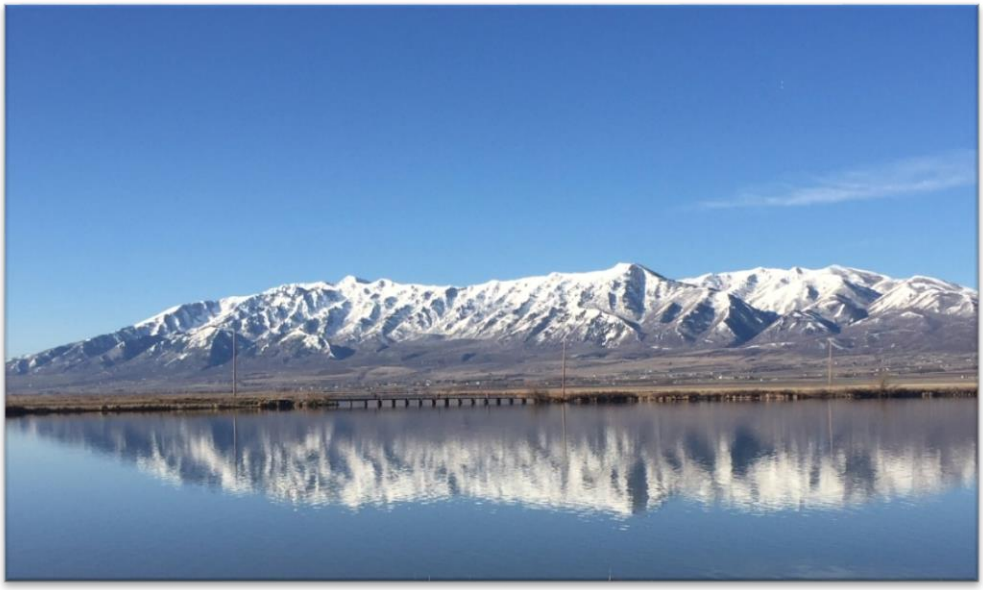
Cutler Hydroelectric Project

FERC Project No. 2420



Resource Management Plan Five-Year Monitoring Report 2013-2017

March 29, 2018 - Corrected Appendix E April 2020

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

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

Resource Management Plan
Five-Year Monitoring Report
2013-2017

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March 29, 2018 - Corrected Appendix E April 2020

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ATV	All-Terrain Vehicle
COE	United States Army Corps of Engineers
CRP	Conservation Reserve Program
DO	Dissolved Oxygen
EPA	Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
GIS	Geographic Information System
GPS	Global Positioning Satellite
NGO	Non-Governmental Organization
NRCS	Natural Resources Conservation Service
NTO	North Temple Office
O&M	Operation and Maintenance
RMP	Resource Management Plan
RR	Railroad
TAC	Technical Advisory Committee
TMDL	Total Maximum Daily Load
UDEQ	Utah Department of Environmental Quality
UDWR	Utah Division of Wildlife Resources
USFWS	U.S. Fish and Wildlife Service

Executive Summary

This Five-Year Monitoring Report for the Cutler Hydroelectric Project (Project), Federal Energy Regulatory Commission (FERC) Project No. 2420, was prepared by PacifiCorp to meet FERC licensing requirements for Cutler Reservoir, located in Cache and Box Elder Counties, Utah. The project boundaries cover approximately 9,191 acres of open water and associated wetlands and uplands surrounding Cutler Reservoir, including the areas of confluence with its major tributaries: the Bear, Little Bear, and Logan rivers; Spring Creek; and Clay Slough.

This report covers the five-year period between 2013 and 2017, inclusive. During this time, implementation of the Cutler Hydroelectric Project Resource Management Plan (RMP) (PacifiCorp 1995) was complete, and the project continued in 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, which is in effect until 2024.

The report is organized into three main 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 (2013-2017) 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 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 of the program components, per the first three Cutler five-year reports (PacifiCorp 2002, 2008, and 2013):

- 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 plots
  - Cattle management fences
  - Property coordination
- Recreation site development program
- Wetland mitigation area program
- Fish habitat structure program
- Water quality monitoring program
- Water level monitoring program

The implementation phase for the programs listed above was largely complete at the end of the first monitoring report period in late 2002, although several property negotiations undertaken to resolve boundary issues with adjacent landowners were still incomplete due to pending legal actions. These issues were largely resolved during the subsequent reporting period, although given the number of adjoiners and adjoining land uses, resolving various encroachments continues to be a large portion of the annual Cutler Project monitoring. Currently there are at least three relatively chronic and more difficult-to-resolve adjoiner issues that may require assistance from the legal department, and numerous minor ones. One additional remaining task includes the boundary delineation of three small, remote land parcels on the south side of Cutler Canyon, which will occur in the next monitoring period. Once the property boundary is marked, the resulting new buffer segments will be integrated into on-going monitoring activities. During the 2013-2017 monitoring period, one woody vegetation pocket was determined to have failed, and was replaced with a new site. Another site was augmented. Although several recreation sites required non-routine major maintenance (two marina ramps were repaired, and the pedestrian fishing bridge had to be repaired due to extensive arson damage), there was no other work on any of the other Cutler RMP components that would be considered license implementation. All other work during this monitoring period was typical of on-going annual monitoring and maintenance.

Monitoring Results

The RMP requires monitoring to gauge the success and stability of the seven programs implemented. A monitoring plan was developed during the initial reporting period (PacifiCorp 2002), and monitoring has proved to be a good mechanism for tracking the condition of the RMP components over time. This monitoring was utilized for all three of the earlier monitoring periods, with very minor changes detailed in the second and third five-year reports (PacifiCorp 2008 and 2013); no changes are proposed in this monitoring report. Findings and recommendations from this monitoring are summarized in Table ES-1.

Plan and Schedule

Monitoring during 2018-2022 will follow protocols established in the 2002 five-year report. No changes are suggested to the most recent monitoring protocols (as noted in the 2008 and 2013 five-year reports, which included only minor changes to the initial protocols, including adjusting the frequency of wildlife food and cover plot monitoring from semi-annual to annual, and suspension of the fish habitat monitoring—per agreement with Utah Division of Wildlife Resources). Water quality monitoring (Appendix E) will continue to be conducted quarterly every fifth year. The next water quality monitoring period is currently underway in 2018, and will be reported on in the 2023 report.

Table ES-1. Summary of Work Completed to Date and Recommendations for the Cutler Hydroelectric Project RMP.

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 1,440 acres of buffer covering 51.7 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 55 total buffer segments. Four buffers (7%) rated as at-risk or poor have been prioritized for corrective action. Another four rated as fair. Remaining 47 buffers (86%) were rated good or excellent.
Woody Vegetation Pockets	Establish 10-15 pockets 0.5-2.0 acres in size.	Planted 15 pockets at a density of 5,000 shrubs/acre. Goal is at least 10 sites established. (Note: To date, four rated as failed/abandoned) Implementation complete.	Annual monitoring will continue as present. Nine sites (55%) rated as established. One new site added and one augmented in 2015 to compensate for one failed site. One chronically marginal site is now rated as good. Two sites will be evaluated in 2018 to determine whether the damage from unauthorized herbicide spray is permanent.

Table ES-1. Summary of Work Completed to Date and Recommendations for the Cutler Hydroelectric Project RMP.			
RMP Program/ Component	**Implementation Required**	**Implementation Completed**	**Findings/ Recommendations**
Bank Stabilization	Stabilize 3.5 miles of shoreline	Stabilized 4.44 miles of shoreline (one site expanded by 70 feet in 2011, increasing bank stabilization linear length total by 0.02 miles). An additional 1.1 miles stabilized at Railroad (RR) Trail as part of the recreation site development program. Implementation complete.	Annual monitoring will continue as present. 100% of bank stabilization sites are in 'good' condition.
Boundary/Buffer Fence	Construct 6 miles of additional fence to create/protect the boundary or buffer	Constructed 60 miles of fence (necessary to protect project boundary from unauthorized uses). Implementation complete.	Annual monitoring will continue as present. Most fences in good working condition. Some areas where boundaries are marked with posts need to be repaired or replaced during upcoming monitoring period. Project boundary at the south side of Cutler Canyon surveyed in 2012 and scheduled to be delineated during 2020-2023.
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 13 sites rated in good condition. Maintenance on Basin 3 improved its functioning to 'good' condition, even after an extremely high runoff year.
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 state boating regulations (including a trapping	Annual monitoring will continue as present. Both osprey platforms are now occupied annually. Great blue heron rookery will be prioritized for

Table ES-1. Summary of Work Completed to Date and Recommendations for the Cutler Hydroelectric Project RMP.			
RMP Program/ Component	**Implementation Required**	**Implementation Completed**	**Findings/ Recommendations**
		program), and planted roses and other shrubs along RR dike. Implementation complete.	additional monitoring to determine if a decline in nesting is occurring. Sensitive/unique habitats are providing important resources for a variety of avian, amphibian, reptilian, mammalian, and other wildlife species.
Agricultural Lease			
Land Use Practices (monitored & managed as part of leases, below)		Complete for grazing, farming, and wildlife food/cover leases. Reduced current leases to at most 2,841 acres. Implementation complete.	Need to ensure GIS database updates with current property lease files, as well as ensure lease conditions are consistent and meet overall RMP goals. Continue to monitor for encroachments or incompatible land uses.
Grazing	Evaluate practices and incorporate new conditions into grazing leases.	Incorporated new practices into leases affecting up to 2,396 acres (of which up to 663 acres can be grazed for wildlife food/cover plots). Leases reconfigured to improve practices. Implementation complete.	Annual monitoring will continue as present. Grazing program pastures currently cover 1,733 acres, with up to another 663 acres potentially grazed as part of the wildlife food/cover plots. 85% of pastures in good or fair condition; 15% in poor or at-risk condition (averaged over the monitoring period).
Farming	Evaluate practices and incorporate new conditions into farming leases.	Incorporated new practices into leases affecting 445 acres. Implementation complete.	Annual monitoring will continue as present. Additional or replacement buffer post markers will be installed as needed.

Table ES-1. Summary of Work Completed to Date and Recommendations for the Cutler Hydroelectric Project RMP.			
RMP Program/ Component	**Implementation Required**	**Implementation Completed**	**Findings/ Recommendations**
Wildlife Food/Cover	Evaluate practices and incorporate new conditions into wildlife food/cover leases.	Currently managing up to nine fields for wildlife food/cover. Implementation complete.	Continue spring-only annual monitoring.
Cattle Management Fence	Construct 6 miles of fence to control cattle/conflicting uses (an additional 6 miles was required in a separate category).	Constructed 21 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.	Resolved most previous issues with adjacent landowners. Chronic and new encroachments continue to be managed through property incident process and civil court, as necessary. Implementation complete.	Annual monitoring will continue as present. Monitoring will continue to enter property coordination issues into PacifiCorp's Hydro License Compliance Tracking spreadsheet. On-going encroachment issues (currently 5 [2.5%]) will be monitored and corrected through property incident process.

Table ES-1. Summary of Work Completed to Date and Recommendations for the Cutler Hydroelectric Project RMP.			
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: 8 day-use sites (4 developed, 4 primitive—last site, Logan River Access, completed in 2010) 2 boat-in picnic sites 1 pedestrian loop trail and fishing bridge and 1 point-to-point pedestrian trail. 3 canoe trails Canoe trail marker system replaced with reflector poles. Interpretive signage and information provided. Recreation use policy and trapping policy instituted. Visitor use survey completed. Implementation complete.	Annual monitoring will continue as present. Major non-routine maintenance was conducted on Cutler Canyon and Benson marina boat ramps; major structural damage resulting from arson on the RR Trail pedestrian fishing bridge was repaired. One new use zone (a protected wading area) was designated at Benson Marina. Use at all recreation sites continues to grow. Cutler recreation sites collectively provide 212,786 annual recreation user days, with 371 peak weekend user days, based on 2014 FERC Form 80 data. Next FERC Form 80 data collection cycle will begin in 2020 and be analyzed and reported in 2021.
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 in 2001 to Utah Division of Wildlife Resources (UDWR) 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.	Monitoring is suspended per agreement with UDWR; angler use surveys suspended until UDWR determines enough angler use/management issue to warrant.

Table ES-1. Summary of Work Completed to Date and Recommendations for the Cutler Hydroelectric Project RMP.			
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 2013 monitoring and full 2013 Water Quality Report (Appendix E) is included in this report.	Monitoring will continue per the current quarterly, five-year intervals, as prescribed by the license. Next water quality data collection period is underway currently in 2018 (to be included in 2023 Cutler five-year report), and is being conducted per the 2008 water quality report recommendations for data analysis and review. Future water quality data collection is scheduled to occur in 2023.
Water Level Monitoring	Conduct reservoir elevation study. File results of proposed operating plan with FERC.	As required. FERC order with modified operating plan received in 2002. New order requires annual submission of average elevation data.	Annual monitoring will continue as present. Reservoir level data will be filed with FERC annually and summarized in the five-year report.

INTRODUCTION

This Five-Year Monitoring Report for the Cutler Hydroelectric Project (Project), Federal Energy Regulatory Commission (FERC) Project No. 2420, was prepared by PacifiCorp to meet FERC licensing requirements for Cutler Reservoir, located in Cache and Box Elder Counties, Utah (Figure i-1). The project boundaries cover approximately 9,191 acres of open water and associated wetlands and uplands surrounding Cutler Reservoir, including the areas of confluence with its major tributaries: the Bear, Little Bear, and Logan rivers; Spring Creek; and Clay Slough.

This report summarizes work completed during the five-year period between 2013 and 2017, inclusive. During this time, implementation of the Cutler Hydroelectric Project Resource Management Plan (RMP) (PacifiCorp 1995) was complete, and the project continued in 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, which is in effect until 2024. Details regarding initial project implementation and monitoring activities were presented in the 2002 Cutler Five-Year Monitoring Report (PacifiCorp 2002); minor changes to the 2002 version monitoring plan as well as details of subsequent additional implementation were presented in the 2008 and 2013 Cutler Five-Year Monitoring reports (PacifiCorp 2008 and PacifiCorp 2013).

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 complete prior to the first project five-year report (PacifiCorp 2002), several property negotiations undertaken to resolve boundary issues with adjacent landowners took longer to complete due to pending legal actions. These initial issues were resolved during subsequent reporting periods. Although none of the initial boundary issues remain, on-going encroachment issues may take several years to resolve. With the high number of adjacent owners and land uses around the Cutler project boundaries, there are typically several occurring at any given time. As initial implementation of the Cutler license is now complete, the results of annual monitoring activities, as specified by the first five-year report (PacifiCorp 2002), make up the majority of this 2013-2017 report.

This report also summarizes activities related to the on-going reservoir water level and water quality program monitoring activities. As required by FERC, this report was submitted to relevant federal, state and local agencies for review prior to submittal to FERC. Agency comments are included in Appendix G.

This report is organized into three main sections:

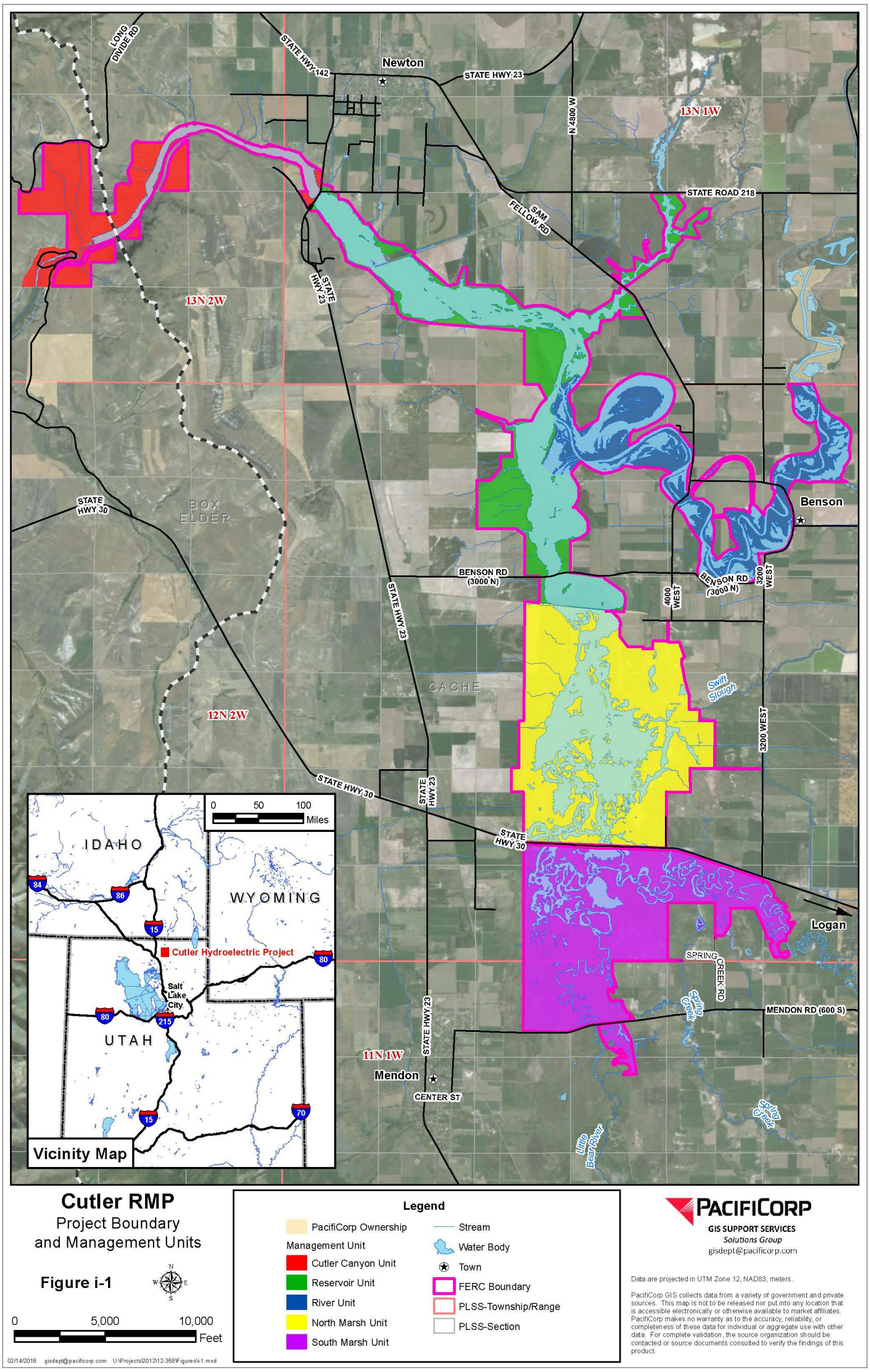
Section 1.0 – RMP Project Summary to Date (implementation phase [1995-2002] through 2017) - A summary of the original RMP requirements and completed project implementation activities, as well as a summary of the previous five-year report monitoring results.

Section 2.0 – Monitoring Results - A summary of current report period (2013-2017) 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 itself due to the focus on project monitoring that will continue through the license term (2024).

Figures i-1 and 1-1 show locations of the RMP components implemented and management units; additional maps comparing actual implementation actions with those proposed in conceptual RMP drawings (PacifiCorp 1995) are included in Appendix A ('B' series and 'A' series, respectively).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Newton
STATE HWY 23
N 4800 W
13N 1W
STATE ROAD 218
SAM FELLOW RD
STATE HWY 23
13N 2W
STATE HWY 30
BOX ELDER
BENSON RD (3000 N)
4000 WEST
3200 WEST
Benson
Swift Slough
CACHE
12N 2W
STATE HWY 23
STATE HWY 30
Logan
SPRING CREEK RD
MENDON RD (600 S)
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CENTER ST
Spring Creek
Little Bear River
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IDAHO
WYOMING
UTAH
Cutler Hydroelectric Project
Salt Lake City
Vicinity Map
Cutler RMP
Project Boundary
and Management Units
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Legend
PacifiCorp Ownership
Management Unit
Cutler Canyon Unit
Reservoir Unit
River Unit
North Marsh Unit
South Marsh Unit
Stream
Water Body
Town
FERC Boundary
PLSS-Township/Range
PLSS-Section
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1.0 CUTLER 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 baseline (2002) and most recent (2013, which covers the period 2008-2012) monitoring results, for ease of comparison with the current period (2013-2017) monitoring results presented in Section 2.0. 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 throughout the license period. Subsequent reports are currently proposed to be submitted in 2023, and 2025 (2018-2022, and 2023-2024 periods, respectively, given the license expiration date in 2024).

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. These issues were largely 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 ongoing monitoring activities. Also, the completion of the new project boundary line allowed for the drafting of a new Cutler Project Exhibit G, which was submitted concurrently with the second Cutler five-year report in early 2008, as well as a new Cutler Reservoir boating policy that was implemented during the 2003-2008 report period, but was formally adopted as law in Utah Code shortly after the final 2008 five-year report was submitted. The final remaining major implementation activity—development of one primitive recreation site—was completed during the 2008-2012 monitoring period after being deferred until 2010 by PacifiCorp and UDOT request, and subsequent FERC orders. These initial implementation actions are now complete. An additional minor new implementation activity included the development and establishment of a new trapping program in 2012. The final implementation activity required is the delineation of the property boundary around three small land parcels located on the south side of Cutler Canyon (the survey was completed in 2012); this activity will be budgeted and prioritized during the next reporting period.

A monitoring plan was developed during the initial reporting period (PacifiCorp 2002), and this monitoring proved to be a good mechanism for tracking the condition of the RMP components over time. This monitoring, with very minor changes detailed in the second five-year report (PacifiCorp 2008), was utilized for this most recent monitoring period. Monitoring plans are summarized in Section 1.2. Initial (2002) and most recent (2013) monitoring results are included in Section 1.3, for comparison with the current monitoring results, detailed in Section 2.0 of this report.

Monitoring conducted during the previous reporting periods indicated the need for one replacement and one augmentation project after initial mitigation efforts at one woody vegetation pocket site failed, and the other remained marginal long enough to warrant additional reclamation actions. Other maintenance work conducted on mitigation components (marina boat ramps, the fishing bridge, fence segments, posts that were removed, erosion control check dam sediment removal, sign maintenance, vandalism

repair, etc.) during this reporting period (2013-2017) included smaller scale repairs or maintenance rather than whole site or component replacement.

1.1 RMP Implementation Summary

The original RMP established five goals set as part of the re-licensing process at Cutler, which was completed in 1994. 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 original conceptual plans. Further, as a result of extensive property trades undertaken to straighten boundaries and maximize shoreline 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. This series of comparison maps (the original conceptual drawings paired with the 'as built' versions) were updated for this five-year report and are included in Appendix A.

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 (specifically required by Article 402 of the FERC license order) and other related license articles, bringing the final program list to seven:

- Water Quality Monitoring Program
- Water Level Monitoring Program

This section summarizes work completed for implementation during the current report period (2013-2017) for each of the seven RMP programs listed above. Implementation activities completed in previous reporting periods are detailed in the 2002, 2008, and 2013 Cutler five-year reports, respectively, and summarized (along with any new implementation activities) in Table 1-1 of this report. The implementation requirements are described for each component, as defined by the license or RMP guideline from which each was derived. There were a few minor exceptions or modifications to proposed implementation activities for the RMP; exceptions are noted in the descriptions. The management unit in which the activity was performed is also 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.

Table 1-1. Summary of Implementation and Work Completed to Date for the Cutler Hydroelectric Project RMP.

RMP Program/ Component	Implementation Required	Work Completed	Initial Implementation Complete?
Vegetation Enhancement Program			
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 1,440 acres of buffer covering 51.7 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 0.5-2.0 acres in size.	Planted 15 pockets at a density of 5,000 shrubs/acre. Goal is at least 10 sites established. (Note: To date, four rated as failed/abandoned) One new site was planted, and one was augmented in 2015 to replace two previously failed/marginal sites, bringing the current total to 11 active sites and 4 failed/abandoned sites.	**Yes**
Bank Stabilization	Stabilize 3.5 miles of shoreline	Stabilized 4.42 miles of shoreline. An additional 1.1 miles stabilized at RR Trail as part of the recreation site development program. One previously stabilized bank was judged to be failed with initial technique and was re-stabilized and expanded by 70 feet in 2011, bringing the new bank stabilization total to 4.44	**Yes**

Table 1-1. Summary of Implementation and Work Completed to Date for the Cutler Hydroelectric Project RMP.

RMP Program/ Component	Implementation Required	Work Completed	Initial Implementation Complete?
		plus 1.1 miles, totaling 5.5 miles of stabilized shoreline banks.	
Boundary/Buffer Fence	Construct 6 miles of additional fence to create/protect the boundary or buffer	Constructed 60 miles of boundary/buffer fence (necessary to protect project boundary and buffers from unauthorized uses). Project boundary on the south side of Cutler Canyon was surveyed in 2012; line is proposed to be delineated with fence and/or posts in 2020-2023.	**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 new Recreation Use Policy and in 2012 a new trapping program, and planted roses and other shrubs along RR dike (rather than along the Rose Oxbow as conceptually proposed).	**Yes**
Agricultural Lease Program			
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 at most 2,841 acres.	**Yes**
Grazing	Evaluate practices and incorporate new conditions into grazing leases.	Incorporated new practices into leases affecting up to 2,396 acres (of which up to 663 acres can be grazed for wildlife food/cover plots). Leases reconfigured to improve practices.	**Yes**
Farming	Evaluate practices and incorporate new conditions into farming leases (note much of the new shoreline buffer was formerly part of these leases).	Incorporated new practices into leases affecting 445 acres.	**Yes**

Table 1-1. Summary of Implementation and Work Completed to Date for the Cutler Hydroelectric Project RMP.

RMP Program/ Component	Implementation Required	Work Completed	Initial Implementation Complete?
Wildlife Food/Cover	Evaluate practices and incorporate new conditions into wildlife food/cover leases.	Currently managing up to nine 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 21 miles of fencing.	**Yes**
Property Coordination	Resolve property and boundary issues.	Resolved most previous issues with adjacent landowners; continue to work on other trespass or adjoiner concerns as they occur.	**Yes**
Recreation Site Development	Establish: 8 day-use sites (4 developed, 4 primitive) 2 boat-in picnic sites pedestrian loop trail and bridge 2 canoe trails Conduct a visitor use survey	Completed: 8 day-use sites (4 developed, 4 primitive—the final Logan River recreation site was constructed in 2010) 2 boat-in picnic sites 1 pedestrian loop trail and fishing access bridge; 1 point-to-point pedestrian trail 3 canoe trails Interpretive signage and information provided New Recreation Use Policy, and in 2012, a new trapping program instituted. Completed visitor use survey	**Yes**
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 in 2001 to Utah Division of Wildlife Resources for permanent management.	**Yes**
Fish Habitat Structures	Install 4-6 fish habitat structures at two sites.	Installed 30 structures at three sites. Monitoring is suspended per agreement with UDWR.	**Yes**
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 2013 monitoring is included in this report. Next monitoring is being conducted currently in 2018 (future monitoring is currently scheduled to be conducted in 2023).	**Yes**

Table 1-1. Summary of Implementation and Work Completed to Date for the Cutler Hydroelectric Project RMP.			
RMP Program/ Component	**Implementation Required**	**Work Completed**	**Initial Implementation Complete?**
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. Links to the annual reports for this reporting period are included in Appendix F.	**Yes**

1.1.1 Vegetation Enhancement Program

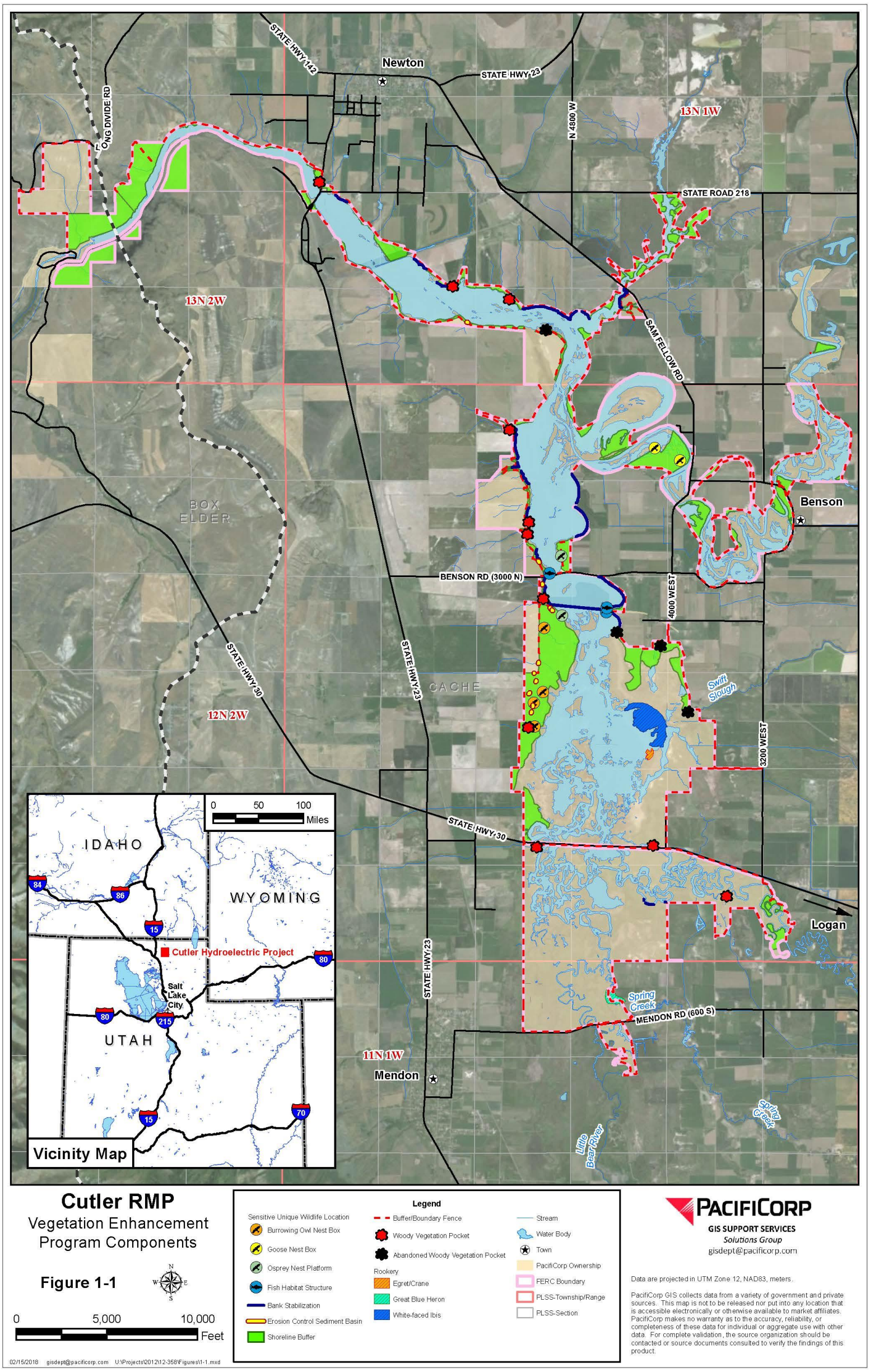
The vegetation enhancement program emphasizes re-establishing shoreline buffer vegetation to improve water quality, wildlife habitat, recreation opportunities, and scenic quality. The main components of this program consist of the establishment of vegetated areas to act as shoreline conservation buffers 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 effects on 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 and nutrient loading into the reservoir. Fencing or posting the Cutler RMP project boundary (see Figure 1-1 and 1-2) and most buffers is another important component of the vegetation enhancement program, in that it helps to delineate and protect buffers and associated habitats. Sensitive wildlife habitats (e.g., osprey nest platforms; burrowing owl nest boxes; the great blue heron rookery; the Cutler Canyon spring; and heron, gull, and ibis colonies) have been either created or protected through lease practices, fencing, and access regulations.

