July 31
Erosion Control Sedimentation Basins	April 1	May 31
Sensitive/Unique Wildlife Habitat	April 1	May 31
Agricultural Lease Program Monitoring		
Grazing Leases	April 1	Nov. 30
Farming Leases	Year-round	
Wildlife Food/Cover Plots (spring)	May 1	May 31
Wildlife Food/Cover Plots (fall)	Nov. 1	Nov. 30
Cattle Management Fence	May 1	July 31
Property Coordination	Year-round	
Recreation Site Program Monitoring		
Canoe Trail (ice off)	March 1	April 30
Canoe Trail (prior to freeze-over)	Oct. 1	Nov. 30
Boat-in Day Use Site (ice off)	March 1	April 30
Developed Day Use Site	March 1	April 30
Developed Walking Trail (spring)	April 1	April 30
Developed Walking Trail (fall)	Nov. 1	Nov. 30
Primitive Recreation Site	Annually	
Wetland Mitigation Program Monitoring	March 1 through 2001, now complete.	April 30 through 2001, now complete.
Fish Habitat Structure Program Monitoring	Resume when feasible; likely next opportunity in fall of 2008.	
Water Quality Monitoring	Quarterly, every 5th year beginning in 2003; next data collection to take place in 2008.	
Water Level Monitoring	Compile average daily levels and file with FERC annually.	

Specific data sheets were designed for the previous Cutler five-year report (PacifiCorp 2002) and were utilized for most of the monitoring tasks. The Hydro Compliance Staff (HCS) files the completed data forms, noting any required maintenance activities, at PacifiCorp's North Temple Office (NTO) in Salt Lake City in binders containing all monitoring data for a given year. Data is also tracked and filed digitally. This information is used as documentation for each of this five-year monitoring reports, and for future required reports over the length of the license.

1.3 2002 RMP Monitoring Results Summary

A summary of the initial (2002) monitoring results is presented in Table 1-3, in order to facilitate comparison with the current period (2003-2007) monitoring results. Formal monitoring is currently underway for all implementation programs with the exception of the Wetland Mitigation Program and the Visitor Use Survey portion of the Recreation Site Monitoring Program, which are now considered complete. Fish habitat structure monitoring has been deferred until after the next major reservoir drawdown, currently planned for fall of 2008. Monitoring results are presented to meet the requirements of the RMP and FERC license order, and to frame the ongoing O&M activities.

Table 1-3. Initial (2002) Monitoring Results for Cutler Hydro Project No. 2420.

Monitoring Program	Time Frame	Initial Results
Vegetation Enhancement Program		
Shoreline Buffer (53 parcels)	Annual monitoring began in 2002	65% buffer parcels rated good to excellent 35% buffer parcels rated poor to at-risk *Work on at-risk buffers scheduled for fall 2002*
Woody Vegetation Pockets (12 sites)	Annual monitoring began as sites were planted (1996-2001)	7 in good condition 4 in marginal condition 1 failed/abandoned *None currently in Phase II 'established' monitoring. Supplemental planting may be needed on some sites.*
Bank Stabilization (17 areas)	Annual monitoring began in 2002	81% in good condition 2% in fair condition 17% in poor condition *Methods used appeared to dictate success. Some areas may require replacement or repair.*
Buffer/Boundary Fences (57 segments)	Annual monitoring began in summer 2002	15 problem areas identified; 8 due to continued farming of buffers taken out of production, 6 due to inadvertent farming damage. *Repairs will be made during 2002/03 annual*

Table 1-3. Initial (2002) Monitoring Results for Cutler Hydro Project No. 2420.		
Monitoring Program	**Time Frame**	**Initial Results**
		maintenance. Some damages will be reviewed in court proceedings with adjacent landowners.
Erosion Control Sedimentation Basins (13 structures)	Annual monitoring began in summer 2002	12 functioning properly, although 1 is impaired. 1 inadvertently farmed over and destroyed. *Many now support wildlife during spring runoff and are currently being monitoring along with sensitive/unique wildlife habitat.*
Sensitive/Unique Wildlife Habitat Areas	Annual monitoring began in 2002	• Shorebirds and other wildlife appear to be increasing near erosion control sediment basins. • Great blue heron rookery used continuously. • White-faced ibis colony used continuously. • Waterfowl, ring-necked pheasant, and Sandhill cranes appear to be benefiting from food/cover plots. • Shrub and willow plantings along RR Trail have experienced rapid and diverse growth and have attracted songbirds, wading birds, fish and moose. • No use of nest structures for osprey, goose, and burrowing owls noted yet (installed in 2001-02).
Agricultural Lease Program		
Grazing Leases	Annual monitoring began in 2002	74% in good condition 26% in poor condition *Pastures in poor condition will be targeted for improvement in fall 2002.*
Farming Leases	Annual monitoring began in 2002	Areas of noncompliance have been reported to PacifiCorp's property agents. *Some noncompliance issues resolved but need continued monitoring. Five individuals farming PacifiCorp land without a lease have legal actions pending.*
Wildlife Food/Cover Plots	Annual monitoring began in 2002	Late-season grazing has supplanted sharecropping on these lands, allowing breeding/nesting by waterfowl, pheasants, and cranes. Initial observations suggest increased goose production.
Cattle Management Fences	Annual monitoring began in 2003.	2002 monitoring indicated need for minor repairs.

Table 1-3. Initial (2002) Monitoring Results for Cutler Hydro Project No. 2420.		
Monitoring Program	**Time Frame**	**Initial Results**
Property Coordination	Annual monitoring began in 2002	Of 190 adjacent landowners, property incident monitoring forms are being used to track and document at least 20 current issues. Several areas being farmed without a lease are currently being addressed in court.
Recreation Site Development Program		
Recreation Areas	Annual monitoring began in 2002	Overall, sites are in good condition with little need for major maintenance. • *Buoys along North Marsh and Little Bear River Canoe Trail destroyed by ice or hunters will be replaced in fall 2002.* • *Noxious weeds noted near recreation site in South Marsh.* • *4-wheeler use noted at Bear River Riparian Walking Trail.*
Visitor Use Survey	Complete	22% of respondents knew of Cutler Reservoir 49% knew when location was explained—the majority of those felt that water quality was the biggest problem for recreation in Cutler Reservoir. 73% had never visited Cutler *Recommend adding an on-site component to the survey.*
Wetland Mitigation Program	Complete	Returned to landowner (UDWR) in 2001.
Fish Habitat Structure Program	Began with installation (1996, 1998, 2000), discontinued per agency consultation and agreement.	Game fish present near structures in 1996. Few recorded in 1998. None in 2000. *Monitoring deferred until next major drawdown of the reservoir, per agreement with UDWR; necessary drawdown tentatively scheduled for fall 2008..*
Water Quality Monitoring Program	Quarterly, 1996-1998, (additional dates 2001-2003); now quarterly every five years: 2003, 2008…	Monitoring indicates that tributaries greatly influence water quality at Cutler. This influence appears to have masked the effects of water quality improvement measures such as erosion control and improved land use practices. The 2002 report contained information from the early monitoring periods; the 2008 Cutler report will include the 2003 water quality monitoring data full report.
Water Level Monitoring Program	Annual reports sent separately to the FERC since 2002.	Will be monitored separately, with average daily reservoir elevations compiled and reported to the FERC annually.

2.0 MONITORING PLAN RESULTS

This section of the report summarizes the monitoring results completed during the current monitoring period, 2003-2007. As previously described, monitoring results are presented to meet the requirements of the RMP and FERC license order, but also to help frame the O&M activities that will result in continual improvements for the project. Monitoring results also provide the framework for any necessary project modifications or proposed changes to the current monitoring plan, as specified in Section 3.0 of this report, the future plan and schedule. Most components of monitoring are working well to provide the information necessary to ensure continued success of the Resource Management Plan; any adjustments needed are detailed in Section 3.0.

A complete copy of the monitoring plan that guided the data collection and analysis presented here can be found in Section 2.0 of the previous Cutler five-year report (PacifiCorp 2002); initial monitoring results and monitoring plan requirements are also summarized in Section 1.0, Tables 1-1 and 1-3 of this report. As already noted, complete sets of monitoring results, data forms, and photos to date are available upon request in binders located in the Hydro Resources Department, PacifiCorp's NTO, Salt Lake City, or digitally. The monitoring data results are summarized in the following sections due to the volume of complete data forms and photos involved (i.e., over 500 pages for Section 2.1.1, alone). Where appropriate, results from other documents (i.e., Cutler Operational Plan annual data or water quality monitoring data) are either referred to or appended.

2.1 Vegetation Enhancement Monitoring Program

The Vegetation Enhancement Monitoring Program initial results are analyzed and presented for the following elements:

- Shoreline Buffer Monitoring
- Woody Vegetation Pocket Monitoring
- Bank Stabilization Monitoring
- Buffer/Boundary Fence Monitoring
- Erosion Control Sediment Basin Monitoring
- Sensitive/Unique Wildlife Habitat Area Monitoring

2.1.1 Shoreline Buffer

The current five-year shoreline buffer monitoring period was completed in 2007. All 54 buffer parcels were traversed during each year to observe and categorize site conditions regarding plant community health, erosion, noxious weed presence, encroachments, and to take a photograph at each established, permanently-marked monitoring point. Table 2-1 summarizes the changes in overall condition of each buffer parcel from 2002 (baseline data for comparison) to 2007. Photos and the corresponding data forms from the permanent photo monitoring points illustrate the evaluation of excellent, good, fair, poor, and at-risk buffers, and are available upon request (PacifiCorp's Hydro Resources Department, Salt Lake City NTO). As shown in Table A-1-1 (Appendix A-1), shoreline buffers exhibited a variety of buffer health conditions. Not surprisingly, those rated

Table 2-1. Cutler Reservoir buffer parcels by condition per year.						
Condition of Buffer*	**2002 (baseline)**	**2003**	**2004**	**2005**	**2006**	**2007**
Excellent	4	4	4	4	4	5
Good	26	26	25	27	24	27
Fair	0	4	6	7	9	12
Poor	16	12	13	12	12	6
At-risk	6	4	4	4	4	3
No Data	2	4	2	0	1	0

* **Excellent** = Established perennial vegetation with rare presence of noxious or annual plants and no erosion. **Good** = Increasing perennial vegetation with limited scattered noxious plants. **Fair** = Established perennial vegetation that is increasing but that has a minor encroachment or other issue that can be resolved in a single year. **Poor** = Limited perennial vegetation with increasing noxious or annual plants. In many cases condition is being aggravated by continued or recent farming encroachment. **At-risk** = Annual vegetative cover offering little protection from surface erosion.

similarly shared some common attributes. The buffers rated in ‘excellent’ condition had established perennial vegetation and very few if any noxious weeds. They showed functionality in preventing erosion, filtering sediment and nutrients from adjacent land uses, and providing habitat for wildlife species. These parcels had no significant encroachments from adjacent land uses.

In the buffers rated in ‘good’ condition, perennial plants were increasing in cover, and showing evidence of future adaptability to reproduce and continue their improvement in distribution. This trend was usually attributed to restorative work done to increase perennial vegetative cover. These actions included control of encroachment from adjacent land use (refer to Section 1.1.2 and 2.2.5), management of noxious and invasive weeds (refer to Appendix A; note this appendix contains only information for weed management in 2007 due to some new technology to provide maps and protocol summaries for every area treated), and seeding of perennial grasses and forbs as part of the buffer seed mix. Vegetative cover establishment was variable depending on soil type, precipitation amount and timing, but usually resulted in sufficient densities from two to three years post treatment.

Buffers rated as ‘fair’ condition share several important features with those rated as ‘good,’ such as increasing perennial vegetation, and decreasing amount of noxious, invasive, or unwanted species. What separates these two categories is the presence on those categorized as ‘fair’ of some issue that requires corrective action, which can be addressed within a single season. For example, a buffer that would otherwise have been rated as ‘good’ would receive a ‘fair’ categorization if portions of the buffer had been inappropriately mowed by an adjacent owner. Through a single corrective action (a letter and follow-up with the adjacent owner), the issue can be remedied. The key to this category is that the corrective action must be able to resolve the issue in a single year, and restore the buffer to a functional ‘good’ condition. Other examples include buffers with machinery stored on them, or those with a small controllable stand of a noxious weed such as thistle.

Many of those rated 'poor' had no or very limited perennial vegetation that showed signs of stress. Furthermore, most of the vegetation that did exist in these buffers was dominated by noxious and/or annual weedy species. This category also had parcels that have been subject to recurrent encroachment. Parcels such as Lindley (22) were reseeded in 2002 and 2004, but the seeding was eliminated by the adjacent landowner. Legal action is pending to resolve this issue.

Lastly, those buffers listed as in 'at-risk' condition had very little perennial component and were dominated by annual, weedy vegetative cover. These parcels are prioritized for vegetative enhancement, but usually need to have issues with adjacent landowners resolved first, such as eliminating farming encroachment or procuring reclamation access.

Frequent wildlife observations were made on buffers that ranged from poor to excellent. Less evidence of wildlife utilization was found on buffers that were considered at-risk. In buffers where emergent wetlands comprised a portion of the buffer plant community, bank erosion was controlled. The presence of emergent wetland along shoreline was a greater indicator of bank stability than the presence of established perennial grass. In those buffers where bank erosion was active, monitoring results indicated there was not an immediate risk to adjacent landowners.

From 2003 to 2007 the general trend of the overall condition of the buffers has been slow improvement, despite ongoing drought conditions. Much of this can be attributed to enforcement against encroachments, management of noxious weeds, and reseeding efforts coupled with adequate spring moisture in 2005 and 2007. Table 2-2 presents an overall summary of current shoreline buffer monitoring results. Refer to Appendix A for details regarding buffer maintenance activities, including seed mixes and seeding areas.

Table 2-2. Summary of Current (2007) Shoreline Buffer Monitoring Results.

Condition of Buffer	No. of Parcels	No. of Acres	Percent of Total Acreage	Characteristics
Excellent	5	15	1.3	Established perennial vegetation with rare presence of noxious or annual plants and no erosion.
Good	26	452	41.8	Increasing perennial vegetation with limited scattered noxious plants.
Fair	12	528	48.8	Similar to 'good' rating, but with a need for corrective action that could restore the buffer to a better rating in a single year.
Poor	6	24	2.2	Limited perennial vegetation with increasing noxious or annual plants. In many cases condition is being aggravated by continued or recent farming encroachment.
At-risk	3	63	5.9	Annual vegetative cover offering little protection from surface erosion.
Totals	52	1082	100%	

A total of 54 parcels were monitored; however, two of the parcels (L. Falslev) have not been GPSed and are not included in this table.

Overall Findings: Future annual monitoring will continue as present, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. Buffers rated as at-risk, poor, or fair were prioritized for corrective actions the following year. Currently 21 buffers are designated for corrective actions during the next monitoring period. Thirty-one buffers (43.1 percent) were rated as excellent or fair in 2007.

2.1.2 Woody Vegetation Pockets

The 11 woody vegetation pocket sites were monitored continuously throughout the current monitoring period; note that one other site (12 total planted) was considered failed and abandoned prior to the current period. Baseline data was collected when the sites were planted, and data regarding survival of marked shrubs on transects was compiled as described for Phase I monitoring in the previous Cutler five-year report (see Section 2.1.2, PacifiCorp 2002).

At the time of the previous five-year report, none of the sites were characterized as 'established,' although seven of the sites were characterized overall as 'good' (see Tables 1-3 and 2-3). Despite the persistent drought conditions over the current monitoring period, five sites were characterized as being 'established,' and therefore can now be moved to Phase II monitoring protocol (PacifiCorp 2002). Of these five, three were previously characterized as 'good,' while surprisingly, the other two were previously considered 'marginal.'

Two other sites were characterized as 'good' over the current monitoring period; one of those stayed as a 'good' site in comparison to the last assessment, while the other improved from a 'marginal' previous assessment. Another two sites, now rated as 'marginal' in the current reporting period, were both considered 'good' sites in the previous assessment; their downgrade may be due to the effects of overspray from herbicides applied along nearby roads. These two sites will continue to be monitored and will be prioritized for augmentation if necessary.

Unfortunately, two other sites, Swift Slough and Big Bend, rated as 'good' and 'marginal,' respectively, in the previous assessment, are now characterized as 'failed' sites and will be formally abandoned through this report documentation. A large increase in the volume of, and decrease in the quality of, water being discharged from the local water treatment plant through Swift Slough may account for the abrupt death of all shrubs (many now seasonally inundated) at that site. The site had previously been augmented, but will now be replaced at a different location. The shrubs planted at the Big Bend site never appeared to take root, and in fact, the vast majority of shrubs at this site did not survive more than two years. It is unknown why this site was unproductive.

Table 2-3 summarizes the results of monitoring to date on woody vegetation pockets. It is clear that with the loss of the two sites referenced above, PacifiCorp is now below the minimum of 10 woody vegetation pockets required by the license, and will need to augment the number of sites during the next monitoring period to ensure survival of a minimum of 10 shrub pockets.

Table 2-3. Summary of Woody Vegetation Pocket Monitoring Results					
Condition of Woody Veg Pocket	**# Of Sites**	**Year Planted**	**Average % Survival Across Transects**	**% of Total Sites**	**Characteristics**
Established 2600 N Lane; Check Dam 7; Cowley Slough; Rigby; RR Trail	5	 1998 1998 1998 1999 2001	158% 63% 61% 158% 46% 33%	41.6%	Established shrub plot with at least 20% shrub survival averaged across transects and stable trend data.
Good G.B. South; Valley View	2	 1999 1997/2001	 80% (missing 2007 data) 66%	16.6%	Shrub survival at least 20% averaged across transects, not considered established due to decreasing or unstable survival trend data.
Marginal Cutler Marsh Rec; Peterson	2	 1998 1999	 18% 17%	16.6%	Shrub survival less than 20% averaged across transects, considered for augmentation with this rating for at least two consecutive years.
Failed/ Abandoned Larson; Big Bend; Swift Slough	3	 1996 2001 1998/2001	 0 % 0% 0%	25%	Original site considered failed and not re-planted.
Totals	12	n/a	n/a	100	

Sites rated as marginal for at least two years will be considered for augmentation, depending on individual site conditions. Continuation of the current drought conditions may delay sites' growth and resultant designation as 'established,' which would also affect the commencement of Phase II monitoring. Future five-year monitoring reports will describe which additional sites have been moved into Phase II monitoring plans. Photos and the corresponding shrub count data forms from the permanent transects and photomonitoring points illustrate the evaluation of established, good, marginal, and failed/abandoned woody vegetation pockets, and are available upon request (PacifiCorp's Hydro Resources Department, Salt Lake City NTO).

Table 2-4 indicates the trend in condition for each of the plots; eight of the sites have either improved or show no change, while four of the sites have been downgraded in comparison to their baseline condition.

Table 2-4. Woody Vegetation Pocket Condition Trend.			
Woody Vegetation Pocket ID	**1998-2002**	**2003-2007**	**Trend since baseline**
2600 N Lane	Marginal	Established	Improved
Check Dam 7	Good	Established	Improved
Cowley Slough	Good	Established	Improved
Rigby	Good	Established	Improved
RR Trail	Marginal	Established	Improved
GB South	Marginal	Good	Improved
Valley View	Good	Good	No change
Cutler Marsh Rec	Good	Marginal	Degraded
Peterson	Good	Marginal	Degraded
Big Bend	Marginal	Failed/Abandoned	Degraded
Swift Slough	Good	Failed/Abandoned	Degraded
Larson	Failed/Abandoned	Failed/Abandoned	No change

Overall Findings: Future annual monitoring will continue as present for both Phase I and Phase II sites, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. Two new woody vegetation pocket sites will need to be selected, planted and established according to the 2002 protocol to ensure a minimum of ten sites established per the RMP. Sixty-four percent of the woody vegetation pockets are currently in established or good condition.

2.1.3 Bank Stabilization

The 16 bank stabilization parcels were monitored during the current monitoring period using the protocol described in Section 2.0 of the previous Cutler five-year report (note that the 17 referred to in the previous five-year report included one segment of bank stabilization [an additional 1.1 miles] undertaken to create the RR Trail loop, which was not counted as part of the 16-segment and 3.9- mile total of stabilized banks). A summary of the condition of bank stabilization efforts is presented in Table A-2-1, Appendix A-2.

In 2007 all sites (Figure 1-1) were rated as good condition. This is due to increases in emergent and bank vegetation. Bank shrub plantings were also monitored; all bank shrub plantings were in good shape, and were increasing or stable, and will therefore be proposed to no longer be counted, although they will still be included in monitoring for the overall site assessment. Only one bank, Ballard, required remedial action during the current monitoring period. The remedial action was taken to replace a section of previously-failed bank stabilization. The establishment of the buffer boundary and vegetation is still needed on this parcel, and will be an area of focus in 2008 as part of our property coordination and lease modifications with the current leaseholder. The bank stabilization, however, is functioning well and increasing in desirable vegetation. Photos and the corresponding data forms from the permanent photomonitoring points and bank shrub count transects illustrate the evaluation of good, fair, and poor/failed bank stabilization sites and are available upon request (PacifiCorp's Hydro Resources Department, Salt Lake City NTO).

Table 2.5 summarizes the overall bank stabilization results gathered by the monitoring efforts. Linear feet and miles are given by year and condition. This is done for all three (good, fair, poor) conditions for each year beginning with 2002 (baseline data year), and ending after 5 years of monitoring in 2007. Also included is the percentage of the total projects that is represented by each condition, each year.

Table 2-5. Summary of Results of Bank Stabilization Projects Monitored at Cutler Reservoir.

	2002 (baseline)		2003		2004		2005		2006		2007	
Condition	Feet/ Miles	% of Total	Feet/ Miles	% of Total	Feet/ Miles	% of Total	Feet/ Miles	% of Total	Feet/ Miles	% of Total	Feet/ Miles	% of Total
Good	16073/ 3.0	77.0	14490/ 2.7	69.5	16073/ 3.0	77.0	18650/ 3.5	89.4	19110/ 3.6	91.6	20862/ 3.9	100
Fair	0/ 0	0	3335/ 0.6	15.9	2212/ 0.4	10.6	2212/ 0.4	10.6	1752/ 0.3	8.4	0/ 0	0
Poor	4789/ 0.9	23.0	3037/ 0.6	14.6	2577/ 0.5	12.4	0/ 0	0	0/ 0	0	0/ 0	0
Total	20862/ 3.9	100	20862/ 3.9	100	20862/ 3.9	100	20862/ 3.9	100	20862/ 3.9	100	20862/ 3.9	100

At the close of this first full, five-year term (2003-2007), of monitoring, some trends and conclusions can be made when compared to the 2002 baseline data. Of the 16 bank stabilization projects, all were characterized as currently being in good condition. All of these had utilized rock in their construction (or in their subsequent repair or replacement), and demonstrated longevity in protecting bank soil and vegetation. The method of using large rocks to create a breakwater zone promoted the greatest vegetative growth in terms of emergent wetland flora and bank shrubs. Prior bank stabilization areas that did not utilize rock in their construction rated fair or poor and clearly showed erosion conditions that necessitated replacement or repair (e.g., Ballard and Stewart). These areas were replaced with rock/breakwater structures. Areas completed originally with rock rip-rap or gabions were also in good condition, although the associated vegetative communities tended to take much longer to establish to the degree that they can accomplish bank protection and stability.

Overall Findings: Future annual monitoring will continue as present, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. Aside from updating the GIS database for banks that were re-stabilized during this monitoring period, no specific future work is recommended for the bank stabilization component of the Vegetation Enhancement Program. All 16 of the bank stabilization projects were characterized as currently being in good condition.

2.1.4 Buffer/Boundary Fence

The annual inspection of boundary/buffer fence and posts was conducted concurrently with the shoreline buffer monitoring during July and August of this monitoring period (see Table A-3-1, Appendix A-3 and Figure 1-1). Post and fence damage was documented to provide the basis for resolving problems that relate primarily to adjacent landowner encroachment. Most of the damage occurred from farm equipment as the adjacent landowners or lessees continued to farm too close to (or on) buffers that were previously taken out of production, most often by using farm equipment carelessly such that posts were broken off at ground level. This accounted for the majority of problems that were recorded from the 54 segments of boundary/buffer fences or posts, and generally consisted of one or more posts being removed. Post replacement was usually accompanied by a conversation and follow-up letter to the adjacent landowner or lessee indicating PacifiCorp intentions. In several cases costs for replacement were sought, including additional lease penalties for one chronic case. This is beginning to reduce intentional or careless destruction by focusing on the pattern of problem landowners as recognized in Table A-3-1 (Appendix A-3). T. Ballard (24) and T. Ballard South (25) had missing posts that were not replaced until the bank stabilization construction work was complete and an adequate buffer could be delineated with the lessee.

Other areas of chronic fence or post problems include Church Farm (26) and Lindley (22), where legal action against trespassing encroachment is pending (see also Sections 1.1.2 and 2.2.5 of this report).

As a result of buffer/boundary fence monitoring over the past five years, a list of replacement/repair actions has been developed to be completed during the annual upcoming fence maintenance. The completed boundary/buffer fence data forms illustrate the evaluation of good and poor condition fences, as well as detail the problems documented by fence segment and are available upon request (PacifiCorp's Hydro Resources Department, Salt Lake City NTO). Photos of the most egregious removal incidents were also taken to document these occurrences and are similarly available.

Overall Findings: Future annual monitoring will continue as present, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. Several segments of boundary/buffer fence or post will need to be repaired or replaced during the next monitoring period; Table A-3-1 (Appendix A-3) lists those segments needing corrective actions after the 2007 monitoring season. Areas prioritized for immediate action in 2008 include the parcels around Clay Slough, as well as several areas near the confluence with the Bear River and Cutler Reservoir.

2.1.5 Erosion Control Sedimentation Basins

The erosion control sediment basins and corresponding check dams were monitored from 2003 to 2007. Baseline conditions in 2002 showed all basins in good functioning condition prior to the current monitoring period. Monitoring results since then indicated that all of the 13 sediment basins had proper functioning condition as evidenced by the presence of water during spring snow melt (Figure 1-1). During the spring of 2005, an extreme precipitation event filled all sediment basins to capacity and three needed minor repairs due to the extreme water volumes. This single event deposited significant sediment in five of the sediment basins, which necessitated dredging in the fall of 2005 and spring of 2006. Table 2-6 presents a summary of sedimentation basin conditions and remedial actions taken over the monitoring period.

Table 2-6. Summary of Results of Erosion Control Sediment Basins Monitored at Cutler Reservoir.

Sediment Basin ID#	2003	2004	2005	2006	2007
1	Good	Good	Dredged and deepened	Good	Rebuilt road crossing
2	Good	Good	Dredged and deepened	Good	Rebuilt road crossing
3	Good	Good	Good	Dredged	Good
4	Good	Good	Good	Dredged	Good
5	Good	Good	Good	Good	Good
6	Good	Good	Good	Good	Good
7	Good	Good	Good	Dredged	Good
8	Added rock to outlet	Good	Good	Dredged	Good
9	Good	Good	Good	Good	Good
10	Good	Good	Good	Good	Good
11	Good	Good	Good	Good	Good
12	Good	Good	Good	Good	Good
13	Good	Good	Good	Good	Good

Sediment basin 11, in the North Marsh, continued to capture perennial water and provided habitat for a variety of breeding shorebirds, waterfowl, and grebes. Other wildlife observed utilizing this aquatic habitat included chorus frogs, tiger salamanders, long-billed curlews, short-eared owls, bats, deer, small mammals, and a variety of songbirds. One other basin was constructed on a small but perennial water source, and several others carry irrigation drain water, which ensures a relatively constant seasonal supply. It was noted that during spring precipitation and runoff, all of the sediment basins in the North Marsh Management Area contain water and provide habitat. Even those structures that surround ephemeral or spring runoff-only drainages create important mud flat and playa habitats for shorebirds.

Sediment basin 6 was half farmed over in 2002. This basin was marked by t-posts and has not experienced further damage since then. All basins were inspected annually for t-post markers, which were replaced as necessary. The completed erosion control sediment basin data forms illustrate the condition of the erosion control check dams, as well as detail the wildlife species utilizing these created habitats, and are available upon request (PacifiCorp's Hydro Resources Department, Salt Lake City NTO). Also note the related discussion in Section 2.1.6, as the habitats created by the sediment basins are also monitored as part of the Sensitive/Unique Wildlife Habitat Program.

Overall Findings: Future annual monitoring will continue as present, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. Erosion control sediment basins are in good condition throughout the North Marsh and Reservoir management units, where they were constructed. Monitoring following an average water year (as opposed to the pattern of drought years recently experienced on the project) will be important to ensure functionality after a comparatively higher run-off season.

2.1.6 Sensitive/Unique Wildlife Habitat Areas

Areas within the Cutler project designated as containing sensitive or unique wildlife habitats are surveyed at least once annually (Figures 1-1 and 1-3). A summary of the results generated through the cooperative monitoring efforts of the Bridgerland Audubon Society on the three transects established to date are included in Appendix B, and describe both species observed and a quantitative measure of their abundance on the transects. Currently, these transects cover the areas east of the ibis/gull/egret colonies, the west side of the reservoir around the erosion control sediment basins and artificial owl nest boxes, and around the spring in Cutler Canyon (North Marsh, Benson, and Cutler Canyon transects, respectively). As each of these areas has been designated as sensitive/unique wildlife habitat, future results from this monitoring will help track the effectiveness of the mitigation measures designed to improve and/or protect utilization of these sites. One of the most interesting findings has been a marked and sustained increase in long-billed curlew, American avocet, and black-necked stilt breeding pairs in the 300-acre parcel surrounding many of the erosion control basins since the parcel was removed from agricultural production and converted to a perennial grassland. Although the artificial nest burrows have been available for occupation by burrowing owls since 2002, the target species has not been observed utilizing the sites. Short-eared owls regularly utilize the posts, and the burrows are being utilized by a variety of burrowing wildlife species. It is hoped that burrowing owls will eventually discover and utilize these sites.