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 2002 five-year report structuring:

- Erosion control sediment basins
- Sensitive/unique wildlife habitats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4000 WEST
Benson
STATE HWY 30
STATE HWY 23
CACHE
Swift Slough
3200 WEST
12N 2W
Logan
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Spring Creek
11N 1W
Mendon
Little Bear River
IDAHO
WYOMING
UTAH
Cutler Hydroelectric Project
Salt Lake City
84
86
15
80
215
70
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Vicinity Map
Cutler RMP
Vegetation Enhancement Program Components
Figure 1-1
0 5,000 10,000 Feet
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
Woody Vegetation Pocket
Abandoned Woody Vegetation Pocket
Rookery
Egret/Crane
Great Blue Heron
White-faced Ibis
Stream
Water Body
Town
PacifiCorp Ownership
FERC Boundary
PLSS-Township/Range
PLSS-Section
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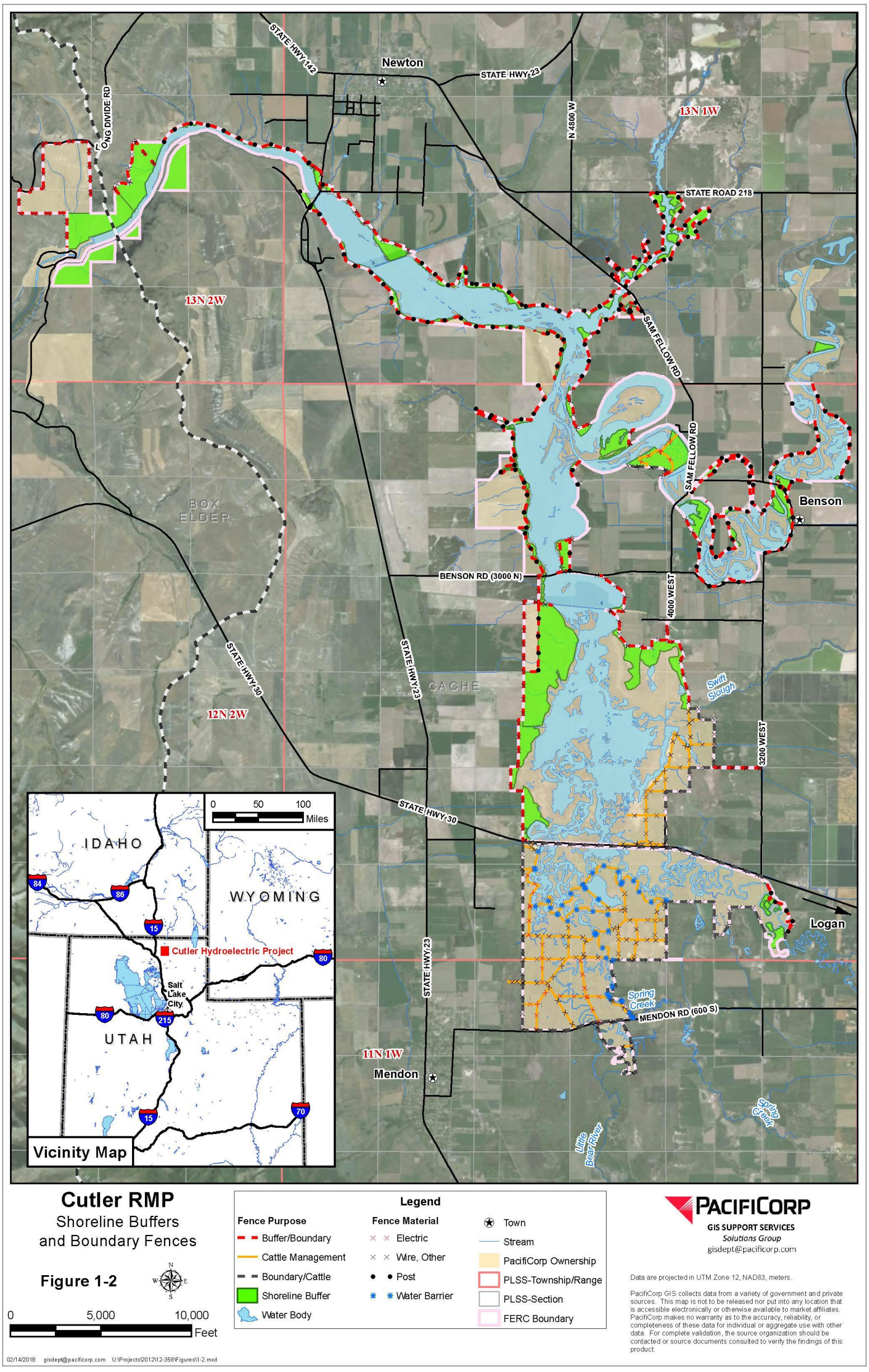
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Vicinity Map
Cutler RMP
Shoreline Buffers
and Boundary Fences
Figure 1-2
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Feet
Legend
Fence Purpose
Buffer/Boundary
Cattle Management
Boundary/Cattle
Shoreline Buffer
Water Body
Fence Material
Electric
Wire, Other
Post
Water Barrier
Town
Stream
PacifiCorp Ownership
PLSS-Township/Range
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Most components in this program were previously completed, and with the exceptions noted regarding one new and one augmented woody vegetation pockets, no other new buffer or other vegetation enhancement program components were created during this reporting period. The replacement/augmentation of the two woody vegetation pockets (only one new location) were indicated by monitoring and completed in late 2015, during this license reporting period (see Table 1-1 for specific requirements and the 2002, 2008, and 2013 five-year monitoring reports for additional details).

One additional component required surveying and delineation of property boundaries of three small, remote, and relatively inaccessible parcels on the south side of Cutler Canyon. This task has been partially completed; however, boundary and buffer delineation fence or posts still need to be completed. This work is currently scheduled for 2020-2023. Monitoring points for the resultant new buffers and boundary/buffer fences will be established following buffer delineation.

All program components have been monitored as proposed or amended in the 2002 and 2008 reports throughout the current report period (see Section 2.0 for current monitoring results). Monitoring results also guided necessary standard O&M work completed during the current report period.

Previous monitoring efforts noted severe and chronic encroachment and trespass issues on two buffers, the Lindley and Church Farm buffers (PacifiCorp 2008 and 2013); one new issue occurred in the Rose Oxbow buffer. Each of these issues is tracked here due to the impact to boundary/buffer fences, as well as in Section 2.2.5 Property Coordination for the encroachment impacts. The Lindley buffer issue was initially resolved through settlement and was rehabilitated; however, buffer monitoring has recently shown additional buffer encroachments (see also Section 2.2.5, Property Coordination and related Property Incident Report form summary, Appendix C, Table C-3). Buffer monitoring and routine O&M work such as weed management and post maintenance will continue on the Lindley buffer segment; resolving the new encroachment issues on this buffer will be prioritized for the next license period.

Although the Church Farm buffer segment was previously created and fenced, ongoing trespass and fence damage/removal issues and confrontations with the adjoiner continued to be a concern, and have required local law enforcement and legal involvement to simply carry out required monitoring activities. During this reporting period, PacifiCorp filed and won a lawsuit against the adjoiner regarding the ongoing trespass and damage; despite increasing sanctions, the adjoiner has continued to defy the court's orders. PacifiCorp will continue to defend this buffer, fence, and access through additional monitoring, law enforcement, and legal efforts if required. Section 2.2.5, Property Coordination and Appendix C, Table C-3 have additional details and references regarding related property incident reports. Buffer monitoring and access for routine O&M work such as weed management and fence maintenance will likely continue to be a challenge as long as the current adjoiner remains in that area. Section 2.1.1 details other buffer segments that have been prioritized to manage encroachment in the upcoming monitoring period.

The Rose Oxbow buffer encroachment involves an extensive and unauthorized wetland fill on Project lands owned by PacifiCorp and is in violation of the Clean Water Act. The Army Corps of Engineers has been contacted to assist in this matter, given the conflict with federal law, but the issue has yet to be resolved. This issue will continue to be monitored, and with ACOE assistance, will be prioritized for resolution during the next monitoring period.

Transects were established at the two new and/or augmented woody vegetation pocket sites (the South Marsh site is new; the Peterson site was augmented) and both have been monitored since their installation (see also Section 2.1 for monitoring details); careful weed control and other O&M work was conducted as indicated.

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 4,500 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

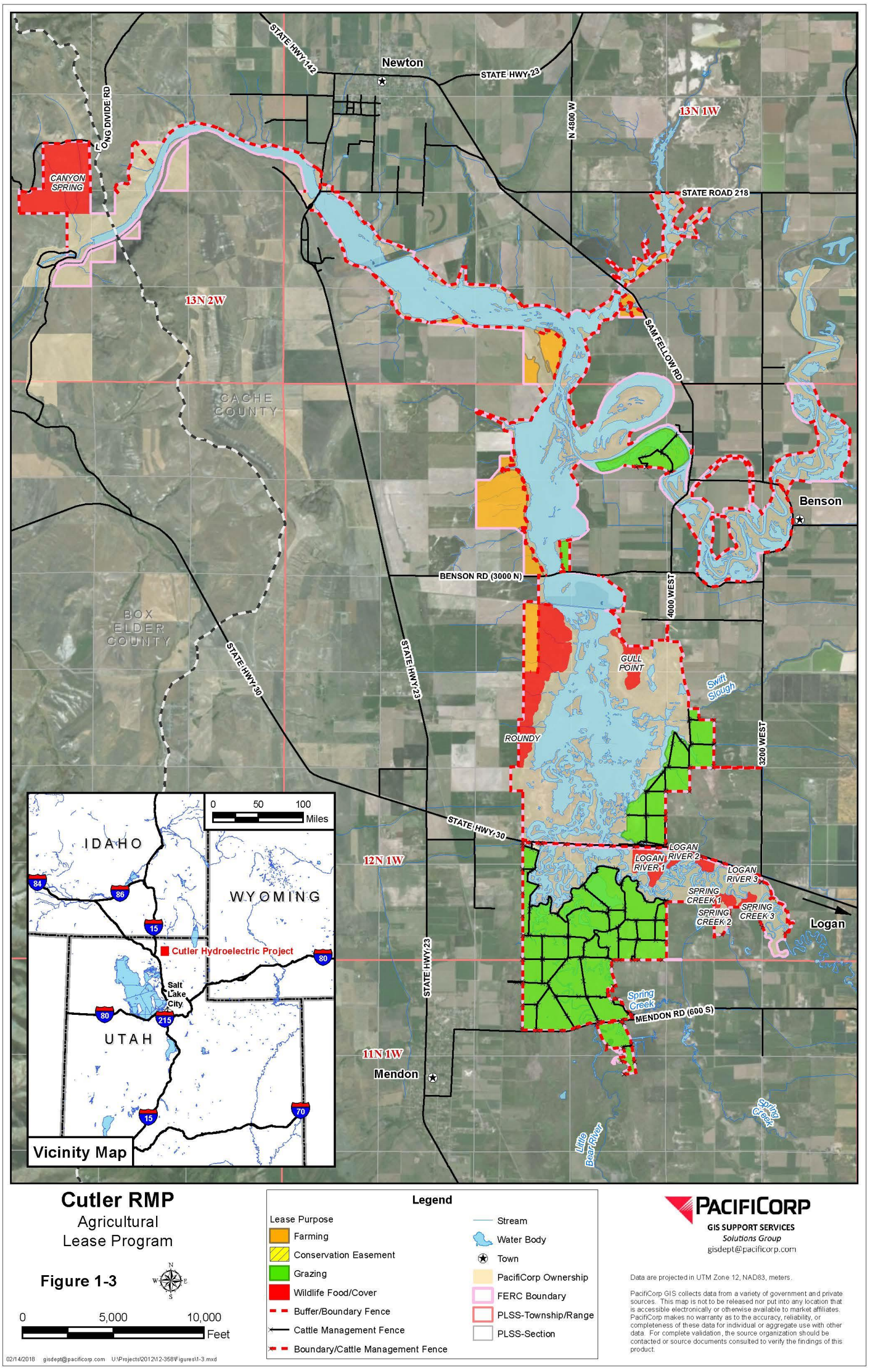
Two other components were reassigned to this program as part of the 2002 five-year report structuring:

- Cattle management fences
- Property coordination

Note that cattle management fences (Figure 1-3) address a second required category of fence, distinct from the 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, 2008, and 2013 five-year monitoring reports 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. Note that the wildlife food/cover leases, although still included in the agricultural lease sections (Spring Creek and Logan River pastures, Cutler Canyon pasture, and the 300-acre pasture), are actually included with and monitored as part of the Sensitive/Unique Wildlife sections of this report (Section 2.1.6).

The only exceptions to previous completion of implementation for this program include the ongoing property boundary management issues noted previously in Section 1.1.1.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BOX ELDER COUNTY
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STATE HWY 23
GULL POINT
Swift Slough
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WYOMING
Cutler Hydroelectric Project
Salt Lake City
UTAH
Vicinity Map
STATE HWY 30
12N 1W
LOGAN RIVER 2
LOGAN RIVER 1
LOGAN RIVER 3
SPRING CREEK 1
SPRING CREEK 2
SPRING CREEK 3
Logan
Spring Creek
MENDON RD (600 S)
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Mendon
Little Bear River
Spring Creek
Cutler RMP
Agricultural
Lease Program
Figure 1-3
0 5,000 10,000 Feet
Legend
Lease Purpose
Farming
Conservation Easement
Grazing
Wildlife Food/Cover
Buffer/Boundary Fence
Cattle Management Fence
Boundary/Cattle Management Fence
Stream
Water Body
Town
PacifiCorp Ownership
FERC Boundary
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Ongoing property boundary resolution is necessary in order to ensure required control of conflicting uses of Project lands.

O&M work for this overall program is similar to that laid out in the 2002 five-year report; major O&M work completed in support of this license component is detailed in Section 2.0 of this report, and in the property incident form summary in Appendix C, Table C-3. Resolution of these ongoing issues will require continued management in the next license period.

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 sites 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 portable 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.

All components in this program were previously completed (see Table 1-1 for specific requirements and the 2002, 2008, and 2013 five-year monitoring reports 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 marina ramp and pedestrian bridge repair, fence and sign maintenance, and weed control) completed during the current report period.

General O&M work for this program consists of recreation site maintenance per the PacifiCorp 2002 five-year monitoring report (Section 1.3). Major O&M work included marina ramp extensions/repair at both Cutler Canyon and Benson marinas, RR Trail fishing bridge repair (from arson), re-designation of an area at Benson Marina as a wading area (in response to visitor use), and adding more gravel at all major parking areas. Damaged signs were repaired and new signs installed where applicable. New signs identifying each recreation site throughout the reservoir were added to existing sign boards; the contents of all boards, including maps, FERC Form 80 information, and new regulations concerning motorized, drone, and cannabis usage in various areas of the reservoir were standardized throughout the area. See Section 2.3 for additional details regarding monitoring activities for recreation sites.

During the 2013-2017 license monitoring period, PacifiCorp continued to support the 2008 state regulations regarding boater guidelines at Cutler, as well as the trapping program instituted in the last license period. The boating regulation stipulates three separate boating zones in the reservoir: in the South zone, motors are limited to 35 horsepower (hp) 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 restriction and safe speeds are in place year round (Figure 1-4). Appendix D-2 includes both the regulation adopted and a copy

of the maps in use throughout the reservoir to educate users as to this policy. Both State Parks and Utah Division of Wildlife Resources (UDWR) are committed to providing the necessary enforcement of the new regulation.

Trapping permits are free, seasonal, and must be renewed annually; permit regulations limit the types of trapping that may occur on Cutler Project lands. The UDWR is aware of and supports the trapping program, and will cite any trapper not in possession of the written authorization, in accordance with Utah law and regulations posted at all recreation sites and potential access points to Cutler project lands.

1.1.4 Wetland Mitigation Area Program

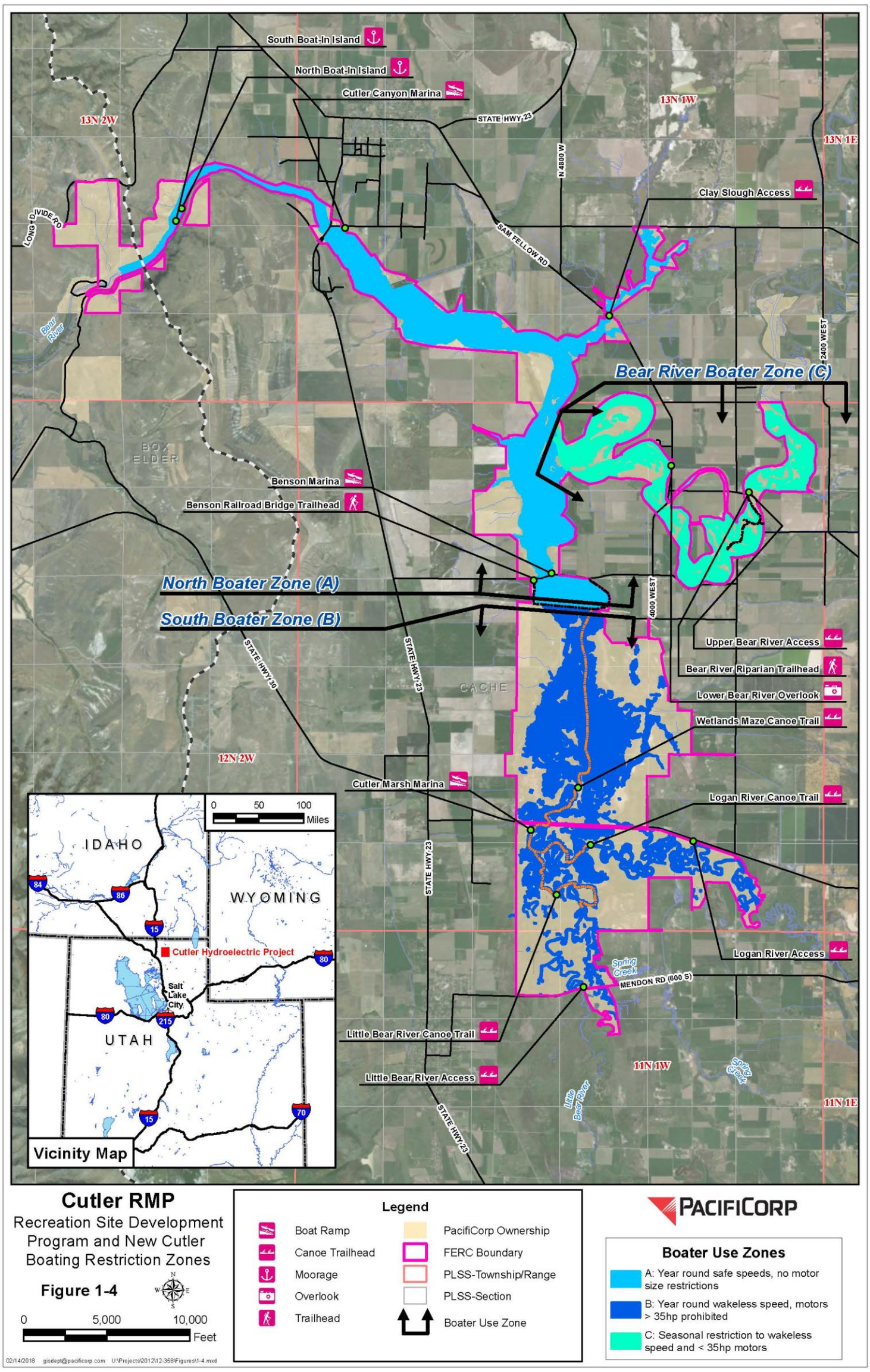
Implementation of the original recreation site development program resulted in some unavoidable impacts to wetlands and other special aquatic sites located at the edge of the reservoir where recreation sites were constructed. Although the original construction plans would have affected approximately two 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/pond complex on land adjacent to the project owned by the UDWR, and the removal of an old road in a wetland adjacent to the Upper Bear River recreation site.

The created wetland mitigation site 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 landowner, 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 (wood and wire 'crappie condos') were designed, constructed, and installed in cooperation with UDWR (see Figure 1-1).



Cutler RMP
Recreation Site Development Program and New Cutler Boating Restriction Zones

Figure 1-4

0 5,000 10,000 Feet

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Legend

- Boat Ramp
- Canoe Trailhead
- Moorage
- Overlook
- Trailhead
- PacifiCorp Ownership
- FERC Boundary
- PLSS-Township/Range
- PLSS-Section
- Boater Use Zone

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Boater Use Zones

- A: Year round safe speeds, no motor size restrictions
- B: Year round wakeless speed, motors > 35hp prohibited
- C: Seasonal restriction to wakeless speed and < 35hp motors

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All implementation components of this program were previously completed (see Table 1-1 for specific requirements and the 2002, 2008, and 2013 five-year monitoring reports 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 as they concurred that reservoir turbidity precluded adequate inspection of the structures while underwater (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. One drawdown opportunity for monitoring the fish habitat structures occurred in late fall of 2008; those efforts resulted in additional consultation with UDWR, and the agreement to suspend future fish habitat structure monitoring. During this license period, in the fall/winter of both 2013-2014 and 2014-2015, FERC-required maintenance on the dam and spill gates necessitated a major drawdown to approximately 4,404 feet; despite the previous agreement to suspend fish structure monitoring, PacifiCorp staff did attempt a visual inspection of the structures that was similarly unsuccessful to the 2008 attempt (not a surprising result, given that the 2008 drawdown lowered the elevation to 4,385 feet; also see Appendix F for links to annual reservoir water level data).

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 Cutler 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 Reservoir. It is noteworthy that water quality in the tributaries overwhelms any water quality effects of Cutler project land management activities or improvements (SWCA 2010 and 2018 [unpublished data]); as a result, PacifiCorp was active in the development and implementation of the Cutler Total Maximum Daily Load (TMDL) limit process, which was finalized by the Environmental Protection Agency (EPA) in 2010, and serves as a member of the Cutler TMDL Technical Advisory Committee (TAC).

The TMDL should result in improvements to the water quality of the reservoir, in part by addressing water quality inputs of the various tributaries, including the Logan City wastewater lagoons (required by Logan City's wastewater operating permit to be replaced by a tertiary treatment wastewater facility to decrease the nutrient loading to Cutler), which discharge to the Swift Slough area of the reservoir. The new treatment plant is proposed to be constructed and operational during the next license monitoring period, although the date has changed repeatedly since 2010. Originally Logan City's compliance schedule required construction and operation by 2017, when their wastewater effluent needed to meet more stringent nutrient parameters (especially for phosphorus) to be in compliance with their wastewater operating permits. Currently, their plans propose initiation of water treatment operations in 2020.

PacifiCorp's Cutler quarterly water quality sampling was originally required by the license annually for three years, ending with the 2002 report period, when the frequency shifted to quarterly monitoring at five-year intervals (see Table 1-1 for specific requirements and the 2002, 2008, and 2013 five-year monitoring reports for additional details). The first year of this new monitoring regime was 2003; data was collected again in 2008, and 2013, and is ongoing currently in 2018. Those results are summarized in Section 2.6 of this report (2013 sampling data), the 2013 Cutler report (which includes the 2008 water quality data) and the 2008 report (which includes the 2003 sampling data). As noted, the next water quality data collection and analysis cycle to fulfill the water quality monitoring requirements is occurring currently, in 2018; the final water quality data collection and analysis period for the current license will occur in 2023. Analysis and results will be submitted with each subsequent Cutler five-year monitoring report (note that because data collection occurs throughout the same year as the five-year reports are submitted in March, each data set is submitted during the following five-year report period.

Starting in 2014, Utah Department of Environmental Quality (UDEQ) started monitoring essentially the same monitoring points at Cutler in their water quality monitoring efforts for the Cutler TMDL. This should allow a more robust dataset, if UDEQ continues to complete their monitoring on the same five-year schedule, as monitoring would then occur for two full years per cycle, first by PacifiCorp, and then by UDEQ the following year. Collecting data in this manner will allow for both parties to better track and potentially address any further impacts or improvements to water quality during the next (2018-2022) Cutler five-year reporting period.

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 2002, 2008, and 2013 five-year monitoring reports for additional detail). Table 1-2 presents the modified operating range proposed by PacifiCorp and accepted by FERC Order for Cutler Reservoir elevations (as measured at Cutler Dam).

Table 1-2. Licensee's Condensed Reservoir Elevation Operating Range for Cutler Reservoir.

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%

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 only linked in this report (see Section 2.7 and Appendix F of this report for additional detail of this RMP component). Copies of the daily average elevation data and relevant details regarding any deviations from the normal operating ranges are stored in digital format, and submitted to FERC annually as the Cutler Annual Elevation Report, available for public review.

1.1.8 Summary of Project Implementation (Implementation Phase through 2012)

Implementation of each of these programs and program components is now complete (Table 1-1). The final component, development of a small section of property boundary delineation in the Cutler Canyon, should be complete by 2020-2023. There are 11 functioning woody vegetation pocket sites; all but two are considered 'established,' and therefore Phase II protocols are used to monitor shrub numbers and site health. With one exception, all former property boundary issues noted in the 2013 five-year monitoring report are now resolved (although new issues are noted annually with monitoring). Ongoing and new property trespass issues continue to be monitored and dealt with as they are identified, per the Cutler Monitoring Plan (PacifiCorp 2002). Note that Table 1-1 figures were updated from the previous five-year report to include new implementation activities conducted during the current monitoring period, 2013-2017. Monitoring points have been established for new sites (the new woody vegetation pocket and the augmented site) per the monitoring plan protocols; monitoring at all sites is generally continuing per the Cutler Monitoring Plan (2002) or as amended in the 2008 and 2013 Cutler five-year reports.

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 license 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 to help frame on-going O&M needs for the project that result in continual improvements. 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 2002 Cutler five-year report (PacifiCorp 2002). A summary and schedule of proposed monitoring activities for the Cutler project is shown in Table 1-3. Monitoring takes place annually or bi-annually with the exception of water quality monitoring, which is conducted quarterly, every fifth year. In addition, fish habitat structure monitoring has been suspended, by agreement with UDWR. A major drawdown in 2008 and subsequent fish structure monitoring in 2014-2015 was not successful in locating the fish habitat structures; other fisheries monitoring activities (angler surveys) were deferred by agreement with UDWR until angler use increases to levels where adequate data can be collected.

Table 1-3. Cutler Monitoring Plan Components.

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)	Eliminated as part of 2008 Cutler five-year report.	
Cattle Management Fence	May 1	July 31
Property Coordination	Year-round	
Recreation Site Program Monitoring		

Table 1-3. Cutler Monitoring Plan Components.

Task	Start Date	End Date
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	Dec. 30
Developed Walking Trail (spring)	April 1	April 30
Developed Walking Trail (fall)	Nov. 1	Nov. 30
Primitive Recreation Site	March 1	Dec. 30
Wetland Mitigation Program Monitoring	March 1 through 2001, now complete.	April 30 through 2001, now complete.
Fish Habitat Structure Program Monitoring	Beginning in 2013, suspended; continue to suspend angler use surveys until angler use increases to a point that adequate data can be collected.	
Water Quality Monitoring	Quarterly, every fifth year beginning in 2003; next data collection is taking place currently, in 2018. Report in Cutler 5-year reports.	
Water Level Monitoring	Compile average daily levels and file with FERC annually.	

Specific data sheets were designed as part of the 2002 Cutler five-year report (PacifiCorp 2002) and were utilized for most of the monitoring tasks. Hydro NTO staff files the completed data forms, noting any required maintenance activities. Data are tracked and filed digitally. This information is used as documentation for each of the five-year monitoring reports, and for future required reports over the length of the license.

1.3 2002 and 2013 RMP Monitoring Results Summary

A summary of the initial (2002) and most recent (2013) monitoring results is presented in Table 1-4, in order to facilitate comparison with the current period (2013-2017) monitoring results found in Section 2.0.

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 was suspended. Past monitoring results are presented to summarize the previous (baseline, 2002; and most recent, 2013) monitoring period results regarding the requirements of the RMP and related FERC license orders, and to frame the comparison of current monitoring results and ongoing O&M activities.

Table 1-4. Cutler Initial (2002) and Most Recent (2013) Monitoring Results Summary.			
Monitoring Program	**Time Frame**	**Initial 2002 Results**	**2013 Results**
Vegetation Enhancement Program			
Shoreline Buffer (55 parcels)	Annual monitoring began in 2002	65% buffer parcels rated good to excellent; 0% fair; 35% rated poor to at-risk	75% buffer parcels rated good or excellent; 15% fair; 10% rated poor to at-risk.
Woody Vegetation Pockets (14 sites; 11 active, 3 failed/abandoned)	Annual monitoring began as sites were planted (1996-2001)	7 in good condition; 4 in marginal condition; 1 failed/abandoned	8 in established or good; 2 in marginal or poor; 4 failed/abandoned 1 new site proposed; 1 augmented
Bank Stabilization (18 areas)	Annual monitoring began in 2002	81% in good condition 2% in fair condition 17% in poor condition	100% in good condition
Buffer/Boundary Fences (56 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.	10 problem areas identified (several chronic); several segments of fence or posts will need to be repaired or replaced during upcoming monitoring period
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.*	All 13 functioning properly after maintenance. *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.	• Similar use to 2002 report by shorebirds, herons, ibis, waterfowl, migratory songbirds, and cranes. • South osprey and both goose nesting platforms used starting in 2005. • Additional studies of water quality and the decline in macro-invertebrates in areas of the North Marsh near the historic white-faced ibis rookery were considered by UDEQ; PacifiCorp

Table 1-4. Cutler Initial (2002) and Most Recent (2013) Monitoring Results Summary.			
Monitoring Program	**Time Frame**	**Initial 2002 Results**	**2013 Results**
		• 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).	will participated in the TMDL process. • Still no use by burrowing owls noted.
Agricultural Lease Program			
Grazing Leases	Annual monitoring began in 2002	74% in good condition 26% in poor condition	Annual monitoring will continue as present. 75% of the 39 grazing pastures monitored (covering 1,733 acres) are in 'Good' condition; 25% are rated in 'Poor' condition.
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*.	Annual monitoring will continue as present. Additional buffer post markers will be installed as needed. *Some noncompliance issues resolved but need continued monitoring. Six individuals farming PacifiCorp land without a lease have property or legal actions pending*.

Table 1-4. Cutler Initial (2002) and Most Recent (2013) Monitoring Results Summary.			
Monitoring Program	**Time Frame**	**Initial 2002 Results**	**2013 Results**
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.	Managing up to nine pastures for wildlife food/cover plots; semi-annual monitoring (spring and fall) replaced with annual spring monitoring only.
Cattle Management Fences	Annual monitoring began in 2003.	2002 monitoring indicated need for minor repairs.	Annual monitoring will continue as present; results indicate need for minor repairs annually.
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 (11%) current issues. Several areas being farmed without a lease are currently being addressed in court. New Exhibit G filed based on completing property surveys and trades.	Of 190 adjacent landowners, property incident monitoring forms are being used to track and document at least 11 (6%) current issues. Several areas being grazed/farmed or otherwise utilized without a lease are still being addressed through the property/legal system. On-going and chronic trespass issues will continue to be monitored and resolved through the property incident process.
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.	Overall, sites are in good condition with little need for major maintenance. • Annual monitoring will continue • Development of last primitive rec site completed • Canoe trail marker buoy system replaced.

Table 1-4. Cutler Initial (2002) and Most Recent (2013) Monitoring Results Summary.

Monitoring Program	Time Frame	Initial 2002 Results	2013 Results
		• 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.	Actions complete in 2002.
Wetland Mitigation Program	Complete	Returned to landowner (UDWR) in 2001.	No future monitoring proposed.
Fish Habitat Structure Program	Began with installation (1996, 1998, 2000), completed 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.*	Future monitoring suspended, per agency agreement. Angler surveys deferred until angler use increases, by agreement with agencies.
Water Quality Monitoring Program	Quarterly, 1996-1998, (additional dates 2001-2003); now quarterly every five years: 2003, 2008, 2013, 2018 and 2023.	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	Quarterly monitoring in 2008 (submitted as part of the 2013 Cutler five-year report) similarly indicated water quality concerns with the Cutler tributaries and inputs. 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 2013 and will be reported in the 2018 Cutler five-year report.

Table 1-4. Cutler Initial (2002) and Most Recent (2013) Monitoring Results Summary.			
Monitoring Program	**Time Frame**	**Initial 2002 Results**	**2013 Results**
		included 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.	No change from previous; Cutler elevations generally stay within the tolerance ranges set by FERC order.

2.0 MONITORING PLAN RESULTS

This section summarizes the results of monitoring completed during the current monitoring period, 2013-2017. As previously noted, monitoring results are presented to meet the requirements of the Cutler 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 RMP; 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 is found in Section 2.0 of the 2002 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 from PacifiCorp Hydro Resources, Salt Lake City North Temple Office (NTO). 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 Cutler water quality monitoring data) are either referred to or appended.

2.1 Vegetation Enhancement Monitoring Program

The vegetation enhancement monitoring program 2013-2017 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 extended through 2017. All 55 buffer parcels were traversed annually 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 2017. 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 from PacifiCorp Hydro Resources, Salt Lake City NTO.

Table 2-1. Cutler Reservoir Buffer Parcels by Condition per Year, 2013-2017.

Conditions of Buffer*	2002 (baseline)	2013	2014	2015	2016	2017
Excellent	4	5	5	5	6	6
Good	26	36	36	40	40	41
Fair	0	8	8	6	5	4
Poor	16	3	3	3	2	2
At-Risk	6	3	3	1	2	2

*__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 or other encroachment. **At-Risk** = Annual vegetative cover offering little protection from surface erosion, or encroachment that threatens the existence or function of the buffer.

As shown in Table 2-1 and Table B-1 (Appendix B-1), shoreline buffers exhibited a variety of buffer health conditions. Not surprisingly, those rated 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 encroachment from adjacent land users.

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 reclamation 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 invasive weeds, and seeding of perennial grasses and forbs as part of the buffer seed mix. Vegetative cover establishment was variable depending on soil type and precipitation amount and timing, but usually resulted in sufficient densities of desired vegetation from two to three years post-treatment.

Buffers rated as 'fair' condition shared several important features with those rated as 'good,' such as increasing perennial vegetation and decreasing noxious, invasive, or unwanted species. What separated these two categories was the presence on those rated 'fair' of some issue that required corrective action that could resolve the issue within a single season. For example, a buffer in otherwise 'good' condition would receive a 'fair' rating if portions of the buffer were inappropriately mowed by an adjacent owner, and through a single corrective action (letter and follow-up with the adjacent owner), the issue could 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 functional 'good' condition. Other examples include buffers with machinery stored on them, or those with small controllable stands of 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 included parcels subject to recurrent encroachment.

Lastly, those buffers listed as 'at risk' had very little perennial component and were dominated by annual, weedy vegetative cover. These parcels were prioritized for vegetative enhancement, but usually needed 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 wetlands along the 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 2013 to 2017, the general trend of the overall condition of the buffers was improvement, with increases in the good and excellent categories, and decreases in the poor and at-risk categorized buffers. The spring of 2017 was one of the wettest on record and contributed to increased growth of shoreline buffer vegetation. On some parcels, buffer improvements were attributable to increased enforcement against encroachment and management of noxious weeds. However, some buffer parcels are still being impacted by farming, grazing, and other encroachments. For the upcoming 2018 monitoring period, three buffer sites were identified as areas of high priority and in need of additional or ongoing remedial action (additional details can also be found in Sections 2.2.2 and 2.2.5 and Appendix C-3 of this document).

Griffin: In 2014 the property line between PacifiCorp and the adjacent landowner was fenced along this section of shoreline buffer to manage constant encroachment issues (i.e., cultivation of the buffer by the adjacent landowner). In 2015-2017, the buffer remained free of encroachment but was overrun by noxious weed populations. Extensive herbicide treatments were conducted in this area in 2015 and 2016, as well as mowing in 2017. The goal is to reseed the buffer once noxious weed populations are controlled and the buffer is in a good state to promote healthy growth of desired vegetation.

Lindley: This buffer area is in degraded condition from encroachment by adjacent landowner activity. This included unauthorized access roads and cultivation. In 2016, the adjacent landowner dredged wetland areas in this buffer and left the spoil piles in the buffer. New areas of cultivation were also observed at this time and several buffer posts were noted as missing. Both the Army Corps of Engineers and the adjacent landowner were contacted but at the conclusion of the 2017 monitoring period the buffer remained impacted by these actions. Specific reclamation goals will be determined in the next monitoring period.

Rose Oxbow: In 2013, the adjacent landowner constructed a large dike across the buffer area, and in 2014 extensive dredging was conducted and spoils piles were added to the dike. In 2014, a letter was sent to the Army Corps of Engineers to inform them of these

infractions. The buffer remains unchanged at this time. Specific goals will be determined in the next monitoring period.

Overall Findings: Future annual monitoring will continue, 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.

2.1.2 Woody Vegetation Pockets

The Cutler license and resultant RMP required at least ten 0.5- to 2.0-acre woody vegetation pockets be planted within the shoreline buffer. Currently, there are 11 existing woody vegetation pocket sites (Figure 1-1) (15 total have been planted since 1994, although three were determined to have failed and were abandoned during the 2008-2012 reporting period and one other site was determined failed in the previous reporting period). The existing sites were monitored annually throughout the current reporting period. Baseline data were collected when the sites were planted, and data regarding survival of marked shrubs on transects were compiled as described for Phase I and/or Phase II monitoring in the 2002 Cutler five-year report. This monitoring period saw several wet spring periods, which contributed to increased growth overall at many shrub sites, although the extremely high run-off levels of 2017 also resulted in several sites being submerged for extensive periods of time, which was detrimental to portions of some sites; future monitoring will inform any determination of permanent loss at the affected sites.

In 2014, it was determined that the 26 N Lane site had failed and this site was abandoned, but was still counted through 2015. A new shrub site, South Marsh, was planted in the fall of 2015 to replace the abandoned 26 N Lane site. The new site was planted with Wood's rose and golden currant shrubs. Baseline counts at the new South Marsh site were not taken until spring of 2017. At this time, due to record-breaking winter snowpack and run-off, the majority of the new site was under water and most of the Wood's rose died, but healthy populations of golden currant remain. In the fall of 2015 at the Peterson site, additional Wood's rose and golden currants were planted to augment the original plantings, and two new transects were added. The site was augmented because the original Peterson planting has remained inconsistent, showing periods of growth followed by periods of die-off. Adding more shrubs and additional transects to the site was an attempt to bring more consistent shrub survival to the site. Baseline counts were not taken until spring of 2017, and resulted in one of the new Peterson transects performing very well, while the other was inundated with water and had significant die-off. The South Marsh and Petersen sites will continue to be monitored annually in the next reporting period; two sites (Cutler Marsh and RR Trail) appeared to have significant unauthorized herbicide spray damage and a damage assessment (essentially a special count) will be conducted in 2018 to determine if the damage was permanent.

Table 2-2 summarizes the results of monitoring to date on woody vegetation pockets.

Table 2-2. Summary of Cutler Woody Vegetation Pocket Monitoring Results, 2013-2017.

Condition of Woody Vegetation Pocket	# of Sites	Year Planted	Average % Survival Across Transects*	% of Total Sites	Characteristics
Established G.B. South R.R. Trail Cutler Marsh Check Dam 7 Cowley Slough Rigby Roundy Pump N Roundy Pump S Valley View New	9	 1999 1999 1998 1998 1998 1998 2008 2008 1997/2001	 129% 56.5%** 20.5%** 58% 35% 65% 138% 48% 111.4%	82%	**'Established' shrub plots have >20% survival across transects and stable trend data.** These sites were deemed established in 2009, 2010, 2013 and 2017; next count in 2018 (Check Dam 7, Cowley Slough, Rigby), 2019 (Roundy Pump N and S, G.B. South, Cutler Marsh, RR Trail), or 2020 (Valley View New).
Good South Marsh	1	2015	51.4%	9%	**Shrub survival >=20% across transects but may not have stable survival trend data or is not >5 yrs since planting.** Move to Established Phase II monitoring if 2018-2020 results warrant.
Marginal Peterson New	1	1999 and 2015	41%	9%	**Shrub survival <20% across transects or decreasing survival trend data.** Continue to monitor using Phase I protocols.
Poor None	-			0%	**Shrub survival <20% and decreasing survival trend data; consider augmentation or replacement after 2 or more years at this level.**
Failed/Abandoned No longer counted Larson Big Bend Swift Slough 26 N Lane	4 (not included in total)	 1996 2001 1998/2001 1998	n/a	n/a	**Original site considered failed and not re-planted.**
Totals	11			100	

*Note that percent survival across transect values does not include experimental species plantings that were initially unsuccessful; value includes only species that actually survived initially on site.
**Need to evaluate in 2018 whether Cutler Marsh and RR Trail sites need to be downgraded due to spray effects.

In 2013, both Roundy Pump N and Roundy Pump S were moved to "established" (using Phase II protocols thereafter). These two sites along with all shrubs sites that were marked as "established" at the beginning of the 2013 monitoring period, have all remained "established" at the conclusion of the current monitoring period in 2017 (established sites are only counted every third year, rather than every year, although annual site visits continue to look for issues such as herbicide damage, etc.). Woody vegetation pocket Valley View New was upgraded to "established" condition, while, as noted, two other sites will be evaluated for signs of permanent damage as a result of unauthorized herbicide use (RR Trail and Cutler Marsh). These sites will be moved to annual counts (Phase I protocols) if 2018 monitoring indicates that damage may have been permanent. No sites remain in the "poor" category, and the Peterson site has moved up to the "marginal" category, based on the augmentation plantings completed in fall of 2015.

Table 2-3 indicates the trend in condition for each of the plots; nine of the sites have shown improvement while two sites have trended down; Table 2-4 indicates the Phase I or II monitoring schedule during the current reporting period.

Table 2-3. Cutler Woody Vegetation Pocket Condition Trend.

Woody Vegetation Pocket ID	1998-2002	2003-2007	2008-2012	2013-2017	Trend since Baseline
2600 N Lane	Marginal	Established	Poor	Failed/ Abandoned	Failed/ Abandoned
Check Dam 7	Good	Established	Established	Established	Improved
Cowley Slough	Good	Established	Established	Established	Improved
Rigby	Good	Established	Established	Established	Improved
RR Trail	Marginal	Established	Established	Established	Damaged-needs spray damage assessment
GB South	Marginal	Good	Established	Established	Improved
Valley View	Good	Good	Marginal	Good-Established	Improved
Cutler Marsh Rec	Good	Marginal	Established	Established	Damaged-needs spray damage assessment
Peterson	Good	Marginal	Poor	Marginal	Improved
Roundy Pump N	NA	NA	Good	Established	Improved
Roundy Pump S	NA	NA	Good	Established	Improved
Big Bend	Marginal	Failed/ Abandoned	Failed/ Abandoned	Failed/ Abandoned	Failed/ Abandoned
Swift Slough	Good	Failed/ Abandoned	Failed/ Abandoned	Failed/ Abandoned	Failed/ Abandoned
Larson	Failed/ Abandoned	Failed/ Abandoned		Failed/ Abandoned	Failed/ Abandoned
South Marsh				Good	Improved

Table 2-4. Cutler Phase I (annual) or II (every three years) Count Schedule, 2013-2017					
Woody Vegetation Pocket ID	**2013**	**2014**	**2015**	**2016**	**2017**
2600 N Lane	Counted	Counted	Counted	Determined to have Failed	Determined to have Failed
Check Dam 7	-	-	Counted	-	-
Cowley Slough	-	-	Counted	-	-
Rigby	-	-	Counted	-	-
RR Trail	-	Counted	-	Counted	-
GB South	Counted	-	-	Counted	-
Valley View	Counted	Counted	Counted	Counted	Counted
Cutler Marsh Rec	Counted	-	-	Counted	-
Peterson	Counted	Counted	Counted	Counted	Counted
Roundy Pump N	Counted	-	-	Counted	-
Roundy Pump S	Counted	-	-	Counted	-
Big Bend (Failed)	-	-	-	-	-
Swift Slough (Failed)	-	-	-	-	-
Larson (Failed)	-	-	-	-	-
South Marsh	-	-	-	Baseline established	Counted

Overall Findings: Future annual monitoring will continue 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. The majority of the sites are improving or remain stable; monitoring will be continued to determine if the new South Marsh site is viable replacement for the abandoned 26 N Lane site. The Valley View site finally appears stable and was changed to the "established" category of sites. The Peterson site will be evaluated to determine if augmenting the site and adding the new transects will lead to the site achieving established status, or if a replacement site will be needed. Two sites, Cutler Marsh and RR Trail will have additional monitoring in 2018 to determine if unauthorized herbicide spray damage is permanent.

2.1.3 Bank Stabilization

The Cutler license required 3.5 miles of bank stabilization, utilizing a combination of both 'hard' (using rock) and 'soft' (using vegetation) techniques. Virtually all sites now use a combination of both techniques, and covered a total of 23,356 feet or 4.42 miles at the beginning of the current reporting period (note that another 1.1 miles of bank stabilization was completed in order to construct the RR Loop Trail that is not counted in the 4.42 mile figure). The 16 (18 including the two that are part of the RR Loop Trail) bank stabilization parcels (Figure 1-1) were monitored during the current monitoring period using the protocol described in Section 2.0 of the 2002 Cutler five-year report (PacifiCorp 2002). A summary of the condition of each of the bank stabilization sites is presented in Table B-2, Appendix B-2. Photos and the corresponding data forms from the permanent photo

monitoring points are retained in digital format and are available upon request from PacifiCorp Hydro Resources, Salt Lake City NTO.

Table 2-5 summarizes the overall bank stabilization results gathered through 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 continuing throughout the current five-year monitoring period, which concluded in 2017. Also included is the percentage of the total projects represented by each condition, each year.

Table 2-5. Summary of Cutler Bank Stabilization Project Monitoring Results, 2013-2017.

	2002 (baseline)		2013		2014		2015		2016		2017	
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	23426/ 4.4	100	23426/ 4.4	100	23426/ 4.4	100	21709/ 4.1	92.7	23426/ 4.4	100
Fair	0/0	0	0/ 0	0	0/ 0	0	0/ 0	0	1717/ 0.33	7.3	0/0	0
Poor	4789/ 0.9	23.0	0/0	0	0/0	0	0/0	0	0/ 0	0	0/ 0	0
Total	20862/ 3.9	100	23426/ 4.4	100	23426/ 4.4	100	23426/ 4.4	100	23426/ 4.4	100	23426/ 4.4	100

In 2013, all sites were rated as good condition due to overall increases in emergent and bank vegetation. At the end of the previous reporting period (reported in 2008), it was determined that all bank shrub plantings were in good condition and were increasing or stable, and therefore the bank shrub monitoring transects would no longer be counted (per the original bank shrub monitoring protocol). These areas are still part of bank monitoring for the overall site assessment, and annual visual inspection and photo point data indicate that all plantings remained as either increasing or stable. In 2016, it was discovered during annual monitoring that the shrub plantings at G Benson and GB South sites had been damaged by overspray from herbicide applications. It was determined that in an effort to control noxious weeds within the bank stabilization areas, Cache County Weed Department had applied chemical treatments by boat to these areas. The damage to the shrub plantings caused both G Benson and GB South sites to be downgraded from Good to Fair condition in 2016. During the 2017 monitoring season, both sites were visited and it was determined that while the die-back from the previous year's herbicide applications was still present, the majority of the affected shrubs were still alive and regenerating new growth. Both sites were upgraded back to good condition in 2017. Cache County Weed Department and PacifiCorp will coordinate efforts to control noxious weeds in these sensitive areas as well as other areas throughout the project to ensure that future damage to sensitive sites does not continue to occur.

In the previous five-year report it was noted that Check Dam 12 and RR Trail West were in good condition, but there was a possible concern regarding bank stability and erosion. Both sites were doing well overall, but small sections of each were experiencing some loss

in bank and vegetation. These sections received additional monitoring over this monitoring period and remain relatively in the same condition. Both sites are still in good condition overall and in the next monitoring period both sites will continue to be monitored as sites of possible concern to determine if any remedial action is required in the future. It was also noted that, several gabions at the Watterson gabions and Archibald bank sites had tipped over and were not visible at high water levels. At this time the banks are in good condition and no action is required, but during the next monitoring period these sites will also require addition monitoring to determine if future remedial action is needed.

Overall Findings: As noted in the 2008 Cutler five-year report, the banks that were stabilized using the method of placing large rocks to create a breakwater zone yielded the greatest vegetative growth in terms of emergent wetland flora and bank shrubs, and therefore have the greatest long-term chance of success at bank stabilization. The sites where this method was employed seem to have fared the best, and this technique is now used exclusively for any needed repairs or replacement of previously stabilized banks. However, it is noteworthy that currently all sites are in good or improving condition and therefore, no specific future work is recommended for the bank stabilization component of the vegetation enhancement program at this time.

2.1.4 Buffer/Boundary Fence

The Cutler license and subsequent RMP required construction of six miles of buffer and boundary fences, although to adequately protect and control the project boundaries, ultimately 60 miles of fence and posts were constructed (another six miles of cattle management fences were also required; see Section 1.1.1 and 2.1.4). The annual inspection of boundary/buffer fences and posts was conducted concurrently with the shoreline buffer monitoring in July and August during this monitoring period (see Table B-3, Appendix B-3 and Figure 1-2). Post and fence damage was documented to provide the basis for resolving problems that relate primarily to adjacent landowner or public 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 recorded from the 56 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's intentions and reparation amounts, if any.

In 2014, the entire Griffin buffer was fenced to protect the buffer from continued encroachment. This new section of fence was added to the annual fence monitoring schedule.

Chronic fence damage on the south side of Highway 30 between the Valley View recreation site and the Logan River recreation site continues to be an issue. This section of fence has received damage in many instances from cars losing control and running through

the fence. In some reported cases, depending on the circumstances causing the loss or accident, the cost of replacement fencing may be sought.

As a result of buffer/boundary fence monitoring over the past five years, a running list of replacement/repair actions has been developed to be completed annually with upcoming fence maintenance. The completed boundary/buffer fence data forms have been changed to reflect management and documentation of performance and maintenance issues by exception. This information, documented by fence segment, is available upon request (PacifiCorp Hydro Resources, Salt Lake City NTO). Photos of some incidents were also taken to document these occurrences and to assist in both property incident forms and any necessary follow-up legal actions.

Overall Findings: There are currently 60 miles of fence in this fence category. 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. During the fall of 2016, an extensive effort was made to perform all needed fence repairs, and as of 2017 all fences are in good working condition. Some areas where the boundary is marked with posts only still need attention during the next monitoring period. Areas prioritized for immediate action in 2018 include Lindley, Rigby, and H brace replacement throughout the cattle management fences (Table B-3, Appendix B-3).

2.1.5 Erosion Control Sedimentation Basins

The Cutler license and RMP required erosion control check dams and sediment basins where needed in the North Marsh and Reservoir Management Units. The 13 resultant erosion control sediment basins and corresponding check dams were monitored annually from 2013 to 2017. All sediment basins, with the exception of Basin 3, remained in a good working condition throughout the current monitoring period (see Table 2-6). During the previous five-year reporting period it was noted that Basin 3 was in fair condition from repeated instances of overflowing water washing out portions of the basin and associated check dam, and the adjacent RR Trail. In 2015, and again in 2016, this was an issue as the basin overflowed causing damage to the RR Trail. The basin and RR Trail were repaired in 2016 and the drain culvert was cleaned out to allow more water to escape. In 2017, the basin was able to contain exceptionally high run-off without washing out. Going forward if washing out continues to be an issue, possible redesign or replacing the culvert with a larger size may be considered.

Table 2-6. Summary of Cutler Erosion Control Sediment Basin Monitoring Results, 2013-2017.

Sediment Basin ID#	2013	2014	2015	2016	2017
1	Good	Good	Good	Good	Good
2	Good	Good	Good	Good	Good
3	Good	Good	Poor (repairs needed)	Roadway and dam repaired	Good
4	Good	Good	Good	Good	Good
5	Good	Good	Good	Good	Good

Table 2-6. Summary of Cutler Erosion Control Sediment Basin Monitoring Results, 2013-2017.					
Sediment Basin ID#	**2013**	**2014**	**2015**	**2016**	**2017**
6	Good	Good	Good	Good	Good
7	Good	Good	Fair (repairs needed)	Washout repaired	Good
8	Good	Good	Good	Good	Good
9	Good	Good	Good	Good	Good
10	Good	Good	Good	Good	Good
11	Good	Good	Fair (repairs needed)	Washout repaired	Good
12	Good	Good	Good	Good	Good
13	Good	Good	Good	Good	Good

Several of the basins continue to hold spring runoff for periods of time creating good conditions for waterfowl habitat and for a variety of breeding amphibians, songbirds, and grebes. The spring of 2017 was extremely wet and long, providing a well-used resource for a variety of animals.

All basins were inspected annually for T-post markers (marking the ends of the check dams), which were replaced if 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 Hydro Resources, Salt Lake City NTO). Habitats created by the sediment basins are also monitored as part of the sensitive/unique wildlife habitat program (see Section 2.1.6).

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.

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). These sites include the spring in Cutler Canyon, the two osprey nest platforms near Benson Marina, the burrowing owl nest boxes, erosion control sedimentation basins, the ibis/gull/tern nesting colony located on islands in the North Marsh, and the six pastures around the Logan River (Logan River 1-3 and Spring Creek 1-3, serving as wildlife food/cover plots), as well as the great blue heron nesting colony located in the South Marsh. Results from this monitoring will help track the effectiveness of the mitigation measures designed to improve and/or protect wildlife utilization of these sites.

In addition to PacifiCorp monitoring efforts, the Bridgerland Audubon Society also conducted monitoring for the ibis nesting colony located in Cutler's North Marsh (although only noting presence annually, rather than actual count data similar to that conducted in

the previous monitoring period). White-faced ibis are listed as a globally imperiled species, and over five percent of the global population of white-faced ibis have been formally counted in surveys conducted over the current reporting period at the nesting colony in Cutler Marsh (counts in late June ranged from 1,237 to 4,230 birds during the years 2008-2012). In recognition of the importance of the habitat at Cutler Marsh for white-faced ibis and other bird species, in 2008 Cutler Marsh was designated by Birdlife International and the National Audubon Society as a Globally Important Bird Area; the presence of white-faced ibis in these globally important numbers constitutes one of the most unique, and therefore valuable benefits to a wildlife species provided by the Cutler Project.

Although the white-faced ibis colony was continuously inhabited during the nesting season over the current report period (note that in 2012, the colony was found to have moved slightly west to other, more isolated islands in the marsh), the colony size has changed in magnitude several times over past monitoring periods. These changes have occurred, 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 decreases may be a 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 unknown why the ibis abandoned the nest colony, although a decrease in disturbance related to a new motorized use policy was implemented in late 2007, which may have improved conditions for the birds, which returned in 2008). Future monitoring will continue to assess this population of a rare species, which is a significant species of concern regarding management of the Cutler system. Loss of the ibis's macroinvertebrate prey base due to declining water quality (the ibis colony is located at the confluence of Swift Slough with Cutler Marsh; Swift Slough carries the effluent from Logan City's wastewater treatment facilities) is also a concern; (see Appendix E for the 2018 water quality report and PacifiCorp 2013 for summaries of USU papers on related topics). Regardless, the ibis colony continues to support habitat conditions important for a number of other waterfowl, shorebirds, and gulls (especially snowy egrets, black-crowned night herons, Franklin's gulls, and double-crested cormorants), and with the exception of 2007, has been occupied continuously for at least the last 20 years.