The great blue heron rookery has been used continuously over the years monitored (Figure 1-1), primarily by great blue herons, but also by double-crested cormorants, and occasionally by Canada geese. Although seasonal fences now protect the area from cattle grazing, it is difficult to assess whether recruitment of new cottonwoods and willows is occurring, as previous cattle grazing and shade-seeking appears to still be preventing widespread successful sprouting of future suitable replacement trees. Future monitoring will continue to assess this factor.

The white-faced ibis colony has changed in magnitude several times over the current monitoring period, possibly in conjunction with conditions in the Bear River Refuge, located on the west side of the Wellsville Mountains; i.e., during periods of favorable nesting conditions at the refuge, nesting ibis at Cutler may decrease, or the observed decrease may be in response to disturbance or other environmental risk factors around the Cutler ibis colony. During the 2007 nesting season, the ibis, although initially present in lower numbers than previous years, eventually abandoned the nest colony completely, corresponding to lower numbers of ibis subsequently throughout the Cache Valley. It is currently unknown why the ibis abandoned the nest colony. Also in 2007, the new Cutler motorized use policy was finalized by the state (see also Section 1.3), which should decrease recreational disturbance to the colony area, and allow for enforcement of what has been a voluntary restriction in the past. These changes should ameliorate disturbance effects, if that was a factor in colony abandonment. Future monitoring will continue to assess this population, which consists of over five percent of the global population of this rare species, and thus a significant species of concern regarding management of the Cutler system. Loss of the ibis's macroinvertebrate prey base due to declining water quality is also being investigated as part of the development of the Cutler Total Maximum Daily Load (TMDL). Regardless, the ibis colony continues to support habitat conditions important for a number of other waterfowl, shorebirds, and gulls, and with the exception of 2007, has been occupied continuously over the current monitoring period.

Monitoring results indicate that waterfowl (especially Canada geese), ring-necked pheasants, and Sandhill cranes are the target species that benefit most from the management of the wildlife food/cover plots (Figure 1-3), although the proximity of high-quality riparian habitats along the Logan River has also resulted in habitat improvements for neo-tropical migrant songbirds. Late-season grazing has mostly supplanted grain sharecropping as management for the six fields around the Logan River, as well as for the 300-acre parcel on the west side of the reservoir, and in Cutler Canyon.

The goose nesting platforms in the Watterson 100-acre parcel were constructed during 2002. They have been utilized since the 2004 nesting season. The osprey platforms were constructed and installed in late 2001; beginning in 2006, the south nest platform was utilized to fledge young successfully in both 2006 and 2007 (Figure 1-1). Apparently water quality improvements have been sufficient to support osprey hunting, and ideally a second breeding pair will take up residence on the north platform also. Future monitoring reports will indicate the nesting success observed for all artificial structures (two each for goose and osprey, four for burrowing owls).

The shrub and willow planting that occurred along the edges of the RR Trail and replaced the requirement for planting roses in the old Bear River Oxbow is monitored bi-annually to assess plant community vigor and wildlife utilization. Results of the monitoring indicate that the vegetation community establishment has been both extremely rapid and quite diverse. All three shrub species planted flowered their first year, and some of the willows have grown extremely prolifically. A wide variety of neo-tropical migrant songbirds (especially goldfinches, kingbirds, and flycatchers), wading birds (great blue and black-crowned night herons), fish, and moose have been observed utilizing the willow habitat; none were observed prior to the planting project. Future five-year monitoring reports will continue to track and document habitat changes and subsequent wildlife utilization of these areas. The completed sensitive/unique wildlife habitat data forms detail the condition of special structures, habitats, and food and cover plots, as well as detail current wildlife utilization in those habitats. Completed data forms are available upon request.

Overall Findings: Future annual monitoring will continue as present, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. Additional studies regarding the water quality and potentially related dearth of macroinvertebrates in the areas of the North Marsh surrounding the former ibis rookery may be conducted as part of the study for a Total Maximum Daily Load nutrient limit currently being developed by the state of Utah. If conducted, these studies may give us more information about the abandonment of the white-faced ibis rookery in 2007, and potentially about other areas of sensitive or unique wildlife habitats.

2.2 Agricultural Lease Monitoring Program

The Agricultural Lease Monitoring Program initial results are analyzed and presented for the following elements:

- Grazing Leases
- Farming Leases
- Wildlife Food/Cover Plots
- Cattle Management Fences
- Property Coordination

2.2.1 Grazing Leases

Monitoring conducted during the current monitoring period provided the opportunity to analyze areas where grazing management and wildlife habitat objectives were being met, and, as importantly, where they were not on the 1237 acres currently leased for grazing. The majority of pastures monitored, 80 percent, were considered in good condition. Several pastures are providing good quality lure crops for geese, waterfowl, and Sandhill cranes (the primary target species) and others are maintaining the vegetation community mix optimal for waterfowl nesting and breeding habitat.

The monitoring also indicated that 20 percent of the pastures were considered to be in poor condition, where maintenance activities could be improved. Current challenges to and limiting factors for the grazing management program include grazing system changes under drought conditions, increases in less desirable or undesirable vegetation, and increases in weeds. These will continue to be addressed by such measures as reseeding, fencing, improving irrigation, and by managing the number and timing of cattle on these pastures.

The north and south marsh grazing pastures were monitored throughout the current report period according to procedures outlined in Section 2.2.1 of the Cutler Monitoring Plan (PacifiCorp 2002). This monitoring data has helped to document changes in vegetation communities from year to year. As summarized in Table 2-7, vegetation measurements fluctuated according to several factors including precipitation amounts, precipitation timing, fencing, and lessee performance. The Robel pole measurements quantify vegetation height and density. Photos and the corresponding data forms, including Robel pole forage utilization measurements from permanent photomonitoring points illustrate

Table 2-7. Average Robel Pole Measurements by Season, 2003-2007.				
Year	**Summer (inches)**	**Fall (inches)**	**Precipitation (inches)**	**Pasture Condition***
2003	16.1	9.2	16.1	74/26
2004	15.1	4.5	18.7	57/43
2005	34.3	10.5	26.5	80/20
2006	14.4	3.9	21.7	74/26
2007	11.1	8.1	14.6	80/20
*percent total pastures in good/poor condition. Good = a rating of good or fair; Poor = a rating of poor or at-risk				

the evaluation of good, poor, and at-risk grazing pastures, and are available upon request (PacifiCorp's Hydro Resources Department, Salt Lake City NTO).

The following sections summarize conditions and management actions taken in each area of the grazing lease program during the current monitoring period (see Figures 2-1 and 2-2).

North Marsh

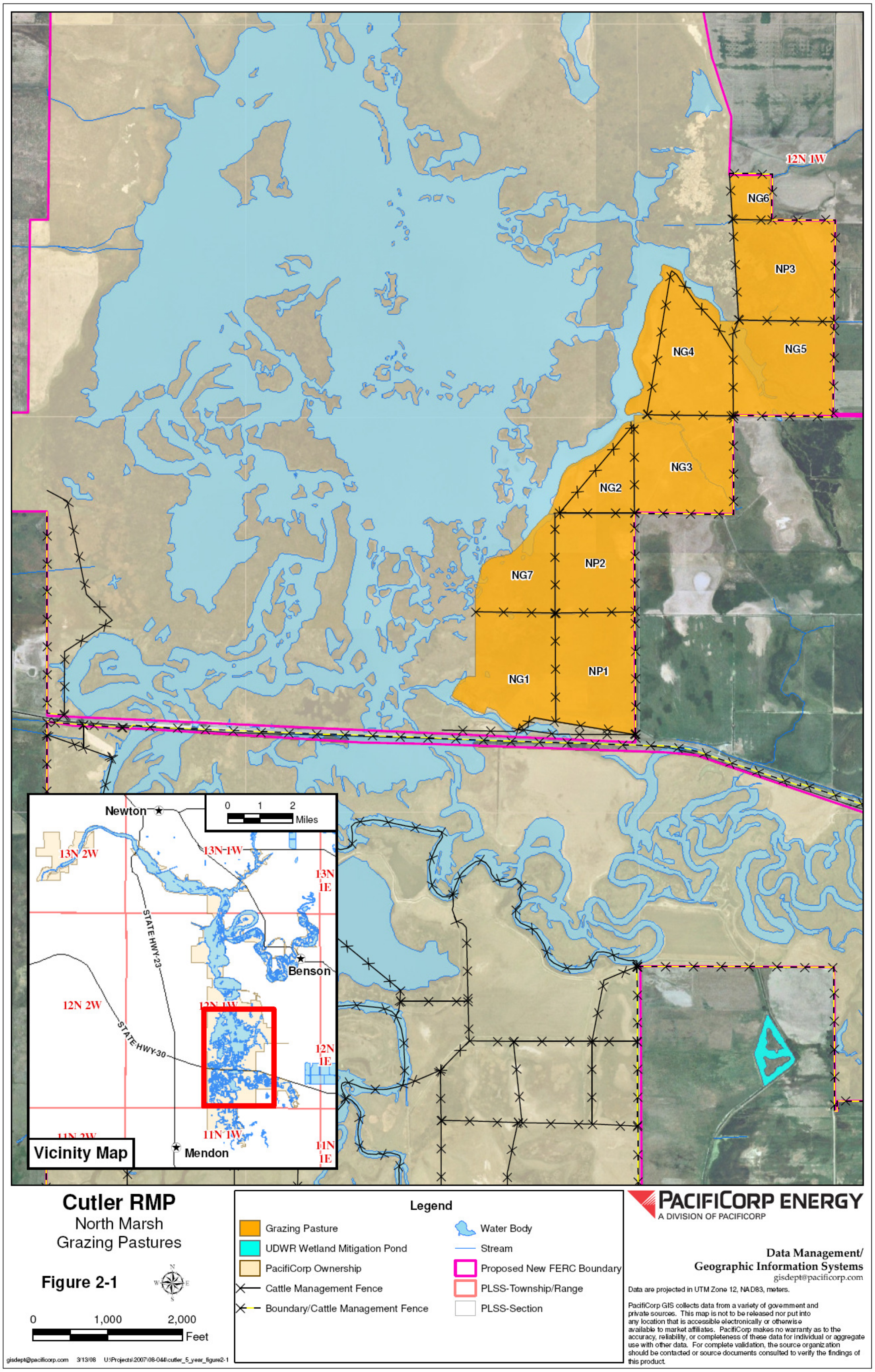
Lessee: Brett Selman
Pastures: NG1, NP1, NP2, NP3, NG3, NG4, NG5, NG7

In the North Marsh pastures, conditions improved slightly over the past 5 years. Much of this can be attributed to changes in irrigation, fall grazing of non-irrigated pastures, and finally securing gates during hunting season.

Seven of the ten pastures receive irrigation to generate vegetation growth. This irrigation is managed by the lessee. Growth performance of these pastures correlates to irrigation efficiency. Irrigation in 2007 was more consistent and adequate in amount, which was attributed to a change in irrigation ditch administration and adjacent landowners.

Geese continued to use the irrigated pastures as feed for goslings in the late spring and early summer. Grazing these pastures early helped to keep grass fresh for this wildlife use, as well as short, which was an attractant to geese by minimizing gosling predation in pastures with less hiding cover for predators.

Pastures without irrigation include NG2, NG4, and parts of NG3. They consist of alkaline soils that support little perennial grass growth. During the fall of 2005 upland grass species including intermediate wheatgrass was planted on ten acres in NG3. Very little growth has resulted from this planting. These pastures will continue to be grazed in the fall to allow existing vegetation to produce seed and then be incorporated into the soil.



12N 1W
NG6
NP3
NG4
NG5
NG3
NG2
NP2
NG7
NG1
NP1
Newton
0 1 2
Miles
13N 2W
13N 1W
13N 1E
STATE HWY 23
Benson
12N 2W
12N 1W
STATE HWY 30
12N 1E
11N 1W
Mendon
11N 1E
Vicinity Map
Cutler RMP
North Marsh
Grazing Pastures
Figure 2-1
0 1,000 2,000
Feet
Legend
Grazing Pasture
UDWR Wetland Mitigation Pond
PacifiCorp Ownership
Cattle Management Fence
Boundary/Cattle Management Fence
Water Body
Stream
Proposed New FERC Boundary
PLSS-Township/Range
PLSS-Section
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Data are projected in UTM Zone 12, NAD83, meters.
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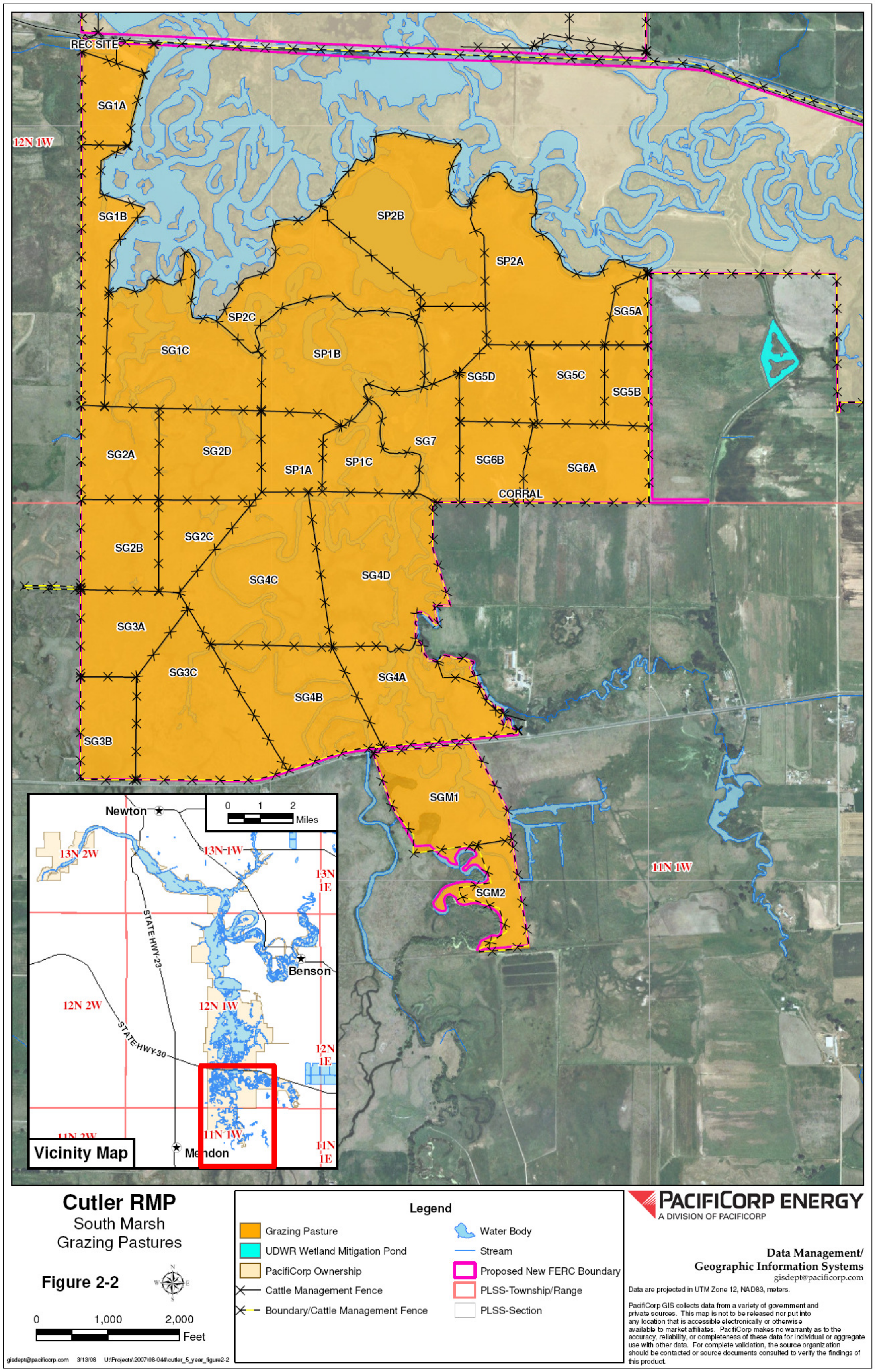
REC SITE
SG1A
12N 1W
SG1B
SP2B
SP2A
SG5A
SP2C
SG1C
SP1B
SG5D
SG5C
SG5B
SG7
SG2A
SG2D
SP1A
SP1C
SG6B
SG6A
CORRAL
SG2B
SG2C
SG4C
SG4D
SG3A
SG3C
SG4B
SG4A
SG3B
SGM1
SGM2
11N 1W
Newton
0 1 2
Miles
13N 2W
13N 1W
13N 1E
STATE HWY-23
Benson
12N 2W
12N 1W
STATE HWY-30
12N 1E
11N 2W
11N 1W
11N 1E
Mendon
Vicinity Map
Cutler RMP
South Marsh
Grazing Pastures
Figure 2-2
0 1,000 2,000
Feet
Legend
Grazing Pasture
UDWR Wetland Mitigation Pond
PacifiCorp Ownership
Cattle Management Fence
Boundary/Cattle Management Fence
Water Body
Stream
Proposed New FERC Boundary
PLSS-Township/Range
PLSS-Section
PACIFICORP ENERGY
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Data are projected in UTM Zone 12, NAD83, meters.
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gisdept@pacificorp.com 3/13/08 U:\Projects\2007\08-044\cutler_5_year_figure2-2

In 2005 Logan City began dramatically increasing the volume in Swift Slough through their use of this system as the route for return flows from their effluent polishing wetlands. This action raised the water in the canal and has eroded all access to NG6, as well as inundated most of the pasture and much of the surrounding lands. As a result, this pasture was removed from the North Marsh grazing program. Discussions with Logan City are underway to determine the potential damages and future of this parcel of land.

One of the challenges to the management of these pastures has been unclosed gates by hunters and others accessing the pastures, resulting in multiple gates being left open at the same time. This allowed the cattle herd to roam freely throughout several pastures simultaneously, which defeated the purpose of a rotational grazing program. The cattle herd was able to feed on up to four pastures at once, which had detrimental effects on the non-irrigated pastures. To correct this problem, chains and padlocks were installed on the internal gates in the system which had been commonly left open.

South Marsh

Lessee: Kelly Walker
Pastures: SP2A, SP2B, SP2C, SG5A, SG5B, SG5C, SG6A, SG6B, SG7

The series of pastures leased by Kelly Walker were maintained in good condition over the past 5 years. Much of this condition can be attributed to adequate irrigation water in that all pastures can be at least flooded in part. PacifiCorp contractors ensure that canal structures are maintained; contractors and lessees ensure those fields are regularly watered.

All but two of these pastures are grazed short in the fall to promote short succulent feed for goose goslings, and thus decrease goose depredation on nearby agricultural lands. SP2A averaged a Robel pole measurement of 2.8 inches in the fall, and for the past three years hundreds of geese were observed using the pasture during May. A clock-wise grazing rotation pattern has resulted in the effective management of grazing behavior in these fields.

Annual maintenance in these pastures included harrowing to break down manure nutrient and create efficient vegetation growth. Ditch cleaning ensured the efficient use of water.

South Marsh

Lessee: Harry Wilmore
Pastures: SG1A, SG1B, SG4D

The pastures in this lease have adequate production in moderate to wet years. The dry conditions observed over the past two years necessitated the use of non-PacifiCorp private pastures to the west as part of the rotation. This helped to prevent over-utilization of the pastures, which was particularly important given the proximity of this leased area to the Cutler Marsh Marina, a point of congregation for many recreational marsh users.

In 2005 pasture SG1C was traded to the Utah State University lease in exchange for SG4D (only lease boundaries between the two lessees changed; PacifiCorp roles remained unchanged). This switch allowed easier grazing rotations and coordination between lessees.

The main source of water in SG1 and SG1B is the reservoir. Erosion along the bank has occurred as the cattle seek water in drier conditions. Currently several off-channel water options are being explored to address this issue, including a cattle-powered water pump and a solar-powered system.

South Marsh

Lessee: Utah State University
Pastures: SG2A, SG2B, SG2C, SG2D, SG3A, SG3B, SG3C, SG4A, SG4B, SG4D, SP1A, SP1B, SP1C

Since Cache Valley has experienced drought years over the current monitoring period, the amount of moisture these pastures received naturally has been insufficient. With non-irrigated pastures (as all pastures in this lease are), the grazing pressure must be managed much more carefully than irrigated pastures. The topography is variable and moisture differences between marsh and upland can be difficult to manage. This variability was the cause for previous grazing damage (pre 2002). Approximately 58 acres of this lease had noxious weeds sprayed, mowed, and then upland grasses including intermediate wheatgrass planted. Most of these areas have since developed a healthier stand of hardy grass that promoted more uniform grazing behavior throughout the pasture.

The topography also presents a challenge in fencing. Areas that have six feet of water one year may only have six inches the next. Electric fences were often modified to prevent cattle from using multiple pastures at a time. This required more frequent monitoring by the lessee, which initially, was a challenge during this monitoring period. Utah State University is continuing to improve their performance in monitoring cattle to ensure an effective rotational grazing program.

Willow and cottonwood regeneration in SG4A and SG4B (in the vicinity of the great blue heron rookery) is being hindered by cattle seeking shade in the summer heat. Future grazing rotations will include earlier and/or later grazing and modifying electric fences.

South Marsh

Lessee: Heber Hardman
Pastures: SGM1, SGM2

The overall health of these two pastures was very good and they were well maintained over the past year 5 years. The positive working relationship with Hardmans proved effective in that they maintained a healthy and growing riparian area along the old Little Bear River floodplain.

Overall Findings: Future annual monitoring will continue as present, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. Some additional qualitative data will be collected in the future monitoring period to more closely correlate pasture health with grazing practices.

2.2.2 Farming Leases

Farming leases on all 440 acres have continued to improve through application of guidelines and conditions outlined in the RMP. Monitoring by PacifiCorp's property agents has helped to identify non-compliance and improve compliance with lease conditions. Instances of non-compliance have been documented through the incident tracking protocol described in the Cutler Monitoring Plan (PacifiCorp 2002). Also see Section 2.2.5 for additional detail regarding lease compliance and monitoring information tracking in coordination with Property Management.

To reduce discrepancies in rent owed at the end of the year, in 1999 property agents implemented a "flat fee" approach rather than the crop-share farming lease used in the past. This change has been successful in more clearly stating expectations and making the year-end lease accounting process less subjective.

All farming lease areas were formally monitored for compliance with the RMP and lease conditions annually during the current monitoring period. All non-compliance was either documented by or reported to the assigned property agent for documentation according to incident tracking protocol. Some non-compliance issues have been resolved but will continue to need monitoring. Currently, two individuals farming or occupying PacifiCorp lands without leases within the Cutler project boundaries have actions pending legal outcome. One additional lease was renewed with provisions for collecting damages for the 2007 encroachment into the buffer; further language was added that gives specific remedies and stronger language for termination of the agreement in the case of any defaults to requirements of the lease. Similar language will be added to the other leases when they are renewed. Documentation of farming lease monitoring is available upon request from PacifiCorp's Property Management Department, Salt Lake City NTO.

Overall Findings: Future annual monitoring will continue as present, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. Several farming lease areas have experienced loss of buffer post markers during the current monitoring period. One area, the Ballard lease, will require additional buffer post installation in the next monitoring period; on the Roundy lease, where a large number of posts were replaced in 2007, monitoring and new lease conditions will ensure their persisting over the next monitoring period.

2.2.3 Wildlife Food/Cover Plots

As noted in Section 2.1.6, tightly monitored late-season grazing has supplanted share-cropping for most of the wildlife food/cover plots, covering 345 acres. The results of monitoring in the pastures managed as part of this program indicate that late-season grazing allows for breeding/nesting utilization of these pastures by waterfowl, pheasants, and Sandhill cranes (the target species for this enhancement), that later grazing can successfully convert tall grass pastures to the desired shorter habitats for spring wildlife utilization, and that grazing is superior to share-cropping by requiring less invasive and intensive land manipulation and eliminating bare ground that is subject to sheet flow and other erosion. The completed wildlife food/cover plot data (as a result of their overall similarities, grazing pasture data forms were utilized for this assessment) illustrate the evaluation of good and poor condition food and cover habitats, as well as detail current wildlife utilization in those pastures. Of the seven wildlife food/cover plot pastures currently being monitored, six were in 'good' condition and one was in 'fair' condition. Completed data forms are available upon request (PacifiCorp's Hydro Resources Department, Salt Lake City NTO).

Overall Findings: Future annual monitoring will continue as present, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. Wildlife food/cover plots are overall in good shape throughout the project; as a result, semi-annual monitoring is proposed to be replaced by annual spring monitoring only.

2.2.4 Cattle Management Fences

Functioning cattle management fences are integral to the success of the overall grazing lease program at Cutler, as grazing is the tool utilized to create and maintain much of the wildlife habitat available on the project, and is central to providing habitat 'lure' areas that minimize impacts of wildlife depredation on surrounding agricultural producers (Figures 2-1 and 2-2). All cattle management fences (as differentiated from buffer/boundary fences; see also Sections 1.1.1 and 1.1.2 of this report; also PacifiCorp 2002) are monitored at least twice a year as prescribed in the Cutler RMP Monitoring Plan, Section 2.2.4 (PacifiCorp 2002). Although not specified in the lease agreement, all lessees are required to check the condition of fences prior to moving cattle into a new pasture. Pastures that contain electric fences require lessees to monitor cattle multiple times per week. The documentation of the primary annual monitoring consists of cattle management fence data forms; individual data forms are catalogued by lessee, pasture, and year, and available upon request (PacifiCorp's Hydro Resources Department, Salt Lake City NTO).

Annual maintenance included tightening gates and braces when necessary. Electric fences were strung and tightened every spring before the grazing season (June 1). At this time fencing contractors also installed solar chargers and batteries, and tested the fence to ensure adequate power. Vegetation commonly grew into the fence during each growing season, reducing its capacity and, therefore, effectiveness. Contractors were used to mow fence lines as needed to ensure their integrity. Following the end of the grazing season, the fences were let down before ice formation, and the batteries were stored.

Table D-2 (Appendix D) describes the maintenance performed on grazing pasture fences and their condition during the current monitoring period, 2003 to 2007.

Overall Findings: Future annual monitoring will continue as present, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. No changes to the cattle management fence monitoring protocol are suggested.

2.2.5 Property Coordination

As stated in Section 2.2.2, two areas have been identified as being farmed without a lease, or are otherwise in a chronic trespass condition. These on-going property issues are currently being addressed through PacifiCorp's legal department. Other incidents continued to be addressed and monitored with the cooperation of property agents, HCS, and the adjacent landowners, per the Monitoring Plan and PacifiCorp's existing Property Incident protocol (Section 2.2.5, PacifiCorp 2002), a process which documents and resolves non-compliance issues on project lands. Current buffer issues are in the process of being resolved on the Seamons, Munk, Falslev, Ballard, B. Griffin and M. Rigby buffers. Of the approximately 190 adjacent landowners and operators within the Cutler project boundaries, property incident monitoring forms are being used to track and document 11 current issues regarding property management or coordination (approximately 6 percent). Appendix D contains a summary table of the Property Incident Forms documented during the current monitoring period. Documentation of property coordination monitoring (either hard copy or electronically) is available upon request from PacifiCorp's Property Management Department, Salt Lake City NTO, and are part of the data binders kept by HCS.

Overall Findings: Future annual monitoring will continue as present, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. One additional task, entering property coordination into the compliance management system (CMS) is recommended to the property coordination monitoring protocol, to ensure continuity of relatively long-term and often complex tasks.

2.3 Recreation Site Monitoring Program

In general, the recreation sites were in good condition during the current monitoring period. The 14 recreation sites (three canoe trails, two hiking trails, two boat-in sites, four developed sites, and three primitive sites; Figure 1-4) were monitored throughout the current monitoring period, 2003-2007, to assess the status of their condition using procedures described in Section 2.0 of the previous monitoring report (PacifiCorp 2002). All of the sites exhibited good conditions in general and required minor maintenance as documented by the monitoring.

The use of recreation sites has increased slightly over the past 5 years based on qualitative observation. This is due in part to the population increase in Cache Valley. The highest use times occur during waterfowl and pheasant hunting seasons. It is not uncommon for parking lots to be at capacity, particularly in the early days of a new hunting season. The sites are also being increasingly used by organized groups such as local schools for science classes studying the characteristics of wetland or aquatic ecosystems. The Utah Multiple Sclerosis Society has also used the Benson Marina as a rest stop in their annual MS150 bicycle tour for the last three years. In order to maintain aesthetic sites, the Cutler Hydroelectric plant personnel have been completing weekly maintenance of the facilities, including mowing and restroom maintenance. This presence has minimized vandalism over the current period.

In 2007, some major improvements were made to a few of the recreation sites. The largest improvement was to the Benson Railroad Trail. Vegetation that had grown over trail edges was trimmed and weeds were cleared by hand as spraying herbicides here would eliminate the willows and other shrubs planted along the trail. Finally, several tons of gravel were added to the entire trail from the western side of the dike, culminating at the walking bridge on the eastern end of the dike trail. New signs identifying each recreation site throughout the reservoir were also added to the existing sign boards; the contents of all boards, including maps, FERC Form 80 information, and new regulations concerning motorized usage in various areas of the reservoir were standardized throughout the area. Other improvements included new boat docks installed at both boat-in sites, making access safer for recreational users.

PacifiCorp, Utah State Parks, and UDWR, in consultation with numerous boaters, hunters, and environmental interests, were able to finalize new regulations regarding motorized boat usage in the marsh during the current monitoring period. These regulations, which went into effect in March 2008, will help protect sensitive wildlife resources, while allowing popular recreation use of the marsh for canoers, hunters, waterskiers, and other motorized boating enthusiasts. The regulation stipulates three separate boating zones in the reservoir: in the south zone, motors are limited to 35hp or less and wakeless speeds year round; in the Bear River zone, motors and wakeless speeds are similarly regulated, but only seasonally, generally from the last weekend in September until the end of March; in the north zone, no motor size restrictions and safe speeds are in place year round. Appendix C includes both the regulation adopted and the maps in use throughout the reservoir to educate users as to the new policy. Both State Parks and UDWR are committed to providing the necessary enforcement of the new regulation.