One of the most interesting findings in other sensitive wildlife habitats 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 in the North Marsh. This parcel was removed from agricultural production and converted to a perennial grassland prior to the previous (2008-2012) reporting period, and it has developed into a core upland habitat for breeding birds, large and small mammals, and high numbers of raptors. Although artificial nest burrows have been available for occupation by burrowing owls since 2002 in the same area, 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. However, in 2017, it appeared to some observers (pers. comm. B. Dixon 2018) that there may have been a substantial decrease in the numbers of nesting great blue herons; this feature will be investigated more closely in 2018 (a closed road prevented the standard monitoring access to the area in 2017). Because seasonal fences now protect the area from cattle grazing, it now appears that recruitment of new cottonwoods and willows is occurring, as previous cattle grazing and shade-seeking was preventing widespread successful sprouting of future suitable replacement trees. Future monitoring will continue to prioritize and assess this factor.

Monitoring results indicate that common waterfowl (especially Canada geese and mallard ducks), ring-necked pheasants, and Sandhill cranes are the species that benefit most from the management of wildlife food/cover plots located in the Logan River and Spring Creek pastures along the Logan River (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 supplanted grain sharecropping as management for the six fields around the Logan River, as well as occasionally 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; since 2006, the south nest platform has been utilized to fledge young osprey successfully, and the north nest platform was occupied intermittently during the current (2013-2017) monitoring period (Figure 1-1). Water quality improvements and/or increased carp numbers and visibility in that portion of the reservoir appear to have been sufficient to support osprey hunting and successful nesting. Future monitoring reports will continue to indicate 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 (which replaced the requirement for planting roses in unsuitable habitat in the old Bear River Oxbow in the original RMP) is monitored 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 prolifically. However, during 2016 unauthorized weed control efforts by Cache County, utilizing herbicide guns from boats, impacted numerous non-target species along the trail in this area. The impact to the planted shrubs also allowed weed species to become established where the desired shrubs were inadvertently eliminated. Follow-up meetings and new coordination efforts between PacifiCorp and Cache County were established to address this issue. Additional monitoring and manual weed control efforts will be employed to determine whether these impacts to the RR Trail vegetation are permanent. A wide variety of neo-tropical migrant songbirds (especially goldfinches, warblers, 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 current wildlife utilization in those habitats. Completed data forms are logged, stored for the current five-year reporting period, and are available upon request.

Overall Findings: Future annual monitoring will continue, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. Additional studies regarding Cutler water quality are underway during 2018 as part of the required five-year interval (which will be reported in the next five-year report in 2023) water quality monitoring conducted by PacifiCorp at Cutler (see also Section 2.6 and Appendix E). Additional monitoring along the RR Trail and the great blue heron rookery site will be conducted in 2018 to determine if any additional remedial actions are required.

2.2 Agricultural Lease Monitoring Program

The agricultural lease monitoring program 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

Vegetative health is dependent on proportionate moisture required by the various flora species that occur within the 2,396 acres (of which 1,733 acres are part of the grazing program, and up to another 663 acres are part of the wildlife food/cover plots that may be grazed) of grazing lease pastures. The climate factors analyzed to describe pasture conditions during each of the five years of this monitoring period included average monthly temperature and average monthly precipitation. Pasture conditions as related to climate factors are summarized below. Climate data were collected from the Utah Climate Center by calendar year rather than water year data.

2013 – This year was the driest and the coolest of the five-year monitoring period during the primary forage growing season. This is reflected by the shortest average forage height of 8.02 inches for this year. Early removal of cattle from pastures allowed some regrowth at the end of the season with fall precipitation and no grazing.

2014 – This year was characterized by consistent precipitation through the growing season and average temperatures. Conditions were adequate for forage production and resulted in above-average biomass being left in pastures at the end of the grazing season. Grazing was managed to recover pastures from the previous drought-stressed year.

2015 – Large precipitation events in the months of April, May, and June inundated pastures with flood waters. Many forage plants are not adapted to the anaerobic conditions caused by the surface flooding and had difficulty recovering once the waters receded. Flora better adapted to the increased amounts water were invigorated; flora less adapted decreased. Grazing in flooded pastures was delayed to protect flora and soil structure.

2016 – This year produced average conditions for forage growth. The most significant rain events occurred in the fall. Late-season rain and cooler temperatures did not produce excessive growth. Grazing and forage production were evenly matched and resulted in average forage residues for fall monitoring.

2017 – Substantial and frequent precipitation events occurred during the months of April, May, and June. This above-average precipitation, combined with the record-setting snowpack of January, February, and March, resulted in pastures being inundated with water for significant periods. Grazing in most pastures was delayed to allow water to recede and to protect soil structure.

Monitoring conducted during the current reporting 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 1,733 acres currently leased for grazing as part of the grazing program. The majority of the 39 grazing lease pastures monitored, 85 percent, were considered in good condition and meeting objectives at the end of the 2013-2017 monitoring period. Several pastures are providing good quality lure crops for geese, waterfowl and Sandhill cranes (per the license and subsequent RMP, the primary target crop-depredating species), and others are maintaining the vegetation community mix optimal for waterfowl and shorebird nesting and breeding habitat.

Monitoring also indicated that 15 percent of the pastures were considered to be in poor condition. Low condition ratings can be explained in pastures with persistent noxious weed issues and flooding issues (explained further in the North Marsh section, below). Pastures in this condition were still meeting wildlife habitat objectives, but producing less livestock forage.

As summarized in Table 2-7, vegetation measurements fluctuated according to several factors, including precipitation timing, fencing, and lessee performance. The Robel pole measurements quantify vegetation height and density. Corresponding data forms, including Robel pole forage utilization measurements from permanent photo monitoring points illustrate the evaluation of good, poor, and at-risk grazing pastures, and are available upon request (PacifiCorp Hydro Resources, Salt Lake City NTO).

Table 2-7. Average Robel Pole Measurements by Season at Cutler, 2013-2017				
Year	**Summer (Inches)**	**Fall (Inches)**	**Precipitation (Inches)**	**Pasture Condition***
2013	8.02	6.9	8.84	88/12
2014	9.5	4.9	15.40	83/17
2015	9.1	4.4	17.12	78/22
2016	8.9	4.4	23.10	76/24
2017	15.3	5.3	22.07	85/15
*percent total pastures in good/poor condition. **Good** = a rating of good or fair. **Poor** = rating of poor or at risk.				

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, 2-2, and 2-3).

Reservoir Unit

Lessee: Watterson
Pastures: East, West

The lessee on the Watterson grazing pastures (Figure 2-3) has been grazing livestock on PacifiCorp property for the 2013-2017 monitoring period (and for a very long time previously as well). Although he has followed the terms of his lease, management changes should be implemented to improve pasture conditions and reduce invasive species such as Russian olive.

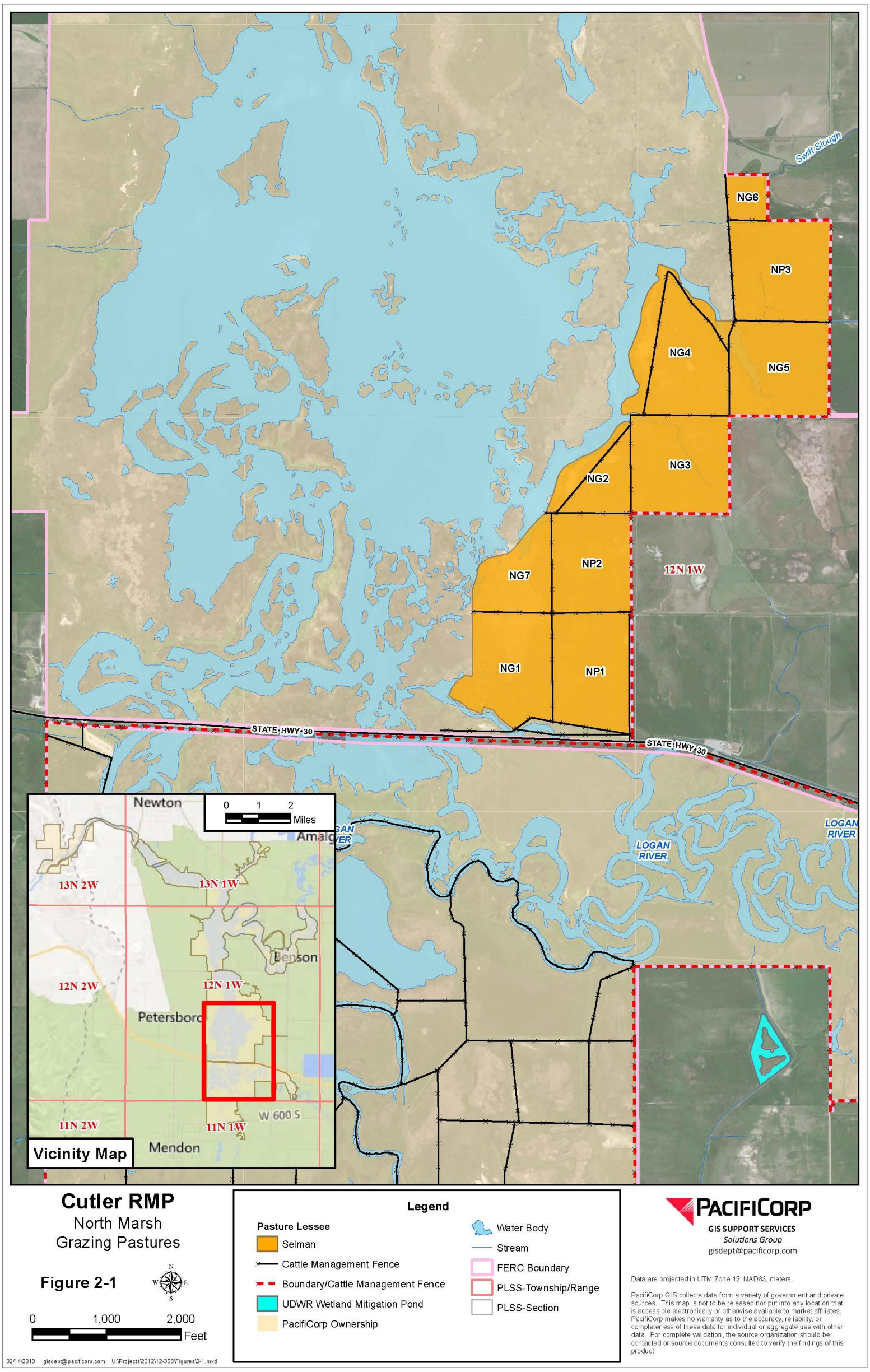
North Marsh

Lessee: Selman
Pastures: NG1, NP1, NG2, NP2, NP3, NG3, NG4, NG5, NG6, NG7

In the North Marsh pastures (Figure 2-1), conditions have not changed from the previous monitoring period

Geese continued to extensively 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. Upland grass species, including intermediate wheatgrass, have slowly been increasing in density and now compose approximately 65 percent of the ground cover. These pastures will continue to be grazed in the fall to allow existing vegetation to produce seed and then be incorporated into the soil.


Swift Slough
NG6
NP3
NG4
NG5
NG3
NG2
NG7
NP2
NG1
NP1
12N 1W
STATE HWY 30
STATE HWY 30
LOGAN RIVER
LOGAN RIVER
Newton
Amalga
0 1 2
Miles
13N 2W
13N 1W
Benson
12N 2W
12N 1W
Petersboro
11N 2W
11N 1W
W 600 S
Mendon
Vicinity Map
Cutler RMP
North Marsh
Grazing Pastures
Figure 2-1
0 1,000 2,000
Feet
Legend
Pasture Lessee
Selman
Cattle Management Fence
Boundary/Cattle Management Fence
UDWR Wetland Mitigation Pond
PacifiCorp Ownership
Water Body
Stream
FERC Boundary
PLSS-Township/Range
PLSS-Section
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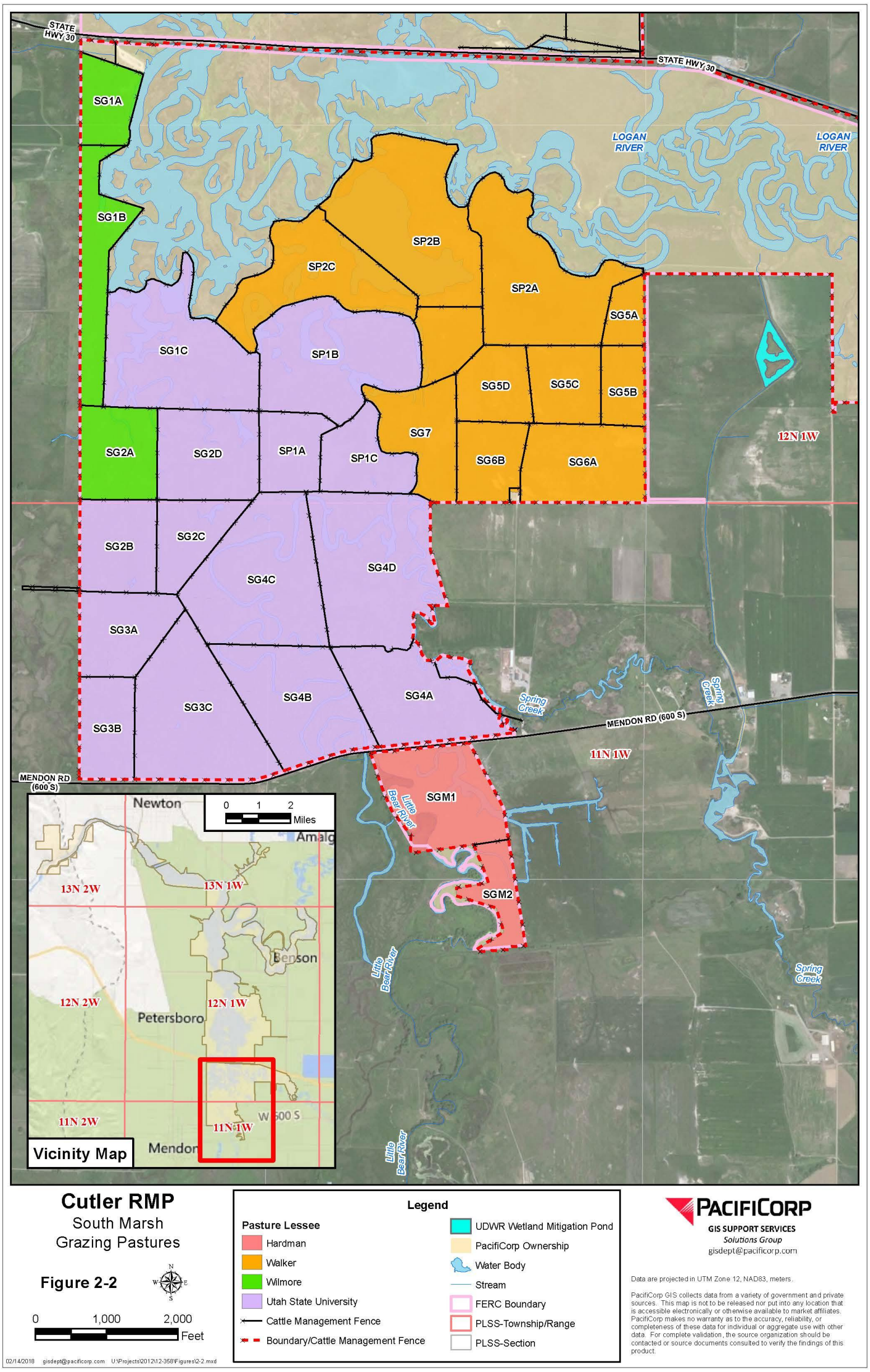
STATE HWY 30
STATE HWY 30
LOGAN RIVER
LOGAN RIVER
SG1A
SG1B
SG1C
SG2A
SG2B
SG2C
SG2D
SG3A
SG3B
SG3C
SG4A
SG4B
SG4C
SG4D
SP1A
SP1B
SP1C
SP2A
SP2B
SP2C
SG5A
SG5B
SG5C
SG5D
SG6A
SG6B
SG7
SGM1
SGM2
12N 1W
11N 1W
MENDON RD (600 S)
Spring Creek
Little Bear River
Newton
Amalg
Benson
Petersboro
Mendon
13N 2W
13N 1W
12N 2W
12N 1W
11N 2W
11N 1W
W 600 S
0 1 2 Miles
Vicinity Map
Cutler RMP
South Marsh
Grazing Pastures
Figure 2-2
0 1,000 2,000 Feet
Legend
Pasture Lessee
Hardman
Walker
Wilmore
Utah State University
Cattle Management Fence
Boundary/Cattle Management Fence
UDWR Wetland Mitigation Pond
PacifiCorp Ownership
Water Body
Stream
FERC Boundary
PLSS-Township/Range
PLSS-Section
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PacifiCorp GIS collects data from a variety of government and private sources. This map is not to be released nor put into any location that is accessible electronically or otherwise available to market affiliates. 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.
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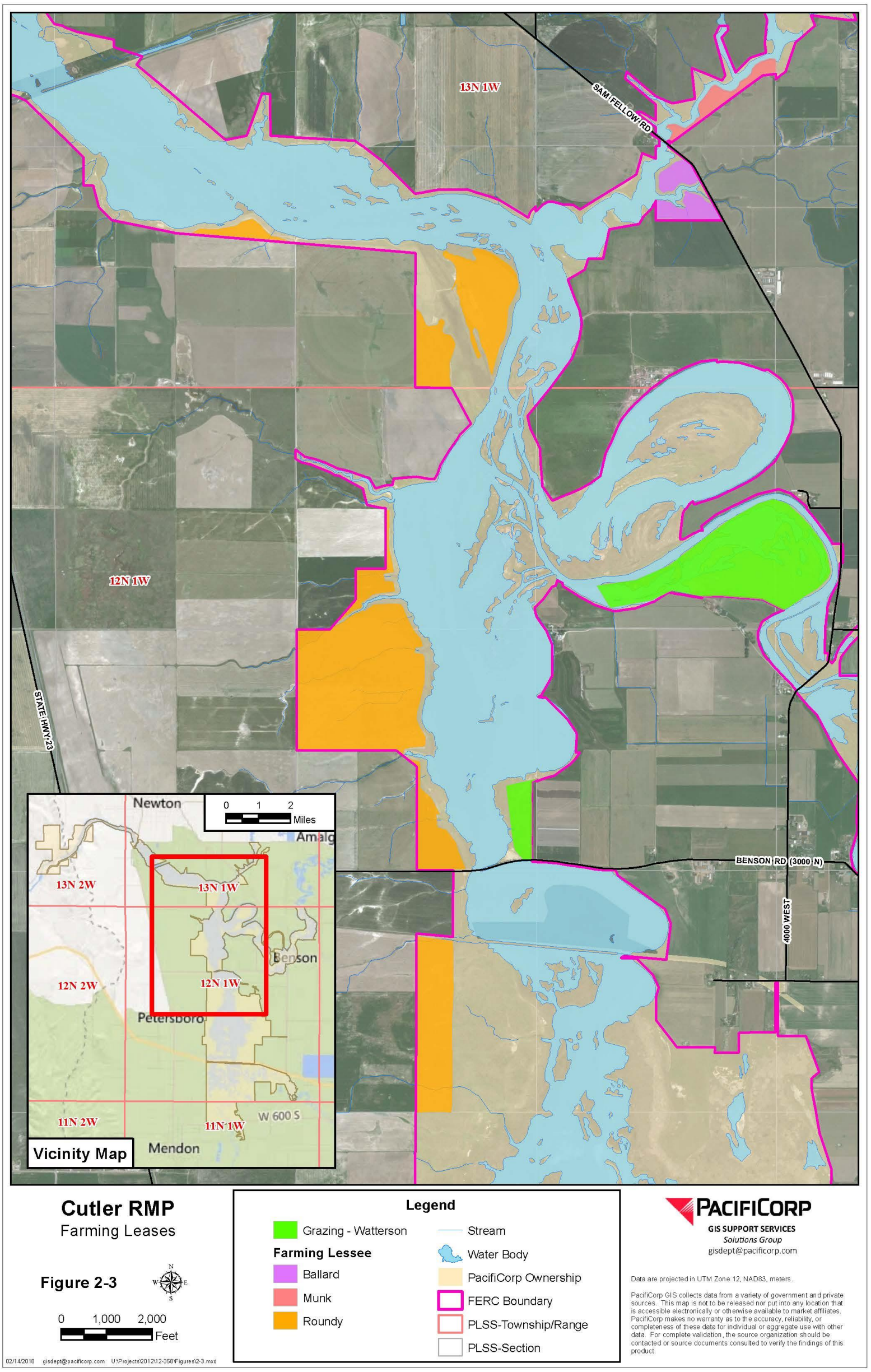
13N 1W
SAM FELLOW RD
12N 1W
STATE HWY 23
BENSON RD (3000 N)
4000 WEST
Newton
Amalg
0 1 2
Miles
13N 2W
13N 1W
Benson
12N 2W
12N 1W
Petersboro
11N 2W
11N 1W
W 600 S
Mendon
Vicinity Map
Cutler RMP
Farming Leases
Figure 2-3
0 1,000 2,000
Feet
Legend
Grazing - Watterson
Farming Lessee
Ballard
Munk
Roundy
Stream
Water Body
PacifiCorp Ownership
FERC Boundary
PLSS-Township/Range
PLSS-Section
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South Marsh

Lessee: Walker
Pasture: SP2A, SP2B, SP2C, SG5A, SG5B, SG5C, SG5D, SG6A, SG6B, SG7

The series of pastures in the North Marsh lease (Figure 2-2) were maintained in good condition over the past five years. Much of this condition can be attributed to adequate irrigation water, in that all pastures can be flooded at least 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 in the fall to promote short, succulent feed for goslings and other waterfowl and shorebirds in spring, and thus decrease goose and other species crop depredation on nearby agricultural lands. SP2A averaged a Robel pole measurement of 2.1 inches in the fall, and for the past five years, hundreds of geese were observed using the pasture during May.

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

South Marsh

Lessee: Wilmore
Pastures: SG1A, SG1B, SG2A

The pastures in this lease (Figure 2-2) have adequate production and maintain their condition in moderate to wet years. 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.

SG1B has shown an increase of forbs less desirable for forage, but not classified as noxious/invasive. It consists of composites including the common sunflower, *Helianthus annus L.* This increasing fraction of the plant community has decreased forage production and is of concern to the grazing lessee.

South Marsh

Lessee: Utah State University
Pastures: SG1C, SG2B, SG2C, SG2D, SG3A, SG3B, SG3C, SG4A, SG4B, SG4C, SG4D, SP1A, SP1B, SP1C

The topography in this lease (Figure 2-2) is variable, and moisture differences between marsh and upland can be difficult to manage, especially in coordination with weed management and pasture reclamation efforts.

The topography also presents a challenge in fencing. Areas that have six feet of water one year may only have six inches the next; several water features (Figure 1-2) are utilized as pasture dividers that may or may not be effective given the water year. Electric fences are often modified to keep cattle in the designated pasture and to eliminate their ability to use multiple pastures at a time. This requires more frequent monitoring by the lessee, which has continually been a challenge during this monitoring period. The lessee is continuing to improve their performance in monitoring their 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, but not the specific area around the base of the existing rookery trees, has increased due to shifting the grazing schedule for these pastures into the late fall. Localized fencing that precludes grazing in areas of regeneration has also helped. These changes are significant in providing a diversity of age classes in woody habitat structure.

South Marsh

Lessee: Hardman

Pastures: SGM1, SGM2

The overall health of these two pastures was very good (Figure 2-2) and they were well maintained over the past five years. The positive working relationship with the lessee proved effective in that they maintained a healthy and growing riparian area along the old Little Bear River floodplain. In an area where the property boundaries are complex, having this effective working relationship with the adjoiner (we have exchanged mutual long-term leases in areas where it would be extremely difficult or even impossible to fence the actual property boundaries) has been particularly valuable.

Overall Findings: Although the health of the majority of the 1,733 acres of grazing lease program pastures overall was rated as good (averaging 82 percent of the pastures of the current five-year monitoring period as compared to 76 percent in the previous monitoring period), adjacent noxious weed issues and neighboring land uses necessitate continued monitoring and preventative measures. These include agreements with neighbors on weed management and rights-of-way use and access issues. Up to another 663 acres may be grazed as part of the wildlife food/cover program; see also Section 2.2.3.

2.2.2 Farming Leases

Farming leases (Figure 2-3) on all 445 acres have continued to improve through application of guidelines and conditions outlined in the RMP. Monitoring and auditing 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 PacifiCorp's Property Management Department.

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 initially in the license period. 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 the property incident tracking protocol. Some non-compliance issues have been resolved but will continue to need monitoring. Currently, there are no individuals farming occupying PacifiCorp lands without a lease within the Cutler project boundaries, or that have actions pending property incident outcomes (see also Section 2.1.1 for additional details). Documentation of farming lease monitoring is available upon request from PacifiCorp Property Management, Salt Lake City NTO.

Overall Findings: Future annual monitoring will continue, as this has proven to be a good mechanism for tracking the condition of this RMP component over time. Encroachments will continue to be managed through ensuring mutual understanding of boundaries, establishing leases, requesting a cease in the encroaching activity, or, if required, civil action. Actions are determined by evaluating resource needs and potential impacts of continued disturbance.

2.2.3 Wildlife Food/Cover Plots

As noted in Section 2.1.6, tightly monitored occasional late-season grazing has supplanted sharecropping for the wildlife food/cover plots, covering up to 663 acres (Figure 1-3). 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, shorebirds, and Sandhill cranes (the target species for this enhancement), that later grazing can often successfully convert tall grass pastures to the desired shorter habitats for spring wildlife utilization, and that grazing is superior to sharecropping by requiring less invasive and intensive land manipulation, and by eliminating bare ground that is subject to sheet flow and other erosive forces. The completed wildlife food/cover plot data (to streamline monitoring activities, sensitive/unique wildlife habitat data forms are 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 nine wildlife food/cover plot pastures currently being monitored (Logan River Pastures 1,2,3, Spring Creek Pastures 1,2,3, Cutler Canyon, Gull Pt., and the 300-acre parcel), eight were in 'good' condition and one (Logan River 2) was in 'fair' condition. See also Section 2.1.6 for additional detail and results related to this monitoring component. Completed data forms are available upon request from PacifiCorp Hydro Resources, Salt Lake City NTO.

Overall Findings: Future annual monitoring will continue, 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, annual spring monitoring only will continue to be utilized rather than the spring and fall monitoring

originally suggested in the 2002 Cutler Monitoring Plan (this change was proposed as part of the Cutler 2008 report).

2.2.4 Cattle Management Fences

The Cutler license and resultant RMP required six miles of cattle management fencing (separate from that described previously for buffer/boundary fences); approximately 21 miles of fence in this category were built to meet the objectives and spirit of the license. Functioning cattle management fences are integral to the success of the overall grazing lease program at Cutler, as grazing is one of the primary tools utilized to create and maintain much of the wildlife habitat available on the project, and appropriate grazing 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/bounding fences, Figure 1-2; 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). As 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 cattle management fences has been changed to manage and document performance and maintenance issues by exception. This information is available upon request from PacifiCorp Hydro Resources, 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 (never earlier than June 1 to allow safe hatching of ground-nesting waterfowl and shorebirds, although occasionally later based on the precipitation, pasture moisture levels, and other variables of a given year). At this time fencing contractors also install, test, and replace as necessary solar chargers and batteries, to ensure adequate fence power. Vegetation commonly grew into the fence during each growing season, reducing its capacity and, therefore, its effectiveness. Contractors mowed electric 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 C-2 (Appendix C) describes the maintenance performed on grazing pasture fences and their condition during the current monitoring period, 2008 to 2012.

Overall Findings: Future annual monitoring will continue, 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

Property coordination monitoring efforts included annual lease review and auditing, documenting and tracking property incidents, and coordinating appropriate responses and resolution of trespass and other property incidents. As stated in Section 2.2.2, at least two

areas have been identified as non-agricultural-related property incidents, and include repeat trespass on and destruction of, a buffer. The Lindley area incident will be addressed with the adjacent landowner and PacifiCorp's legal department if necessary. The other, Rose Oxbow, is an on-going property issue that is currently being addressed through the Army Corps of Engineers and PacifiCorp's legal department, as necessary. Other incidents continue to be addressed and monitored with the cooperation of property agents 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 several buffers. Of the approximately 190 adjacent landowners and lessees within the Cutler project boundaries, property incident monitoring forms are being used to track and document five current issues regarding property management or coordination (approximately 2.5 percent). Appendix C-3 contains a summary table of the property incident forms documented during the current monitoring period. Documentation of property coordination monitoring is available upon request from PacifiCorp Property Management, Salt Lake City NTO.

Overall Findings: Future annual monitoring will continue, 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) was a part of the property coordination monitoring protocol in the Cutler Monitoring Plan (2002) to ensure continuity of relatively long-term and often complex tasks; this measure has been adapted to instead document property incidents as part of the Hydro East license compliance tracking spreadsheet, which is reviewed and updated bi-monthly at a minimum.