Minor concerns noted include the continuing presence of a number of noxious weeds near the recreation sites, and continued 4-wheeler use at the Bear River Riparian Walking Trail, despite site modifications including boulders and berms intended to preclude this motorized use. These concerns will continue to be monitored and new strategies will be devised to address these issues as they occur.

The condition of the recreation sites and any maintenance that occurred were recorded on data sheets which are available upon request from PacifiCorp's Hydro Resources Department, Salt Lake City NTO. On an annual basis the following was completed at most sites:

- Placement of boat docks in and out of the water as well as any maintenance needed to provide for safe use.

- General cleaning of trash and decadent vegetation.

- Cleaning of permanent restrooms and placement of portable facilities in some sites.

- Cleaning, painting, and replacement, when necessary, of informational and FERC Part 8 signs.

- Replacement or repair of damaged gates, fences, and safety reflectors.

- Grading of parking surfaces as necessary and when conditions permitted.

A list summarizing significant maintenance that was completed by project per year can be found in Appendix C.

Significant maintenance is scheduled for all three canoe trails in spring of 2008. Floating buoys are consistently being shot and/or destroyed by winter ice. PacifiCorp will replace buoys with metal posts with reflectors placed along the canoe trails. This method was tested at several locations in 2004 and has proved more durable.

One additional recreation site has yet to be built. This site was originally proposed to be located on State Hwy 30 to access the lower reach of the Logan River, but required an acceleration/deceleration lane that UDOT requested PacifiCorp delay the construction of until UDOT can complete the proposed highway widening in this area. This work has twice been additionally deferred by UDOT, and the current FERC timeline for construction of the site requires completion by the end of 2010. The highway widening is still not scheduled to occur in that time frame, so PacifiCorp is currently investigating alternative sites or construction alignments that will still fulfill the original site placement intention of canoe access to the lower reaches of the Logan River and Cutler Marsh. The next Cutler five-year report (2013) will detail the development of this final required primitive recreation site to complete the original RMP and license requirement.

Overall Findings: Future annual monitoring will continue as present, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. No changes to the recreation site monitoring protocol are suggested, although a major maintenance item, replacement of the canoe trail marker buoy system was noted and is scheduled for the next monitoring period.

2.4 Wetland Mitigation Monitoring Program

As noted previously, this monitoring program was completed with the submission of the final monitoring report and site visit in 2001. Future five-year monitoring reports will not contain this monitoring program element, as once the final monitoring report was accepted by the COE and the site was officially transferred back to the UDWR, all future O&M, and any further monitoring are the responsibility of the UDWR as the land owner.

Overall Findings: No future monitoring is proposed as this RMP component is now complete.

2.5 Fish Habitat Enhancement Monitoring Program

Previous monitoring of the fish habitat structures began shortly after their installment in 1995. The electrofishing monitoring activities recorded a few game fish in 1996. The species found in close proximity to structures included black bullhead, largemouth bass, black crappie, green sunfish, and bluegill. However, in 1998 similar monitoring activities resulted in few game fish and in 2000 none were recorded (Table 3-4, PacifiCorp 2002).

Note that the four electrofishing monitoring efforts produced very few fish per effort undertaken. Conclusions from the aquatic biologists involved were that game fish habitat, species diversity, and population numbers will continue to be limited by continued poor water quality and low numbers of forage fish. No additional monitoring of the structures or the fish around them were undertaken or required during the current (2003-2007) report period.

However, since the most recent PacifiCorp/UDWR joint electrofishing effort in 2000, the state contracted with Utah State University to assess the overall fishery health in Cutler Reservoir, as part of the current TMDL Assessment being prepared for Cutler Reservoir. Their study, conducted in 2005 and 2006, showed relatively greater diversity and fish numbers than expected, based on previous monitoring and observations (Budy et al. 2006)

As noted in Section 1.5, the other two original Fish Habitat Structure Monitoring Plan elements (angler creel surveys and visual inspections of the structures) were changed per agreement with UDWR. It has been suggested that the habitat structures could now be impaired due to sediment. Inspection will occur during the next major drawdown, potentially scheduled for fall of 2008, as underwater visibility is extremely poor in the reservoir. Results of any relevant monitoring conducted for this program will be included in the 2013 edition of this report.

Overall Findings: Future annual monitoring will only occur when appropriate magnitude reservoir drawdowns occur, per agency agreement. As a drawdown of this magnitude is tentatively scheduled for fall of 2008, agency notification and consultation is recommended early in 2008.

2.6 Water Quality Enhancement Monitoring Program

Water quality monitoring results for the current monitoring period include the samples taken quarterly in 2003, per the Cutler license. The next water quality sampling period will commence in 2008, again, quarterly per the license. Quarterly sampling will be conducted every 5^{th} year (i.e., 2008, 2013, 2018, 2023) through the end of the license; analysis and results will be included in future monitoring reports. The information in this section is a summary and synthesis of the 2003 water quality monitoring; Appendix E includes the actual results of the 2003 monitoring and subsequent analysis report.

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 (see Figure 1, Appendix E). Chemical parameters included nutrient concentrations of phosphorus (total and orthophosphate); nitrogen as NO_3, NO_2, and $NH_{3;}$ and physical parameters included temperature, total suspended solids (TSS), and dissolved oxygen (DO) values. The samples were collected quarterly during distinct sampling periods with the initial water quality monitoring completed annually from 1996 through 1998 and another monitoring period at five-year intervals beginning in 2003 (some interval samples from 2000-2003 were also included in the 2003 analysis due to their availability and fit in the dataset). These two monitoring periods were characterized by varied hydrologic conditions, based on water releases from Cutler Reservoir downstream to the Bear River during these time periods. The monitoring period between 1996 and 1998 was characterized by wet conditions and high flows, while the period between 2000 and 2003 was characterized by dry conditions with low flows.

Differences in water quality parameters between the two monitoring periods were most likely related to the marked difference in hydrologic conditions. Data collected between 2000 and 2003 generally indicated 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 appeared 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 the winter season. This could be associated with discharge from the Logan Wastewater Treatment Plant, which occurred throughout the winter but only during a portion of the summer in 2003.

Data collected between 2000 and 2003 indicated that water quality in southern tributaries, specifically Spring Creek, the Little Bear River, and Swift Slough had dramatic impacts on water quality throughout Cutler Reservoir. A similar pattern was identified in the earlier monitoring period (1996–1998), namely, Spring Creek continued 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 (line of demarcation between the two sections at Benson Marina) remained markedly different with the south being characterized by higher nutrient concentrations, higher turbidity, and lower dissolved oxygen. Due to slow moving water and the shallow nature of the southern reservoir (0.55 meters mean depth), reservoir sediments were 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 were significantly higher with high total phosphorus levels far exceeding levels within the northern portion of the reservoir. The tributaries of Spring Creek and Swift Slough (where Logan City effluent is released), which drain directly to the southern portion of the reservoir, contributed a very high concentration level of nutrients directly to the southern reservoir.

Monitoring results also determined that due to the significant influence of tributary water quality parameters, the performance of potential water quality improvements such as implementation of erosion control features and improvements in land use practices was masked. Further, basinwide efforts to address land uses that may degrade water quality will likely need to be implemented in order to result in water quality improvements to Cutler Reservoir.

Because a variety of other agencies, non-governmental organizations, the City of Logan, private companies, and other stakeholders (primarily municipal, agricultural and animal processing interests) are now focusing on development of a TMDL for the Bear River upstream to the state line and Cutler Reservoir proper, greater efforts through collaboration and cooperation should result in increased, measurable benefits to water quality. Future five-year monitoring reports will continue to track and document water quality parameters, and resultant improvements.

Overall Findings: Future annual monitoring will continue per the current quarterly, 5-year intervals as prescribed by the license, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. The next water quality data collection period is scheduled to occur in 2008, and will be expanded to cover two new collection sites and several new collection times, including during run-off and storm events, per the recommendations of the 2003 data analysis and review.

2.7 Water Level Monitoring Program (Cutler Operational Plan)

Because this monitoring element is covered under a separate modified order with a different reporting timeline (see Appendix H of the 2002 Cutler five-year monitoring report), it was determined that the annual summary of results of water level monitoring would be submitted to FERC independently of this report. Table 2-8 presents the modified operating range proposed by PacifiCorp and accepted by FERC for Cutler Reservoir elevations (as measured at Cutler Dam). Average daily reservoir elevations are compiled, analyzed, and reported to FERC by 31 December of each year (Summary graphs are included in Appendix F). The full reports are available upon request to the PacifiCorp Energy Hydro Resources Hydrologist, Salt Lake City NTO.

Table 2-8. Licensee's Condensed Reservoir Elevation Operating Range.			
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%

Overall Findings: Future annual monitoring will continue as present, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. No changes to the Cutler reservoir level monitoring program, or the Cutler operating plan, are suggested; data will continue to be filed annually with the FERC and summarized in this series of 5-year reports.

3.0 Monitoring Plan and Schedule for Next 5-year RMP Implementation Period

The RMP required monitoring to gauge success and stability of the seven implementation programs:

- Vegetation Enhancement
- Agricultural Lease
- Recreation Site Development
- Wetland Mitigation
- Fish Habitat Enhancement
- Water Quality Monitoring
- Water Level Monitoring

In addition, monitoring results are used to identify O&M needs and aid continual program improvement. Table 3-1 summarizes 1) routine monitoring activities and schedules defined in the 2002 Cutler 5-Year Report, 2) modifications to routine monitoring that will occur during the next 5-year RMP implementation period (2008-2012), and 3) additional license compliance needs identified during the current 5-year RMP implementation period (2003-2007).

Monitoring typically occurs either annually or biannually. An exception, water quality monitoring, is conducted quarterly every fifth year. In addition, monitoring of fish habitat structures by agreement with UDWR, only occurs during a major reservoir drawdown. Detailed monitoring protocols, tasks, and schedules are provided in Section 1.2 of this document. Unless specified in Table 3-1, monitoring during 2008-2012 will follow protocols established in the 2002 Cutler 5-Year Report.

Table 3-1. Monitoring Plan and Schedule for Cutler Hydro Project (FERC No. 2420), 2008-2012.			
Task Name	**Task Description**	**Task Frequency**	**Task Duration**
Vegetation Enhancement Program Monitoring			
Shoreline Buffer	1. Continue routine monitoring according to Section 2.1.1, in PacifiCorp 2002.	Annual	May 1-Jul 31
	2. Initiate routine monitoring of the Lundberg buffer.	Summer 2008	
	3. Resolve discrepancies between the number of currently monitored buffer parcels (i.e., 54) and the number of buffers in the GIS database. Discrepancies might be due to buffer changes occurring when the GIS database was created (i.e., RR Trail West, L. Falslev, L. Falslev Peninsula, Lundberg, and Roundy Big Bend).	Summer 2008	
	4. Address concerns at the Munk, Falslev, Seamons, and USU buffers.	Summer 2008	
Woody Vegetation	1. Continue routine Phase I monitoring at 'good' and 'marginal' woody vegetation pockets according to Section 2.1.2 in PacifiCorp 2002.	Annual	May 1-May 31
	2. Initiate routine Phase II monitoring at 'established' woody vegetation pockets (see Section 2.1.2, PacifiCorp 2002).	Annual	May 1-May 31
	3. Locate two new sites to replace two failed woody vegetation pockets.	2008-2009	
	4. Initiate budget and requisition process for the replacement woody vegetation pockets.	2008	
	5. Procure planting materials for the replacement woody vegetation pockets	2009	
	6. Plant the replacement woody vegetation pockets.	2009-2010	
	7. Initiate routine Phase I monitoring at the two new woody vegetation pockets (see Section 2.1.2, PacifiCorp 2002).	2011	
Bank Stabilization	1. Continue routine monitoring according to Section 2.1.3 in PacifiCorp 2002.	Annual	Jun 1-Jun 30
	2. Map and GPS the Stewart West and Ballard bank stabilization sites.	Summer 2008	
Buffer/Boundary Fence	1. Continue routine monitoring and maintenance according to Section 2.1.4 in PacifiCorp 2002.	Annual	May 1-Jul 31
	2. Install new buffer/boundary fences at Munk, Falslev, Seamons, and Ballard shoreline buffers.	Fall 2008	

Table 3-1. Monitoring Plan and Schedule for Cutler Hydro Project (FERC No. 2420), 2008-2012.			
Task Name	**Task Description**	**Task Frequency**	**Task Duration**
	3. Survey and delineate property boundary at south side Cutler Canyon.	Fall 2008	
	4. Resolve discrepancies between the number of currently monitored buffer/boundary fences and the number in the GIS database. Discrepancies might be due to buffer changes occurring when the GIS database was created (i.e., RR Trail West, L. Falslev, L. Falslev Peninsula, Lundberg, and Roundy Big Bend).	Winter 2008	
Erosion Control Sedimentation Basins	1. Continue routine monitoring according to Section 2.1.5 in PacifiCorp 2002.	Annual	Apr 1-May 31
Sensitive/Unique Wildlife Habitat	1. Continue routine monitoring and maintenance according to Section 2.1.6 in PacifiCorp 2002.	Annual	Apr 1-May 31
Agricultural Lease Program Monitoring			
Grazing Leases	1. Continue routine monitoring according to Section 2.2.1 in PacifiCorp 2002; add individual pasture assessment on good/fair, poor/at-risk measurement scale annually.	Annual	Apr 1-Nov 30
	2. Annually collect and document grazing AUM data from lessees.	Annual	Dec 1- Dec 31
Farming Leases	1. Continue routine monitoring according to Section 2.2.2 in PacifiCorp 2002.	Annual	Jan 1-Dec 31
	2. Install additional boundary posts/carsonite markers at Ballard lease to prevent encroachment.	Fall 2008	
Wildlife Food/Cover Plots (spring)	1. Continue routine according to Section 2.2.3 in PacifiCorp 2002.	Annual	May 1- June 30
Wildlife Food/Cover Plots (fall)	1. Eliminate fall monitoring of wildlife food/cover plots.	Mar 2008	
Cattle Management Fence	1. Continue routine monitoring according to Section 2.2.4 in PacifiCorp 2002.	Annual	May 1-Jul 31
Property Coordination	1. Continue routine property coordination tasks according to Section 2.2.5 in PacifiCorp 2002.	Annual	Jan 1-Dec 31
	2. Enter Property Management tasks into the Compliance Management System software to ensure continuity of relatively long-term and complex tasks.	Semi-annual	Aug 15- Aug 31 Jan 1- Jan 31
Recreation Site Program Monitoring			
Recreation Areas	1. Continue routine monitoring of the canoe trails at ice-off according to Section 2.3.1 in PacifiCorp 2002.	Annual	Mar 1-Apr 30

Table 3-1. Monitoring Plan and Schedule for Cutler Hydro Project (FERC No. 2420), 2008-2012.			
Task Name	**Task Description**	**Task Frequency**	**Task Duration**
	2. Continue routine monitoring of the canoe trails prior to freeze over according to Section 2.3.1 in PacifiCorp 2002.	Annual	Oct 1-Nov 30
	3. Replace trail markers at the three canoe trails with alternative marking post rather than buoys.	2008	Apr 1-Jul 30
	4. Continue routine monitoring of the Boat-in Day Use Sites at ice-off according to Section 2.3.1 in PacifiCorp 2002.	Annual	Mar 1-Apr 30
	5. Continue routine monitoring of Developed Day Use Sites according to Section 2.3.1 in PacifiCorp 2002.	Annual	Mar 1-Apr 30
	6. Continue routine spring monitoring of Developed Walking Trails according to Section 2.3.1in PacifiCorp 2002.	Annual	Apr 1-Apr 30
	7. Continue routine fall monitoring of Developed Walking Trails according to Section 2.3.1in PacifiCorp 2002.	Annual	Nov 1-Nov 30
	8. Continue routine monitoring of Primitive Recreation Sites according to Section 2.3.1 in PacifiCorp 2002.	Annual	Jan 1-Dec 31
Logan River Recreation Site	1. Coordinate with UDOT and FERC to finalize an alternative location.	2008	Apr 1-Dec 31
	2. Finalize alternative site plan.	2009	Jun 1- Sep 1
	3. Construct new recreation site.	2010	May 1- Nov 30
Wetland Mitigation Program Monitoring: Program is complete and no monitoring will occur.			
Fish Habitat Structure Program Monitoring			
Fish Habitat Structures	1. Consult with UDEQ, UDWR, USFWS, and FERC for a potential fall 2009 reservoir drawdown.	2008	Mar 1-Aug 31
	2. Develop plan to monitor fish habitat structures during potential 2008 reservoir drawdown.	2008	May 1-Sep 1
	3. Monitor fish habitat structures if potential 2008 reservoir drawdown occurs. Ensure plans to accomplish this required monitoring are completed.	2008	Oct 1-Nov 1
	4. Monitor fish habitat structures during future scheduled reservoir drawdowns of sufficient magnitude.	Opportunistically	

Table 3-1. Monitoring Plan and Schedule for Cutler Hydro Project (FERC No. 2420), 2008-2012.

Task Name	Task Description	Task Frequency	Task Duration
Water Quality Monitoring			
Quarterly Monitoring	1. Monitor water quality quarterly during 2008. Next quarterly monitoring due 2013.	5-year Interval; data collected quarterly	Mar 1 2008-Feb 1 2009
	2. Install two new sampling sites (Northern Reservoir Segment and the Southern Reservoir Segment's North Marsh Unit) to address water quality concerns in Cutler Reservoir as identified in the current TMDL process.	March 2008	
	3. Monitor water quality according to the quarterly sampling period, which adds one new sampling period during high spring runoff at all locations and a new storm-event monitoring period at all locations per the 2003 water quality summary report, Appendix E Water Quality.	March 2008- Jan 2009, and thereafter as scheduled (2013, ..)	
Development of Cutler Total Maximum Daily Load (TMDL) limits.	1. Participate in Cutler TMDL process.	monthly meetings	2004-completion
Water Level Monitoring			
Reservoir Operations Plan	1. Monitor and compile average daily reservoir elevations.	Annual	Oct 1-Sep 30
	2. Prepare annual reservoir operation report and file with FERC.	Annual	Dec 1-Dec 31

4.0 REFERENCES

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APPENDIX A

VEGETATION ENHANCEMENT PROGRAM

APPENDIX A-1
BUFFERS

Table A-1-1. Buffer Parcel Overall Condition by Year.							
Buffer Identification		**Buffer Condition**					
ID No.	**Buffer Name**	**2002 (baseline)**	**2003**	**2004**	**2005**	**2006**	**2007**
1	North Marsh West Buffer	Good	Good	Good	Good	Good	Good
2	Roundy CRP Buffer	Poor	Poor	Poor	Poor	Poor	Fair
3	Roundy 300 ac Buffer	Good	Good	Poor	Fair	Fair	Fair
4	Railroad Trail West	Good	Fair	Fair	Fair	Fair	Poor
5	Roundy Middle	Good	Good	Good	Good	Good	Good
6	Cowley Slough	Poor	Poor	Poor	Poor	Poor	Poor
7	Roundy Big Bend B	Good	Good	Fair	Fair	Fair	Fair
8	Roundy North	Poor	Poor	Poor	Poor	Poor	Good
9	M Rigby	Poor	Poor	Poor	Poor	Poor	Fair
10	Griffin	Poor	Poor	Poor	Poor	Poor	Poor
11	B. Ballard	At-Risk	At-Risk	At-Risk	At-Risk	At-Risk	Poor
12	B. Ballard North	Poor	Poor	Poor	Poor	Poor	Poor
13	Newton substation	Poor	Good	Good	Good	Good	Good
14	Canyon/J. Benson	Good	Good	Good	Good	Good	Good
15	C Griffin	Good	Good	Good	Good	Good	Good
16	Railroad	Good	Good	Good	Good	Good	Good
17	Garth Benson	Poor	Poor	Poor	Poor	Fair	Good
18	Val J. Rigby	Poor	Poor	Fair	Fair	Fair	Fair
19	Stewart	At-Risk	At-Risk	At-Risk	At-Risk	Poor	Fair
20	Seamons	Good	Good	Good	Good	Good	Good
21	Rasmussen	Good	Good	Good	Good	Good	Good
22	Lindley	Poor	Poor	Poor	Poor	Poor	At-Risk
23	Munk	Good	Good	Good	Good	Good	Good
24	T. Ballard	At-Risk	At-Risk	At-Risk	At-Risk	At-Risk	At-Risk
25	T. Ballard South	At-Risk	At-Risk	At-Risk	Poor	Poor	Good
26	Church Farm	Good	Good	Good	Good	Fair	Fair
27	Watterson House	Good	Good	Good	Good	Good	Good
28	Benson/Watterson	Good	No Data	Good	Good	Good	Good
29	Archibald	At-Risk	Fair	Fair	Good	Good	Good
30	Larson (J shape)	Poor	Poor	Poor	Poor	Poor	Fair
31	Gull Point	Good	Good	Good	Good	Good	Good
32	Watterson 100 AC	Poor	No Data	Poor	Poor	Poor	Fair
33	Rose Oxbow	Good	Good	Good	Fair	Fair	Fair
34	H. Falslev Island	Good	Good	Good	Good	Good	Good
35	B. Reese	Good	Good	Good	Good	Good	Good
36	R. Reese	Excellent/ poor	Excellent / poor	Excellent / poor	Good / poor	Fair / poor	Good
37	Thayne Gate	Poor	Poor	Poor	Poor	Poor	Fair

Table A-1-1. Buffer Parcel Overall Condition by Year.							
Buffer Identification		**Buffer Condition**					
ID No.	**Buffer Name**	**2002 (baseline)**	**2003**	**2004**	**2005**	**2006**	**2007**
38	J. Allen	Good	Good	Good	Good	Good	Excellent
39	T. Ballard-Benson	Good	Good	Good	Good	Good	Good
40	H Falslev	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
41	Benson Oxbow Road North	Good	Good	Good	Good	Good	Good
42	Hobbs	Poor	Poor	Poor	At-Risk	At-Risk	Poor
43	Z. Balls	Good	Good	Good	Good	Good	Excellent
44	Benson Oxbow Road	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
45	H. Johnson	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
46	Cardon South	Poor	Good	Good	Good	Good	Good
47	Newton Bridge West	At-Risk	Fair	Fair	Fair	At-Risk	At-Risk
48	Canyon-Peterson	Poor	Fair	Fair	Good	Good	Good
49	Canyon-Lofthouse	Good	Good	Good	Fair	Fair	Fair
50	Canyon-Salisbury	Good	Good	Good	Good	Good	Good
51	Canyon-Anderson	Good	Good	Good	Good	Good	Good
52	Canyon – Larson	Good	Good	Good	Good	Good	Good
53	Larry Falslev	n/a	n/a	n/a	Good	Good	Good
54	Larry Falslev Penn	n/a	n/a	n/a	Excellent	Excellent	Excellent

Green = Steady condition of the buffer with no change or improving from the previous year.
Blue = Improvement in buffer condition from the previous year.
Red = Decline in buffer condition from the previous year.

* **Excellent** = Established perennial vegetation with rare presence of noxious or annual plants and no erosion. **Good** = Increasing perennial vegetation with limited scattered noxious plants. **Fair** = Established perennial vegetation that is increasing but that has a minor issue that can be resolved in a single year. **Poor** = Limited perennial vegetation with increasing noxious or annual plants. In many cases condition is being aggravated by continued or recent farming encroachment. **At-Risk =** annual vegetative cover offering little protection from surface erosion.

BUFFER MAINTENANCE DATA

Buffer Remedial Actions 2003 -2007

The conditions of buffer parcels have improved (see Section 2.1.1) in part due to completed remedial actions. These actions included mowing, tilling and drilling a perennial grass/forb seed mixture, and no-tilling a perennial grass/forb seed mixture. These actions are described in greater detail below:

Mowing

Areas in buffer parcels were mowed using a flail and/or rotary mower to control weeds that had bolted, but not yet set seed. This action primarily limits seed production and viability. The cutting height was set at 8 inches so as not to disturb the crown region of the plants. The mowing was completed after the month of July so as to not impact any nesting birds.

Tilling and Drilling

Areas in buffer parcels that needed reseeding were tilled in preparation for planting prior to the contractor purchase of a no-till drill specifically made for drilling native grass seed in 2005. Tilling and drilling consisted of any of the following actions:

- Moldboard plowing – Turning of soil over at a depth of 12-15 inches.
- Disking – Further tillage of soil to create finer texture of soil particles.
- Coulterpacking – Rollers that firm soil in preparation of seedbed.
- Drilling – Conventional drill that uses double-disc openers to place seed ¼ of an inch in the soil and then firmed by rollers.

No-Till Planting

In 2005 PacifiCorp's contractor purchased a Great Plains No-Till Drill that was designed specifically for planting native grass. This machine has a coulter that opens a slot in hard ground, just before the double-disc openers. This method reduces the impact to soil, reduces the chance for soil erosion, and allows fewer weeds to become established in the seed bed.

The seed mixture was developed to provide a variety of perennial vegetation to cover multiple soil types as well as wildlife habitats. The following mixture was planted at rates that varied from 12 pounds to 20 pounds to the acre:

% Pure Live Seed	Common Name	Variety
26.80	Tall Wheatgrass	Jose
13.84	Foxtail Millet	VNS
12.97	Winter Triticale	154 E
6.70	Nuttall Alkaligrass	Quill
6.63	Western Wheatgrass	Rosana
6.56	Slender Wheatgrass	Revenue
3.21	Creeping Wildrye	Shoshone
1.24	W. Stem Rubber Rabbitbrush	VNS
0.74	Inland Saltgrass	VNS
.036	Other Crop	
7.65	Inert Matter	
.04	Weed seed	

This seed mix was planted in a total of 112 acres from 2002 to 2007. The following table describes which areas were planted and the year that planting as completed.

Table A-1-2. Buffer Remedial Actions						
Buffer Identification		**Actions**				
ID No.	**Buffer Name**	**2003**	**2004**	**2005**	**2006**	**2007**
2	Roundy CRP Buffer	Mowed weeds (42.04ac)	Mowed weeds (42.04ac)	Roundy's planted to CRP		
4	Railroad Trail West			Mowed alfalfa and weeds (15.36 ac)	Mowed alfalfa and weeds No-Tilled in Fall (15.36 ac)	
8	Roundy North		Till/Planted Fall (13.28 ac)	No-Tilled Fall (6.0 ac)	Mowed (13.28 ac)	Mowed (13.28 ac)
9	M Rigby			No-Tilled Fall (12.66 ac)	Mowed (12.66 ac)	Mowed (12.66 ac)
10	Griffin	Planted (3.13 ac)		Planted (3.13 ac)		
17	Garth Benson				No-Tilled (7.79 ac)	
19	Stewart				Mowed No-Tilled in Fall (6.54 ac)	No-Tilled in Fall (2.50 ac)
29	Archibald		Till/Planted Fall (4.81 ac)	Mowed Trail (2.40 ac)	Mowed Trail (2.40 ac)	Mowed Trail (2.40 ac)
30	Larson (J shape)		No-Tilled Fall (15.00 ac)	No-Tilled Fall (15.00 ac)		
47	Newton Bridge West	Till/Planted Fall (5.98 ac)				

PacifiCorp will continue to plant areas in buffer parcels to improve conditions through the establishment of perennial vegetation. Priorities will be focused in parcels that have been rated as “At-Risk” or “Poor”. Refer to section 2.1.1 for a description of these buffers.

WEED MANAGEMENT DATA

Introduction

The Cutler Reservoir resource area, located primarily in northern Utah's Cache County, is owned and managed by PacifiCorp as a natural asset that is associated with the Cutler Hydroelectric Project. Much of the 10,000-acre reservoir is actually a large, emergent marsh wetland. This resource is managed in compliance with the 1994 Resource Management Plan and the 2002 Cutler Monitoring Plan. Both plans address the need to proactively manage noxious and invasive weeds.

Noxious and invasive weeds pose a significant threat to ecosystems. There is much evidence that as weed populations increase, the amount of effort, time and money to control them also increases resulting in exponentially larger costs to restore functionality to these ecosystems. As such, it is essential to utilize all methods available to control current weed infestations, prevent new infestations, and protect non-infested lands. Ecological concerns associated with noxious weeds are numerous and include:

- Loss of wildlife habitat
- Increases in conflicts with adjacent landowners
- Loss of biodiversity
- Decreases in forage value for livestock and wildlife
- Loss/ reduction of recreational opportunities such as hiking, biking, and wildlife and viewing.
- Increases in soil erosion
- Disruption of soil and vegetation communities from changes in soil nutrient cycling.

Monitoring 2002-2007

Since 2002, the presence of weed populations has been monitored on an annual basis and in compliance with the Resource Monitoring Plan procedures for Grazing Lease Pastures and Buffer parcels. Weed populations were identified according to species by contractors trained in plant and weed identification. The following list of Utah state-listed and Cache county-listed weed species have been identified as present on PacifiCorp owned lands:

- Canada thistle (*Cirsium arvense*)
- Dyer's woad (*Isatis tinctoria*)
- Field bindweed (*Convolvulus arvensis*)
- Goatsrue (*Galega officinalis*)
- Hoary cress (*Cardaria draba)*
- Jointed goatgrass (*Aegilops cylindrical)*
- Musk thistle (*Carduus nutans*)
- Perennial Pepperweed (*Lepidium latifolium*)
- Poison hemlock (*Conium maculatum*)
- Scotch thistle (*Onopordum acanthium*)
- Purple Loosestrife (*Lythrum salicaria*)

Weed species were also categorized into classes of density and abundance in each buffer parcel or grazing pasture. The classifications were defined as follows:

- Rare – Fewer than two individual noxious weed plants
- Scattered – Individual noxious weed plants scattered with less than two small dense infestations.
- Dominant - Noxious weed plants dispersed consistently throughout parcel, or more than two dense infestations that total over an acre

The next two sections summarize data collected since 2002 in the buffer parcels and grazing pastures.