2.3 Recreation Site Monitoring Program

In general the recreation sites were in good condition during the current monitoring period. The 15 Cutler recreation sites (three canoe trails, two hiking trails, two boat-in sites, four developed sites, and four primitive sites) (Figure 1-4) were monitored throughout the current monitoring period, 2013-2017, to assess the status of their condition using procedures described in Section 2.0 of the 2002 monitoring report (PacifiCorp 2002). In fall and winter of 2013-2014, and again in 2014-January 2015, the water levels at Cutler reservoir were lowered for maintenance on the dam, which made it possible to inspect the concrete boat launch ramps that would normally be under water. Two ramps, those located at Cutler Canyon and at Benson Marina, required non-routine maintenance work. The Cutler Canyon recreation site ramp needed to be extended five feet, and the Benson Marina ramp needed to be partially replaced. The initial construction work was completed at both locations in the fall of 2014. At Benson Marina the old concrete ramp was removed and placed adjacent to the shoreline, in an area that was being used by the public to launch boats due to the deteriorating conditions of the previous boat launch. This substitute boat launch was damaging the shoreline however, and the removed concrete ramp was placed as a barrier to prevent individuals from launching in this area. In 2016, PacifiCorp determined that the exposed concrete could pose a safety hazard to the public or to maintenance staff, and it was not serving to improve the aesthetics of the site. However, it was also noted during the monitoring period that the removed concrete ramp was being used as a play area by the public as it was in close proximity to the water, and was especially

useful in providing a shallow, protected wading area for children between the two boat docks. Removal of the concrete ramp was difficult due to its large size and weight, and in view of its ongoing recreation use, a new plan was developed for the area to provide for its ongoing, but safer recreational use. In 2017, the concrete ramp was buried with first a road base layer, and then fine sand to create a small beach area for the public to use. The new area was fenced off from the parking area, and buoys will be added in the water (in spring 2018) to prevent boats from entering the area of shoreline between the two boat docks. This will create more opportunities for the public to utilize recreation activities at Benson Marina.

The same reservoir drawdown that allowed for the repair of the two boat ramps, also negatively affected fall reservoir hunting opportunities for two seasons due to the inaccessibility of both boat ramps and large portions of the lowered reservoir. Trapping, fishing, and canoeing recreation activities were also likely affected during the two drawdown periods, at least in portions of the area.

The spring of 2017 saw high levels of runoff from a record-level snow pack due to warm temperatures and above average early rainfall. During the spring monitoring period both the Logan and Bear rivers experienced record water flows resulting in some localized flooding. The Logan River Recreation site and Upper Bear Recreation site were both partially inundated with water, making them unusable for a period and both required repairs to boat ramps and parking areas. In the summer of 2017, after the spring recreation monitoring period, the RR Trail foot bridge was damaged by vandalism. The bridge was set on fire from below, causing extensive damage to portions of the middle section of the bridge. This resulted in the bridge being closed for most of the 2017 season until repairs could be completed in the fall of 2017. All other sites exhibited good conditions in general and required minor maintenance as documented by the monitoring.

Use of the recreation sites has increased greatly over the past five years, based on FERC Form 80 data (see Appendix D-3 for a link to these data). This is due in part to the population increase in Cache Valley, and in part to the prevalence of alternative recreation locations being fee-based for activities such as hunting and boating, as well as the opportunities Cutler presents for convenient access for recreation, including hiking, birding, fishing, and canoeing. The highest use times occur during the waterfowl and pheasant hunting seasons, followed by the spring season. It is not uncommon for parking lots to be at or over capacity, particularly in the early days of a new hunting season. FERC Form 80 documentation, which quantitatively tracks recreation site visitation and use, is required on a six-year cycle and was collected in 2014, and submitted in early 2015. The compiled 2014 results indicated Cutler had 212,786 annual visitor days, with a peak weekend average of 371 visits/day (see Appendix D-3 for a link to these data). FERC Form 80 data will be collected and compiled next in 2020 for submission in 2021.

The sites are also being increasingly used by organized groups such as local universities and primary or secondary schools for science classes studying the characteristics of wetland or aquatic ecosystems and water quality, and for university research projects. Additional special uses of Cutler over the past five-year period have included: dog trial

competitions, fishing competitions, multiple Eagle Scout and other service projects, and similar events. In order to accommodate these increasing special requests (both commercial and not-for-profit) to use portions of the Cutler project area, PacifiCorp created a Temporary Special Use Permit application form that ensures permittees and their participants are aware of any relevant special requirements or resource constraints, and that they have the appropriate insurance and risk management coverage to minimize company liability on PacifiCorp property.

In order to maintain aesthetic sites, the Cutler Hydroelectric Plant personnel complete weekly inspections of each Recreation site to go along with ongoing PacifiCorp spring and fall yearly monitoring. Throughout this monitoring period minor site improvements were made, which included adding more gravel at all major parking areas, and bare ground herbicide treatments to parking areas. Damaged signs were repaired and new signs installed where applicable. Sign boards at each site contain maps, FERC Form 80 information, and new regulations concerning motorized and drone usage in various areas of the reservoir.

Efforts to control noxious weeds around recreation sites was an area of concern noted in the previous five-year report. For the most part noxious weeds were controlled in these areas. Concerns noted through monitoring included heavy uses of the RR Trail and bridge area. This is leading to large amounts of trash and other items left behind. Also fire pits created at recreation sites is of concern, with both debris left behind and the increased risk of fire danger.

The condition of the recreation sites and any maintenance that occurred were recorded, and are available upon request from PacifiCorp Hydro Resources, 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 cleanup and removal 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 completed by project per year can be found in Appendix D-1.

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 other changes to the recreation site monitoring protocol are suggested. FERC Form 80 monitoring will proceed as scheduled, with data collection and analysis occurring next in 2020, and results submitted in 2021.

2.4 Wetland Mitigation Monitoring Program

As noted previously in this report and as detailed in the 2013 five-year report, 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 detail 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 landowner.

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 they were installed in 1995. Cooperative electrofishing monitoring activities with UDWR recorded a few game fish in the vicinity of the structures in 1996. The species found in close proximity to the habitat 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 high numbers of carp and no game fish were recorded (Table 3-4, PacifiCorp 2002).

Note that the earlier 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 would likely continue to be limited by poor water quality and low numbers of forage fish, per 1996 agreement with UDWR (see PacifiCorp 2002 for additional detail). Further, additional and more recent (2007-2012) fishery monitoring efforts by USU aquatic ecology professors and students reflect greater diversity than believed, but also describe a very eutrophic and potentially deteriorating system due to human impacts on water quality and ecology at Cutler. Summaries of the 2007-2012 fisheries and limnology data are included in Appendix F of the 2013 five-year report.

As noted previously, the other two original Fish Habitat Structure Monitoring Plan elements (angler use/creel surveys and visual inspections of the structures) were suspended per agreement with UDWR based on estimates of fisheries use, and following a major drawdown in 2008 (PacifiCorp 2008 and PacifiCorp 2012).

Although PacifiCorp and UDWR monitoring during the 2008 drawdown (which went up to 8 feet lower than the 2013-2014 and 2014-2015 drawdowns) did not locate the fish habitat structures, and resulted in the subsequent agreement to suspend the fish structure monitoring as a part of the last (2013) five-year report, PacifiCorp staff again looked for the fish structures during the 2013 and 2014 drawdowns, again unsuccessfully. This outcome supports the agreement to suspend this monitoring element due to ineffectiveness;

also, there are currently no plans for a major reservoir drawdown in the next (2018-2022) monitoring period.

Overall Findings: Future monitoring of fish habitat structures during major drawdowns has been suspended as it is currently not effective. Per agreement with UDWR, angler surveys have been deferred until angler use increases to a point where adequate data can be collected.

2.6 Water Quality Enhancement Monitoring Program

Water quality monitoring results for the current monitoring period include the samples taken quarterly in 2008 and 2013, per the Cutler license, as well as those collected during the initial annual quarterly phase (1996-1998 and 2000-2003). The next water quality sampling period is currently underway in 2018, again, quarterly per the license. Quarterly sampling will be conducted every fifth year (currently in 2018 and lastly in 2023) through the end of the license; analysis and results will be included in future monitoring reports (the 2018 results will be included in the 2023 Cutler five-year report. The information in this section is a summary and synthesis of the 2013 water quality monitoring; Appendix E includes the full results of the 2013 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 Little Bear River, Spring Creek, Logan River, Bear River, Cutler Reservoir at Benson Marina, Cutler Reservoir east of Highway 23, Cutler Reservoir south of Swift Slough, and Bear River below Cutler Dam (see Figure 1, Appendix E). Chemical parameters include nutrient concentrations of phosphorus (total and orthophosphate), nitrogen as NO_3, NO_2, and NH_3, and physical parameters including temperature, total suspended solids, and dissolved oxygen (DO) values. The samples were collected quarterly during four monitoring periods (1996–1998, 2000–2003, 2008, and 2013; initially annually, and subsequently at five-year intervals). These monitoring periods are characterized by varied hydrologic conditions, based on water entering Cutler Reservoir from the Bear River (primarily) and other tributaries 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. The hydrologic periods in 2008 and 2013 were characterized by low flows, with 2008 and 2013 being relatively dry years. Future samples will be collected quarterly at five-year intervals throughout the remainder of the license (the current monitoring starting in January of 2018, and the final period which is planned for 2023),

Differences in water quality parameters between the various monitoring periods are most likely related to the marked difference in hydrologic conditions. Data collected in 2008 and 2013 generally indicate increased temperature, decreased flows, increased pH, increased coliform bacteria, and decreased concentrations of phosphorus throughout the Cutler Reservoir system compared to the earlier (1996-2003) monitoring periods. Only small differences in nitrate nitrogen and total nitrogen and DO were noted between the

monitoring periods; turbidity was not measured until 2008, and differences in turbidity are notably greater when compared seasonally than compared across years.

Water quality varied by season and hydroperiod for most parameters analyzed across monitoring periods; 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 spring season while nutrient concentrations at some sites, including Cutler Reservoir, are generally highest in the summer season.

Data collected over the various monitoring periods between 1996 and 2013 indicate that water quality in the southern tributaries, specifically Spring Creek and the Little Bear River, and Swift Slough have dramatic impacts on water quality throughout Cutler Reservoir. Spring Creek continues to have significantly higher tributary nutrient concentrations as compared to the other sampling locations within the watershed. Water quality in the southern (south of Benson Marina) and northern (north of Benson Marina) sections of the reservoir remains markedly different with the south being characterized by higher nutrient concentrations, higher turbidity, and lower DO. High nutrient loads to the southern reservoir are partly from point source discharges in Spring Creek (e.g., the meat-packing plant) and Swift Slough (Logan City and Service Area Wastewater Treatment discharge). Due to slow-moving water and the shallow nature of the southern reservoir (1.8 feet mean depth), reservoir sediments are likely to exert a greater influence on water quality there than in the faster-flowing and deeper northern reservoir (3.6 feet mean depth).

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 overall 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) focused on the development and implementation of a TMDL for the Bear River upstream to the state line and Cutler Reservoir proper, greater efforts through collaboration and cooperation should continue to 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, five-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 occurring currently in 2018, and per the methodology recommendations of the 2003 data analysis and review. Note that the previous 2013 five-year report discussed the Logan City 2017 compliance schedule to meet new TMDL limit targets, which, along with other TMDL plan implementation, was proposed to start to

reduce the high nutrient loading of Cutler Reservoir. That compliance schedule has been delayed to 2020, but is still anticipated to help to reduce the overall nutrient loading in the Reservoir.

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), PacifiCorp determined that the annual summary of results of water level monitoring would necessarily be submitted to FERC independently of this report. Average daily reservoir elevations are compiled, analyzed, and reported to FERC by December 31 of each year (links to the reports are included in Appendix F). Note that there were two major drawdowns required during the 2013-2017 monitoring period, both to facilitate required work on the Cutler dam spillway gates. The drawdowns occurred in the late fall and winter of 2013-2014 and 2014-2015; both are evident in the associated annual water elevation reports.

Overall Findings: Future annual monitoring will continue, 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 five-year reports.

3.0 MONITORING PLAN AND SCHEDULE FOR NEXT FIVE-YEAR RMP IMPLEMENTATION PERIOD

The RMP required monitoring to gauge success and stability of the seven implementation programs described in the first Cutler five-year report (2002):

- 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 five-year report and as modified in the 2008 report, 2) modifications to routine monitoring that will occur during the next five-year RMP implementation period (2018-2022), and 3) additional license compliance needs identified during the current five-year RMP implementation period (2013-2017).

Monitoring typically occurs either annually or biannually. An exception, water quality monitoring, is conducted quarterly every fifth year. Monitoring of fish habitat structures, by 1996 letter agreement with UDWR, and subsequently in 2008, has been suspended. Similarly, in 1996 UDWR also agreed to wait to conduct angler use (creel) surveys until sufficient anglers/fisheries management issues/questions are present to warrant the activity.

Detailed monitoring protocols, tasks, and schedules are provided in Section 1.2 of the 2002 report, and are summarized in Table 1-3 of this report. Unless specified in Table 3-1, monitoring during 2018-2022 will follow protocols established in the 2002 Cutler five-year report.

Table 3-1. Cutler Monitoring Plan and Schedule (2018-2023).

Task Name	Task Description	Task Frequency	Task Duration
Vegetation Enhancement Program Monitoring			
Shoreline Buffer	1. Continue routine monitoring for the 55 buffer parcels according to Section 2.1.1, in PacifiCorp 2002.	Annual	May 1-Jul 31
	2. Continue to address concerns at chronic buffer encroachment areas (Church Farm, Lindley, etc.), based on annual monitoring findings.	Ongoing	
Woody Vegetation	1. Continue routine Phase I monitoring at 'good', 'marginal', and 'poor' 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 pocket Valley View; assess South Marsh results for Phase II if 2018-2020 monitoring results warrant; continue at previously 'established' sites (see Section 2.1.2, PacifiCorp 2002).	Annual	May 1-May 31
	3. Evaluate augmentation actions at Peterson site, also visit RR Trail and Cutler Marsh sites to evaluate recent spray damage.	May 1-May 31 2018	
Bank Stabilization	1. Continue routine monitoring according to Section 2.1.3 in PacifiCorp 2002.	Annual	Jun 1-Jun 30
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 replacement buffer/boundary fences/posts at problem buffer/boundary areas.	Ongoing	
	3. Scope and delineate property boundary on south side Cutler Canyon parcels.	Summer 2020-2023	
	4. Resolve discrepancies between the number of currently monitored buffer/boundary fences and the number in the GIS database.	Winter 2018	
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
All Vegetation Enhancement Program components	1. Address database correction/completion/discrepancy issues for all components.	2019-2020	

Table 3-1. Cutler Monitoring Plan and Schedule (2018-2023).

Task Name	Task Description	Task Frequency	Task Duration
Agricultural Lease Program Monitoring			
Grazing Leases	1. Continue routine monitoring according to Section 2.2.1 in PacifiCorp 2002; continue 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 chronic trespass sites as needed to prevent encroachment.	Ongoing	
Wildlife Food/Cover Plots (spring)	1. Continue routine monitoring according to Section 2.2.3 in PacifiCorp 2002.	Annual** [**Changed from twice/year, to once, spring-only in 2008.]	May 1- June 30
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 and on-going property coordination tasks according to Section 2.2.5 in PacifiCorp 2002.	Annual	Jan 1-Dec 31
	2. Enter Property Management tasks into the Hydro License Compliance spreadsheet to ensure continuity of relatively long-term and complex tasks	Ongoing	
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
	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 as needed.	Annual	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 and Primitive 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

Table 3-1. Cutler Monitoring Plan and Schedule (2018-2023).

Task Name	Task Description	Task Frequency	Task Duration
Wetland Mitigation Program Monitoring: Program is complete and no more monitoring will occur.			
Fish Habitat Structure Program Monitoring			
	1. Suspend monitoring plan element to monitor fish habitat structures during potential large magnitude reservoir drawdowns suspended	Per 2013 agency concurrence	n/a
	2. Continue to defer angler use surveys, per agreement with UDWR.	Continue to defer, per 2008 and 2013 agency consultation	n/a
Water Quality Monitoring			
Quarterly Monitoring	1. Monitor water quality quarterly during 2018. Next quarterly monitoring due 2023 (for 2018 sampling, data analyzed and report written in 2019 and included in 2023 Cutler five-year report). • Continue to utilize two additional sampling sites (Northern Reservoir Segment and the Southern Reservoir Segment's North Marsh Unit, per the 2003 report) to address water quality concerns in Cutler Reservoir as identified in the current TMDL process. • Monitor water quality according to the quarterly sampling period, which adds one a 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 G Water Quality.	5-year interval; data collected quarterly	Jan 1, 2018- Jan 1, 2019
	2. Ensure water quality sampling monitoring contracts/budget are in place in previous year to next required sampling.	Jan 2022	
Implementation of Cutler Total Maximum Daily Load (TMDL) limits.	1. Participate in and track Cutler TMDL implementation.	quarterly meetings, as scheduled	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

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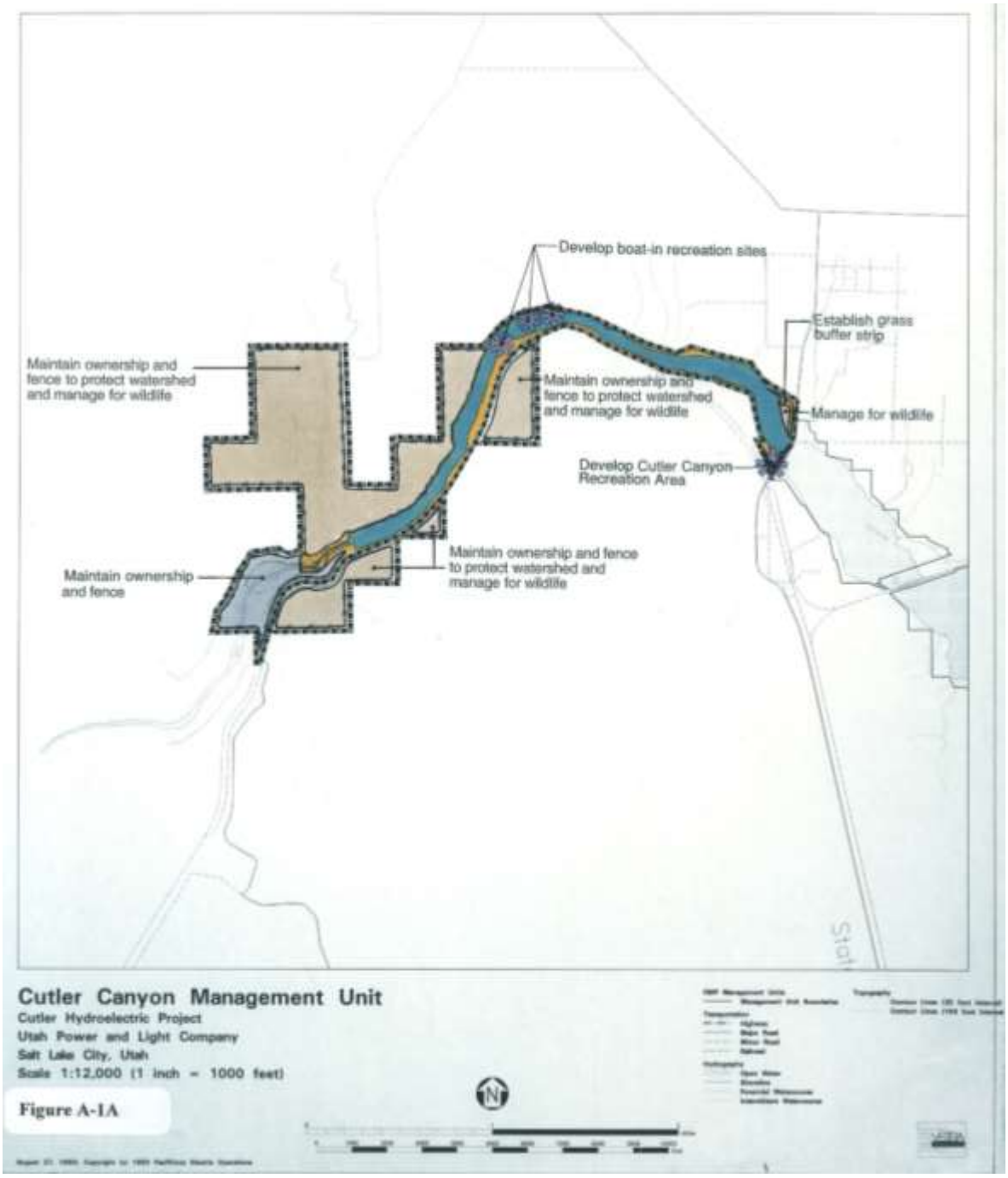
APPENDIX A

COMPARISON MAPS

COMPARISON MAPS

The series of maps that follows includes the original conceptual drawings (“A” series) of the Cutler RMP management units paired with the ‘as built’ versions (“B” series) and is presented for side-by-side comparison.


Develop boat-in recreation sites
Establish grass buffer strip
Maintain ownership and fence to protect watershed and manage for wildlife
Maintain ownership and fence to protect watershed and manage for wildlife
Manage for wildlife
Develop Cutler Canyon Recreation Area
Maintain ownership and fence to protect watershed and manage for wildlife
Maintain ownership and fence
Cutler Canyon Management Unit
Cutler Hydroelectric Project
Utah Power and Light Company
Salt Lake City, Utah
Scale 1:12,000 (1 inch = 1000 feet)
Figure A-1A

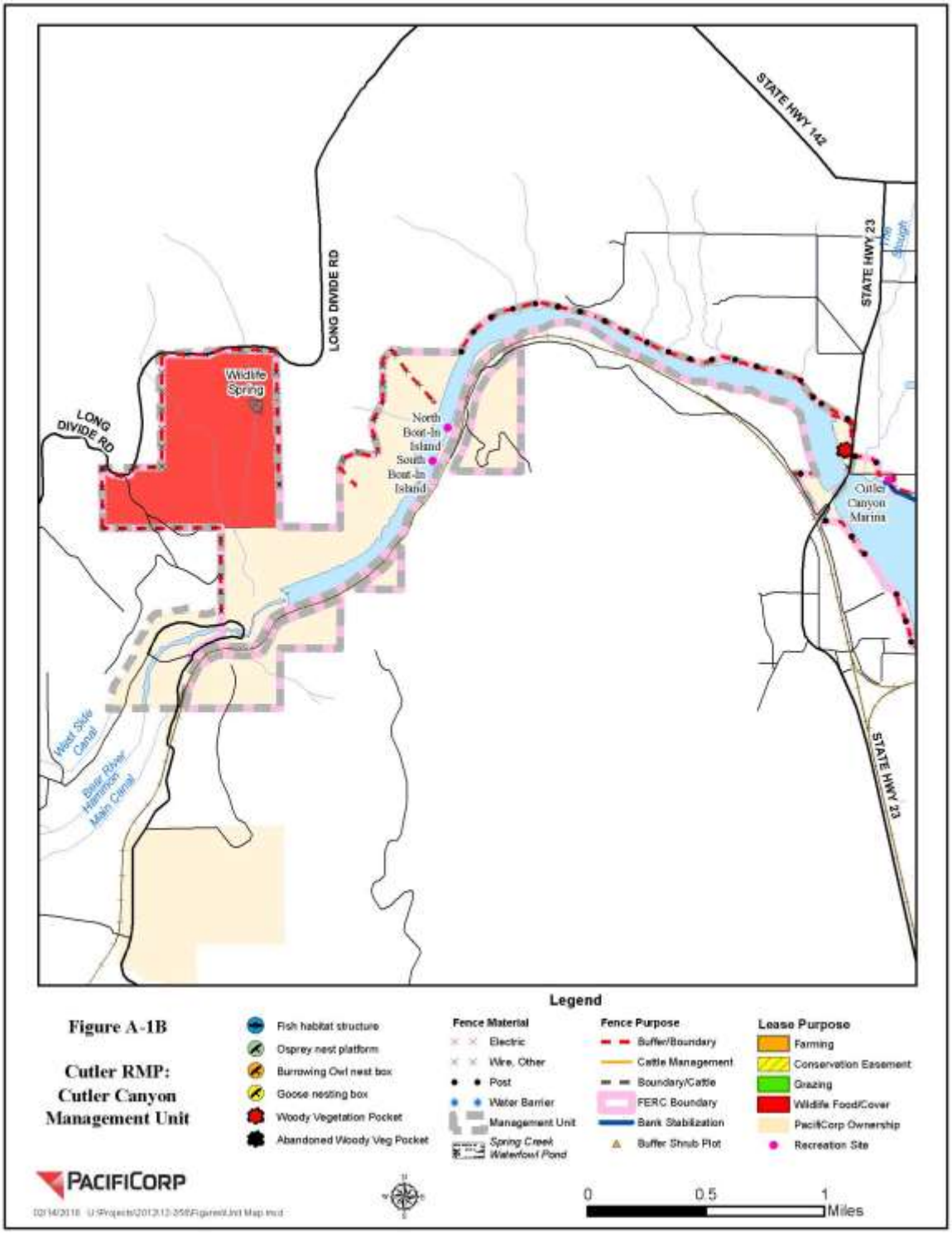
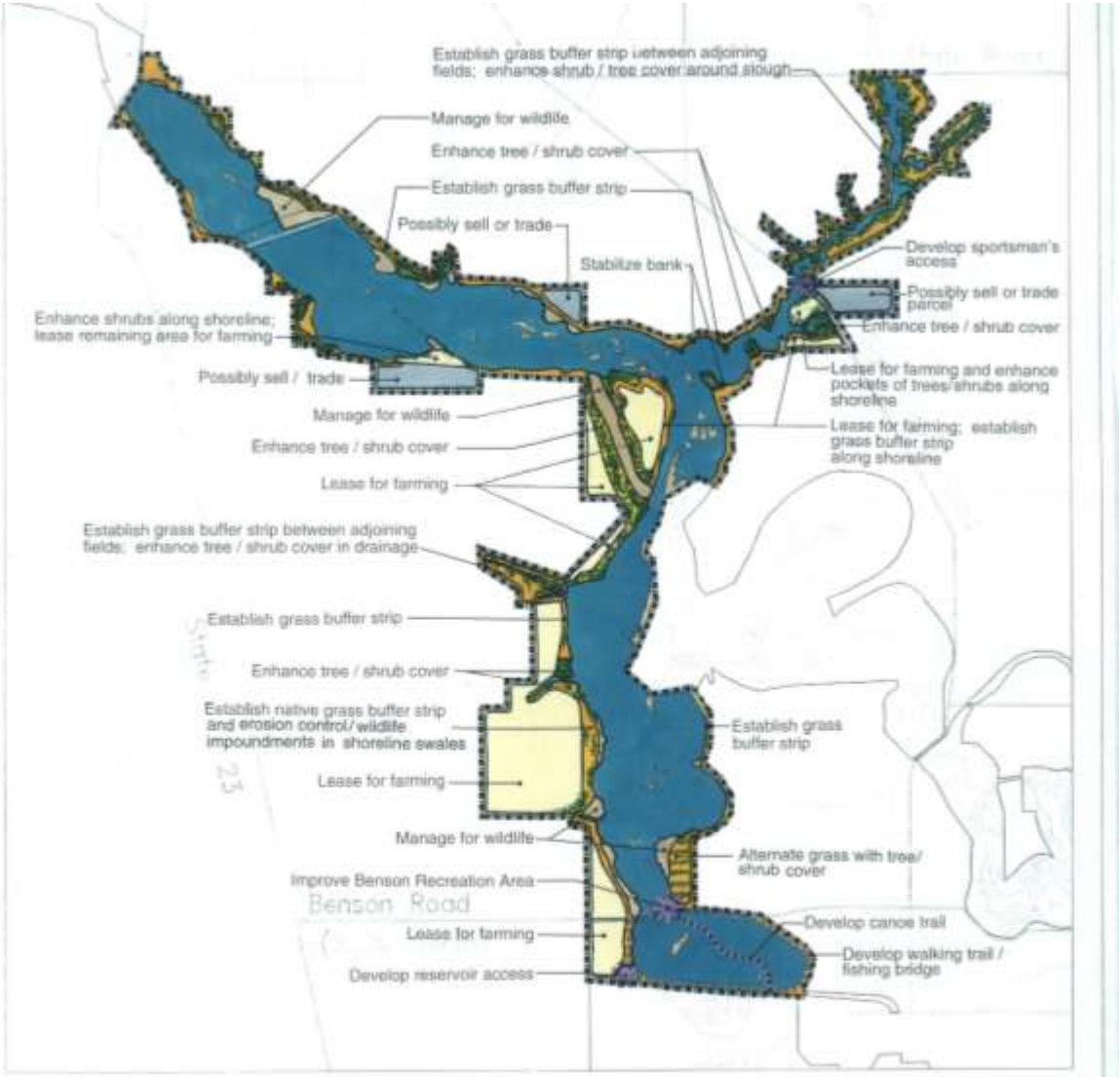


Figure A-1B

Cutler RMP: Cutler Canyon Management Unit

PACIFICORP

02/14/2018 U:\Projects\2012\12-256\Figures\Unit Map.mxd



Main Reservoir Management Unit
Cutler Hydroelectric Project
Utah Power and Light Company
Salt Lake City, Utah
Scale 1:12,000 (1 inch = 1000 feet)