<u>Buffer Parcels</u>
There are 54 shoreline buffer parcels at Cutler that are monitored yearly for weeds. During the monitoring period for this report, weed density increased in 6 buffer parcels and decreased in 2 parcels. Buffer parcels with changes in weeds are listed with reasons for change:

Increase in weed populations

1. North Marsh West – Extended drought are causing changes in wetland vegetation.
6. Cowley Slough – Extended drought and failed perennial grass plantings
10. B. Ballard – Uncooperative adjacent landowner prevents access to manage weeds
24. T. Ballard – Encroachment in buffer parcel
44. Benson Oxbow Road – Extended drought

Decrease in weed populations

9. M. Rigby – Establishment of perennial grass cover.
19. Stewart – Establishment of perennial grass cover.

Table A-1-3 describes the level of weed infestation in each of the 54 buffers:

Table A-1-3 Number of buffer zones in each weed infestation category, 2003-2007

	Rare	**Scattered**	**Dominant**	**Total**
2003	9	33	12	**54**
2004	8	33	13	**54**
2005	6	33	16	**54**
2006	6	33	16	**54**
2007	8	33	13	**54**

Rare – Fewer than two individual noxious weed plants
Scattered – Individual noxious weed plants scattered with less than two small dense infestations.
Dominant - Noxious weed plants dispersed consistently throughout parcel, or more than two dense infestations that total over an acre.

Changes in weed populations can be attributed to increased weed populations on adjacent lands, more thorough weed monitoring in later years, and prolonged drought conditions that have stressed perennial vegetation. Dyer's woad has become a major concern for adjacent landowners in the buffer parcels near Cache-Junction, an historic railroad depot. This has placed greater priority on these locations and weed populations. While infestations on company lands are treated annually, re-infestation from the railroad right-of-way is extensive.

Grazing Pastures

There are 38 grazing pastures designated in the Agricultural Leasing Program associated with the Cutler Reservoir Resource Management Plan. These pastures are monitored using procedures similar to those associated with buffer parcels. Table A-1-4 summarizes the abundance and density of weed species found in grazing pastures year by year.

Table A-1-4 Number of grazing pastures in each weed infestation category, 2003-2007.

	Rare	Scattered	Dominant	Total
2003	16	18	4	**38**
2004	16	19	3	**38**
2005	18	17	3	**38**
2006	17	19	2	**38**
2007	18	18	2	**38**

Rare – Fewer than two individual noxious weed plants
Scattered – Individual noxious weed plants scattered with less than two small dense infestations.
Dominant - Noxious weed plants dispersed consistently throughout parcel, or more than two dense infestations that total over an acre.

Common weed species found in pastures are canada thistle, scotch thistle, hoary cress, and poison hemlock. Many of the weed infestations can be traced to pre-license conditions in that established seed sources have yet to be depleted. These include old feed rows, and corrals for cattle. These areas have been reduced in size and number, as reflected in the data, through aggressive treatment and reseeding efforts. Table A-1-5 summarizes the treatment and reseeding of priority pastures.

Table A-1-5 Restoration summary of priority pastures, 2003-2007

Year	Pastures	Treatment	Reseeding
2003	SG4A,SG4B NP1	18.4 acres	21.8 acres
2004	SG4B, SG4D	12.6 acres	14.0 acres
2005	SG4D,SG3A	8.0 acres	5.2 acres
2006	SG3A, SG5A	22.1 acres	12.1 acres
2007	SG5A	0.5 acres	0 acres
Total		**61.6 acres**	**53.1 acres**

2006 Inventory

PacifiCorp personnel and contractors recognized the need to create an integrated approach to weed management in 2006. It was determined that weed species need to be mapped to form the foundation of future effective strategies. This mapping was conducted in 2006 in connection with the monitoring that is prescribed in the Cutler Monitoring Plan.

Weed species were mapped by using hand drawn notes and maps while visiting each of the buffer parcels and grazing pastures. Infestations about an acre or larger were hand drawn on field maps and then transferred to a GIS database as polygons.

The maps of weed species located at Cutler Reservoir are placed at the end of this report. Table A-1-6 summarizes the data that was collected.

Table A-1-6 Summary of mapped weed species in 2006		
Common Names	**Scientific Names**	**Acreage**
Thistle Species		264 acres
Scotch	*Onopordum acanthium*	54 acres
Canadian	*Cirsium arvense*	138 acres
Musk	*Carduus nutans*	72 acres
Field bindweed	*Convolvulus arvensis*	106 acres
Poison Hemlock	*Conium maculatum*	33 acres
Dyer's Woad	*Isatis tinctoria*	11 acres
Goatsrue	*Galega officinalis*	68 acres
Hoary Cress	*Cardaria draba*	8 acres
Total		**490 acres**

It is recognized that this inventory did not include aquatic weeds such as Purple Loosestrife or the invasive common reedgrass *Phragmites australis*. These plants still need to be mapped and are scheduled for 2008.

2007 Integrated Weed Management Approach

Integrated Weed Management (IWM) is a multidisciplinary, holistic approach to managing noxious weeds and invasive species. IWM includes the use of an appropriate combination of education, prevention, proper land management practices, biological control agents, physical or mechanical methods, herbicide methods, and cultural methods. The methods for managing a given weed infestation depends on many factors such as access, growth form of the weed species, size of the weed patch, and the weather at the time of control. The strategies for managing weeds include pulling, mowing, cultural controls, livestock grazing, biological control agents, and herbicides.

PacifiCorp's contractor under the guidance of company personnel developed several integrated strategies to effectively manage weed populations. This included the prioritization of weed species and management areas. Table A-1-7 lists these items.

PacifiCorp has been cooperating with the Cache County Weed Supervisor to manage infestations of Purple Loosestrife by collecting and distributing beetles that depredate on the foliage of this plant. Effective control has been attained in the past two years. Intensive monitoring in 2008 will determine if biological control is adequate to limit the spread of this aquatic nuisance plant.

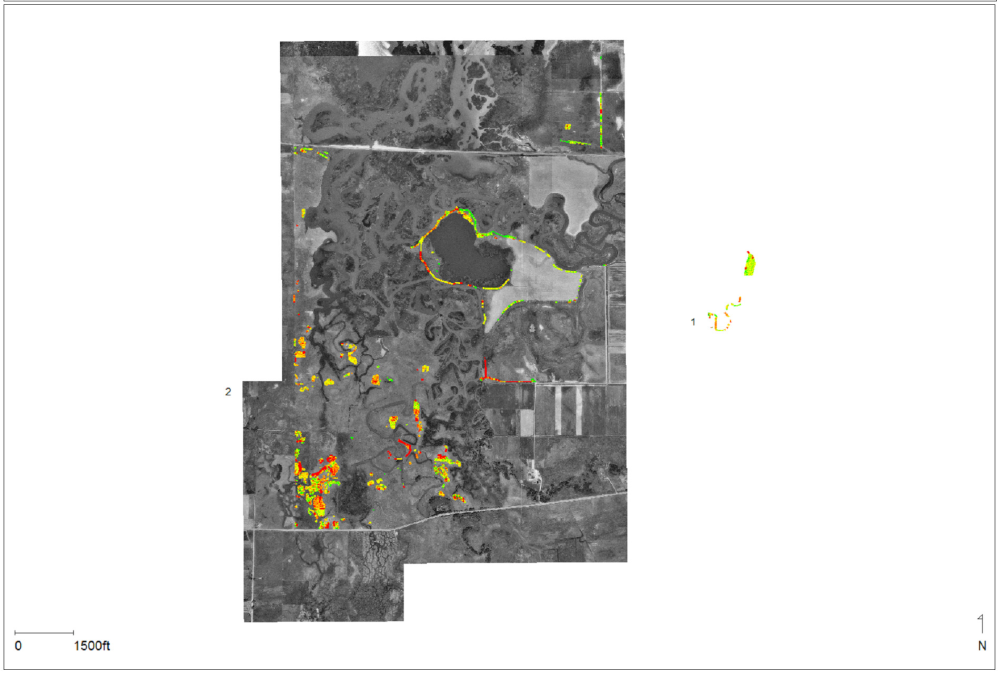
Table A-1-7 Prioritization of Weed Species and Locations at Cutler				
Priority	Common Name	Scientific Name	Location	Management Intensity
1	Scotch Thistle	*Onopordum acanthium*	Pastures, Hobbs, RR Walking Trail	Control
1	Poison Hemlock	*Conium maculatum*	Pastures, Benson and Canyon Buffers	Control
1	Hoary Cress	*Cardaria draba*	North Marsh, Roundy buffer parcels	Contain
2	Canadian Thistle	*Cirsium arvense*	RR Walking Trail	Control
2	Dyer's Woad	*Isatis tinctoria*	Cache Junction, Canyon Buffers	Control
3	Field bindweed	*Convolvulus arvensis*	Buffers	Control
4	Musk Thistle	*Carduus nutans*	Pastures	Control
1=high priority, 2=medium priority, 3=low priority, 4=lowest priority				
Contain –Infestations thus far are relatively concentrated in small areas and should be treated such that they do not spread beyond their present borders or be allowed to infest other areas. **Control** –Infestations are generally in many places in parcel that will need consistent control treatments from this point forward. **Eradicate** –Infestations are few and very small. Every effort should be made to completely eliminate these weeds from the property as a whole.				

PacifiCorp's contractor, Providia Management, has implemented new technology that uses precision GPS computers to regulate chemical application and create as-applied maps for treatments. Figure A-1 illustrates the type of data collected during treatment. Table A-1-8 summarizes data all types of treatments in 2007.

Table A-1-8 Summary of weed treatments in 2007	
Chemical	221.4 acres
Mowing	21.8 acres
Bag – O – Woad (county volunteer weed program)	3.5 acres
Hand cutting/pulling	1.5 acres
Total	**248.2 acres**

Chemical treatments used four different chemicals depending on the species being treated and timing of treatments. These included 2, 4-D, Banvel, Telar, and Milestone. Each was applied according to the requirements described in the labels.

Cutler South Marsh - Weed Treatments 2007



Map Layer 2 	Map Layer 1 
Grower : Pacificorp Utah Farm : South Marsh West Field : Feild 1 Year : 2007 Operation : Image Crop / Product : NO PRODUCT Op. Instance : Instance - 1 Count : 2	Grower : Pacificorp Utah Year : 2007 Operation : Spraying Area : 63.40 ac Est. Amount : 1,004.4 gal(US) Avg. Rate : 15.84 gal(US)/ac Start Date : 5/4/2007 End Date : 10/16/2007 GPS Count : 17790
Dataset Name Terraserver Photo Image - Feild 1	Rate Applied(Liquid vol) (gal(US)/ac) 21.86 - 257.12 (4.95 ac) 18.08 - 21.86 (7.31 ac) 16.40 - 18.08 (8.49 ac) 15.01 - 16.40 (9.26 ac) 13.83 - 15.01 (10.10 ac) 12.54 - 13.83 (10.96 ac) 0.00 - 12.54 (12.04 ac)

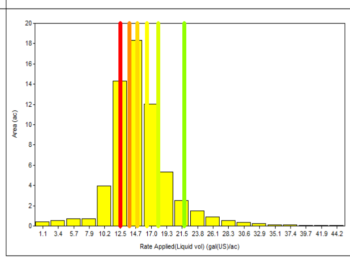


Figure A-1 Treatment Mapping in the South Marsh

Mowing was completed in areas where chemical treatment was not appropriate or in areas where chemical treatment would not have prevented seed maturation. Vegetation was also mowed along the RR Trail to prevent damage to the trail surface and provide additional safety for users.

PacifiCorp has cooperated with the Cache County Weed's "Bag-O-Woad" program through a sponsorship. This program has given cash incentives to county residents who bag hand-pulled dyer's woad plants. The county weed personnel have encouraged residents to work on PacifiCorp property along the RR Trail. This area cannot be sprayed due to the buffer shrub plots. Hand-pulling by volunteers has proven effective in reducing the number of plants producing seed.

PacifiCorp is coordinating with Utah State University in conducting research on goatsrue. Several plots testing the effectiveness and residual time of chemicals were utilized in 2007 on pastures in the North Marsh. The USDA is also conducting rate of spread research for this species near the Benson Marina.

2008 Integrated Weed Management Strategies

PacifiCorp will continue to work with Providia in implementing an integrated approach to weed management. IWM takes time to fully develop and demonstrate significant progress. The following strategies will be implemented in 2008:

1- Continued refinement of weed inventories.
2- Inventories of purple loosestrife, phragmites, and goatsrue.
3- Chemical treatments of priority one and two species.
4- Continued coordination with the Cache County Weed Supervisor
5- Continued cooperation in noxious weed and invasive weed species research with Utah State and the USDA.

APPENDIX A-2
BANK STABILIZATION

Table A-2-1. Summary of Cutler Reservoir Bank Stabilization.							
Project Identification		**Functioning Condition of Bank Stabilization Structure by Year**					
ID	**Bank Name**	**2002 (baseline)**	**2003**	**2004**	**2005**	**2006**	**2007**
1	J Benson	Good	Good	Good	Good	Good	Good
2	G Benson	Good	Good	Good	Good	Good	Good
3	GB South	Good	Fair	Good	Good	Good	Good
4	Stewart West	Poor	Poor	Poor	Good	Good	Good
5	Ballard	Poor	Poor	Good	Fair	Good	Good
6	Watterson Rip-Rap	Good	Good	Good	Good	Good	Good
7	Watterson Gabions	Good	Good	Good	Good	Good	Good
8	Archibald	Good	Good	Good	Good	Good	Good
9	Larson	Good	Good	Good	Good	Good	Good
10	Spring Creek	Good	Good	Good	Good	Good	Good
11	RR Trail West	Poor	Fair	Fair	Fair	Fair	Good
12	Benson West	Fair	Fair	Fair	Fair	Fair	Good
13	Near Checkdam 12	Poor	Fair	Good	Good	Good	Good
14	Roundy Pump	Good	Good	Good	Good	Good	Good
15	Middle Roundy	Good	Good	Good	Good	Good	Good
16	Upper Roundy	Good	Good	Good	Good	Good	Good

Green = Steady condition of the buffer with no change from the previous year.
Blue = Improvement in buffer condition from the previous year.
Red = Decline in buffer condition from the previous year.

APPENDIX A-3
BOUNDARY BUFFER FENCES

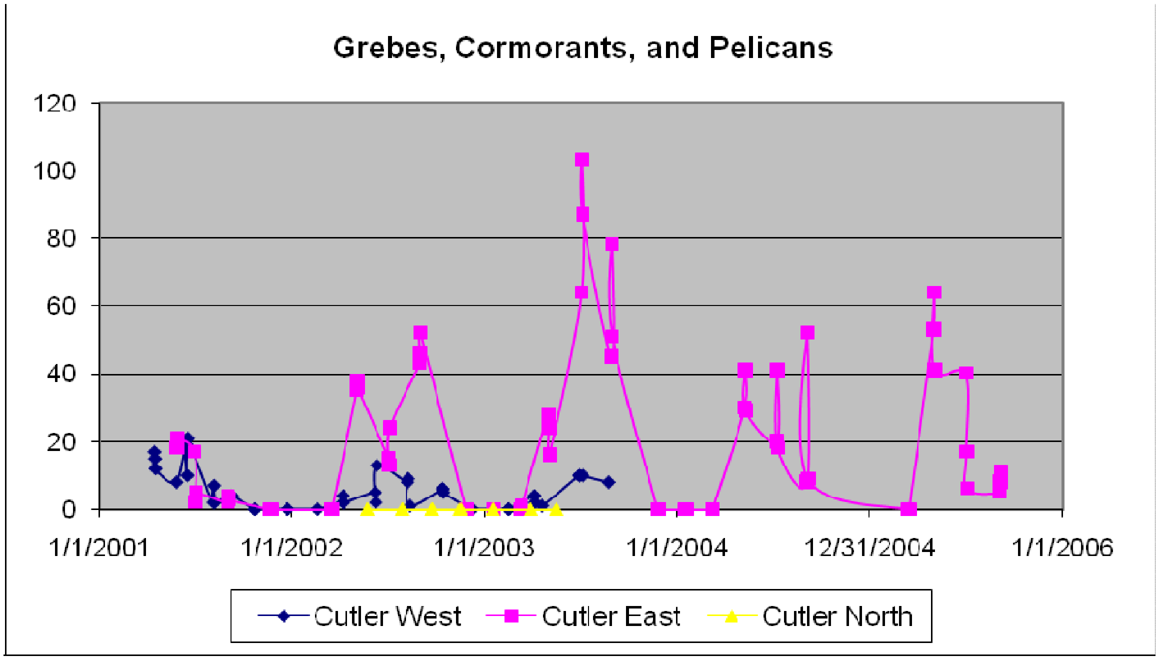
Table A-3-1 Boundary/Buffer Fence Condition by Year .							
Buffer Identification		**Fence Condition**					
ID No.	**Buffer Name**	**2002 (baseline)**	**2003**	**2004**	**2005**	**2006**	**2007**
1	North Marsh West Buffer	Complete	Complete	Complete	Complete	Complete	Complete
2	Roundy CRP Buffer .	Complete	Complete	Complete	Complete	Complete	Complete
3	Roundy 300ac Buffer	Complete	Complete	Complete	Complete	Access lock replaced	12 posts added to buffer/N. gate strengthened
4	Railroad Trail West	Complete	Complete	Complete	Complete	Complete	Complete
5	Roundy Middle	Complete	2 posts replaced	3 posts replaced	Complete	1 post replaced	2 posts replaced 39 posts added to buffer
6	Cowley Slough	Complete	4 posts replaced	Complete	Complete	Complete	Complete
7	Roundy Big Bend B	Complete	Complete	Complete	Complete	Complete	2 posts replaced
8	Roundy North	Complete	5 Carsonites and line straightened with t-posts	Complete	Complete	Complete	Complete
9	M Rigby	2 posts replaced	Complete	3 posts replaced	4 posts missing	4 posts missing	2 posts missing/3 replaced/2 added to buffer
10	Griffin	Complete	5 posts replaced	Complete	Complete	Complete	Complete
11	B. Ballard	Complete	Complete	Complete	Complete	Complete	Complete
12	B. Ballard North	Complete	Complete	Complete	Complete	Complete	Complete
13	Newton substation	Complete	2 posts replaced	Complete	Complete	Complete	Complete
14	Canyon/J. Benson	Complete	Complete	Complete	Complete	N. Fence near reservoir repaired	Complete
15	C Griffin	Complete	Complete	Complete	Complete	Complete	Complete
16	Railroad	Complete	Complete	Complete	Complete	Complete	Complete
17	Garth Benson	Complete	Complete	Complete	Complete	Complete	Complete
18	Val J. Rigby	Complete	Complete	Complete	3 posts missing	3 posts missing	3 posts missing
19	Stewart	Complete	Complete	Complete	Complete	Complete	Complete

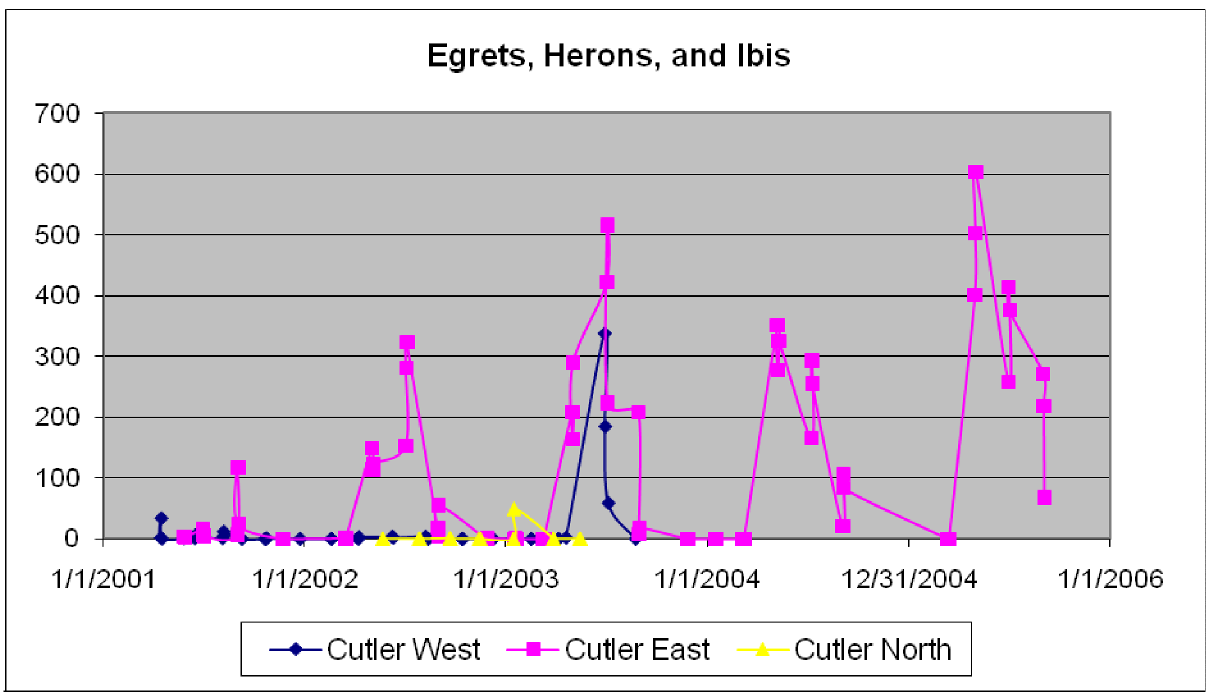
Table A-3-1 Boundary/Buffer Fence Condition by Year .							
Buffer Identification		**Fence Condition**					
ID No.	**Buffer Name**	**2002 (baseline)**	**2003**	**2004**	**2005**	**2006**	**2007**
20	Seamons	Complete	Complete	3 posts missing	7 posts missing	7 posts missing	7 posts missing
21	Rasmussen	Complete	Complete	Complete	Complete	Complete	Complete
22	Lindley	Complete	9 posts replaced	9 posts missing	34 posts missing	All posts missing	All posts missing
23	Munk	6 Posts replaced	Complete	Complete	Complete	Complete	Complete
24	T. Ballard	All posts missing	All posts missing	All posts missing	All posts missing	8 posts added to buffer	Additional posts needed
25	T. Ballard South	All posts missing	All posts missing	All posts missing	All posts missing	8 posts added to buffer	Additional posts needed
26	Church Farm	Complete	Gates and fences installed	Gates and fences repaired	Fences cut for pivot and cattle trespass	Fences cut for pivot and cattle trespass	Fences cut for pivot and cattle trespass
27	Watterson House	Complete	Posts added to buffer	Complete	Complete	Complete	Complete
28	Benson/Watterson	Complete	Posts added to buffer	Complete	Complete	Complete	Complete
29	Archibald	Complete	Complete	Complete	Fence cut for pivot access	Complete	Access lock added to north gate
30	Larson (J shape)	Complete	Complete	Complete	Complete	Complete	Access lock added to west gate
31	Gull Point	Complete	Complete	Complete	Complete	Complete	Complete
32	Watterson 100 AC	Complete	Posts added to buffer	Complete	Complete	Complete	Complete
33	Rose Oxbow	Complete	3 Carsonites replaced	Complete	Complete	Complete	Complete
34	H. Falslev Island	Complete	Posts added to buffer	5 posts replaced	4 posts replaced	3 posts missing	3 posts missing
35	B. Reese	Complete	1 post replaced	Complete	Complete	Complete	Complete
36	R. Reese	Complete	Complete	Complete	Complete	Complete	Complete
37	Thayne Gate	Complete	Complete	Complete	Complete	Complete	Complete
38	J. Allen	Complete	Complete	Complete	Complete	Complete	Complete
39	T. Ballard-Benson	Complete	Complete	Complete	Complete	Complete	1 post missing
40	H Falslev	Complete	1 post replaced	Complete	3 posts missing	3 posts missing	3 posts missing

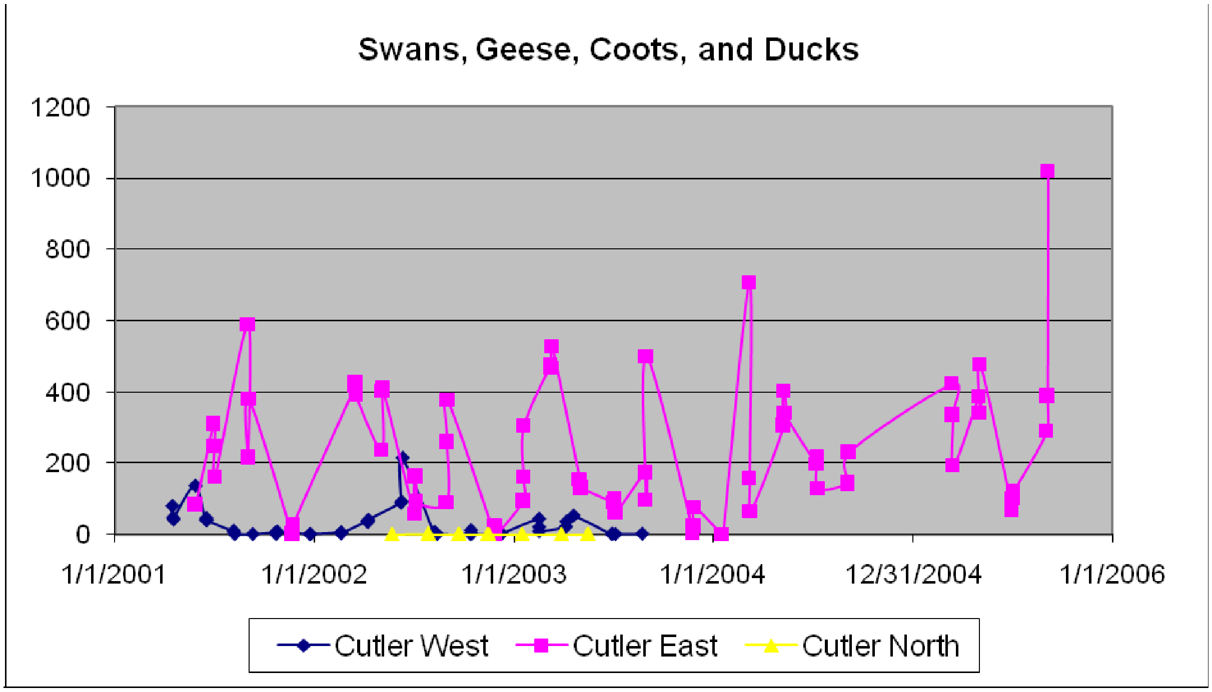
Table A-3-1 Boundary/Buffer Fence Condition by Year .							
Buffer Identification		**Fence Condition**					
ID No.	**Buffer Name**	**2002 (baseline)**	**2003**	**2004**	**2005**	**2006**	**2007**
41	Benson Oxbow Road North	Complete	Complete	Complete	Complete	Complete	Complete
42	Hobbs	Complete	Complete	Hobbs installed 2-wire fence	Fence not functioning	Rebuilt fence to Pacificorp standards	Complete
43	Z. Balls	Complete	Complete	Complete	Complete	Complete	Complete
44	Benson Oxbow Road	Complete	Complete	Complete	Complete	Complete	Complete
45	H. Johnson	Complete	Complete	Complete	Complete	Complete	Complete
46	Cardon South	Fences installed	Complete	Complete	Complete	Complete	Complete
47	Newton Bridge West	Complete	Complete	Complete	Complete	Complete	Complete
48	Canyon-Peterson	Complete	Complete	Complete	Complete	Complete	Complete
49	Canyon-Lofthouse	Complete	Complete	Complete	Complete	Complete	Complete
50	Canyon-Salisbury	Complete	Complete	Complete	Complete	Complete	Complete
51	Canyon-Anderson	Complete	Complete	Complete	Complete	Complete	Complete
52	Canyon – Larson	Complete	Complete	Complete	Complete	Complete	Complete
53	Larry Falslev	n/a	n/a	Posts added to buffer	Complete	2 posts missing	4 posts missing
54	Larry Falslev Penn	n/a	n/a	Fences added to buffer	Complete	Complete	Complete

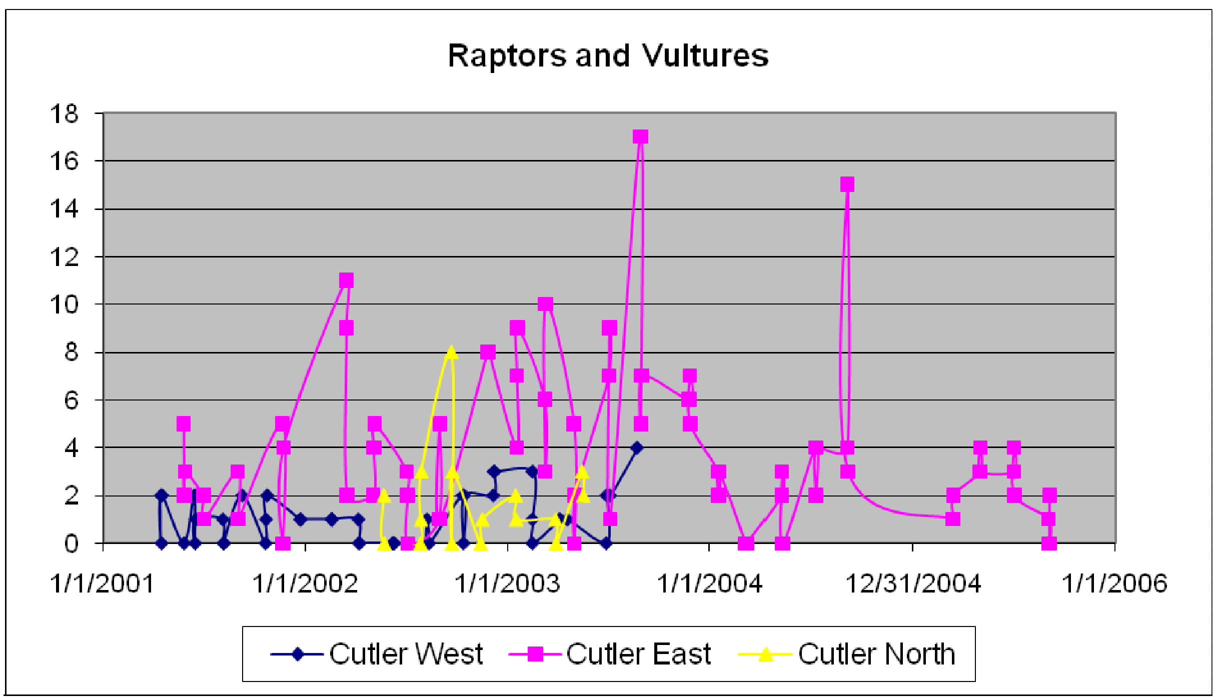
APPENDIX B
WILDLIFE TRANSECT DATA SUMMARY

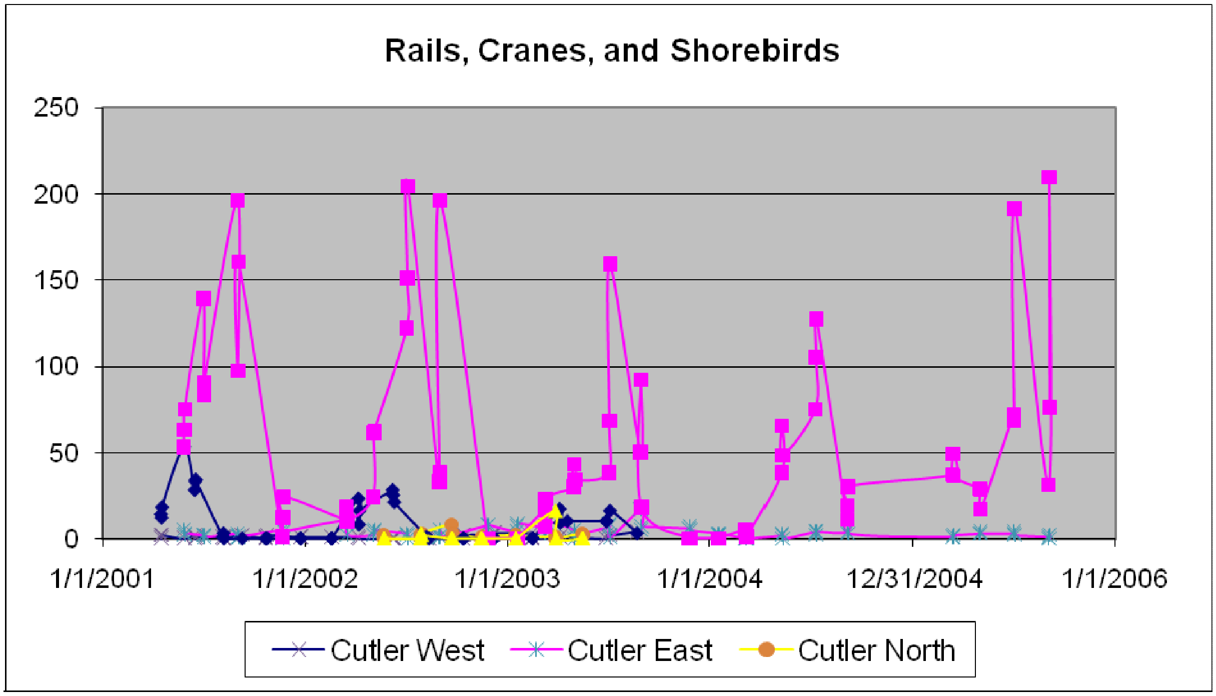
Provided by Bridgerland Audubon Society

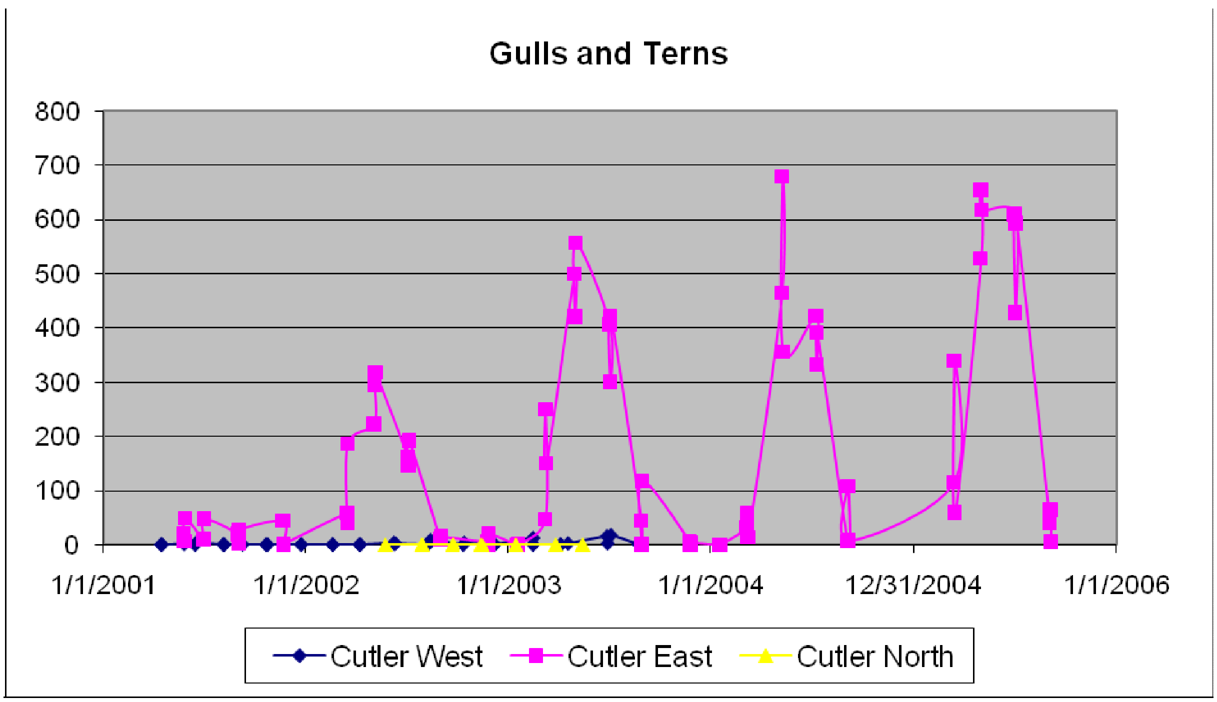

Grebes, Cormorants, and Pelicans
120
100
80
60
40
20
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East
Cutler North

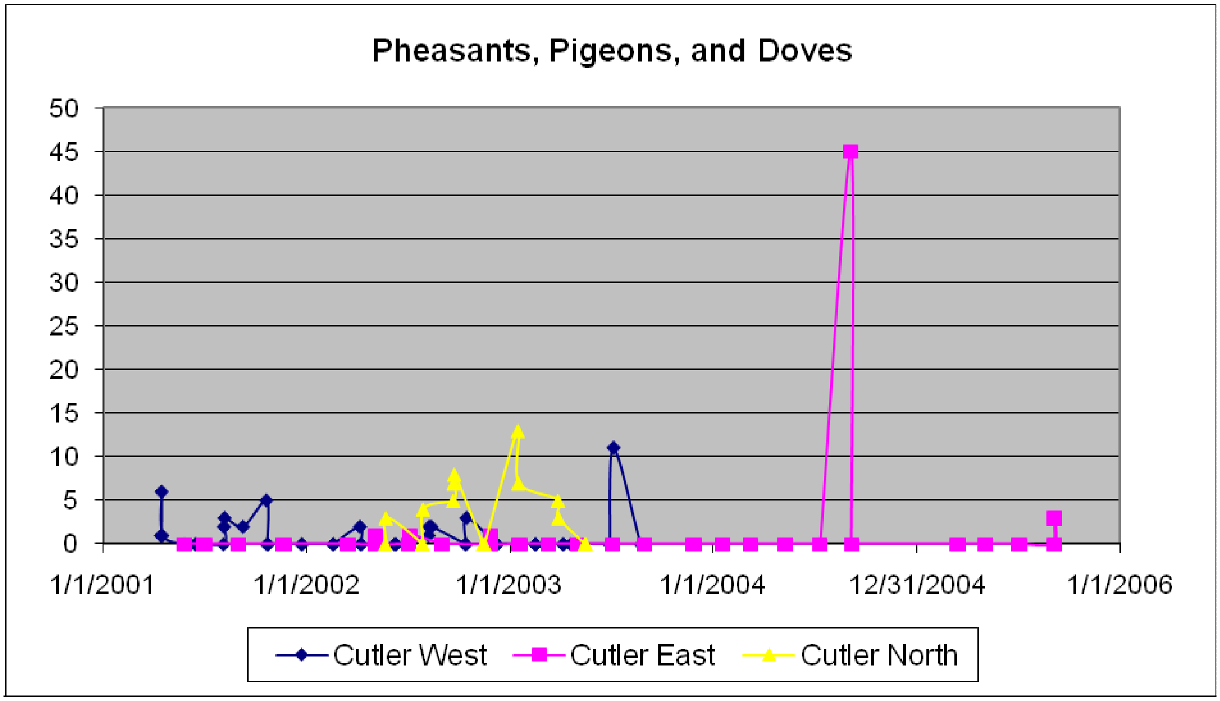

Egrets, Herons, and Ibis
700
600
500
400
300
200
100
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East
Cutler North

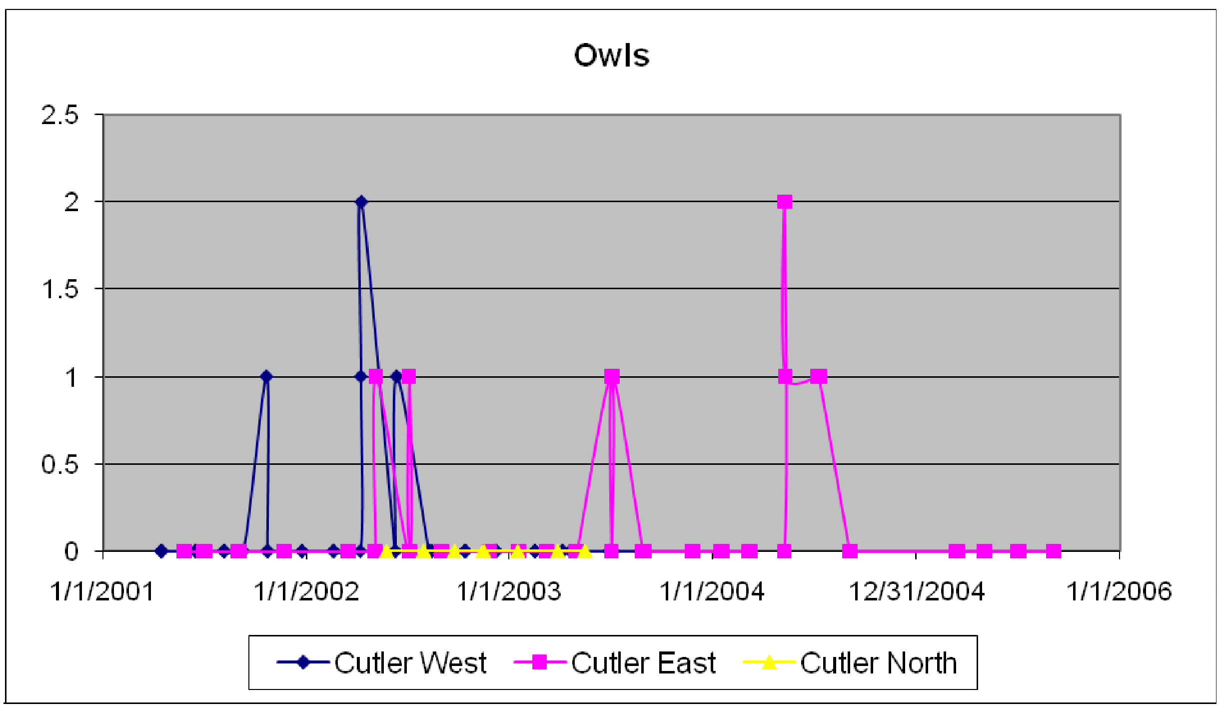

Swans, Geese, Coots, and Ducks
1200
1000
800
600
400
200
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East
Cutler North

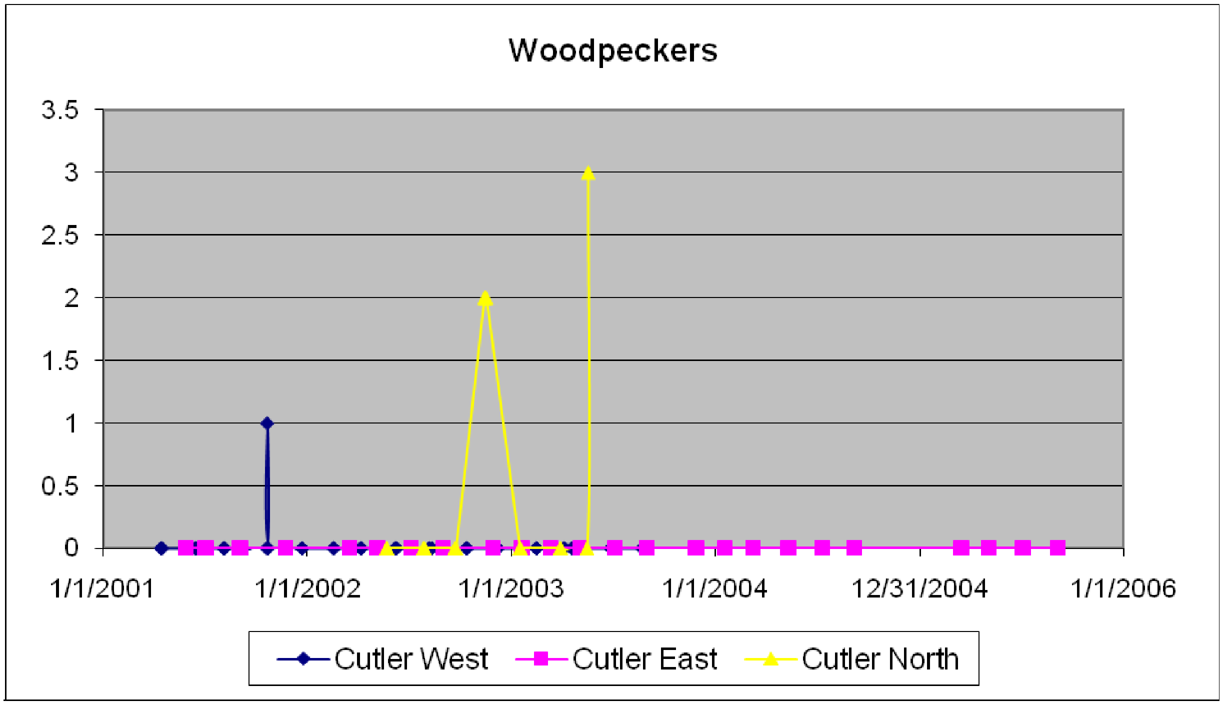

Raptors and Vultures
18
16
14
12
10
8
6
4
2
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East
Cutler North

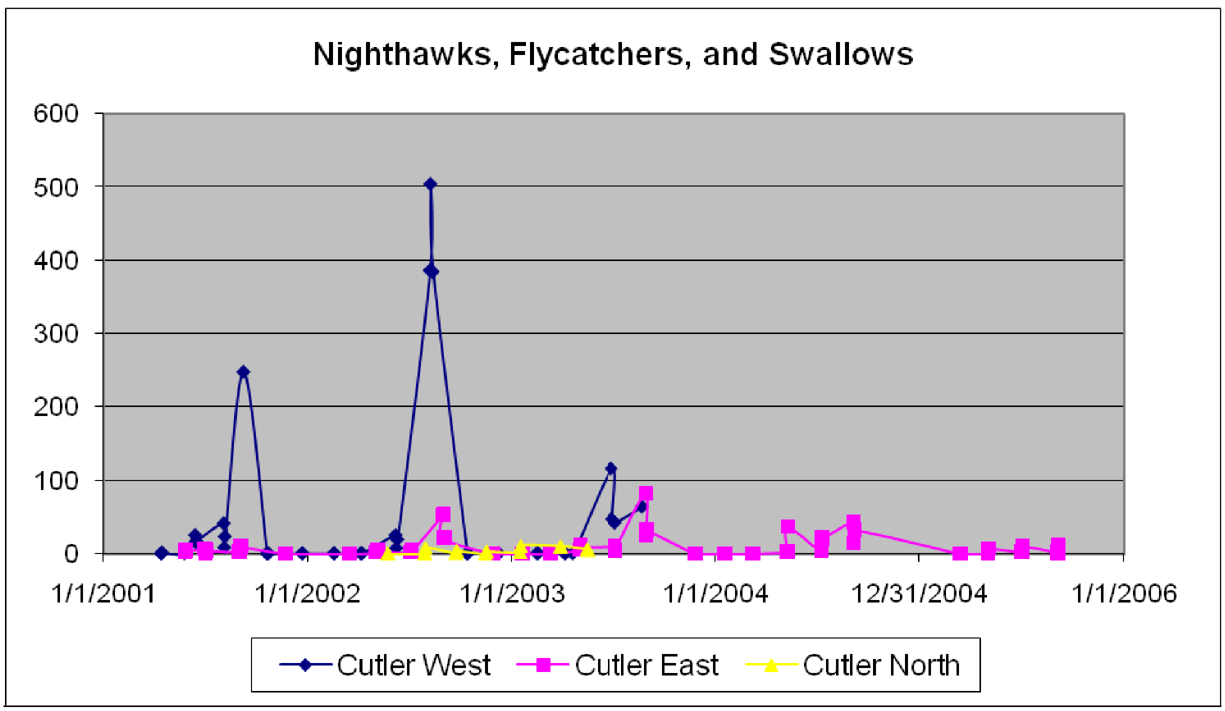

Rails, Cranes, and Shorebirds
250
200
150
100
50
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East
Cutler North

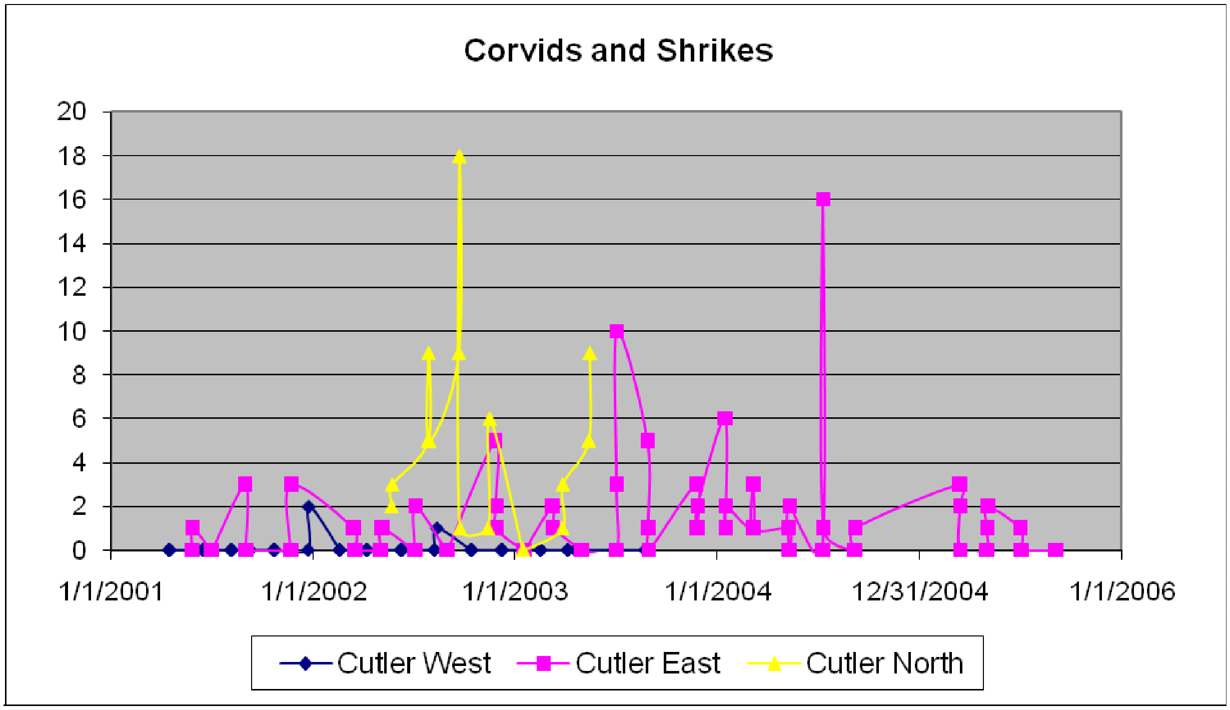

Gulls and Terns
800
700
600
500
400
300
200
100
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East
Cutler North


Pheasants, Pigeons, and Doves
50
45
40
35
30
25
20
15
10
5
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East
Cutler North

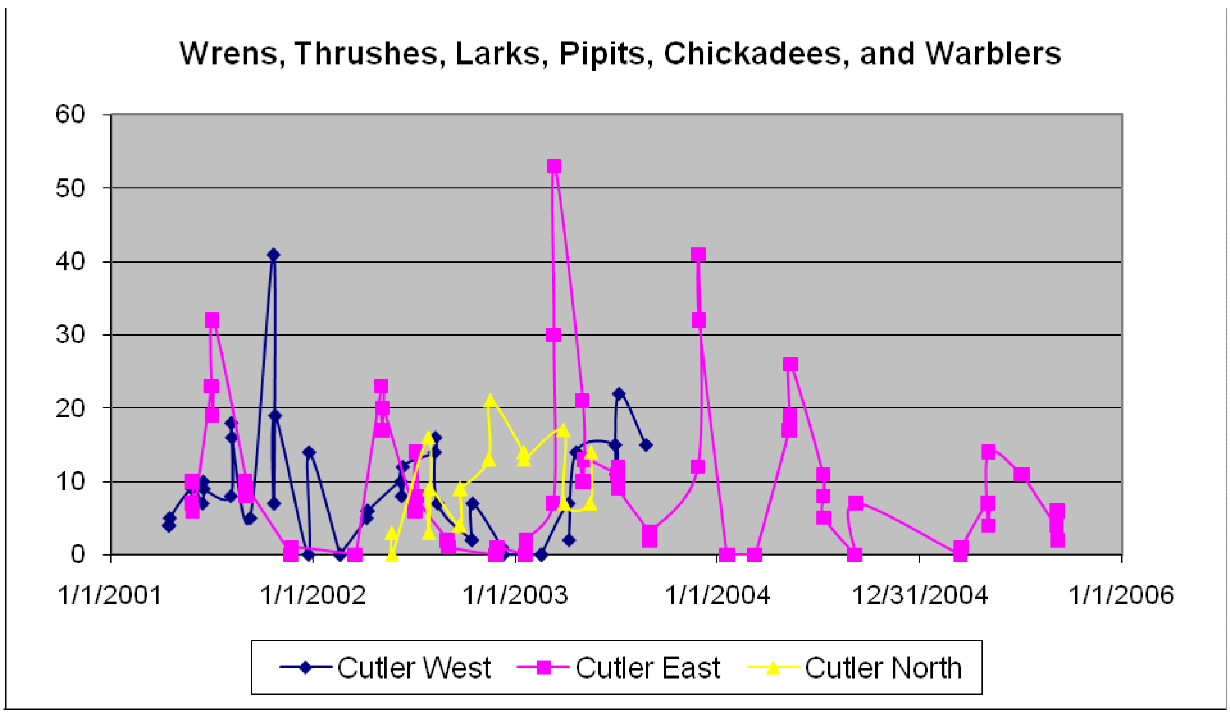

Owls
2.5
2
1.5
1
0.5
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East
Cutler North


Woodpeckers
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East
Cutler North

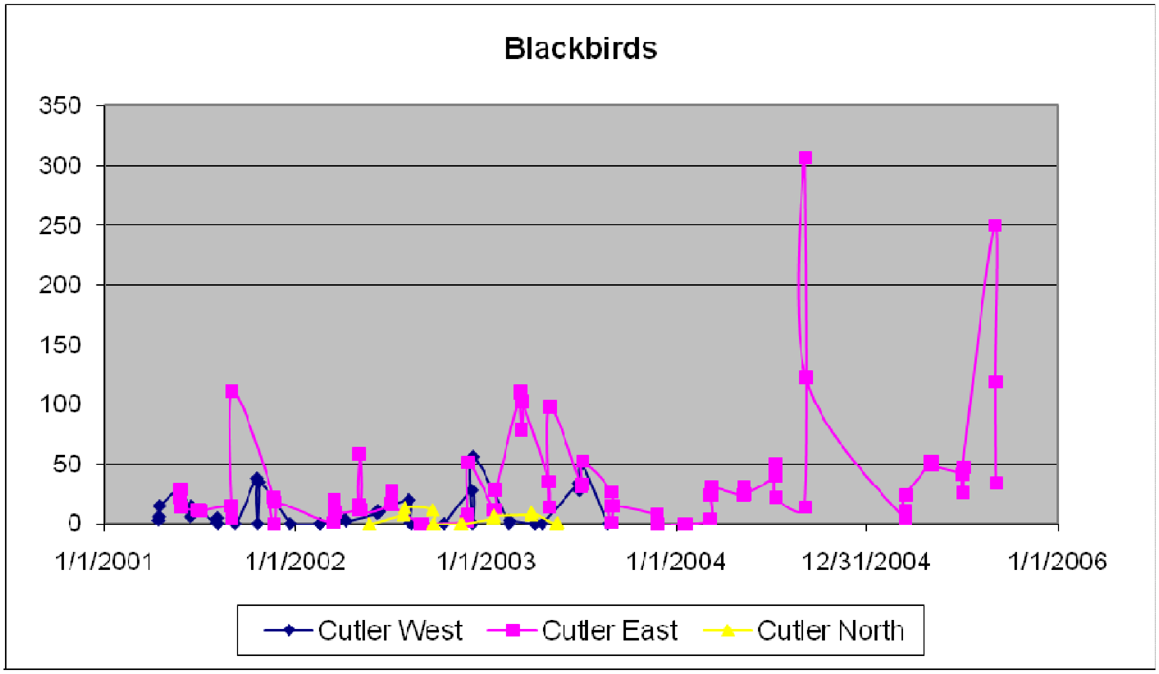

Nighthawks, Flycatchers, and Swallows
600
500
400
300
200
100
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East
Cutler North

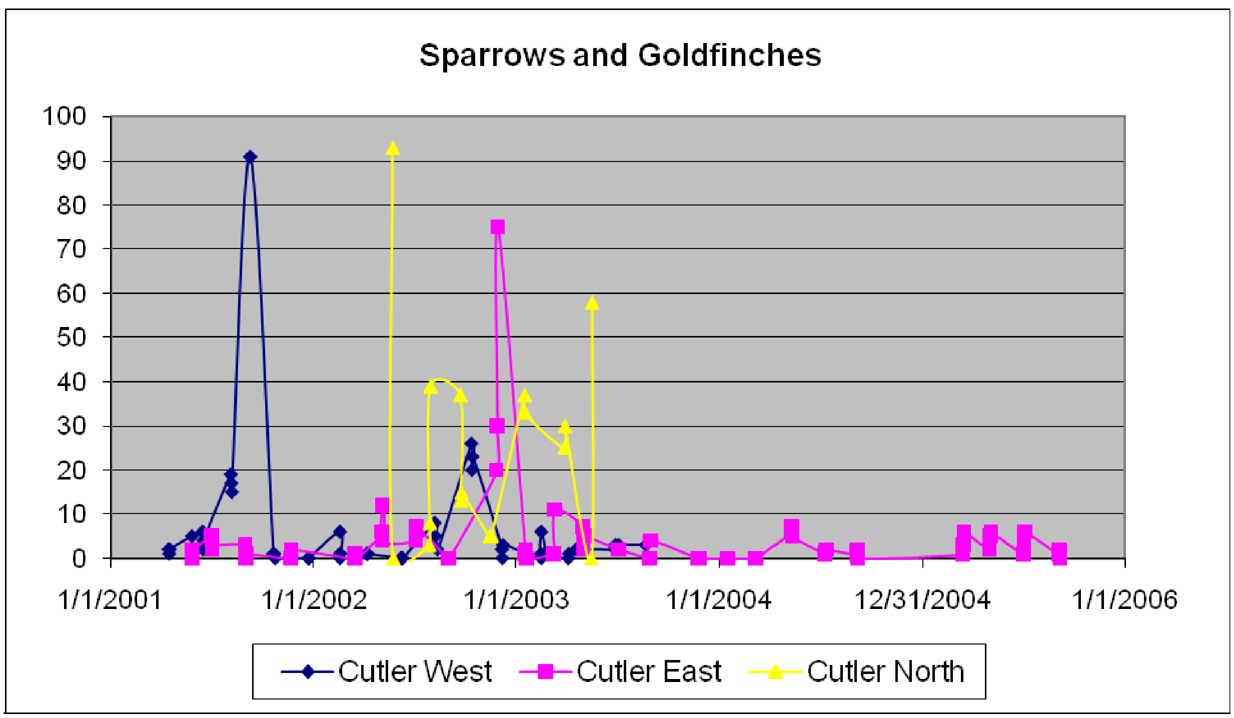


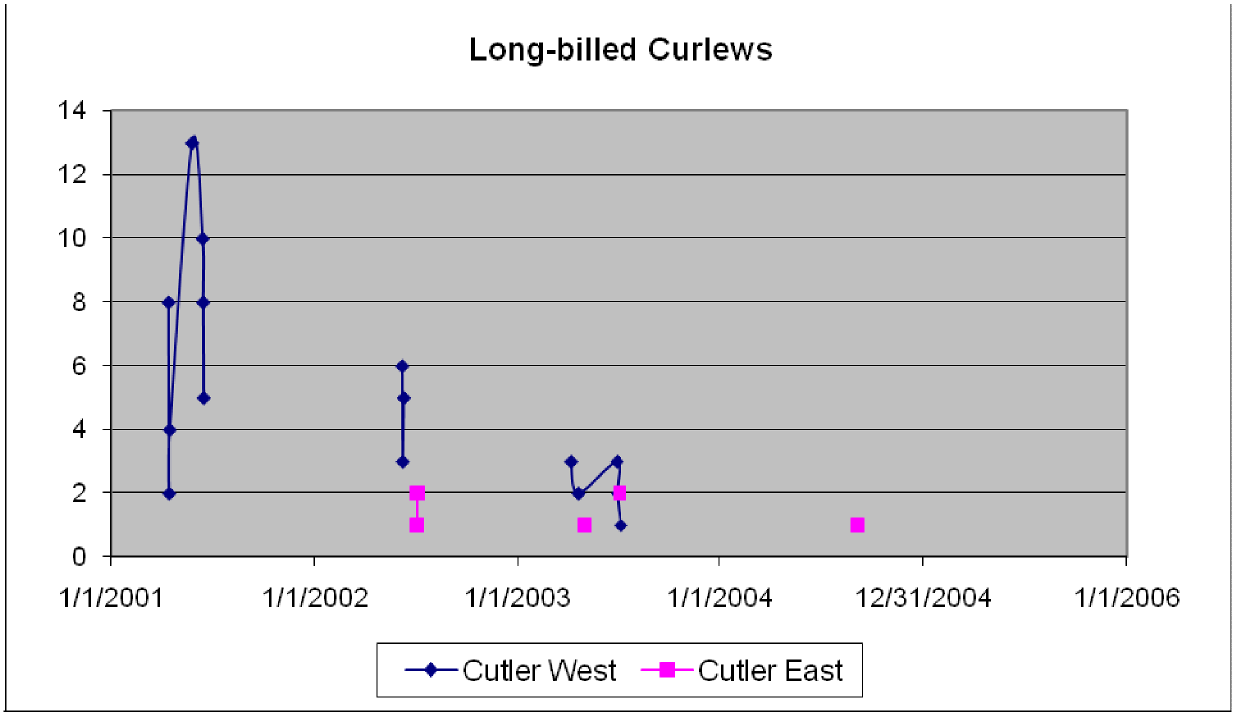
Corvids and Shrikes
20
18
16
14
12
10
8
6
4
2
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East
Cutler North