Figure A-2A

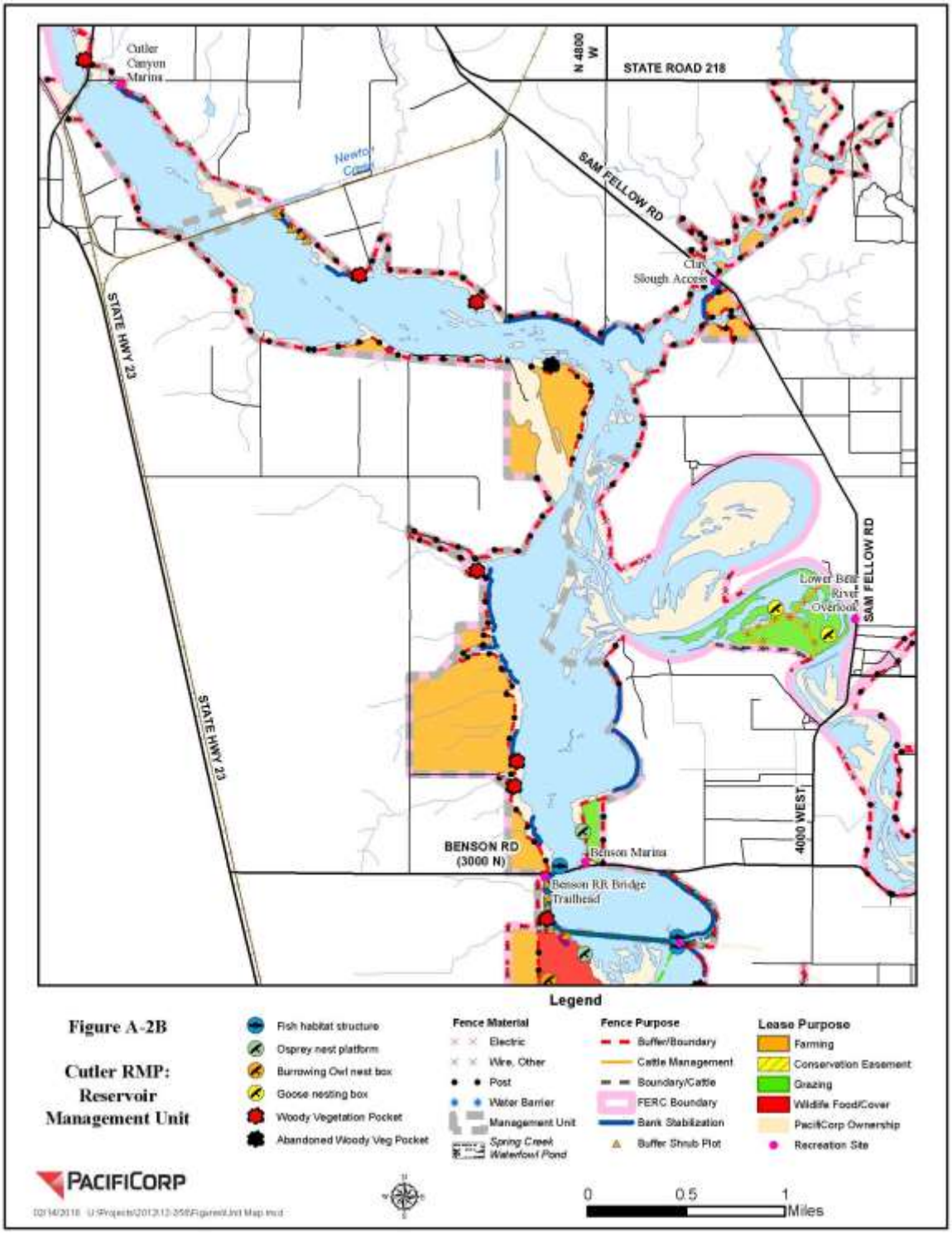
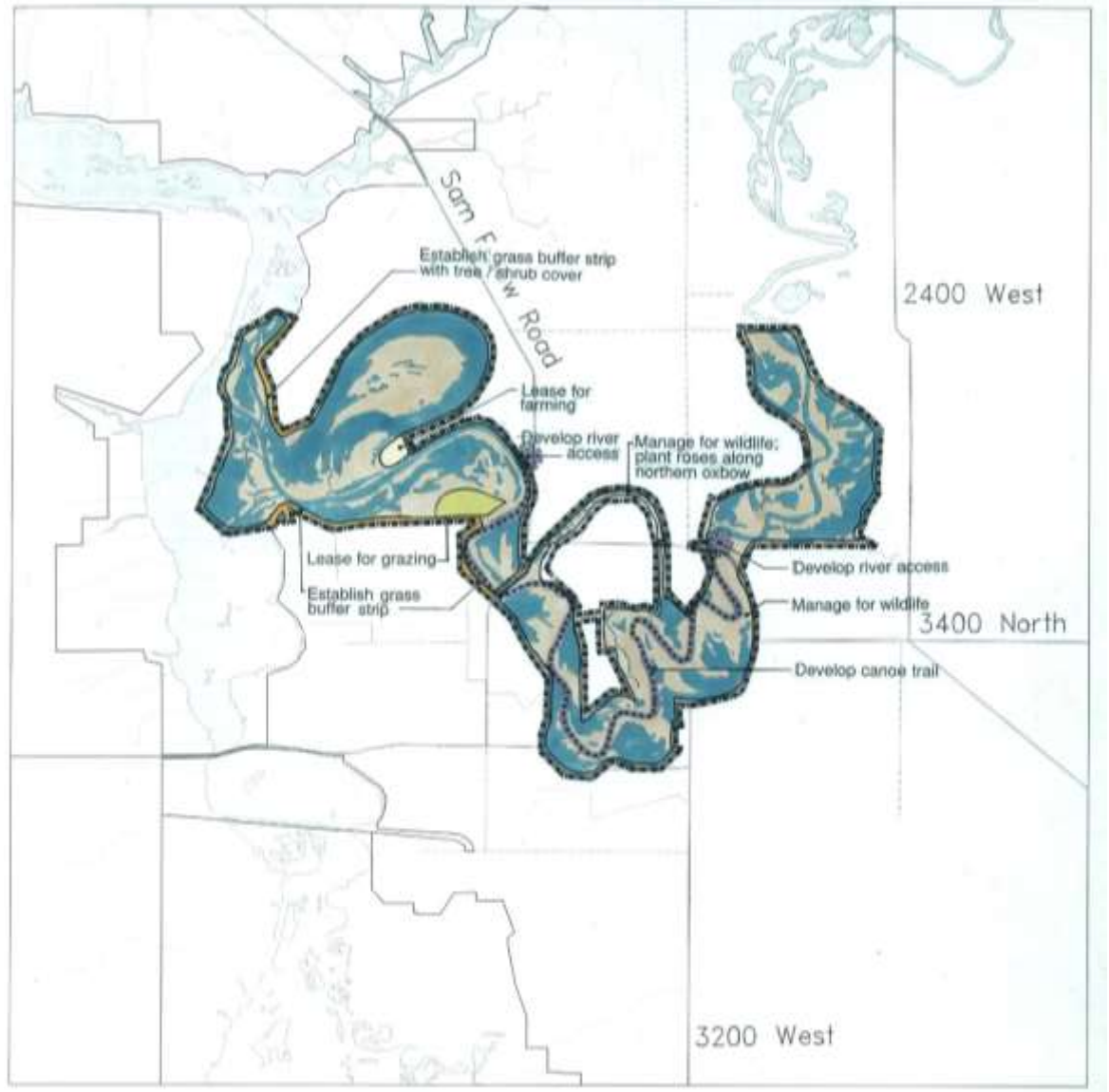


Figure A-2B

Cutler RMP: Reservoir Management Unit



Bear River Management Unit
Cutler Hydroelectric Project
Utah Power and Light Company
Salt Lake City, Utah
Scale 1:12,000 (1 inch = 1000 feet)

Figure A-3A

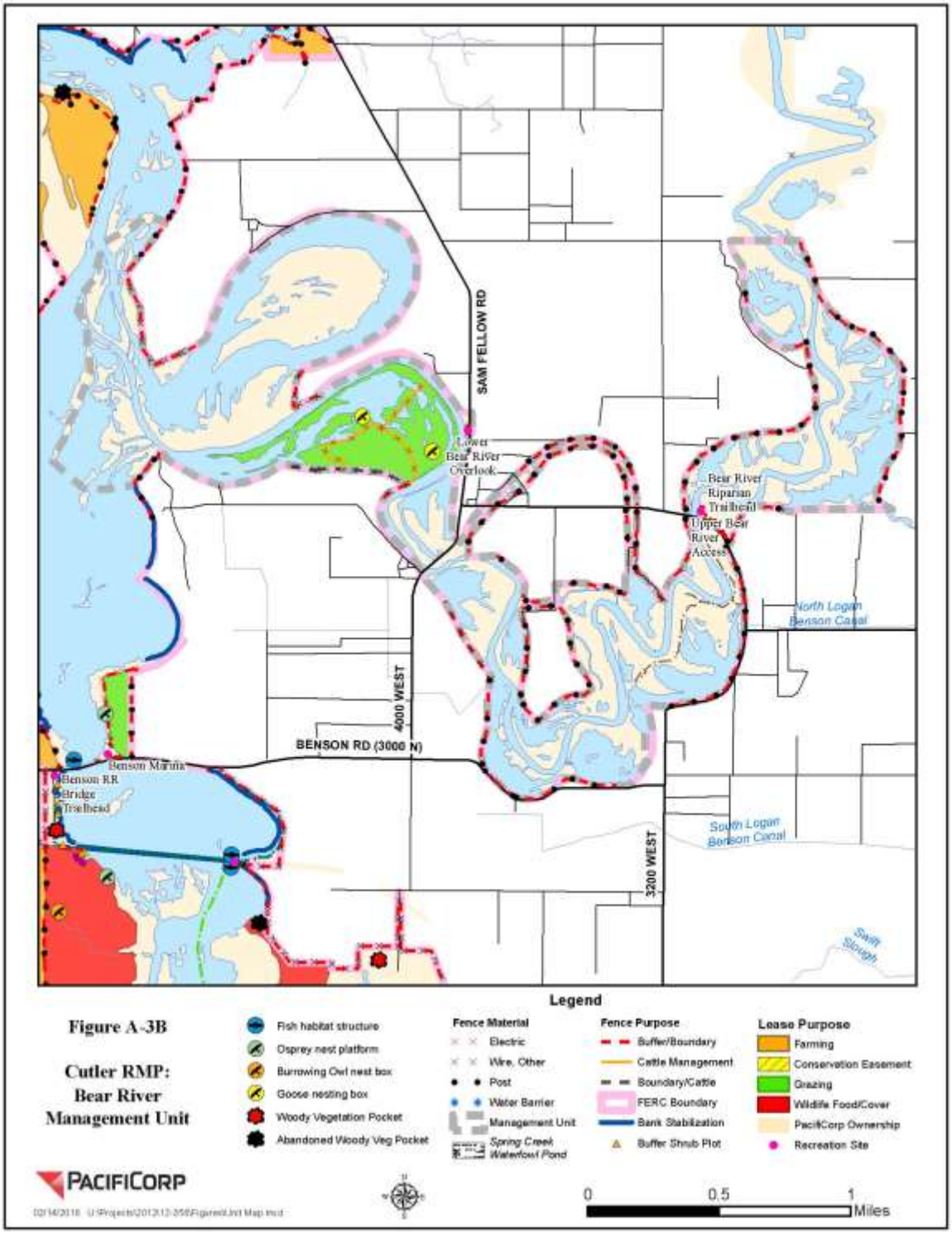
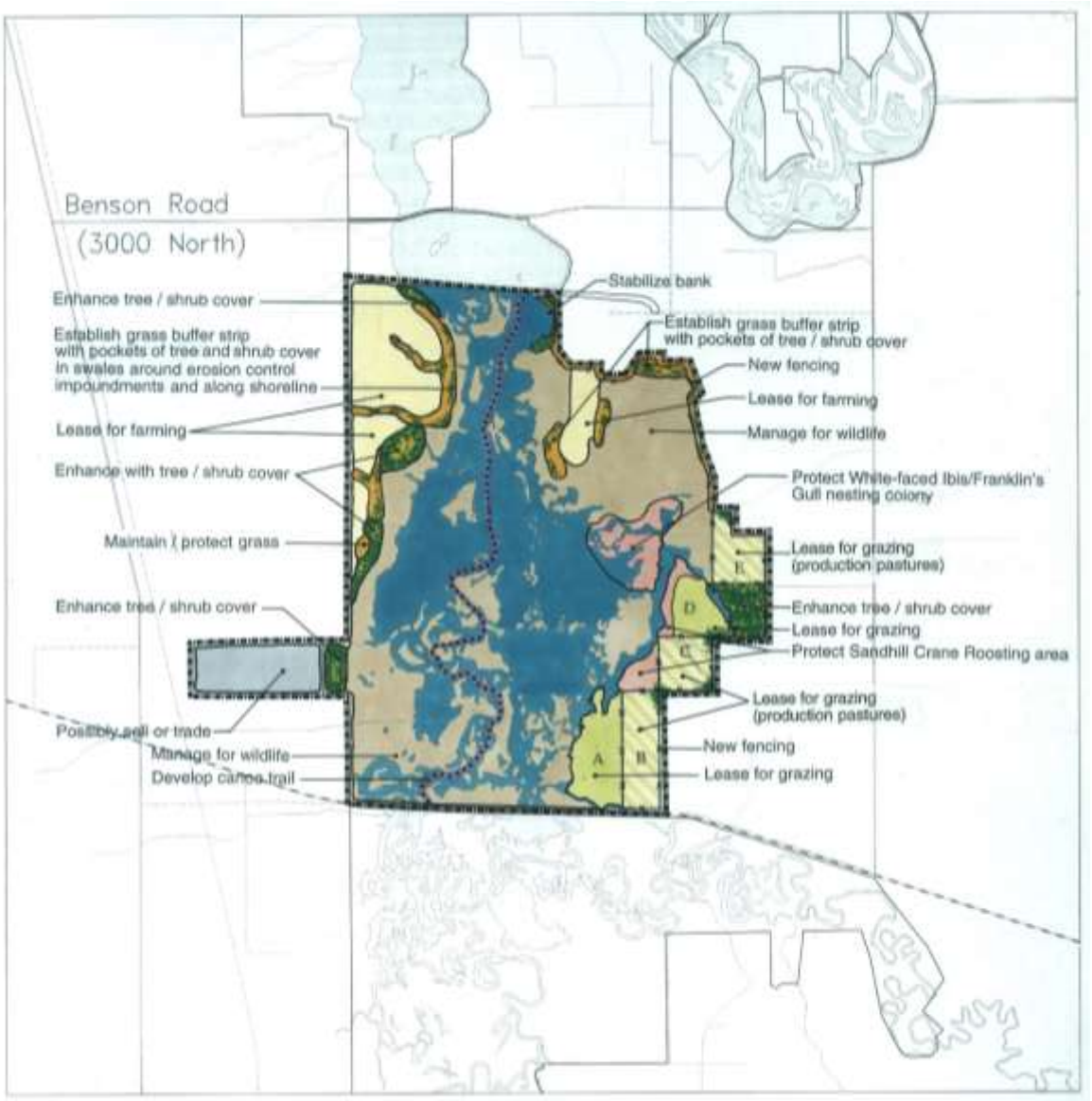


Figure A-3B

Cutler RMP: Bear River Management Unit



North Marsh Management Unit
Cutler Hydroelectric Project
Utah Power and Light Company
Salt Lake City, Utah
Scale 1:12,000 (1 inch = 1000 feet)

Figure A-4A

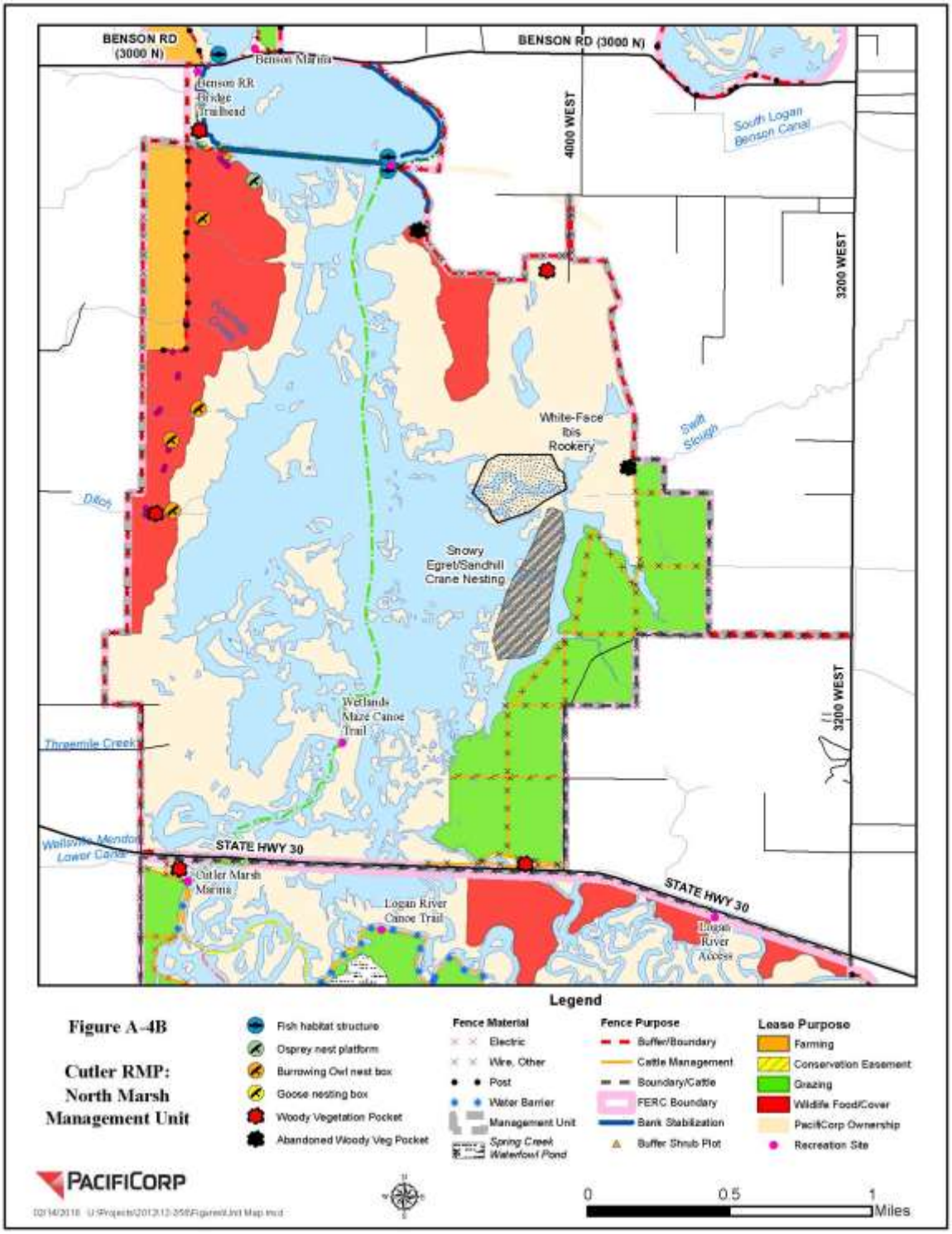
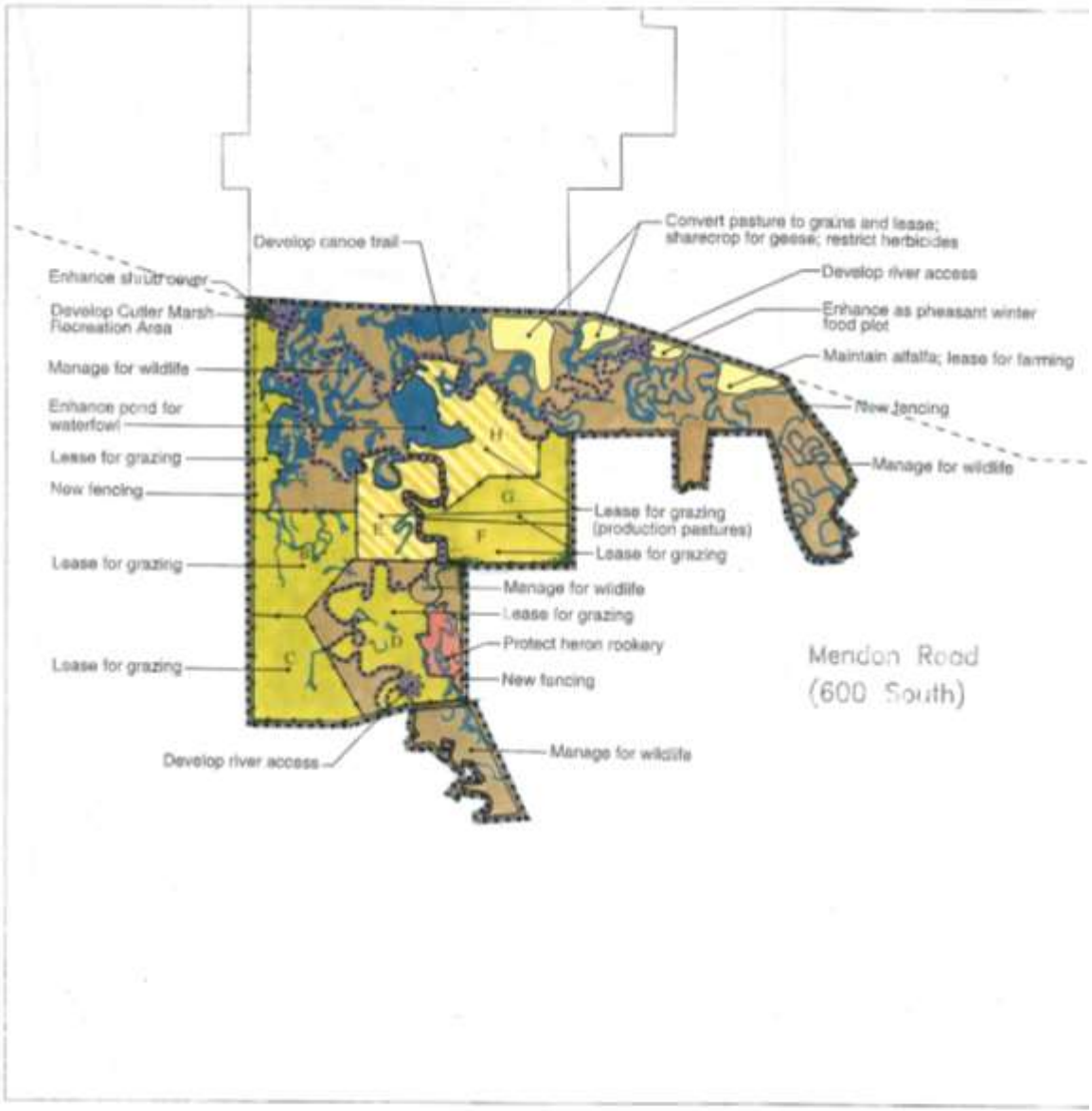


Figure A-4B

Cutler RMP: North Marsh Management Unit



South Marsh Management Unit
Cutler Hydroelectric Project
Utah Power and Light Company
Salt Lake City, Utah
Scale 1:12,000 (1 inch = 1000 feet)

Figure A-5A

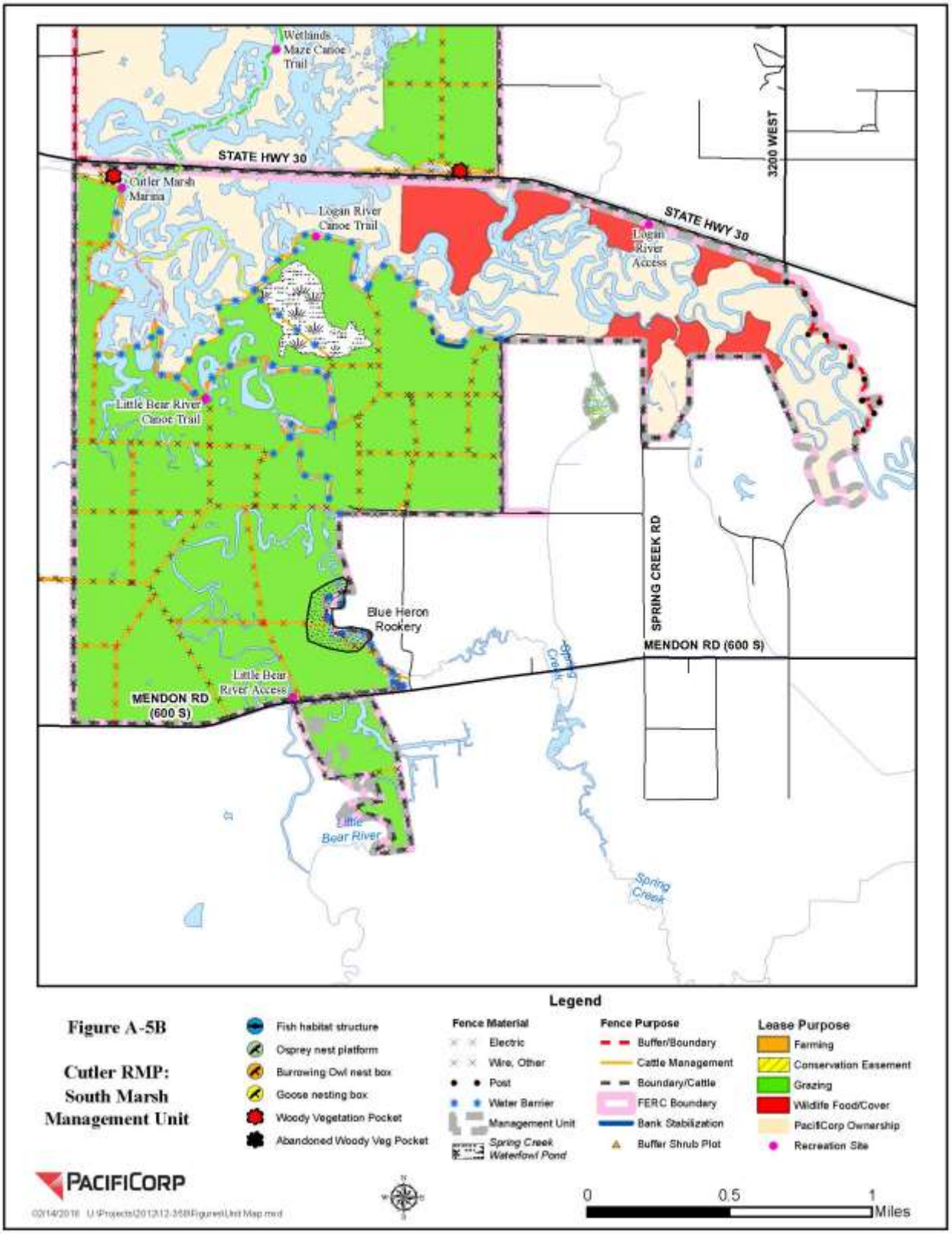


Figure A-5B

Cutler RMP: South Marsh Management Unit

PACIFICORP

02/14/2018 U:\Projects\2012\12-358\Figures\Unit Map.mxd

APPENDIX B

VEGETATION ENHANCEMENT PROGRAM

APPENDIX B-1: SHORELINE BUFFERS

APPENDIX B-2: BANK STABILIZATION

APPENDIX B-3: BOUNDARY BUFFER FENCES

APPENDIX B-1

SHORELINE BUFFERS

Table B-1 presents a summary of the overall condition of buffer parcels created as part of the vegetation enhancement program, including 2002 (baseline) and 2013-2017 data.