Wrens, Thrushes, Larks, Pipits, Chickadees, and Warblers
60
50
40
30
20
10
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East
Cutler North


Blackbirds
350
300
250
200
150
100
50
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East
Cutler North


Sparrows and Goldfinches
100
90
80
70
60
50
40
30
20
10
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East
Cutler North


Long-billed Curlews
14
12
10
8
6
4
2
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
12/31/2004
1/1/2006
Cutler West
Cutler East

APPENDIX C
RECREATION SITE MONITORING

APPENDIX C-1
MAJOR RECREATION SITE MAINTENANCE

1. **Little Bear River Rec Site:**
   - 2006 – Gravel added to parking lot
   - 2005 – Removed broken Audubon sign
   - 2003 – Broken cable barrier replaced

2. **Little Bear Canoe Trail**
   - 2004 – Missing buoys replaced

3. **Logan River Cane Trail**
   - 2004 – Missing buoys replaced

4. **Cutler Marsh Marina:**
   - 2002 – Installed pedestrian walk-through in south fence
   - 2004 - Gravel added to parking lot

5. **Wetland Maze Canoe Trail**
   - 2004 – Missing buoys replaced

6. **Railroad Walking Trail:**
   - 2005 – Walking bridge railings strengthened

7. **Benson Marina**:
   - 2005 - Gravel was added at the end of the boat ramp

8. **Benson Walking Trail**:
   - 2003 – Added rock barrier to prevent ATV use of trail

9. **Upper Bear River Marina**:
   - 2003 – Unauthorized boat ramp use eliminated

10. **Bear River Overlook**:

11. **Clay Slough Rec. Site**:
    - 2005 - Banks near popular fishing sites stabilized

12. **Cutler Canyon Marina**:
    - 2006 – Significant weed infestation in northwest corner of site eradicated

13. **East Cutler Canyon Boat-In:**

14. **West Cutler Canyon Boat-In**:

APPENDIX C-2
BOATER POLICY, REGULATIONS, AND SIGNS

BOATER USE ZONE SIGN

(Posted at All Recreation Sites)

BOATER USE ZONES

The Cutler hydroelectric project consists of nearly 10,000 acres of land and water managed for power production, irrigation, public recreation, wildlife, and compatible agricultural uses. PacifiCorp recognizes and is committed to maintaining the unique recreation opportunities and wildlife habitat values provided by Cutler Reservoir.

To insure the enjoyment of the diverse users and protect the unique resource values of the area, PacifiCorp, Utah State Parks, and the Utah Division of Wildlife Resources are implementing the following watercraft use rules (see adjacent map):

North Boater Zone A (access via Benson or Canyon marinas)

In the area north of the Benson Railroad Bridge and west of the confluence with the Bear River:

- All motor sizes and safe speeds are allowed year round.

South Boater Zone B (access via Cutler Marsh or Benson marinas)

In the area south of the Benson Railroad Bridge:

- Motorized watercraft are restricted to a maximum of 35 horsepower motors and wakeless speeds year round.

Bear River Boater Zone C (access via Upper Bear River or Benson Marina)

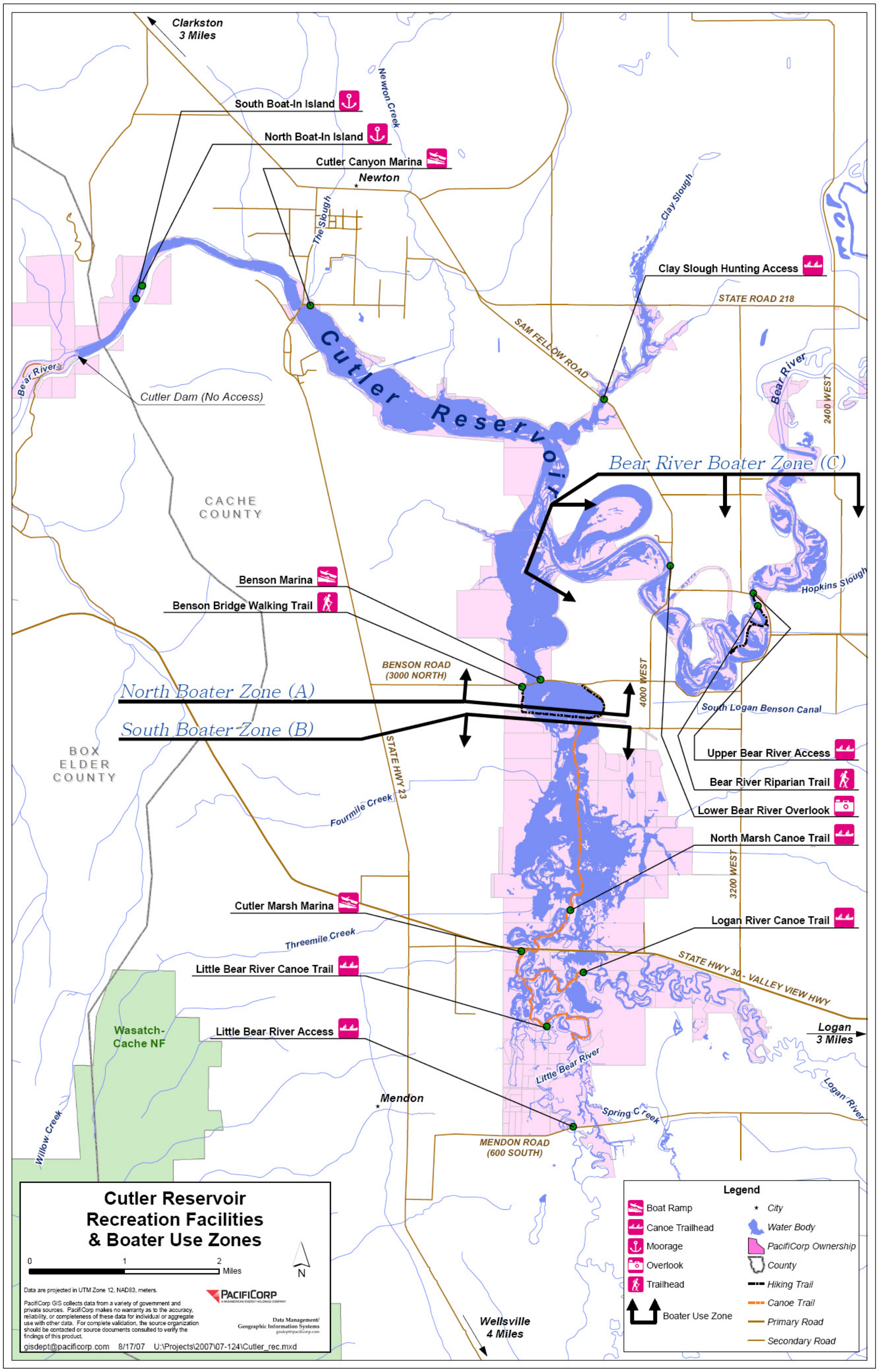
In the Bear River area, east of the confluence with Cutler Reservoir (including the ‘horseshoe area’):

- Motorized watercraft are restricted to a maximum of 35 horsepower motors and wakeless speeds from the last Saturday in September to March 31 every year.

Boater use zones will be enforced. Please remember that you are entering a natural area where hazards exist….. *Your Safety is Your Responsibility.*

BOATER USE ZONE MAP

(Posted at all Recreation Sites)


Cutler Reservoir
Recreation Facilities
& Boater Use Zones
Clarkston 3 Miles
South Boat-In Island
North Boat-In Island
Cutler Canyon Marina
Newton
Clay Slough Hunting Access
STATE ROAD 218
SAM FELLOW ROAD
Cutler Dam (No Access)
Bear River
Cutler Reservoir
Bear River Boater Zone (C)
CACHE COUNTY
Benson Marina
Benson Bridge Walking Trail
BENSON ROAD (3000 NORTH)
North Boater Zone (A)
South Boater Zone (B)
4000 WEST
South Logan Benson Canal
Hopkins Slough
2400 WEST
BOX ELDER COUNTY
STATE HWY 23
Upper Bear River Access
Bear River Riparian Trail
Lower Bear River Overlook
North Marsh Canoe Trail
Fourmile Creek
3200 WEST
Cutler Marsh Marina
Logan River Canoe Trail
Threemile Creek
STATE HWY 30 - VALLEY VIEW HWY
Little Bear River Canoe Trail
Little Bear River Access
Wasatch-Cache NF
Logan 3 Miles
Little Bear River
Mendon
Spring Creek
Logan River
MENDON ROAD (600 SOUTH)
Willow Creek
Wellsville 4 Miles
Legend
Boat Ramp
Canoe Trailhead
Moorage
Overlook
Trailhead
Boater Use Zone
City
Water Body
PacifiCorp Ownership
County
Hiking Trail
Canoe Trail
Primary Road
Secondary Road
0 1 2 Miles
N
Data are projected in UTM Zone 12, NAD83, meters.
PacifiCorp GIS collects data from a variety of government and private sources. PacifiCorp makes no warranty as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. For complete validation, the source organization should be contacted or source documents consulted to verify the findings of this product.
PACIFICORP
Data Management/ Geographic Information Systems
gisdept@pacificorp.com 8/17/07 U:\Projects\2007\07-124\Cutler_rec.mxd

STATE BOATER REGULATION
Effective March 2008

STATE BOATER REGULATION FOR CUTLER RESERVOIR
Effective March 2008

R651-205-17. Cutler Reservoir. The use of motors whose manufactured listed horsepower is more than 35 horsepower is prohibited and a vessel may not be operated at a speed greater than wakeless speed at any time in the area south of the Benson Railroad Bridge. A vessel may not be operated at a speed greater than wakeless speed from the last Saturday in September through March 31st in the Bear River, east of the confluence with the reservoir.

APPENDIX D
AGRICULTURAL LEASES

Table D-1. Annual Grazing Pasture AUM Data, 2003-2007				
Grazing Leases	**Expiration Date**	**# of Animals**	**Acres**	**Grazing Period**
Walker, Kelly	30-Apr-10		255	
		89 AUM		June 1 to Nov 14, 2003
		98 AUM		June 9 to Nov 8, 2004
		95 AUM		June 10 to Nov 11, 2005
		100 AUM		June 3 to Oct 26, 2006
		106 AUM		June 2 to Nov 2, 2007
Willmore, Harry & Tom	30-Apr-09	250 AUM max	121	Approx June 1 to Nov 1
Utah State University	30-Apr-08		361	
		100 AUM		June 2 to Nov 3, 2003
		99 AUM		June 5 to Sept 6, 2004
		109 AUM		June 17 to Nov 1, 2005
		104 AUM		June 9 to Oct 31, 2006
Rinderknecht, Odell	31-Mar-08		85	
		91 AUM		Nov 15 to Jan 15, 2004
		68 AUM		June 1 to Nov 10, 2005
		96 AUM		Nov 15 to Jan 12, 2006
		94 AUM		Nov 15 to Jan 12, 2007
Selman, Bret	30-Apr-08		300	
		71 AUM		June 7 to Nov 15, 2003
		36 AUM		June 9 to Nov 11, 2004
		71 AUM		June 10 to Nov 14, 2005
		27 AUM		June 11 to Oct 22, 2006
		71 AUM		June 12 to Nov 16, 2007
Hardman, Heber	31-May-08	Approx 50 pair	80	Approx June 1 to Oct 25
		48 AUM		June 21 to July 19, 2003
		50 AUM		July 17 to Aug 21, 2004
		48 AUM		July 3 to Aug 6, 2005
		51 AUM		July 23 to Aug 27, 2006
		50 AUM		June 2 to July 7, 2007
Watterson, Jim	31-Mar-24	Approx 50 pair	120	Approx June 1 to Nov 30
		No year to year info is required by lease--just parameters		

Table D-2. Cattle Management Fence Condition from 2003 to 2007					
Pasture Name	**2003**	**2004**	**2005**	**2006**	**2007**
NG1	Complete	Complete	Complete	Complete	Complete
NP1	Complete	Complete	North gate repaired	Complete	Complete
NP2	Complete	Spring exclosure rebuilt	Complete	Complete	Complete
NP3	Complete	Complete	Complete	Complete	Complete
NG3	Complete	Complete	Complete	Complete	Complete
NG4	Complete	Complete	Complete	Complete	Complete
NG5	Complete	Complete	Complete	Complete	Complete
NG7	Complete	Complete	Complete	Complete	Gate added on west fence
SP2A	Complete	Complete	Complete	Complete	Complete
SP2B	Complete	Complete	Complete	Complete	Complete
SP2C	Complete	Complete	Electric dividing fence replaced with poles	Complete	Complete
SG5A	Complete	Complete	Complete	Complete	Complete
SG5B	Electric fence replaced with high tensile wire	Complete	Complete	Complete	Complete
SG5C	Complete	Complete	Complete	Complete	Complete
SG6A	Complete	Complete	Complete	Complete	Complete
SG6B	Complete	Complete	Complete	Complete	Complete
SG7	Complete	Complete	Complete	Complete	Complete
SG1A	Electric wire added to west fence	Complete	Complete	New electric fence charger installed	Complete
SG1B	Complete	Complete	Complete	Electric fence modified for water access	Complete
SG2A	Complete	Complete	Complete	Complete	Complete
SG2B	Complete	Complete	Complete	Complete	Complete
SG2C	Complete	Complete	Complete	Complete	Complete
SG2D	Complete	Complete	Complete	Complete	Complete
SG3A	Complete	Complete	Complete	Complete	Complete
SG3B	Complete	Complete	Complete	Complete	Complete
SG3C	Complete	Complete	Electric fence modified to provide water access	Complete	Complete
SG4A	Complete	Electric fence extended over river crossings.	Complete	Complete	Complete

Table D-2. Cattle Management Fence Condition from 2003 to 2007					
Pasture Name	**2003**	**2004**	**2005**	**2006**	**2007**
a	Complete	Electric fence extended over river crossings	Complete	Complete	Complete
SG4C	Complete	Electric fence extended over river crossings	Complete	Complete	Complete
SG4D	Complete	Electric fence extended over river crossings	Complete	Complete	Complete
SP1A	Complete	Complete	Complete	Complete	Complete
SP1B	Complete	Complete	Complete	Complete	Electric fence needs to be replaced
SP1C	Complete	Complete	Complete	Complete	Complete
SGM1	Complete	Complete	Complete	Complete	Complete
SGM2	Fence repaired due to vehicle damage	Complete	Complete	Complete	Complete

Table D-3. Property Coordination, Cutler Five-Year Report 2003-2007				
Year	**Date**	**Adjacent Landowner**	**Property Issue**	**Resolution**
2003	1/7	M Rigby	Selling of Property to Utah State University	Access easements completed
	1/7	V Rigby	Cutting grass on PacifiCorp property	Landowner agreed to obtain permission before cutting grass or controlling weeds
	1/7	R Reese	Trespass grazing and manure containment near river	Cattle contained and manure container project
	3/12	L Falslev	Boundary conflicts and land trade issues	Meeting cancelled and rescheduled
	3/13	L Cowley	PacifiCorp contractortrespass while fencing property line.	Will give notice and get permission from Mr. Cowley
	4/17	M Falslev	Livestock sewage draining onto PacifiCorp property	Applied for Division of Water Quality for funds to fix problem
	5/9	D Thain	Farming of PacifiCorp land and access issues	Deeded portion of farm ground for an access agreement
	6/3	B Munk	Needs to use backhoe to allow for proper drainage of property	Agreed to wait until after bird nesting period
	6/3	W Cardon	Trespass grazing and bank erosion	**Not responded to assistance with alterations**
	6/23	Roundy	Diesel water pump leaking into water	Roundy removed all contaminated soil and replaced diesel pump with an electric one
	7/15	R Drolette	Personal trespass and alteration of culverts and drainage routes	Verbal commitment to not to conduct work without contacting PacifiCorp
	8/18	C Archibald	Water shares	Unable to assist land owner with shares
	9/2	B Griffin	Crop planting over re-seeded buffer zone and removal of property markers	Reseeded again, replacement of property markers and notification to landowner and law enforcement
	9/5	H Falslev	Damaged irrigation pipe	Split cost of repairs with land owner
	10/3	D Kunzler	Property line issues	Executed boundary line agreement in exchange for a conservation easement
	10/22	B Griffin	Tilling PacifiCorp property up to the river	Agreed to honor boundary line. Notified local law enforcement.
	10/23	L Falslev	Property line issues, trespass grazing from sublease	Resolve with surveying and fencing

Table D-3. Property Coordination, Cutler Five-Year Report 2003-2007				
Year	**Date**	**Adjacent Landowner**	**Property Issue**	**Resolution**
	10/23	H Falslev	Property line issues	Made boundary line agreement in exchange for a conservation easement between property line and existing boundary line agreement
	12/29	H Lundberg	Access Agreement and boundary Line Agreement	Made easement 25 years instead of perpetual and gave Lundberg first right to cut hay on the "third crossing parcel"
2004	6/3	Seamons	Farming has removed buffer posts	Send written notice to owner and replaced posts in 2008
	12/22	G Hobbs	Down fence installed by Hobbs	Notified Hobbs and had him fix problem
2005	8/18	B Griffin	Verbally threatening a worker accessing PacifiCorp property through his	Get Access Agreement in writing and document Any and all contact with land owner
	8/24	W Cardon	Broken fence and gates that allow trespass grazing and stock watering	**Continued attempts to contact landowner. May take legal action**
	8/24	S Lindley	Posts removed, buffer tilled and farmed	In process of legal action to resolve damages in buffer
2006				
2007	5/24	T Ballard	Trench being dug for irrigation pipe	Check for cultural resource material. Land owner agreed to coordinate with PacifiCorp in the future

APPENDIX E
WATER QUALITY

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

Table of Contents

List of Tables

List of Figures

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

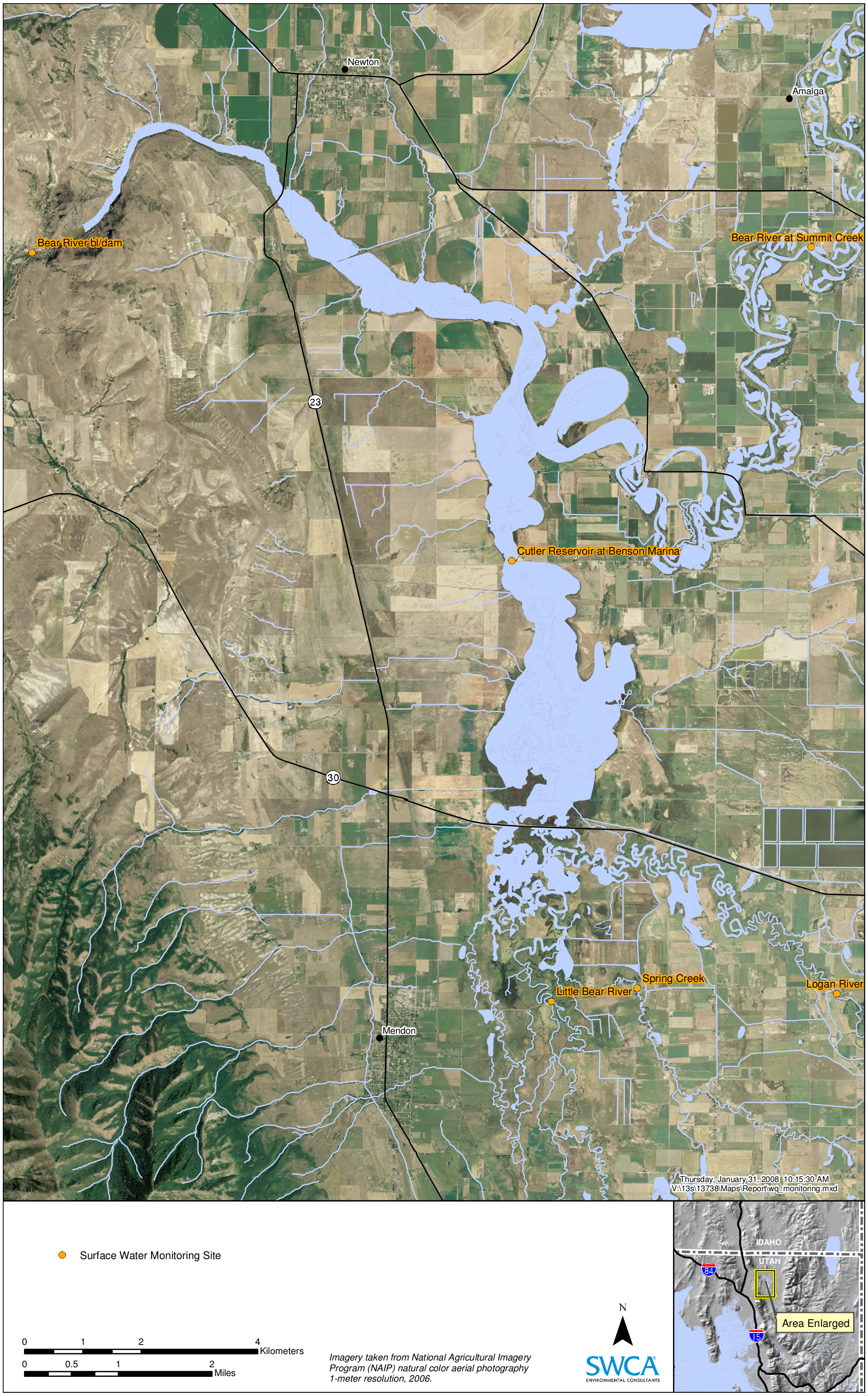


Figure 1. Cutler Reservoir surface water monitoring sites.

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.

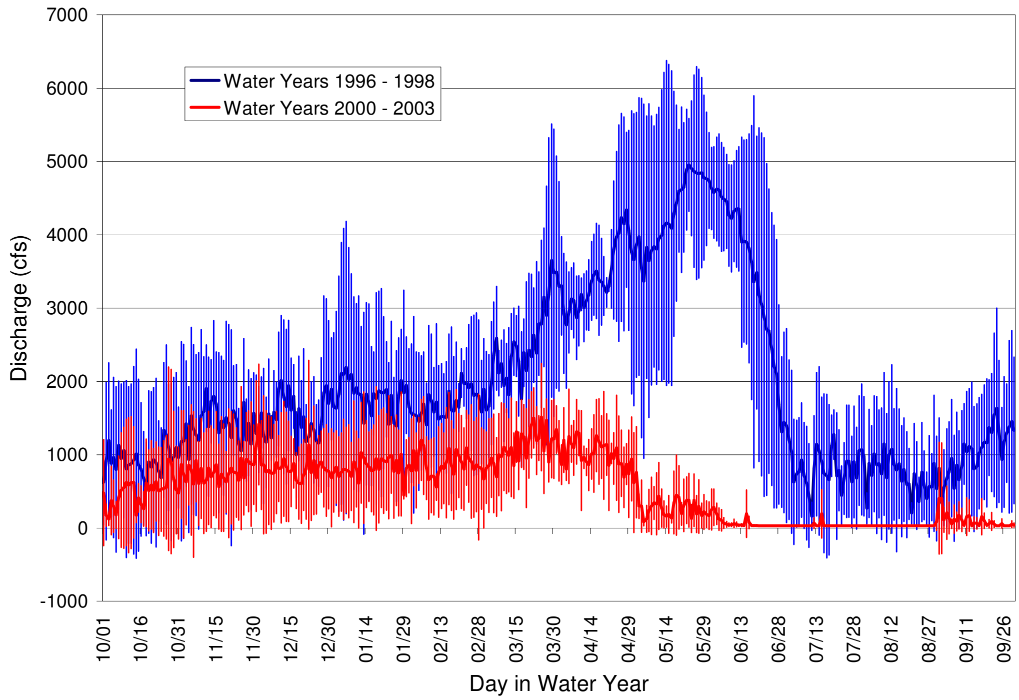


Figure 2. Hydrograph for average daily releases from Cutler Reservoir (cfs) during two monitoring periods. Solid line shows average discharge surrounded by standard deviation in shaded bars.

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.

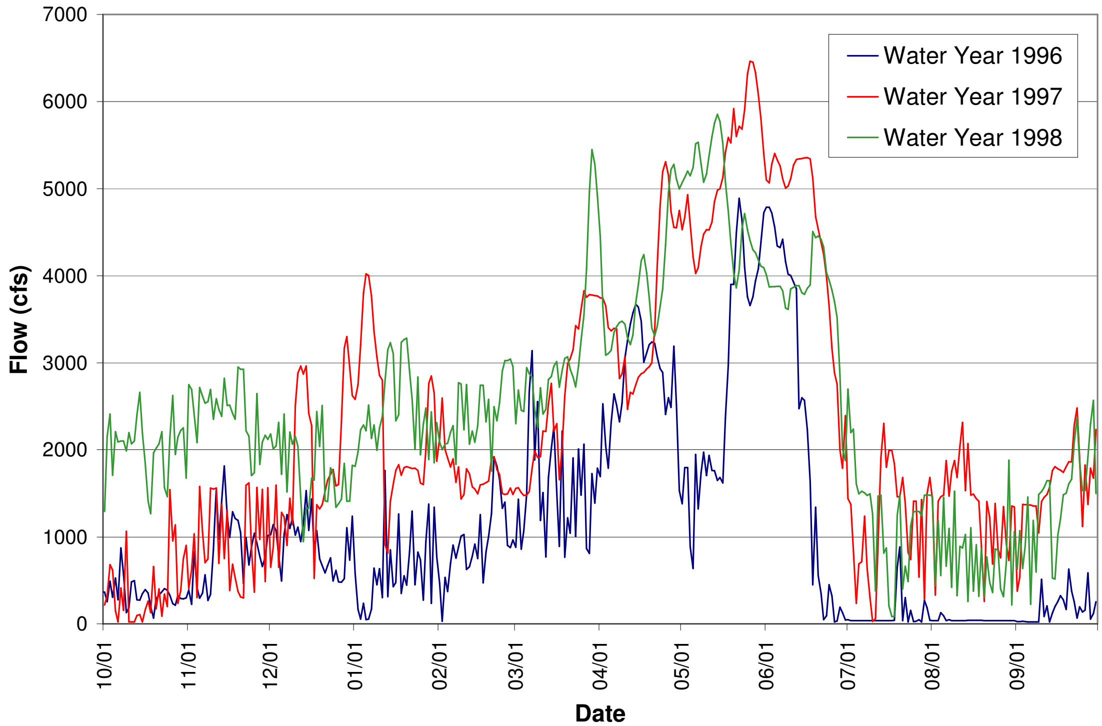


Figure 3. Hydrograph of discharge from Cutler Dam by water year (1996–1998)

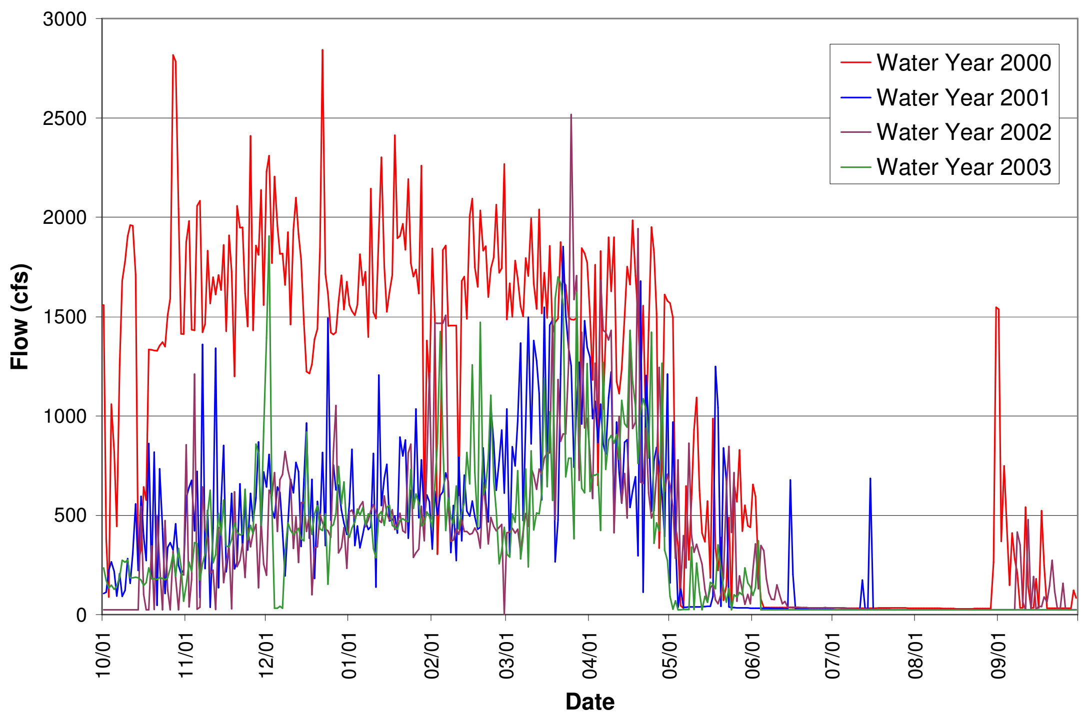


Figure 4. Hydrograph of discharge from Cutler Dam by Water Year (2000–2003)

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.