Table B-1. Buffer Parcel Overall Condition By Year.							
Buffer Identification		**Buffer Condition**					
ID No.	**Bank Name**	**2002 (baseline)**	**2013**	**2014**	**2015**	**2016**	**2017**
1	North Marsh West	Good	Good	Good	Good	Good	Good
2	Roundy CRP	Poor	Good	Good	Good	Good	Good
3	Roundy 300 ac	Good	Good	Good	Good	Good	Good
4	Railroad Trail West	Good	Good	Good	Good	Good	Good
5	Roundy Middle	Good	Good	Good	Good	Good	Good
6	Clay Slough	Poor	Poor	Poor	Poor	Poor	Fair
7	Roundy Big Bend	Good	Good	Good	Good	Good	Good
8	Roundy North	Poor	Good	Good	Good	Good	Good
9	M Rigby	Poor	Fair	Fair	Fair	Fair	Fair
10	Griffin	Poor	At-Risk	Poor	Poor	Poor	Poor
11	B Ballard	At-Risk	Fair	Fair	Fair	Fair	Good
12	B Ballard North	Poor	Fair	Fair	Good	Good	Good
13	Newton Substation	Poor	Fair	At-Risk	Good	Excellent	Excellent
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	Good	Fair	Good	Good	Good
18	Val J. Rigby	Poor	Good	Good	Good	Good	Good
19	Stewart	At-Risk	Good	Good	Fair	Good	Good
20	Seamons	Good	Good	Good	Good	Good	Good
21	Rasmussen	Good	Good	Good	Good	Good	Good
22	Lindley	Poor	Poor	Poor	Poor	At-Risk	At-Risk
23	Munk	Good	Good	Good	Good	Good	Good
24	T Ballard	At-Risk	Good	Good	Good	Good	Good
25	T. Ballard South	At-Risk	Good	Good	Good	Good	Good
26	Church Farm	Good	At-Risk	Good	Good	Good	Good
27	Watterson House	Good	Good	Good	Good	Good	Good
28	Benson/Watterson	Good	Good	Good	Good	Good	Good
29	Archibald	At-Risk	Good	Good	Fair	Fair	Good
30	Larson (J shape)	Poor	Good	Good	Good	Good	Good
31	Gull Point	Good	Good	Good	Good	Good	Good
32	Watterson 100 AC	Poor	Fair	Fair	Fair	Fair	Fair
33	Rose Oxbow	Good	At-Risk	At-Risk	At-Risk	At-Risk	At-Risk
34	H. Falslev Island	Good	Good	Good	Fair	Good	Good
35	B. Reese	Good	Good	Good	Good	Good	Good
36	R. Reese	Excellent	Good	Good	Good	Good	Good
37	Thayne Gate	Poor	Fair	Fair	Good	Fair	Good
38	J Allen	Good	Excellent	Excellent	Excellent	Excellent	Excellent
39	T. Ballard-Benson	Good	Good	Good	Good	Good	Good
40	H Falslev	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
41	Benson Oxbow Road N	Good	Good	Good	Good	Good	Good
42	Hobbs	Poor	Good	At-Risk	Fair	Fair	Good
43	Z. Balls	Good	Fair	Good	Good	Good	Good
44	Benson Oxbow Rd	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
45	H. Johnson	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
46	Cardon South	Poor	Poor	Fair	Good	Good	Fair
47	Newton Bridge W	At-Risk	Fair	Fair	Good	Good	Good

Table B-1. Buffer Parcel Overall Condition By Year.							
Buffer Identification		**Buffer Condition**					
ID No.	**Bank Name**	**2002 (baseline)**	**2013**	**2014**	**2015**	**2016**	**2017**
48	Canyon-Peterson	Poor	Good	Good	Good	Good	Good
49	Canyon-Lofthouse	Good	Good	Good	Good	Good	Good
50	Canyon-Salisbury	Good	Good	Good	Good	Fair	Good
51	Canyon-Anderson	Good	Good	Good	Good	At-Risk	Good
52	Canyon-Larson	Good	Good	Good	Good	Good	Good
53	Larry Falslev	n/a	Good	Good	Good	Good	Good
54	Larry Faslev Penn	n/a	Excellent	Excellent	Excellent	Excellent	Good
55	Kunzler	n/a	Good	Good	Good	Good	Good
Green=Improvement in buffer condition from previous year. Blue=Steady condition of the buffer with no change or improving from previous year. Red=Decline in buffer condition from the previous year.							

APPENDIX B-2

BANK STABILIZATION

Table B-2 presents a summary of the condition of each of the bank stabilization sites created as part of the vegetation enhancement program, including 2002 (baseline) and 2013-2017 data.

Table B-2. Summary of Cutler Reservoir Bank Stabilization							
Project Identification		**Functioning Condition of Bank Stabilization Structure by Year**					
ID	**Bank Name**	**2002 (baseline)**	**2013**	**2014**	**2015**	**2016**	**2017**
1	J Benson	Good	Good	Good	Good	Good	Good
2	G Benson	Good	Good	Fair	Good	Fair	Good
3	GB South	Good	Good	Fair	Good	Fair	Good
4	Stewart West	Poor	Good	Good	Good	Good	Good
5	Ballard	Poor	Good	Good	Good	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	Good	Good	Good	Good	Good
12	Benson West	Fair	Good	Good	Good	Good	Good
13	Near Checkdam 12	Poor	Good	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 = Improvement in the buffer from the previous year. Blue =Steady condition of the buffer with no change from the previous year. Red = Decline in buffer condition from the previous year.							

APPENDIX B-3
BOUNDARY BUFFER FENCES

Table B-3 presents a summary of the condition of the boundary buffer fences monitored as part of the vegetation enhancement monitoring program, 2013-2017.

Table B-3. Buffer/Boundary Fence Condition by Year.						
Buffer Identification		**Fence Condition**				
ID No.	**Buffer Name**	**2013**	**2014**	**2015**	**2016**	**2017**
1	North Marsh West Buffer	Complete	Complete	Complete	Complete	Complete
2	Roundy CRP Buffer	Complete	Complete	Complete	Complete	Complete
3	Roundy 300ac Buffer	Complete	Complete	Complete	Complete	Complete
4	Rail Trail West	Complete	Complete	Complete	Complete	Complete
5	Roundy Middle	Replaced 5 posts	Complete	Complete	Complete	Complete
6	Cowley Slough	Complete	Complete	Complete	Complete	Complete
7	Roundy Big Bend B	Complete	Complete	Complete	Complete	Complete
8	Roundy North	Complete	Complete	Complete	Complete	Complete
9	M Rigby	Complete	Complete	Complete	Complete	Complete
10	Griffin	Complete	Complete	Complete	Complete	Complete
11	B. Ballard	Complete	Complete	Complete	Complete	Complete
12	B. Ballard North	Complete	Complete	Complete	Complete	Complete
13	Newton substation	Complete	Complete	Complete	Complete	Complete
14	Canyon/J. Benson	Complete	Complete	Complete	Complete	Complete
15	C Griffin	Complete	Complete	Complete	Complete	Complete
16	Railroad	Complete	Complete	Complete	Complete	Complete
17	Garth Benson	Complete	Complete	Complete	Complete	Complete
18	Val J. Rigby	Complete	Complete	Complete	Complete	Complete
19	Stewart	Complete	Complete	Complete	Complete	Complete
20	Seamons	Complete	Complete	Complete	Complete	Complete
21	Rasmussen	Complete	Complete	Complete	Complete	Complete
22	Lindley	Complete	Complete	Complete	Several missing posts/ongoing	Several missing posts/ongoing
23	Munk	Complete	Complete	Complete	Complete	Complete
24	T. Ballard	Complete	Complete	Complete	Complete	Complete
25	T. Ballard South	Complete	Complete	Complete	Complete	Complete
26	Church Farm	Complete	Complete	Complete	Complete	Complete
27	Watterson House	Complete	Complete	Complete	Complete	Complete
28	Benson/Watterson	Complete	Complete	Complete	Complete	Complete
29	Archibald	Complete	Complete	Complete	Repairs made	Complete
30	Larson (J Shape)	Complete	Complete	Complete	Complete	Complete
31	Gull Point	Complete	Complete	Complete	Complete	Complete
32	Watterson 100 AC	Complete	Complete	Complete	Complete	Complete
33	Rose Oxbow	Complete	Complete	Complete	Complete	Complete
34	H. Falslev Island	Replaced serval missing posts	Complete	Complete	Complete	Complete
35	B. Reese	Complete	Complete	Complete	Complete	Complete
36	R. Reese	Complete	Complete	Complete	Complete	Complete
37	Thayne Gate	Complete	Complete	Complete	Complete	Complete
38	J. Allen	Complete	Complete	Complete	Complete	Complete
39	T. Ballard-Benson	Complete	Complete	Complete	Complete	Complete
40	H Falslev	Complete	Complete	Complete	Complete	Complete

Table B-3. Buffer/Boundary Fence Condition by Year.						
Buffer Identification		**Fence Condition**				
ID No.	**Buffer Name**	**2013**	**2014**	**2015**	**2016**	**2017**
41	Benson Oxbow Rd North	Complete	Complete	Complete	Complete	Complete
42	Hobbs	Complete	Complete	Complete	Complete	Complete
43	Z. Balls	Complete	Complete	Complete	Complete	Complete
44	Benson Oxbow Rd	Complete	Complete	Complete	Complete	Complete
45	H. Johnson	Complete	Complete	Complete	Complete	Complete
46	Cardon South	Complete	Complete	Complete	Complete	Complete
47	Newton Bridge West	Complete	Complete	Complete	Complete	Complete
48	Canyon-Peterson	Complete	Complete	Complete	Complete	Complete
49	Canyon-Lofthouse	Complete	Complete	Complete	Complete	Complete
50	Canyon-Salisbury	Complete	Complete	Complete	Complete	Complete
51	Canyon-Anderson	Complete	Complete	Complete	Complete	Complete
52	Canyon-Larson	Complete	Complete	Complete	Complete	Complete
53	Larry Falslev	Complete	Complete	Complete	Complete	Complete
54	Larry Falslev penn.	Complete	Complete	Complete	Complete	Complete

APPENDIX C

AGRICULTURAL LEASES

APPENDIX C-1: CUTLER ANNUAL AGRICULTURAL LEASE DATA

APPENDIX C-2: CATTLE MANAGEMENT FENCE MONITORING DATA

APPENDIX C-3: PROPERTY INCIDENT SUMMARY DATA

APPENDIX C-1. CUTLER ANNUAL AGRICULTURAL LEASE DATA

Table C-1 presents a summary of Cutler annual grazing animal unit month (AUM) and farm lease data, 2013-2017.

Table C-1. Annual Grazing Pasture AUM Data, 2013-2017.					
Grazing Lease Holder(s)	**Lease Expiration Date**	**Acres**	**# of Animals**	**Grazing Period**	
				Year	**Grazing Period**
Willmore, Harry and Tom	Apr 30, 2016	121	25	2013	June 29 to Oct 26
			29	2014	July 1 to Oct 23
			31	2015	July 1 to Oct 23
			32	2016	June 24 to Oct 22
			32	2017	July 3 to Oct 28
Selman, Harold and Bret Cutler Canyon	Dec 31, 2017	260	42	2013	May 15 to June 19
			n/a	2014	None
			n/a	2015	None
			69	2016	May 4 to June 16
			69	2017	May 10 to June 27
Selman, Harold and Bret North Marsh	Dec 31, 2017	300	51	2013	June 1 to Dec 6
			61	2014	June 2 to Dec 6
			60	2015	June 2 to Oct 26
			71	2016	June 13 to Dec 7
			59	2017	June 24 to Dec 1
Watterson, Jim	Mar 31, 2024	120	50	2013	June 10 to Oct 5
Utah State University	Apr 30, 2017	361	103	2013	June 3 to Oct 31
			101	2014	June 2 to Oct 30
			101	2015	June 1 to Oct 22
			102	2016	June 1 to Oct 20
			107	2017	July 3 to Nov 14
Walker, Kelly	Apr 30, 2019	255	80	2013	June 8 to Oct 31
			82	2014	June 1 to Nov 2
			76	2015	June 1 to Nov 5
			70	2016	June 4 to Nov 2
			88	2017	June 10 to Oct 30
Jon Hardman	May 31, 2018	80	45.2	2013	June 9 to July 3
			45.4	2014	June 8 to July 12
			44.2	2015	July 1 to July 31
			53.6	2016	July 30 to Aug 12
			51	2017	July 14 to Aug 4

APPENDIX C-2: CATTLE MANAGEMENT FENCE MONITORING DATA

Table C-2 presents a summary of cattle management fence monitoring results by year, 2013-2017.

Table C-2 Cattle Management Fence Condition, 2013-2017					
Pasture Name	**2013**	**2014**	**2015**	**2016**	**2017**
NG1	Complete	Complete	Complete	Complete	Complete
NP1	Rebuilt North gate	Complete	Rebuilt public access walk-through	Complete	Complete
NP2	Complete	Complete	Complete	North gate rebuilt	Complete
NP3	Complete	Complete	Complete	Complete	Complete
NG3	Complete	Complete	Complete	Complete	Complete
NG4	Complete	Complete	Complete	Complete	Complete
NG5			Rebuilt south barbed wire fence		
NG7	Complete	Complete	Complete	Complete	Complete
SP2A	Complete	Complete	Complete	Complete	Complete
SP2B	Complete	Complete	Complete	Complete	Complete
SP2C	Complete	Complete	Complete	Complete	Complete
SG5A	Complete	Complete	Complete	Complete	Complete
SG6A	Complete	Complete	Complete	Complete	Complete
SG6B	Complete	Complete	Complete	Complete	Complete
SG7	Complete	Complete	Complete	Complete	Complete
SG1A	Complete	Complete	Complete	Complete	Complete
SG1B	Complete	Complete	Complete	Complete	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	Electric fence modified to protect new willow growth along water on north	Complete	Rebuilt South fence and gate after traffic accident	Complete
SG4A	Complete	Complete	Complete	Repaired South fence after flooding	Complete
SG4B	Complete	Complete	Complete	Complete	Complete
SG4C	Complete	Complete	Complete	Complete	Complete
SG4D	Complete	Complete	Complete	Complete	Complete
SP1A	Complete	Complete	Complete	Complete	Complete
SP1B	Complete	Complete	Complete	Complete	Complete
SP1C	Complete	Complete	Complete	Complete	Complete
SGM1	Complete	Complete	Complete	Complete	Complete
SGM2	Repaired fence from adjacent landowner trespass	Repaired fence from adjacent landowner trespass	Complete	Repaired fence from adjacent landowner trespass	Complete

APPENDIX C-3: PROPERTY INCIDENT SUMMARY DATA

Table C-3 presents a summary of PacifiCorp's property incident forms for the current monitoring period, 2013-2017.

Table C-3. Property Coordination - Buffer Monitoring Incident/Encroachment Reports, 2013-2017				
Buffer	**Incident/Encroachment**	**Action Needed**	**Comments**	**Complete**
2013 Buffer Monitoring Incident/Encroachment Report				
#10 Griffin	The adjacent landowner has repeatedly trespass-farmed and destroyed buffer plantings. Further remedial actions are pending resolution through the property incident process. This buffer is currently being actively farmed, and is planted to the shore's edge. All buffer posts have been removed as well as photo point markers. No change in 2013, proposed solutions are still being considered.	Contact adjacent landowner and resolve issues, replace missing buffer posts.	Property to contact PMG to replace posts	YES on contacting adjacent owner, NO on replacing missing posts.
#13 Newton Substation	Adjacent landowner has mowed and bailed the buffer grass.	Contact adjacent landowner and resolve issues through the property incident process. This is an ongoing issue year to year, consider fencing.	Property to contact PMG to build fence?	YES, and fence was built.
#22 Lindley	This buffer area is in degraded condition from encroachment by adjacent landowner activity. This has included unauthorized access roads and cultivation.	Contact adjacent landowner to stop activities.	Property to contact.	NO
#26 Church Farm	The adjoiner to the Church Farm buffer has continued to remove and alter fences, graze the buffer, and deny court-awarded access for monitoring. Legal actions are ongoing to resolve issues; In fall of 2013 it was discovered that the adjacent landowner had removed a section of fence on the northern section of the property boundary and had cultivated the buffer and planted crops.	Visit with Legal to determine options. Repair fence.	Property and Davies to make contact PMG to repair fence	NO. South west section extensive fence maintenance performed. North section remains unchanged.
#33 Rose Oxbow	Several encroachment issues at this buffer area were observed during monitoring. A large dike has been constructed of soil and waste concrete. The dike extends across the marsh and is being used as a bridge. Cattle are also trespass grazing in the buffer, and several buffer posts are missing.	Contact Army Corps of Engineers	Davies to contact	YES ACOE contacted; NO issue is not yet resolved.
#37 Thayne Gate	The PacifiCorp metal gate that provides access to the buffer area was found to be open and the chain and lock missing at the	Contact adjacent landowner to discontinue unauthorized use.	Property to contact Bryan Westerberg to replace missing lock	YES

Table C-3. Property Coordination - Buffer Monitoring Incident/Encroachment Reports, 2013-2017				
Buffer	**Incident/Encroachment**	**Action Needed**	**Comments**	**Complete**
	time of monitoring. Unauthorized access roads have been established across the buffer area and an improvised firearms shooting range is in use.			
#46 Cardon South	Cattle were present at the time of monitoring and the buffer was heavily grazed.	Contact adjacent landowner to discontinue unauthorized use.	Property to contact	YES
2014 Buffer Monitoring/Encroachment Report				
#10 Griffin	Adjacent landowner continues to cultivate the buffer area.	Contact adjacent landowner again to stop encroaching and fence the property line.	Property to contact landowner; PMG to build fence.	YES, in fall of 2014.
#22 Lindley	This buffer area is in degraded condition from encroachment by adjacent landowner activity. This includes unauthorized access roads and cultivation. Remedial actions are pending resolution through the property incident process.	Contact adjacent landowner to stop activities.	Property to contact.	YES
#26 Church Farm	North section fence is still missing and buffer is planted in crops.	Replace fence.	PMG to replace fence.	YES, fence replaced.
#33 Rose Oxbow	No change from 2013.	Awaiting reply from Army Corps.	Property to contact.	NO
#37 Thayne Gate	Chain and lock missing again, unauthorized travel.	Contact adjacent landowner again.	Property to contact.	YES
#42 Hobbs	The boundary fence has been damaged and several loads of debris and garbage have been dumped in the buffer area.	Contact adjacent landowners and have debris removed and fence repaired.	Property to contact.	YES
2015 Buffer Monitoring/Encroachment Report				
#9 M. Rigby	Unauthorized road being established.	Install gate at east end.	PMG to install.	YES
#29 Archibald	Adjacent landowner has removed small section of fence to gain access to his pivot.	Contact landowner to stop practice, repair fence.	Property to contact PMG to repair fence.	YES
#33 Rose Oxbow	Remains the same as 2013.	No progress.		NO
#34 H. Falslev Island	Several missing buffer posts.	Contact adjacent landowner and replace posts.	Property to contact PMG to replace posts.	YES
2016 Buffer Monitoring/Encroachment Report				
#22 Lindley	The wetland areas have been dredged and spoils piled on PacifiCorp property, some	Contact adjacent landowner.	Property to contact.	NO

Table C-3. Property Coordination - Buffer Monitoring Incident/Encroachment Reports, 2013-2017				
Buffer	**Incident/Encroachment**	**Action Needed**	**Comments**	**Complete**
	cultivation activities in the buffer, several missing buffer posts.			
#29 Archibald	Fence has been cut in front of pivot again.	Contact and repair fence, install rails in damaged area.	Property to contact PMG for repairs.	YES
#33 Rose Oxbow	Remains the same as 2013.	No progress.		NO
#37 Thayne Gate	Chain and lock missing on gate, unauthorized travel, constructed boat launch and installed dock in buffer.	Contact adjacent landowner and have dock removed and practices discontinued.	Property to contact.	YES, lock and chain were not replaced.
#43 Z. Balls	Shooting range has been constructed in the buffer.	Contact neighbors and determine who is responsible and have it removed.	Property to contact.	NO
2017 Buffer Monitoring/Encroachment Report				
#22 Lindley	The wetland areas have been dredged and spoils piled on PacifiCorp property, some cultivation activities in the buffer, several missing buffer posts.	Contact adjacent landowner.	Property to contact.	NO
#33 Rose Oxbow	Remains the same as 2013.	No progress.		NO
#43 Z. Balls	Shooting range has been constructed in the buffer.	Contact neighbors and determine who is responsible and have it removed.	Property to contact.	NO
#50 Canyon Salsbury	Water slide has been constructed. Trailer parked on PacifiCorp property, pumps and hose present. Area disturbed by equipment.	Contact and meet with adjacent owner about removing slide and reclaiming the area.	Property to contact.	YES, met with owner, everything has been removed. Reclamation still needed.

APPENDIX D

RECREATION SITE MONITORING

APPENDIX D-1: NON-ROUTINE RECREATION SITE MAINTENANCE

APPENDIX D-2: BOATER POLICY, REGULATIONS, AND SIGNS

APPENDIX D-3: FERC FORM 80 DATA LINK

APPENDIX D-1

NON-ROUTINE RECREATION SITE MAINTENANCE

Photos D-1 through D-7 depict non-routine recreation site maintenance completed during the 2013-2017 monitoring period.

Photo D-1. Benson Marina Improvements

Photo D-2. Benson Marina Improvements

Photo D-3. Pedestrian Fishing Bridge Repair

Photo D-4. Pedestrian Fishing Bridge Repair

Photo D-5. Ramp repair work at Cutler Canyon during reservoir draw down.

Photo D-6. Major ramp repair work at Benson Marina during reservoir draw down.

Photo D-7. Major ramp repair work at Benson Marina during reservoir draw down.

APPENDIX D-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)

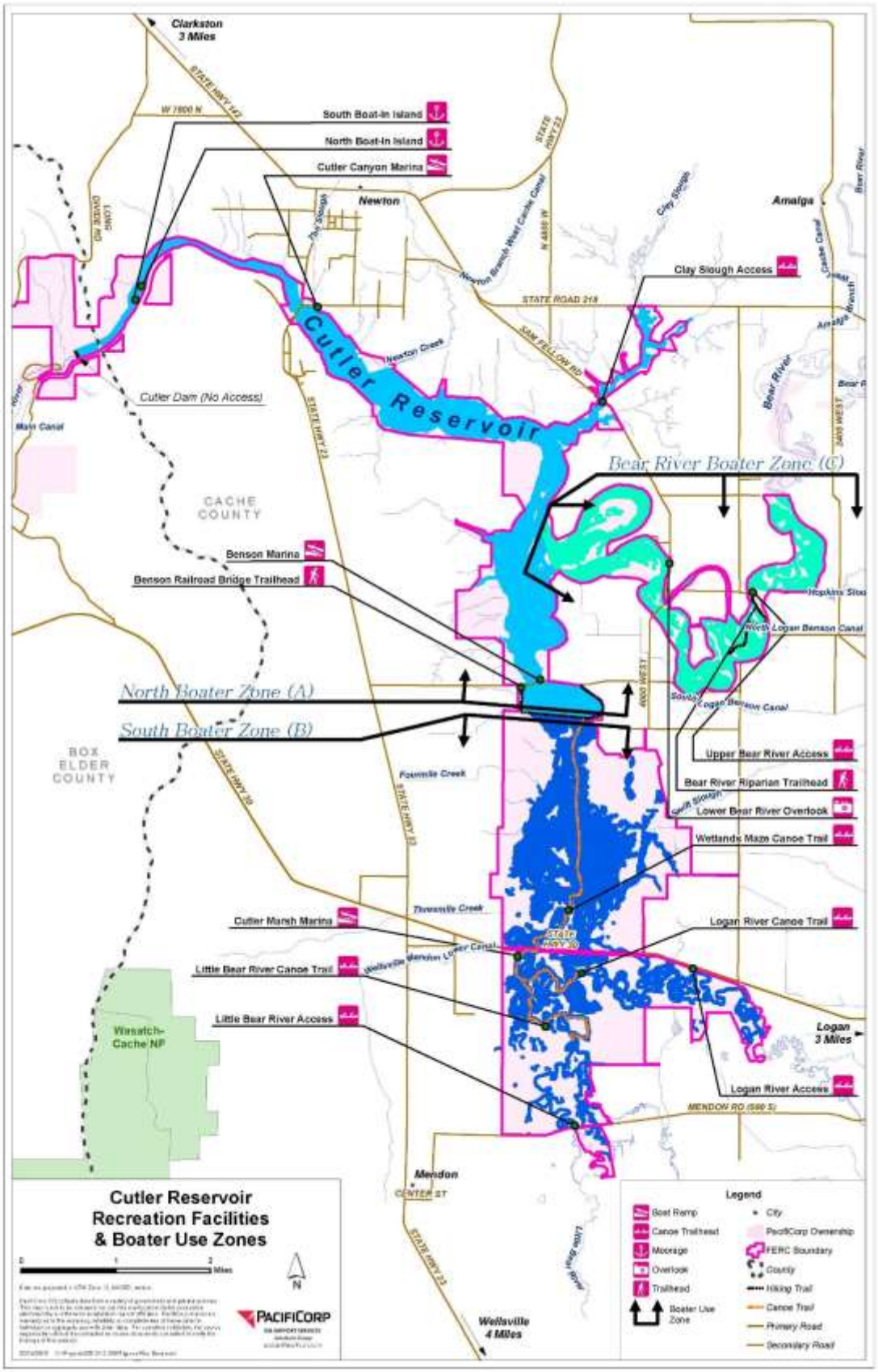
In the Bear River area, east of the confluence with Cutler Reservoir (including the 'horseshoe area'):

- 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)


Clarkston
3 Miles
STATE HWY 142
W 7800 N
South Boat-In Island
North Boat-In Island
Cutler Canyon Marina
Newton
Thatcher Slough
Newton Branch West Canal
STATE HWY 23
Clay Slough
Amalga
Bear River
Cache Canal
Clay Slough Access
STATE ROAD 218
SAM FELLOW RD
Cutler Reservoir
Newton Creek
Cutler Dam (No Access)
Main Canal
STATE HWY 23
Bear River
2400 WEST
Bear River Boater Zone (C)
CACHE
COUNTY
Benson Marina
Benson Railroad Bridge Trailhead
Hopkins Slough
West Logan Benson Canal
North Boater Zone (A)
South Boater Zone (B)
4800 WEST
South Logan Benson Canal
BOX
ELDER
COUNTY
STATE HWY 30
Fourmile Creek
STATE HWY 23
Upper Bear River Access
Bear River Riparian Trailhead
Lower Bear River Overlook
Wetlands Maze Canoe Trail
Thrasville Creek
Cutler Marsh Marina
Logan River Canoe Trail
STATE HWY 30
Little Bear River Canoe Trail
Thrasville Benson Lower Canal
Little Bear River Access
Wasatch-
Cache NF
Logan
3 Miles
Logan River Access
MENDON RD (SR 5)
Mendon
CENTER ST
STATE HWY 23
Wellsville
4 Miles
Cutler Reservoir
Recreation Facilities
& Boater Use Zones
0
1
2
Miles
N
PACIFICORP
Legend
Boat Ramp
Canoe Trailhead
Moorage
Overlook
Trailhead
Boater Use Zone
City
PacifiCorp Ownership
FERC Boundary
County
Hiking Trail
Canoe Trail
Primary Road
Secondary Road

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.

PART 8 PLACARD
(Posted at All Recreation Sites)

Cutler Hydroelectric Project

This Hydroelectric Project is Licensed

by the

Federal Energy Regulatory Commission

- Project No. 2420 -

For information concerning local PacifiCorp recreation sites or
funding provided by PacifiCorp
for the management of this site call
(801) 220-2245

PacifiCorp recreation facilities are for use to all members of the public without regard to race, color, religious creed, or national origin, or any other status protected under applicable local, state, or federal law.

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

RECREATION RULES
(Posted at All Recreation Sites)

WELCOME TO A PACIFICORP RECREATION AREA

Recreation opportunities and facilities are provided by PacifiCorp as a public service.

DAY-USE RULES

Summer Hours are: April 1 – September 30, 5 a.m. to 10 p.m.
Winter Hours are: October 1 – March 31, 5 a.m. to 7 p.m.
NO OVERNIGHT CAMPING IS ALLOWED.

PacifiCorp reserves the right to change these hours without notice.

In order to ensure the enjoyment of all recreation site guests PacifiCorp requires observance of the following:

Vehicle Use / Parking

- *The speed limit in all recreation sites* is 5 miles per hour.
- Use only designated roadways and parking areas.
- Parking is permitted only in designated areas.
- Off road motorized vehicle use, including snowmobiles, is not allowed in recreation sites or on any PacifiCorp Lands.

The use or possession of alcohol is not permitted in any PacifiCorp day-use area.

All applicable laws regarding public safety, illegal substances, sanitation, boating and fires will be enforced.

The discharge of firearms or other discharging of projectiles within 100 yards of any recreation site is not permitted. Fireworks and other explosive materials are not permitted in recreation sites or on PacifiCorp lands.

The use of unmanned aerial vehicles (i.e. drones) is not permitted in or near PacifiCorp facilities, infrastructure or recreation sites.

All fires shall be confined to fireplaces/grills installed by PacifiCorp or to manufactured grills/stoves (some sites are posted separately "No Fires Allowed").

Operation of public address systems or other noise producing devices is not permitted. Similarly, loud music or any other noise that affects others is not permitted.

Pets shall be under the owner's control AND physically restrained at all times by leashes no more than 6 feet in length. Pet owners shall put animal waste in plastic bags and remove it from the premises or dispose of it in a trash receptacle.

Commercial use of these facilities or offers for commercial services are not permitted without prior written permission of PacifiCorp. Commercial use includes vending merchandise, equipment sales or rentals, advertising, providing services, etc.

Please place bottles, cans, paper, garbage, or other refuse in receptacles or pack it out with you.

Damage to trees, vegetation, or facilities is not permitted. No trees – alive or dead – shall be cut for firewood or any other purpose.

Wildlife is not to be disturbed.

Any person, who removes, injures, destroys, defaces, excavates, or appropriates any PacifiCorp property or structures including historic or prehistoric structures, ruins, artifacts, or object of antiquity on PacifiCorp lands is subject to arrest and penalty of law.

SPECIAL NOTES:

Swimming activities should be monitored. PacifiCorp does not maintain a lifeguard at any of its recreation facilities.

Boater use rules are posted separately from this sign.

River users should be aware of their own ability, river conditions and difficulty level of the river reach before embarking on a river trip.

Violators of policies are subject to removal and prosecution.
Policies are subject to change without notice

PacifiCorp does not accept responsibility for the safety and well-being of recreation area guests.