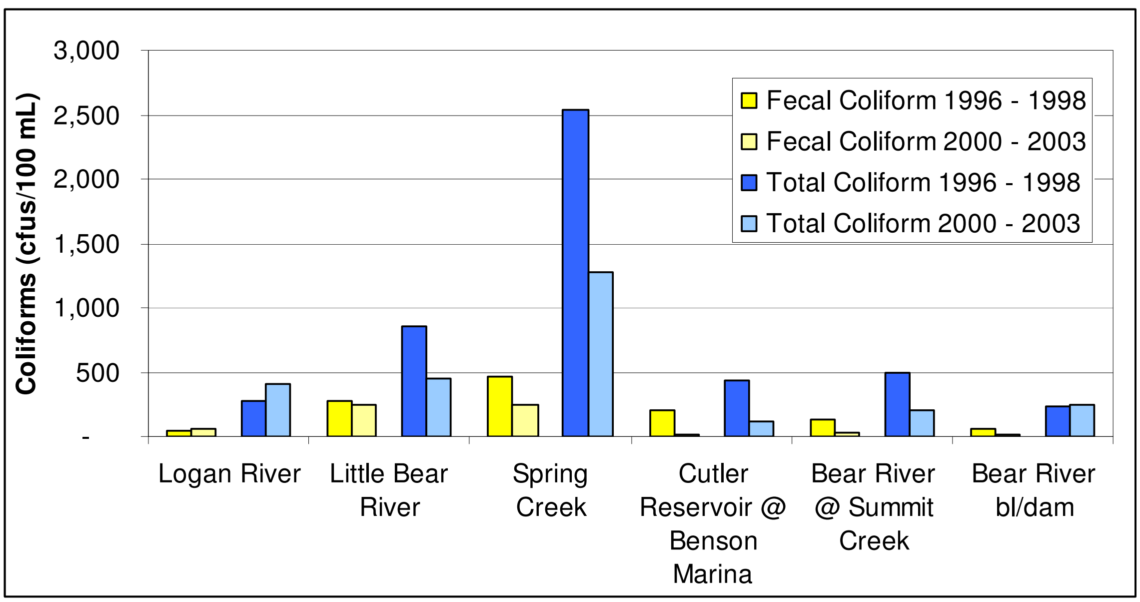


Figure 5. Change in coliform bacteria in Cutler Reservoir system between first monitoring period (1996–1998) and second monitoring period (2000–2003).

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.

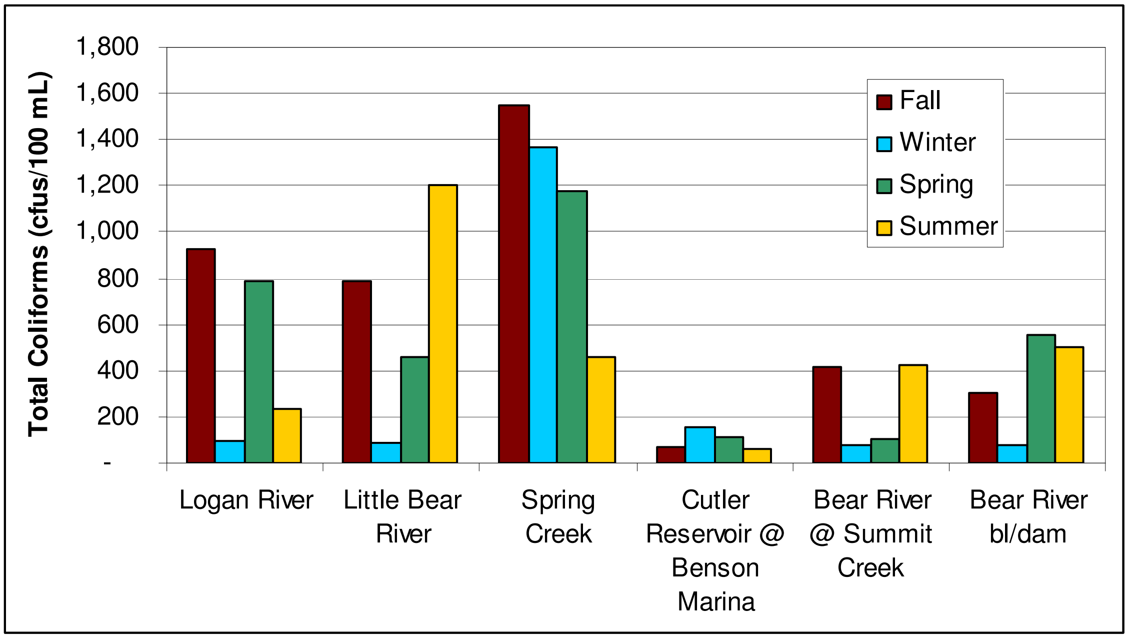


Figure 6. Total coliform bacteria (cfus/100 mL) for sampling sites by season during the 2000–2003 monitoring period

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.

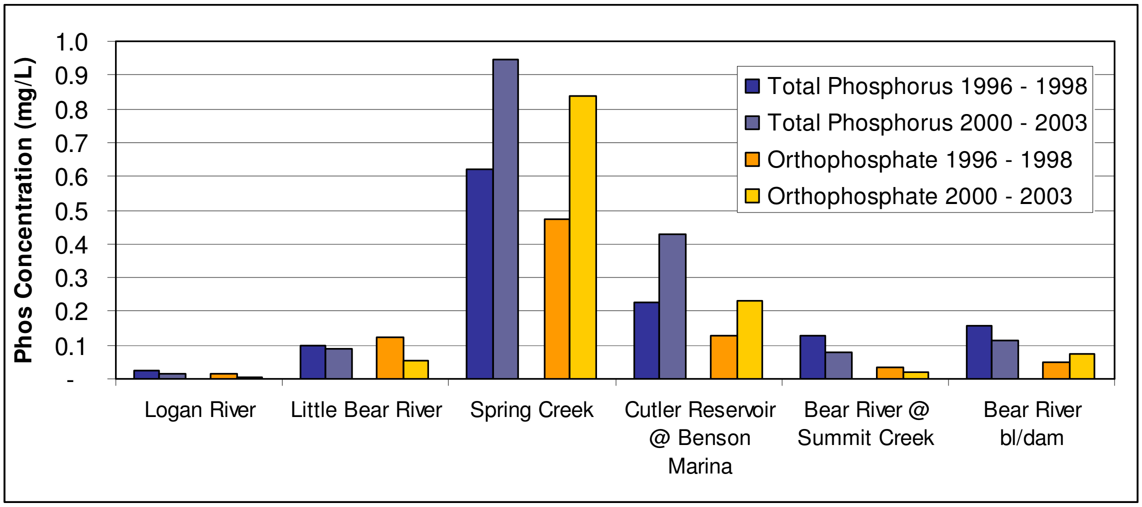


Figure 7. Change in phosphorus concentrations in Cutler Reservoir system between first monitoring period (1996–1998) and second monitoring period (2000–2003).

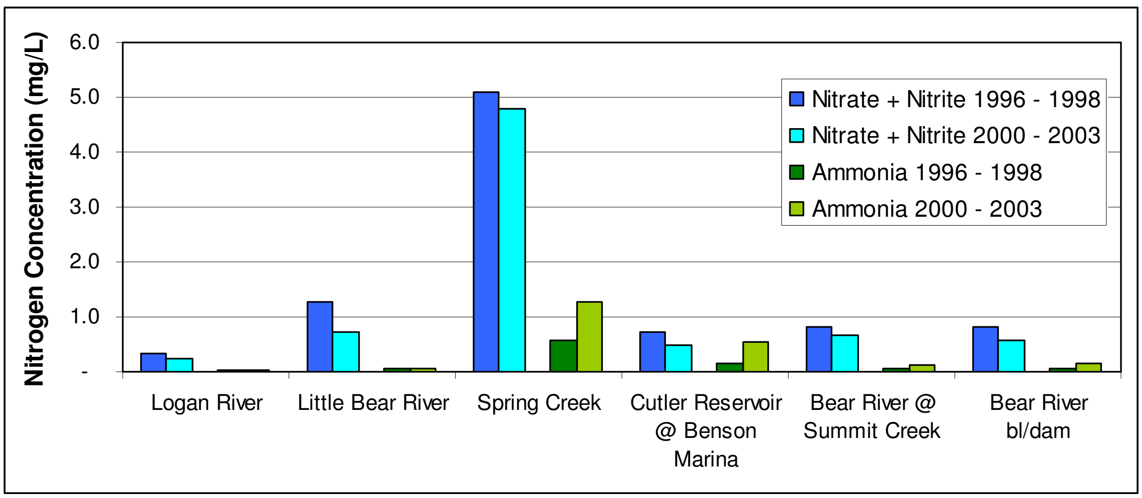


Figure 8. Change in nitrogen concentrations in Cutler Reservoir system between first monitoring period (1996–1998) and second monitoring period (2000–2003).

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.

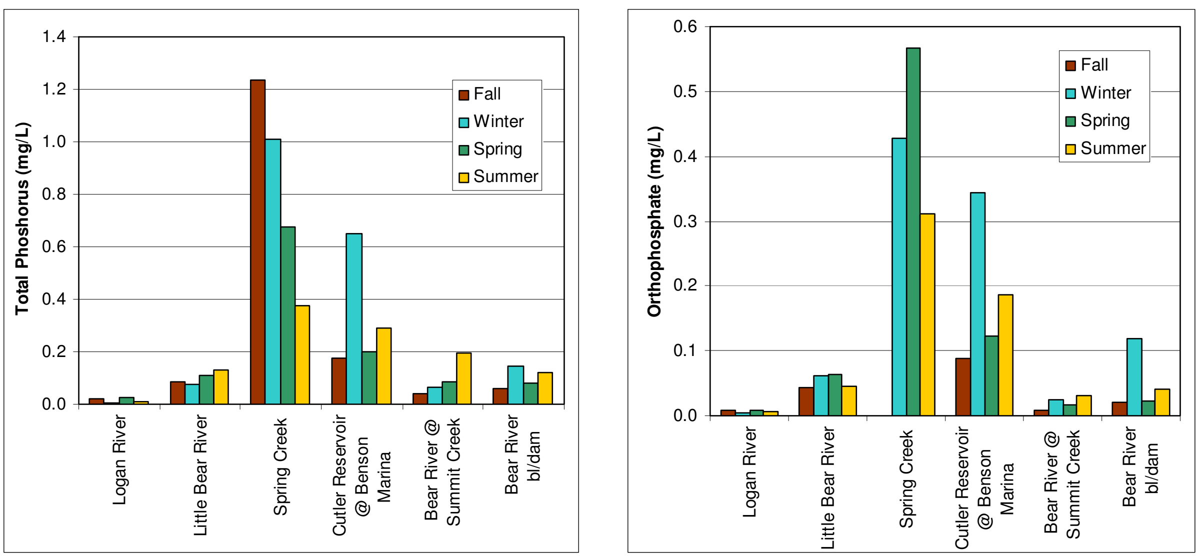


Figure 9. Phosphorus concentrations for sampling sites by season during the 2000–2003 monitoring period

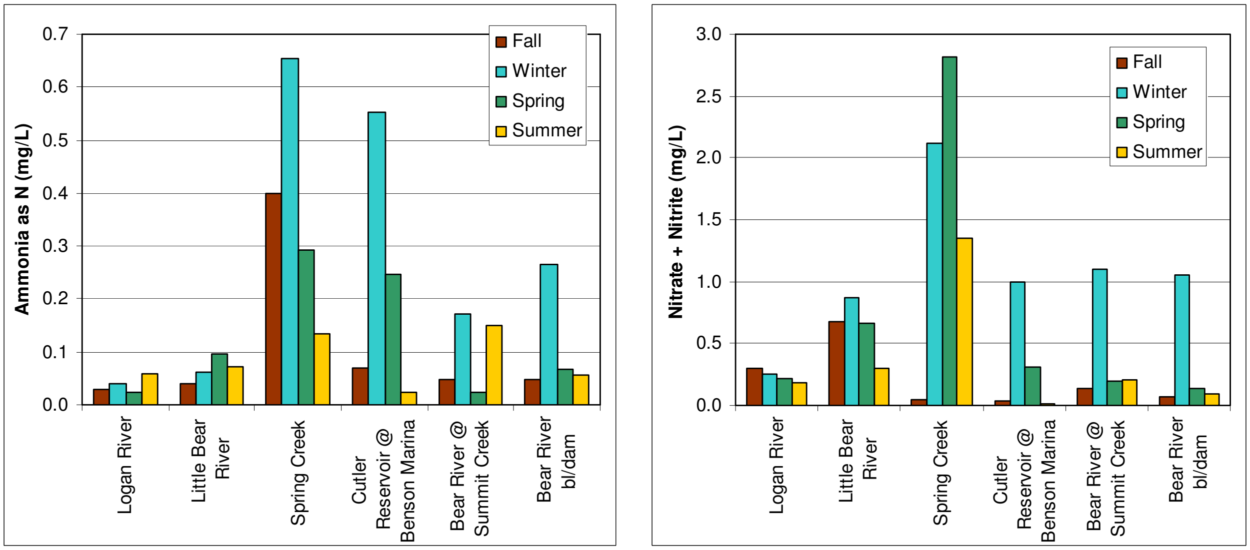


Figure 10. Nitrogen concentrations for sampling sites by season during the 2000–2003 monitoring period

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).

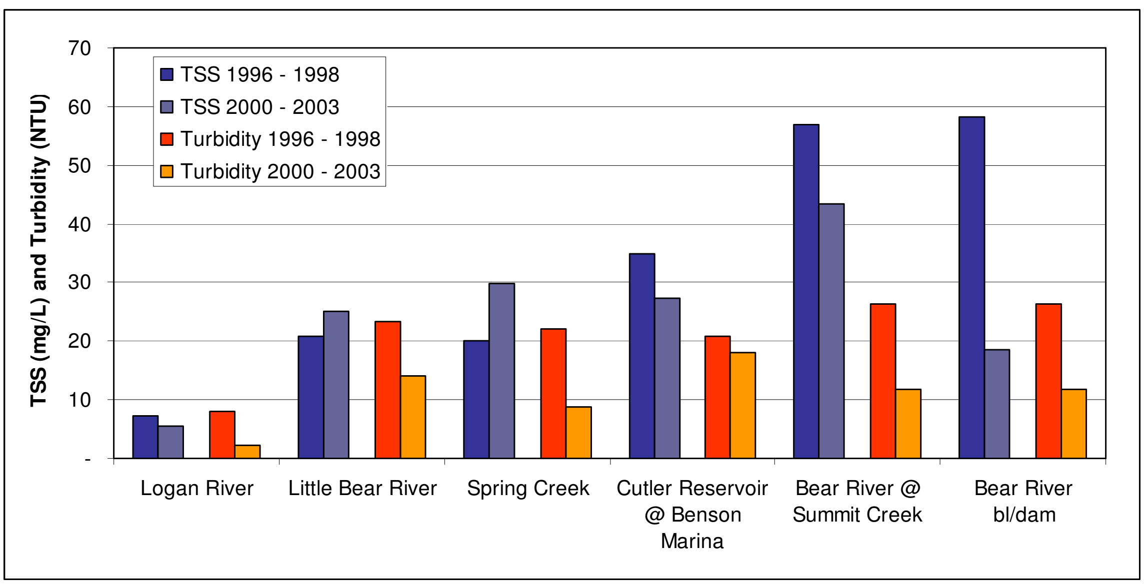


Figure 11. Change in turbidity in the Cutler Reservoir system between first monitoring period (1996–1998) and second monitoring period (2000–2003)

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.

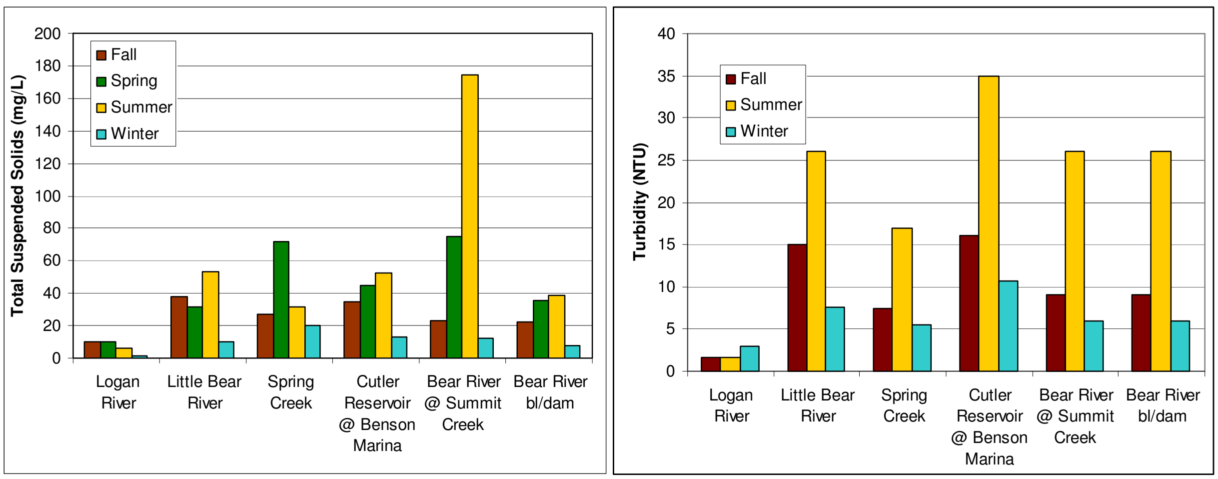


Figure 12. Average sediment concentration (TSS) and turbidity for sampling sites by season during the 2000–2003 monitoring period

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.	

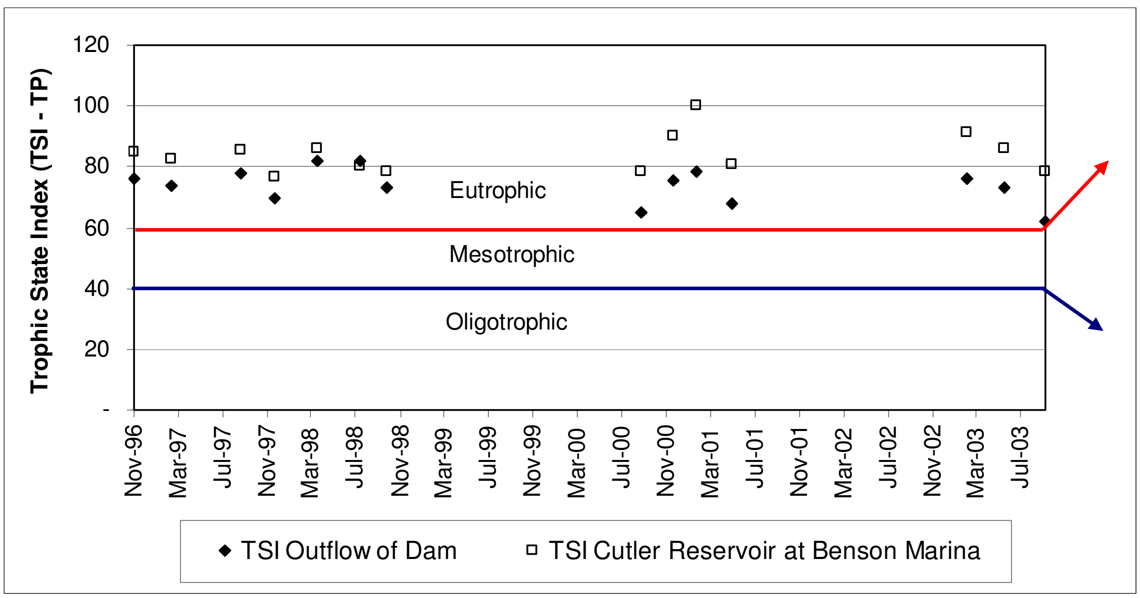


Figure 13. Trophic state index (TSI) predicted based on total phosphorus concentrations in Cutler Reservoir.

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.

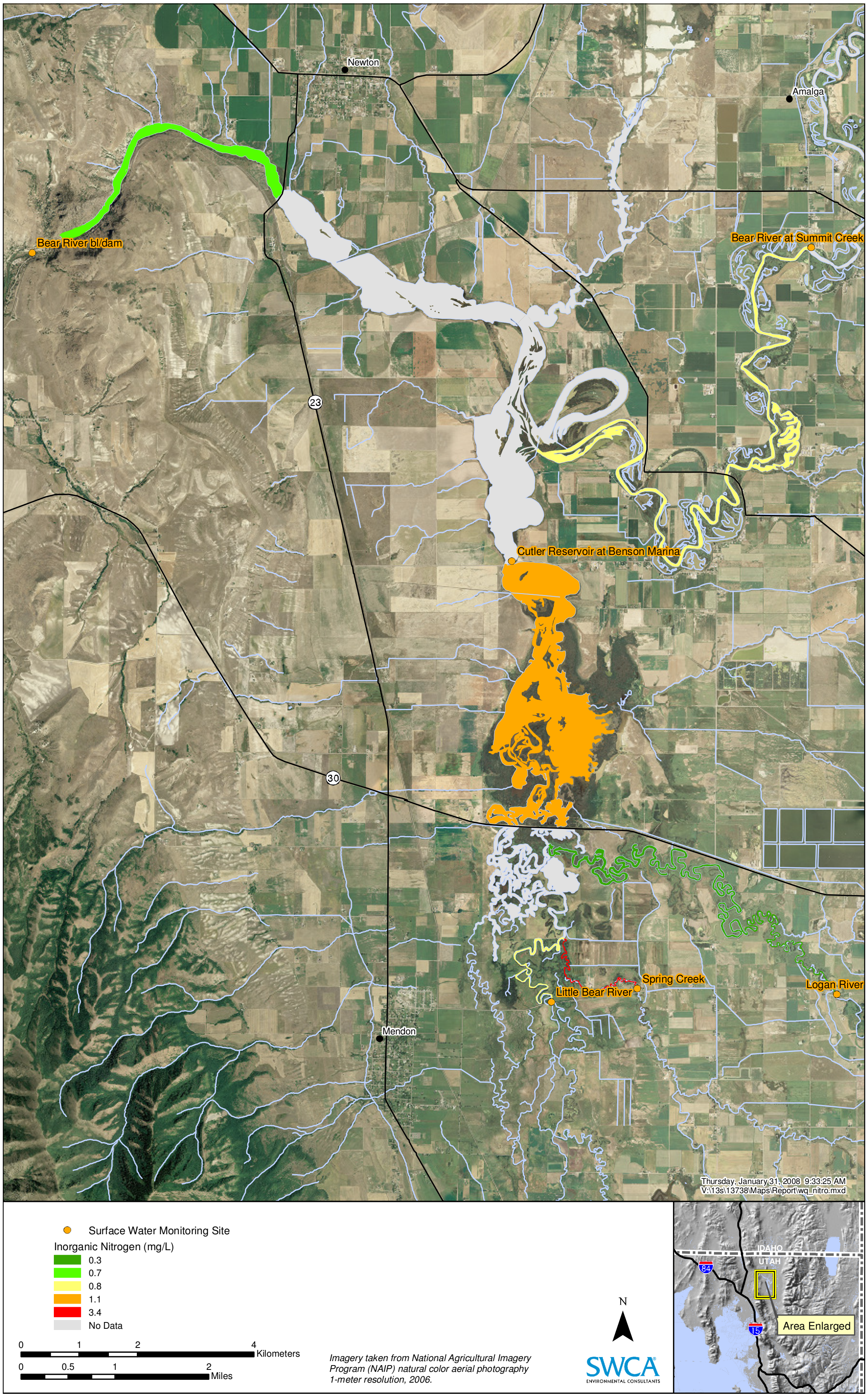


Figure 14. Inorganic nitrogen levels in the Cutler Reservoir watershed.

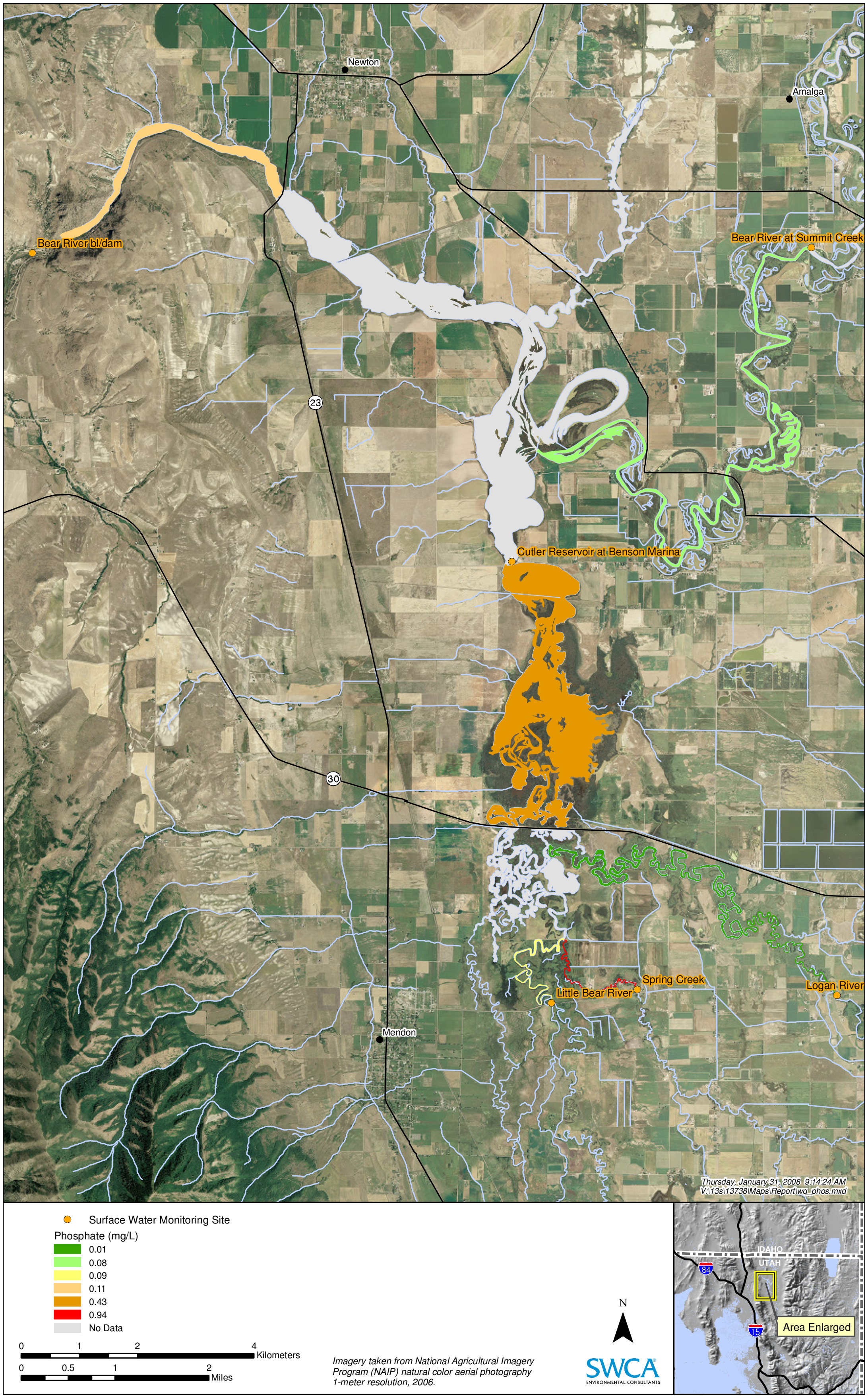


Figure 15. Phosphate levels in the Cutler Reservoir watershed.

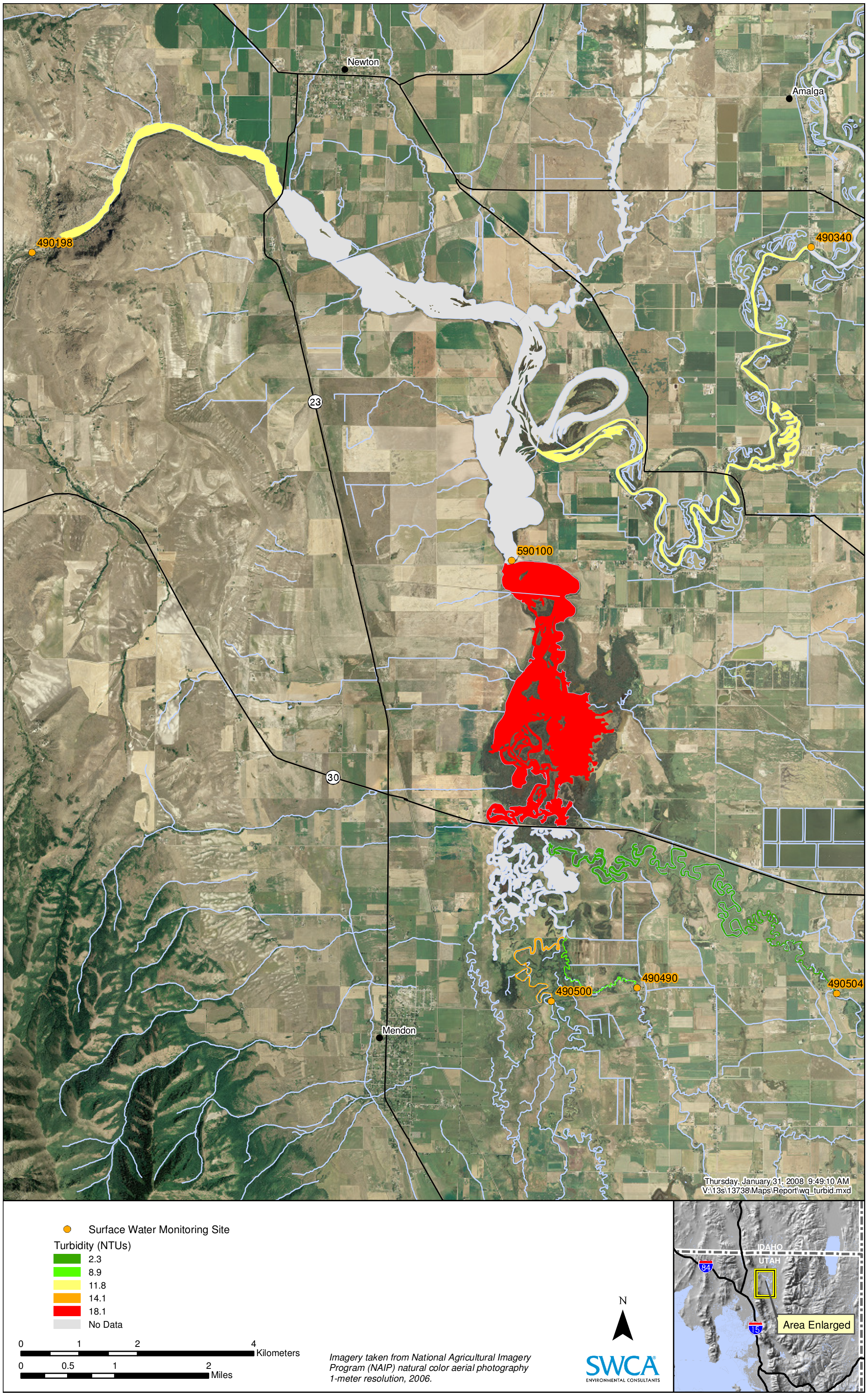


Figure 16. Turbidity levels in the Cutler Reservoir watershed.

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

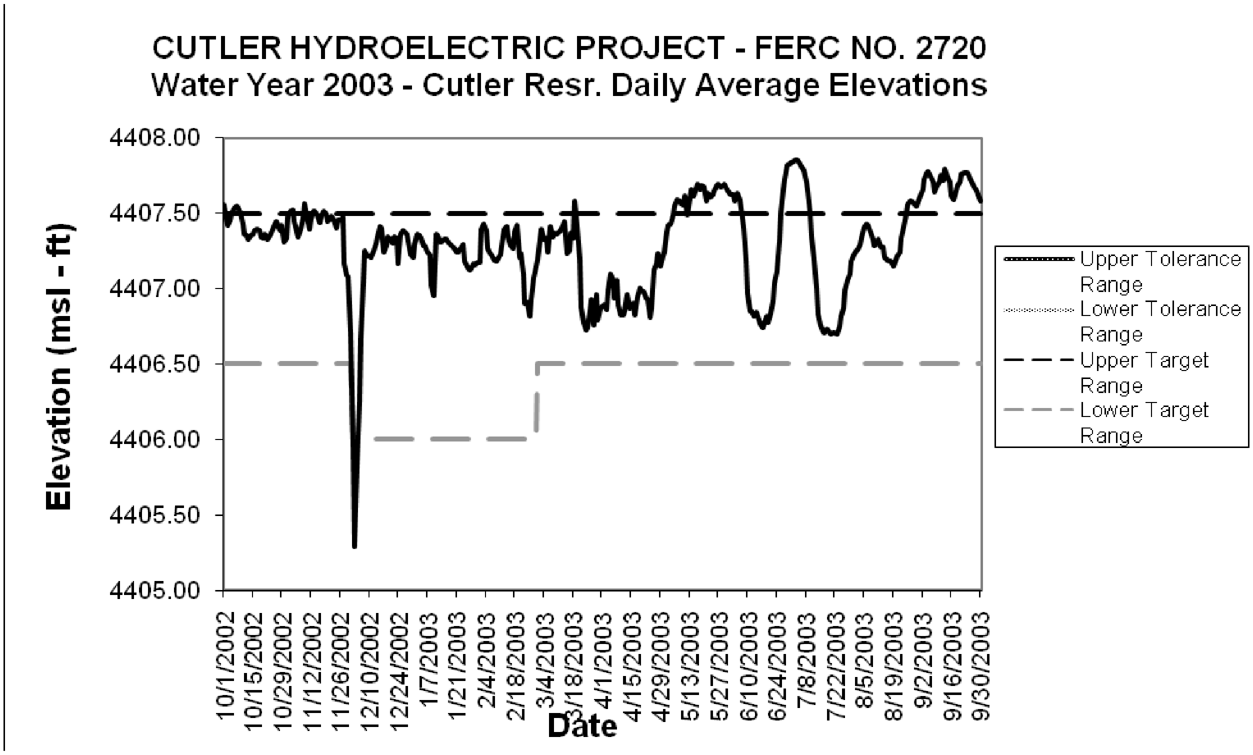
LOGAN R AB CNFL / LITTLE BEAR R AT CR376 XING		Fall	Winter	Spring	Summer	Annual
Dissolved oxygen (DO)	Number of Samples	2	4	1	1	8
	Average	9.6	12.3	8.9	9.8	10.9
	Maximum	11.1	13.3	8.9	9.8	13.3
	Minimum	8.1	11.4	8.9	9.8	8.1
	Stanard Deviation	2.1	0.8	--	--	1.8
Dissolved oxygen saturation	Number of Samples	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

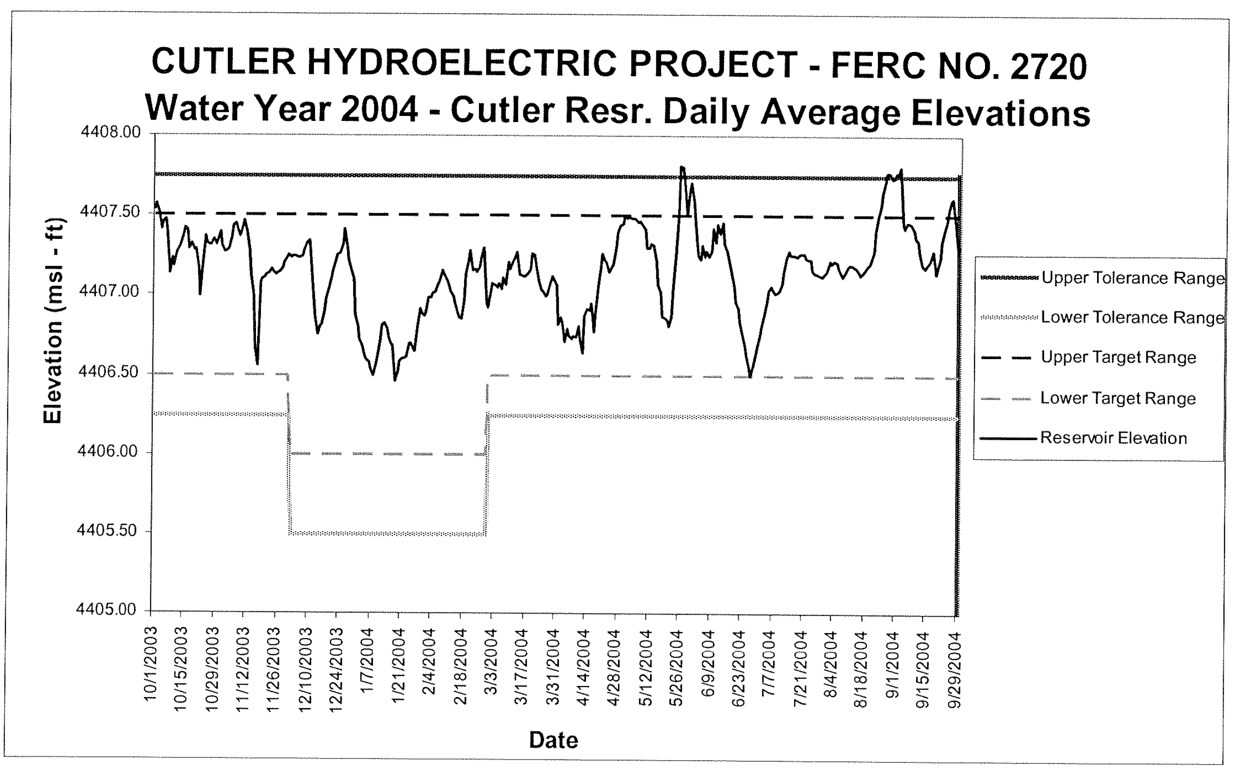
LOGAN R AB CNFL / LITTLE BEAR R AT CR376 XING			Fall	Winter	Spring	Summer	Annual
	Specific conductance	Number of Samples	2	4	1	1	8
		Average	514	426	341	348	428
		Maximum	524	435	341	348	524
		Minimum	504	420	341	348	341
		Stanard Deviation	14	6	--	--	64
	Temperature, water	Number of Samples	2	4	1	1	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

APPENDIX F
WATER LEVELS


CUTLER HYDROELECTRIC PROJECT - FERC NO. 2720
Water Year 2003 - Cutler Resr. Daily Average Elevations
Elevation (msl - ft)
4408.00
4407.50
4407.00
4406.50
4406.00
4405.50
4405.00
Date
Upper Tolerance Range
Lower Tolerance Range
Upper Target Range
Lower Target Range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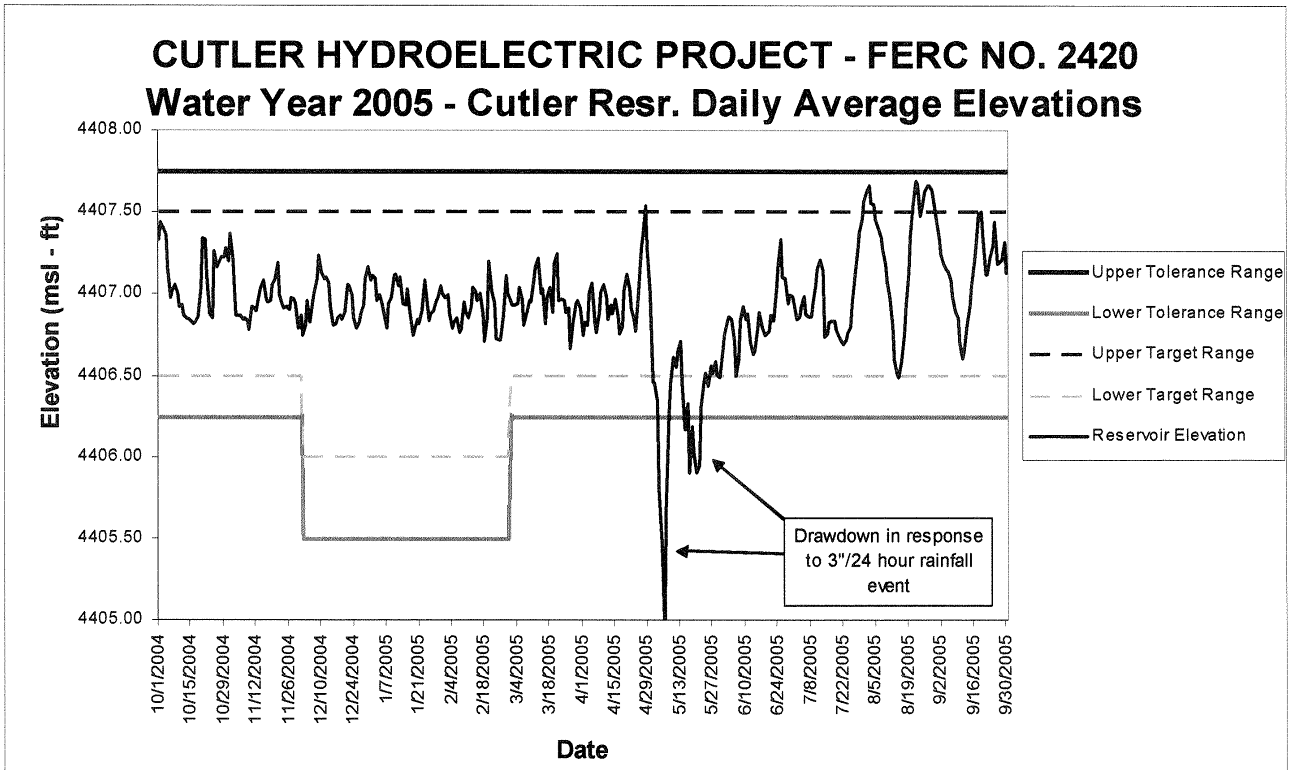
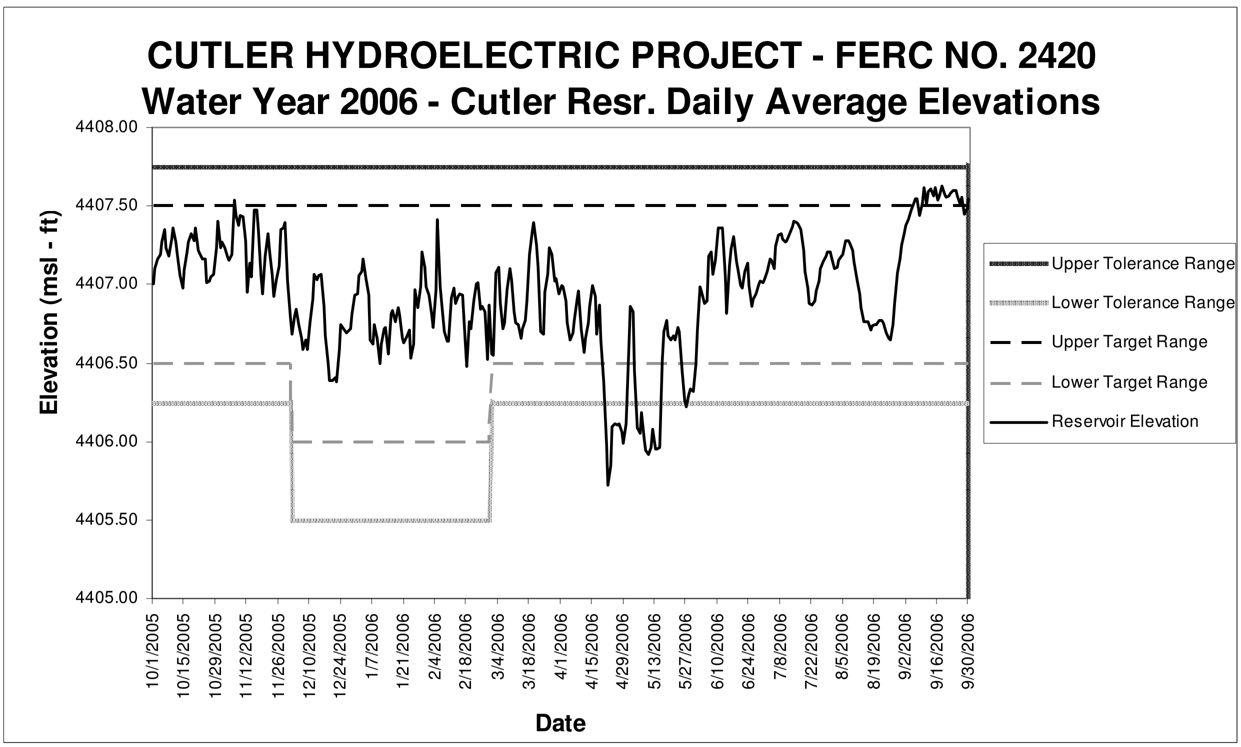
Water Year 2004 - Cutler Resr. Daily Average Elevations
Elevation (msl - ft)
4408.00
4407.50
4407.00
4406.50
4406.00
4405.50
4405.00
Date
Upper Tolerance Range
Lower Tolerance Range
Upper Target Range
Lower Target Range
Reservoir Elevation


CUTLER HYDROELECTRIC PROJECT - FERC NO. 2420
Water Year 2005 - Cutler Resr. Daily Average Elevations
Elevation (msl - ft)
4408.00
4407.50
4407.00
4406.50
4406.00
4405.50
4405.00
Date
10/1/2004
10/15/2004
10/29/2004
11/12/2004
11/26/2004
12/10/2004
12/24/2004
1/7/2005
1/21/2005
2/4/2005
2/18/2005
3/4/2005
3/18/2005
4/1/2005
4/15/2005
4/29/2005
5/13/2005
5/27/2005
6/10/2005
6/24/2005
7/8/2005
7/22/2005
8/5/2005
8/19/2005
9/2/2005
9/16/2005
9/30/2005
Upper Tolerance Range
Lower Tolerance Range
Upper Target Range
Lower Target Range
Reservoir Elevation
Drawdown in response to 3"/24 hour rainfall event


CUTLER HYDROELECTRIC PROJECT - FERC NO. 2420
Water Year 2006 - Cutler Resr. Daily Average Elevations
Elevation (msl - ft)
4408.00
4407.50
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4406.50
4406.00
4405.50
4405.00
Date
10/1/2005
10/15/2005
10/29/2005
11/12/2005
11/26/2005
12/10/2005
12/24/2005
1/7/2006
1/21/2006
2/4/2006
2/18/2006
3/4/2006
3/18/2006
4/1/2006
4/15/2006
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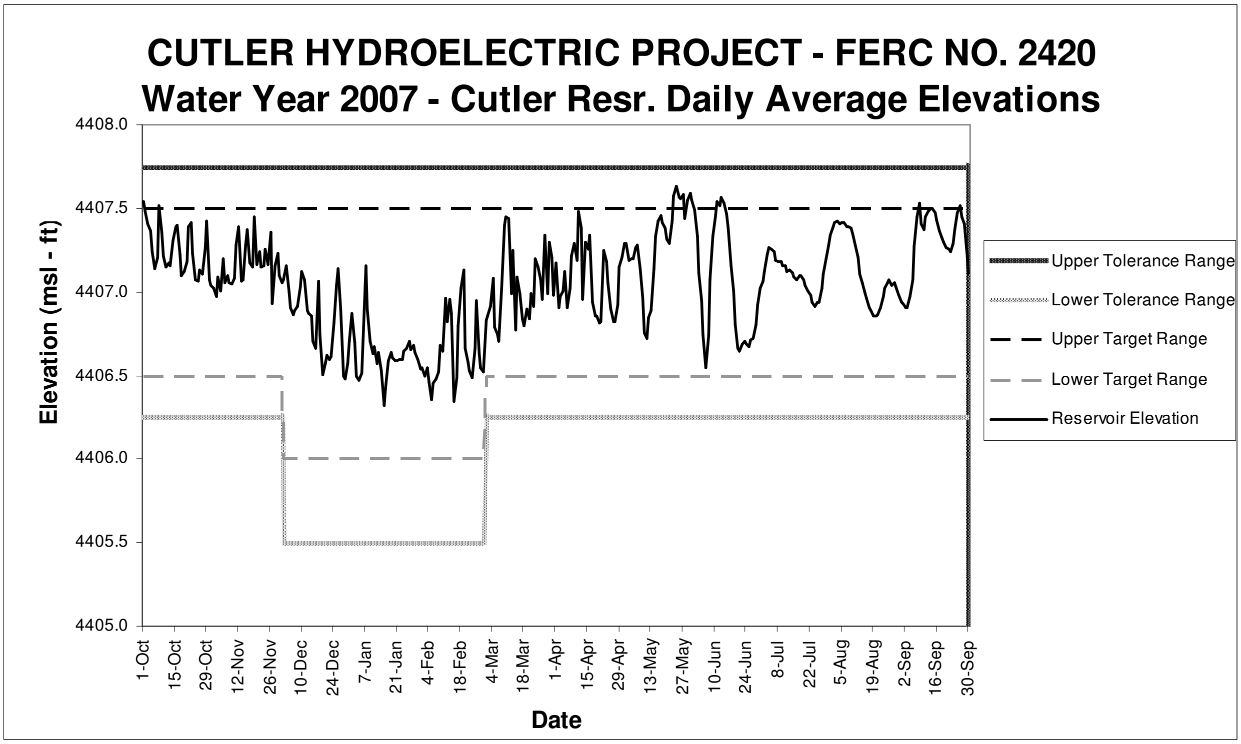
5/27/2006
6/10/2006
6/24/2006
7/8/2006
7/22/2006
8/5/2006
8/19/2006
9/2/2006
9/16/2006
9/30/2006
Upper Tolerance Range
Lower Tolerance Range
Upper Target Range
Lower Target Range
Reservoir Elevation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Water Year 2007 - Cutler Resr. Daily Average Elevations
Elevation (msl - ft)
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4407.5
4407.0
4406.5
4406.0
4405.5
4405.0
1-Oct
15-Oct
29-Oct
12-Nov
26-Nov
10-Dec
24-Dec
7-Jan
21-Jan
4-Feb
18-Feb
4-Mar
18-Mar
1-Apr
15-Apr
29-Apr
13-May
27-May
10-Jun
24-Jun
8-Jul
22-Jul
5-Aug
19-Aug
2-Sep
16-Sep
30-Sep
Date
Upper Tolerance Range
Lower Tolerance Range
Upper Target Range
Lower Target Range
Reservoir Elevation

APPENDIX G
AGENCY CONSULTATION

PACIFICORP ENERGY
A DIVISION OF PACIFICORP

825 NE Multnomah, Suite 1500
Portland, Oregon 97232

February 26, 2008

Subject: **Cutler Hydroelectric Project, FERC No. P-2420**
5-year Monitoring Report for the Article 402 Resource Management Plan

Enclosed is PacifiCorp Energy's draft 5-year Monitoring Report for the Cutler Hydroelectric Project's Resource Management Plan (RMP). The report is required by the Project's Federal Energy Regulatory Commission (FERC) license (Article 402) and documents resource management activities and progress conducted from 2003 through 2007.

In an order dated November 6, 1995, the FERC approved the RMP and required that monitoring reports be prepared in consultation with the following parties:

- U.S. Fish & Wildlife Service
- U.S. Forest Service
- Utah Division of Wildlife Resources
- Utah Division of Water Resource
- Utah Division of Parks and Recreation
- National Park Service
- Bear River Canal Company

The report is due to the FERC on March 31, 2008. Therefore, please review the enclosed draft report and provide your written comments to the following address by March 27, 2008:

Eve Davies
PacifiCorp Energy
1407 W. North Temple Street, Suite 110
Salt Lake City, Utah 84140
Fax: (801)220-4748

If you have questions about the report, please contact me at 801-220-2245.

Sincerely,

Eve Davies
Utah License Compliance Manager, Hydro Resources

ED: FBE

Encl: **Draft 2003-2007 RMP Monitoring Report**
Distribution List

Draft 2003-2007 RMP Monitoring Report
Consultation Distribution List

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

District Ranger
U.S. Forest Service
Logan Ranger District
1500 East Highway 89
Logan, UT 84321

Ron Hodson, Regional Supervisor
Utah Division of Wildlife Resources
515 East 5300 South
Ogden, UT 84405

Dennis Strong, Director
Utah Division of Water Resources
1594 West North Temple
P.O. Box 146201
Salt Lake City, UT 84114-6201

Mary Tullius, Director
Utah State Parks and Recreation
1594 West North Temple, Suite 116
P.O. Box 146001
Salt Lake City, Utah 84114

Regional Director
National Park Service
Rocky Mountain Regional Office
12795 West Alameda Parkway
Denver, CO 80228

Dan Davidson
Bear River Canal Company
275 North 1600 East
Tremonton, Utah

Internal Distribution

icc: Davies, Eve; deTar, Diana; Edelmann, Frank; Hydro Document Services; Wazlaw, James

DMS: Cutler, Compliance, FERC, license, Article 402, report, environmental, Resource Management Plan, monitoring, 5-year Report.

United States Department of Agriculture | Forest Service | Wasatch-Cache National Forest | 125 South State Street
Federal Building
Salt Lake City, Utah 84138

File Code: 2770
Date: March 24, 2008

Eve Davies
PacifiCorp Energy
1407 W. North Temple Street, Suite 110
Salt Lake City, Utah 84140

Dear Ms. Davies

This letter is to document our review of the Agency Draft Cutler Hydro Project No. 2420 Resource Management Plan Five-Year Monitoring Report. Based on my staff's review of this report we are satisfied that continued operation of this project will have no negative affects to resources on National Forest System Lands. Implementation of many of these projects has had a positive benefit to citizens and resources in Cache Valley.

Sincerely,

/S/ JENNEFER PARKER

Jennefer Parker
District Ranger
Logan Ranger District

From: Susan Zarekarizi [mailto:susanzarekarizi@utah.gov]
Sent: Monday, March 10, 2008 1:13 PM
To: Davies, Eve
Cc: Dave Harris
Subject: Cutler Hydro Draft Project Report

Just a few edits:

pg. 21, last sentence, recommended wording - In November of 2007 the proposed new regulation was adopted by the State Boating Council and State Parks Board; it will become part of Utah State Regulations by early 2008.

Appendix C-2 Boater Policy, Boater Use Zones, South Boater Zone B - Horsepower is 35 not 20.

Appendix C-2 Boater Policy, Boater Use Zones, Bear River Boater Zone C - Horsepower is 35 not 20 and dates should read "last Saturday in Sept - March 31 every year".

Appendix C-2, Draft Boater Regulation - The correct rule numbering is R651-205-17. The first sentence of this rule should begin, The use of motors... Replace the word presence with use.

If you have any questions with any of these comments, please contact me or Dave Harris. Dave's phone number is (801) 538-7341.

Thanks,

Susan Zarekarizi
Utah State Parks and Recreation
Lands/Environmental Coordinator
Phone: 801-538-7496
Fax: 801-538-7378
susanzarekarizi@utah.gov

From: Dan Davidson [mailto:trapperdan357@msn.com]
Sent: Wednesday, March 26, 2008 9:48 AM
To: Baldwin, Connely
Cc: Davies, Eve
Subject: RE: Comments on Cutler Reservoir 5-Year Report

Eve,

I read the summary last night and I don't have time to read today so I will not comment on the report.

Dan

Subject: Comments on Cutler Reservoir 5-Year Report
Date: Tue, 25 Mar 2008 13:47:06 -0600
From: Connely.Baldwin@PacifiCorp.com
To: trapperdan357@msn.com
CC: Eve.Davies@PacifiCorp.com

Dan,

As a follow-up to my voice mail, if you have any comments on the Cutler Reservoir 5-Year Report that Eve has prepared to send to FERC, let Eve know by e-mail:

Eve.Davies@PacifiCorp.com

If you want to view the executive summary in addition to the full report she has already sent you, let her know.

Thanks,
Connely

Connely Baldwin
PacifiCorp Energy
Hydro Resources
(801) 220-4636 office
(801) 554-8406 cell
Connely.Baldwin@PacifiCorp.com

From: Craig Schaugaard [mailto:craigschaugaard@utah.gov]
Sent: Thursday, March 27, 2008 2:23 PM
To: Davies, Eve
Subject: Re:

No I am sorry I said I would get that to you before 12:00 and could have but I feel like I am busier than a one legged man in a but kicking contest.

I didn't see any problems with it and asked the wildlife manager if he had concerns at Cutler and he just wanted to check to make sure the boat regulation is what he understood it to be and was every one here is good with it.

Sorry again hope it wasn't too much of an inconvenience.
Craig

Take a kid fishing and take advantage of the new 365 day fishing licence.

Craig J Schaugaard
NRO Regional Aquatic Program Manager
Utah Division of Wildlife Resources, Northern Region
515 East 5300 South
Ogden, UT. 84405
Office: (801) 476-2770
Cell: (801) 791-3675
Fax: (801) 479-4010
email: craigschaugaard@utah.gov

---- Forwarded message from Eve.Davies@PacifiCorp.com -----
Date: Fri, 28 Mar 2008 11:14:18 -0600
From: "Davies, Eve" <Eve.Davies@PacifiCorp.com>
Reply-To: "Davies, Eve" <Eve.Davies@PacifiCorp.com>
Subject: USFWS comment on 2008 Cutler 5-yr report
To: "Davies, Eve" <Eve.Davies@PacifiCorp.com>, Miriam Hugentobler <yazoo@xmission.com>
Cc: "Edelmann, Frank" Frank.Edelmann@PacifiCorp.com

Paul Abate of the USFWS texted me this morning from his cell phone with the following Cutler report comment:

"No comments on your report. I did find it in my inbox though. Thanks for taking the time to coordinate."

Eve Davies
Principal Scientist
Hydroresources
PacifiCorp Energy