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

Recreation Rules - Utah 6.28.17

APPENDIX D-3

FERC FORM 80 DATA LINK

Form 80 data for the Cutler Hydroelectric Project is available from the FERC library at:

https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20150330-5354

APPENDIX E

WATER QUALITY REPORT

Appendix E

Final Water Quality Analysis and Five-year Summary for Cutler Reservoir, Utah

Prepared for

PacifiCorp

Prepared by

SWCA Environmental Consultants

Initially submitted March 2018; corrected April 2020

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FIGURES

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Executive Summary

The 2013 water quality monitoring dataset collected by PacifiCorp around Cutler Reservoir (and presented as part of the 2018 Cutler 5-Yr Monitoring Report) covers a wide range of tributaries and reservoir locations as well as a variety of physical and chemical water quality constituents. Sample locations include Little Bear River, Spring Creek, Logan River, Bear River, Cutler Reservoir at Benson Marina, Cutler Reservoir east of Highway 23, Cutler Reservoir south of Swift Slough, and Bear River below Cutler Dam. Chemical parameters include nutrient concentrations of phosphorus (total and orthophosphate) and nitrogen as NO_3, NO_2, NH_3, and total Kjeldahl nitrogen (TKN). Physical parameters include temperature, total suspended solids (TSS), specific conductivity, pH, and dissolved oxygen (DO) values. During the current license period (1994-2024), samples were initially collected quarterly and annually (1996-1998 and 2000-2003), but subsequently quarterly at five-year intervals (2008 and 2013; samples were also collected in 2018 (for inclusion in the 2023 Cutler 5-Yr Report) and planned for 2023).

The four monitoring periods are characterized by varied hydrologic conditions based on water discharged from Cutler Reservoir to the Bear River at those times. The 1996–1998 monitoring period was characterized by wet conditions and high flows; 2000–2003 was characterized by dry conditions with low flows; 2008 was the driest of these moderate flow years. The 2013 monitoring period was characterized by low flows with season averages between 1% and 69% of the previous monitoring periods. Future samples will be collected quarterly at five-year intervals throughout the remainder of the license, which expires in 2024.

Differences in water quality parameters between the four monitoring periods are most likely related to the marked difference in hydrologic conditions. Data collected between 2008 and 2013 generally indicate a decrease in temperature, pH, DO, nitrate, and sediment, with an increase in bacteria, turbidity, and total nitrogen. Water quality varied by season and hydroperiod for most parameters analyzed across monitoring periods; 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 and sediment were generally highest during the spring runoff and storms, while nutrients (e.g., total phosphorus) were low throughout the year.

Data collected over the various monitoring periods between 1996 and 2013 indicate that water quality in the southern tributaries, specifically Spring Creek and the Little Bear River, has dramatic impacts on water quality throughout Cutler Reservoir. Spring Creek continues to have significantly higher tributary bacteria concentrations compared to the other sampling locations in the watershed. Water quality in the southern (south of Benson Marina) and northern (north of Benson Marina) sections of the reservoir remains markedly different, with the south having higher pathogen and nitrogen concentrations and the north having higher total phosphorus (excluding non-detects).

INTRODUCTION

Cutler Reservoir is located 6 miles west of Logan, Utah, at an elevation of 4,407 feet, and covers much of the western portion of Cache Valley. Cutler Dam impounds water from the Bear River, as well as from the Logan River, Little Bear River, Spring Creek, and several small tributaries and sloughs. The original Wheelon Dam was constructed in the early 1890s; the current Cutler Dam was constructed in 1927 by Utah Power and Light, a predecessor company to PacifiCorp. Doing business in Utah as Rocky Mountain Power, PacifiCorp operates the facility to provide water for agricultural use, flood control, and power generation. The Federal Energy Regulatory Commission (FERC) license for Cutler Dam as a hydropower facility was last renewed in 1994. The license included the establishment of an operational elevation range at which the reservoir would be maintained to support fish and wildlife in the reservoir, and development of the *Cutler Resource Management Plan* (hereafter referred to as the Cutler RMP) (PacifiCorp 2002). The Cutler RMP outlines specific requirements for wildlife habitat improvements, agricultural lease modifications, buffer establishment, bank stabilization, recreation site improvements, and other natural resources projects and monitoring, including water quality monitoring, initially required quarterly and annually (1996-1998 and 2000-2003), but subsequently quarterly at five-year intervals (2008 and 2013; samples are being collected in 2018 (for inclusion in the 2023 Cutler 5-Yr Report) and a final sampling is planned for 2023). Cutler Reservoir has a maximum storage capacity of 15,386 acre-feet of water, with a large surface area and shallow depth (averaging less than four feet deep), resulting in approximately 10,000 acres of open water and associated wetlands and uplands. The reservoir is operated in essentially run-of-river mode such that water surface elevation is maintained between 4,406.25 feet and 4,407.75 feet from March 1 through December 1, and from 4,405.50 to 4,407.75 feet from December 2 through February 28. These ranges are required by PacifiCorp's FERC license. However, in October 2013 a drawdown to 4,390.6 was needed to perform maintenance on the spill gates of the dam.

The Cutler Reservoir watershed encompasses 2,201 square miles and lies within the larger Bear River basin of 6,900 square miles. The Bear River basin 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 degrees) characterize 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 Cache Valley and most of the lower elevation valleys in the watershed. The most common crops include irrigated pasture, hay, alfalfa, and corn; all are used locally to feed cattle and dairy cows. Developed land uses also occupy a portion of Cache Valley, along the U.S. Highway 89 corridor, and now extending westward towards Cutler Reservoir.

Under Section 303(d) of the Clean Water Act, Cutler Reservoir has been identified as water quality limited due to low DO levels from excess phosphorus loading to the rivers and reservoir from the surrounding watershed. The designated beneficial uses determined 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). In 2002, the reservoir was found to be unsupportive of the warm-water game fish designated use (3B) as identified on Utah's 2008 Integrated 303(d) list. Secondary contact recreation (2B) and agricultural water supply (4) beneficial uses were deemed to be fully supported in Cutler Reservoir in 2008. However, the Middle Bear River and Cutler Reservoir total maximum daily loads (TMDLs) identified that the recreational (2B) and the waterfowl and shorebirds (3D) beneficial uses in Cutler Reservoir may also be impaired based on narrative water criteria. A TMDL for Cutler Reservoir was developed by the Utah Division of Water Quality and approved by EPA in 2010 with

nutrient reduction targets identified for point and non-point sources to the Cutler Reservoir (DWQ 2010).

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 reclamation. As part of these efforts, and in compliance with the current FERC license, as noted, PacifiCorp currently monitors water quality at the mouth of tributaries to Cutler Reservoir and in the reservoir every 5 years. Water quality monitoring was initially conducted quarterly every year from 1996 through 1998, and 2000 through 2003; the frequency then changed to every five years, and was conducted in 2008, and again in 2013, and 2018. Future monitoring will continue to take place quarterly at 5-year intervals throughout the remainder of the license period, which expires in 2024. The data cover a wide range of watershed locations and a variety of physical and chemical water quality constituents.

In this report, water quality data collected during the fourth monitoring period (2013) are summarized and compared spatially, seasonally, and by hydroperiod to the three previous monitoring periods (1996–1998, 2000–2003, and 2008). Additional information from the three previous monitoring periods was provided in the 2008 *Water Quality Analysis and Summary for Cutler Reservoir, Utah* (PacifiCorp 2008). This report covers data collected during the 2013 sampling effort, and will be included in the next 5-year report to the FERC, which will cover the monitoring period 2013–2017, inclusive, and which is due in 2018.

WATER QUALITY DATA COLLECTION

The goal of this monitoring plan is to characterize water quality over various hydrologic conditions. SWCA Environmental Consultants (SWCA) collected water quality samples for PacifiCorp from January 2013 to December 2013. Six sample trips were made in 2013: four quarterly baseflow samples (defined by at least 3 dry days prior), one fall storm sample, and one runoff sample. SWCA coordinated with PacifiCorp to share information and aid sample collection when necessary. The following subsections describe the sampling methods that were used to collect samples, analyze them, and integrate temporal and spatial coverage of samples and results.

Sampling Methods

Water quality samples were collected from just below the water surface at each sampling site. Where possible, most samples were collected from bridges or at bank edges using a bucket that was pre-rinsed multiple times. A HANNA probe was placed directly in the water to measure dissolved oxygen (DO), turbidity, temperature and pH values. Water samples for laboratory analysis were collected in clean, unused sample containers that were provided by the laboratory and labeled prior to sampling. After samples were collected, they were immediately placed in an ice-filled cooler for transport to the laboratory. Samples were delivered to the laboratory within six hours of sampling and within sample holding times.

Analytical Methods

Samples were analyzed by three different laboratories during the 2013 monitoring period. American West Analytical Laboratory in Salt Lake City, Utah, was used for all nutrient and sediment samples collected in 2013. The Utah State Department of Health Unified Laboratory in Taylorsville, Utah, was used for bacteria and chlorophyll *a* (chl *a*) collected in April and May. Chemtech-Ford

Laboratories in Sandy, Utah, was used for all other bacteria and chl *a* samples. The change in laboratories occurred to ensure reliable data analysis when the Utah State Department of Health Unified Laboratory did not accept and run a set of fecal coliform samples as pre-arranged. Analyses for fecal coliform were only completed for the April 18, 2013, sampling event because laboratory analysis standards shifted to *E. coli* for all samples after that date. As a result, fecal coliform was removed from the 2013 Cutler Reservoir sampling plan, and fecal coliform prior to 2008 was converted to *E. coli* (see section 4.4) for purposes of data comparison. All samples were analyzed using standard U.S. Environmental Protection Agency (EPA) and American Public Health Association (APHA) methods (Table 1). It is important to note that the expected precision of analytical results near the parameter reporting limit can require additional interpretation. For example, sample results are expected to agree within the upper and lower bounds of the detection limit if the result is less than 5 times the detection limit, or within a relative percent difference (RPD) of plus or minus 20 percent if the result is greater than 5 times the detection limit (personal communication, email correspondence with Pat Noteboom, senior chemist, American West Analytical Laboratories, with Andrew Myers, SWCA, February 4, 2014).

Table 1. PacifiCorp Water Quality Monitoring Parameters and Analytical Methods (2013)

Parameter	Analysis Type	Methods used in 2013		
		Utah State Department of Health Unified Laboratory	Chemtech-Ford Laboratories	American West Analytical Laboratory
Total coliform	Total	SM 9222E-EC	SM 9223-B-QT	N/A
Fecal coliform	Total	SM 9222E-EC	N/A	N/A
Escherichia coli (*E. coli*)	Total	SM 9222E-EC	SM 9223-B-QT	N/A
Chlorophyll *a (*chl *a*)		SM 10200	SM 10200-H	N/A
Nitrogen, ammonia as N	Total	N/A	N/A	EPA Method No. 350.1
Total Kjeldahl nitrogen (TKN)	Total	N/A	N/A	EPA Method No. 351.2
Nitrogen, Nitrate (NO3) as NO3	Total	N/A	N/A	EPA Method No. 353.2
Nitrogen, Nitrite (NO2) as NO2	Total	N/A	N/A	EPA Method No. 3543.2
Phosphorus as P	Total	N/A	N/A	SM 4500-P-F
Phosphorus, orthophosphate as P	Dissolved	N/A	N/A	EPA Method No. 365.1
Solids, total dissolved (TDS)	Dissolved	N/A	N/A	SM 2540-C
Solids, total suspended (TSS)	Total	N/A	N/A	SM 2540-D

N/A = not applicable

Data Handling

Quality Assurance and Quality Control

The precision of the data was assessed to ensure data were of sufficient quality for purposes of this analysis. The precision, or reproducibility, of field samples and field sample duplicates (field sampling precision) was evaluated based on relative percent difference (RPD)

$$\text{RPD} = \frac{(D_1 - D_2)}{(D_1 + D_2)/2} \text{ x } 100$$

where D_1 is the first duplicate field sample value and D_2 is the second duplicate field sample value. For field duplicates, a calculated RPD of greater than plus or minus 20% was deemed unacceptable, and the results were excluded from analysis.

At least one duplicate sample was collected for quality assurance/quality control (QA/QC) purposes during each sampling event from 2000 to 2003, 2008, and in 2013. Results of the RPD analysis of 2013 data are shown in Table 2. There are 12 instances where samples and sample duplicate results have a difference of greater than 20 percent.

Non-Detect Treatment

Several analytical results for total phosphorus, orthophosphate, ammonia, nitrate, nitrite, TKN, sediment, coliform, and chl *a* were identified as below detection limits. In such cases a value of one-half the detection limit was used in the data analysis. Using values of half the detection limit is common practice because values of zero may underestimate the true concentration, while values of the detection limit itself may overestimate the true concentration. A summary of non-detect entries for data collected in 2013 is presented in Table 2.

Table 2. Summary of Non-Detect Entries for Data Collected in 2013

Parameter	Number of Non-Detects	Percent of Data Set
Nitrogen, ammonia as N	30	57%
Nitrogen, nitrate as N	13	25%
Nitrogen, nitrite as N	22	42%
Phosphorus as P	49	92%
Phosphorus, orthophosphate as P	37	70%
Total Kjeldahl nitrogen (TKN)	21	40%
TDS	1	2%
Solids, total suspended (TSS)	2	4%
Total coliform	20	38%
E. coli	1	2%
Chlorophyll *a* (chl *a*)	22	42%

Treatment of Outliers

To identify non-representative data or outliers in the dataset, a threshold of plus or minus three standard deviations from the mean was applied to all the datasets collected by PacifiCorp to determine those data that should be excluded from the analysis. A threshold of plus or minus three standard deviations is often applied to identify outliers in environmental data. Following this methodology, identified outliers from all four sampling periods were excluded from subsequent analyses.

Seasonal Coverage

Water quality monitoring was completed from 1996 through 1998, 2000 through 2003, in 2008, and again in 2013. In general, samples were collected quarterly; however, prior to 2008, samples were not collected during several sampling seasons (Table 3). In past years, coverage was generally better during winter, spring, and fall months. Physical water quality characteristics (e.g., DO, turbidity, temperature, and pH concentrations) measured during all monitoring events for a particular season are assumed to be representative of season-specific watershed conditions.

Table 3. Water Quality Sampling Over Time

Sampling Cycle	Year	Winter			Spring			Summer			Fall		
		Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
1996–1998	1996												X
	1997	X			X						X		
	1998					X				X		X	
2000–2003	2000	X									X		
	2001			X			X						
	2003	X		X				X			X		
2008*	2008					SR	BF			BF	BF		ST
	2009		BF										
2013	2013	BF				BF	SR			BF	ST	BF	

* includes one sample in January of 2009 to complete the 2008 dataset

X = sampled (likely during baseflow conditions); BF = baseflow; ST = storm; SR = spring runoff

Hydrologic Coverage

The Bear River/Cutler Reservoir hydrologic 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.

During the 2013 sampling period, the Bear River represented most of the water flowing into Cutler Reservoir at 76% of the annual average inflow. The Logan River supplied 18% of the average annual flow to Cutler Reservoir, while the Little Bear River supplied 6%. These tributaries supply the majority of flow to Cutler Reservoir. Discharge data from Cutler Reservoir to the Bear River are available during the 2013 sampling period as well as flow data collected by the U.S. Geological Survey along the Bear River

near the Utah–Idaho state line. Hydrographs for each flow sampling location during the 2013 water quality sampling period are provided in Figure 1.

The water quality monitoring program established by PacifiCorp for the Cutler Reservoir system provides moderate distribution of water quality data across space and time. To better examine seasonal and temporal trends, 2008 and 2013 water quality sampling was also tied to hydrologic events (i.e., storm events). The resulting analyses are more easily compared across time and allow for a more nuanced understanding because water quality is largely dependent on water quantity (e.g., flow).

To maintain the quarterly sampling plan established by PacifiCorp, seasonal baseflow (defined by at least three dry days prior) samples were collected during spring, summer, fall, and winter. A spring baseflow sample (April 18, 2013) was taken prior to irrigation, and a summer baseflow sample (August 15, 2013) was taken during irrigation activity. A fall baseflow sample (October 2, 2013) was taken following peak irrigation activity, followed by a winter baseflow sample (December 11, 2013). In addition, water quality samples were collected during a fall storm (September 27, 2013) that resulted in 0.33 inches of rainfall, as well as at the peak of spring melt runoff (May 17, 2013). Note that many of the tributaries are not gaged, thus runoff from these tributaries is not well represented in Figure 1. No summer storms were captured in 2013 sampling efforts.

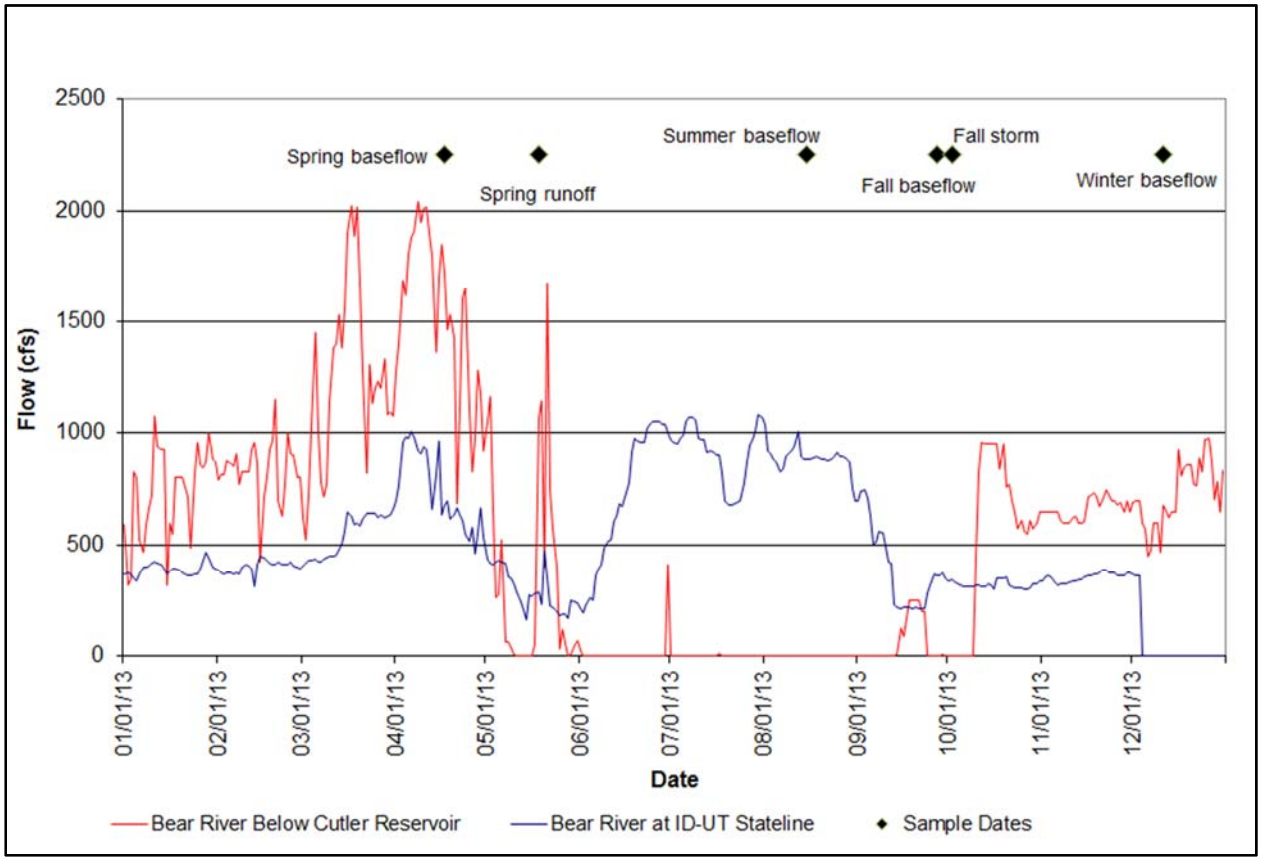

Figure 1. Bear River hydrograph for the 2013 calendar year.

Spatial Coverage

In past sampling periods, water quality samples were collected from Cutler Reservoir at Benson Marina, from four tributary sites entering the reservoir (Logan River, Little Bear River, Spring Creek, and Bear

Figure 2. Cutler Reservoir surface water monitoring sites.

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River), and at the Bear River below Cutler Dam (Figure 2). In 2008, two additional reservoir monitoring sites were added: one in the northern section of the reservoir (Cutler Reservoir at Highway 23) and one in the southern section of the reservoir, above the confluence with Swift Slough (Cutler Reservoir at Swift Slough). The northern site was added to assess the influence of the Bear River, while the southern site was added to assess the influence of the southern tributaries on water quality in Cutler Reservoir. Unfortunately, reservoir drawdown and boat access prevented sample collection from the Swift Slough site on September 27, 2013, and December 11, 2013 (a sample was taken from the Highway 30 bridge during the December sample event). All sampling sites are shown on Figure 2 and listed in Table 4.

Table 4. Summary of Sampling Sites around Cutler Reservoir

Site ID	Site Name	Site Key	Segment Location
4901980	Bear River below Cutler Reservoir at UP&L Bridge	Bear River below dam	Cutler Reservoir outflow
4903400	Bear River below confluence with Summit Creek	Bear River at Summit Creek	Bear River
4904900	Spring Creek at CR 376 (Mendon) Crossing	Spring Creek	Southern tributary
4905000	Little Bear River at CR376 (Mendon) Crossing	Little Bear River	Southern tributary
4905040	Logan River above confluence with Little Bear River at CR376 Crossing	Logan River	Southern tributary
5901000	Cutler Reservoir at Benson Marina Bridge	Cutler Reservoir at Benson Marina	Southern reservoir
5900980	Cutler Reservoir at Highway 23 Bridge	Cutler Reservoir at Hwy 23	Northern reservoir
PacifiCorp1	Cutler Reservoir south of Swift Slough near island	Cutler Reservoir at Swift Slough	Southern reservoir

Note: Numbered sites correspond to Utah Division of Environmental Quality monitoring sites.

RESERVOIR HYDROLOGY

The PacifiCorp water quality monitoring data were collected over a wide range of hydrologic conditions in the watershed. Notable changes in the hydrologic conditions of Cutler Reservoir are evident in the releases from the reservoir throughout the entire monitoring period (1996 to 2013) as compared to releases during each water year (Table 5). Comparison between low (>80 percentile), average (20–80 percentile), and high (<20 percentile) years based on average annual releases shows that 2001–2003 was a low flow period; 1996, 2000, 2004–2013 were mostly average; and 1997–1999 and 2011 were high. Flows increased in the spring by an average of 75% due to runoff, before decreasing in the summer and fall due to receding hydrograph and irrigation withdrawals. Annual precipitation values collected at the Cutler Dam (Table 5) (Utah State University Climate Center 2014) which range from 9.39 inches in 2008 to 30.08 in 2005, explain approximately 36% of the variability in annual reservoir releases.

Table 5. Average Annual Precipitation and Cutler Reservoir Releases by Water Year and Season

Water Year	Annual Precipitation (inches)	Average Annual (cfs)	Fall (cfs)	Spring (cfs)	Summer (cfs)	Winter (cfs)	1996 – 2013 Flow Release Percentile (high < 20%; average 20 -80%; low > 80%)
1996	12.70	1,104	456	2,360	785	817	42%
1997	25.75	2,262	965	3,796	2,309	1,977	16%
1998	17.89	2,507	1,947	3,961	1,903	2,218	5%
1999	15.30	2,290	1,923	3,410	1,691	2,135	11%
2000	11.56	1,012	1,099	1,191	68	1,688	53%
2001	11.34	407	288	703	44	594	84%
2002	15.65	369	184	701	48	545	89%
2003	10.63	345	217	580	31	550	95%
2004	17.18	418	230	850	114	478	79%
2005	30.08	1,535	540	3,506	1,057	1,037	26%
2006	20.15	1,521	774	3,548	397	1,365	32%
2007	11.96	807	822	1,241	31	1,135	58%
2008	9.39	699	417	1,123	414	841	68%
2009	10.36	1,230	554	2,388	981	995	37%
2010	12.49	721	555	1,057	457	816	63%
2011	24.66	2,255	748	3,951	3,010	1,312	21%
2012	11.44	1,052	1,372	1,208	28	1,599	47%
2013	12.79	555	397	1,019	5	799	74%

cfs = cubic feet per second.

The hydrographs of average daily discharges from Cutler Reservoir during water quality monitoring periods are shown in Figure 3, which illustrates the variability in the timing and magnitude of flow releases to the Bear River. Comparing releases from Cutler Reservoir only during monitoring periods, the 1996–1998 monitoring period were characterized by high average flows (1,959 cfs), whereas the 2000 to 2003 monitoring period was characterized by average low flows (534 cfs), while 2008 and 2013 water years were relatively low flow years (699 cfs and 555 cfs).The magnitude of releases during the 1996–1998 period were between 52% (2008), and 69% greater (2000–2003) than peak releases during the other sampling periods. Minimum daily releases or the lowest recorded flows across the sampling periods range from 0 cfs (2013) to 159 cfs (1996–1998). Average precipitation totals during the four sampling periods are presented in Table 6 and reflect the trend in flows shown in Figure 3 (Utah State University Climate Center 2014).

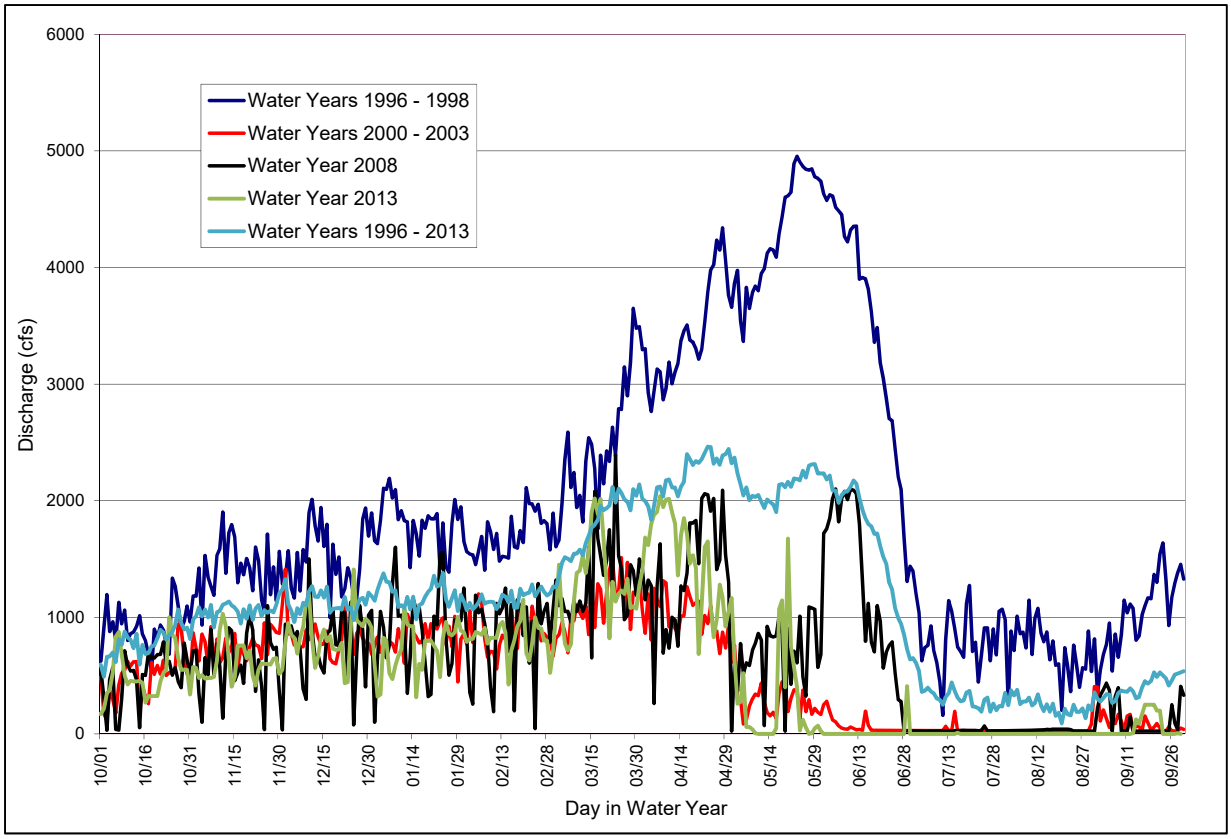

Figure 3. Hydrograph for average daily releases from Cutler Reservoir (cfs) during four monitoring periods.

Table 6. Average Annual Precipitation during the Four Monitoring Periods

Monitoring Period	Precipitation (in)	Average Annual Flow (cfs)
Water years 1996–1998	18.78	1,959
Water years 2000–2003	12.29	534
Water year 2008	9.39	699
Water year 2013	12.79	555
Water years 1996 –2013	15.79	1,172

WATER QUALITY RESULTS

The 2013 Reservoir Drawdown

As discussed previously, Cutler Reservoir is operated in run-of-river mode such that water surface elevation is maintained between 4,406.25 feet and 4,407.75 feet from March 1 through December 1, and from 4,405.5 to 4,407.75 from December 2 through February 28. Although the surface elevation of the reservoir is managed according to FERC license specifications, in October 2013 a drawdown to 4,390.6

began for maintenance on the spill gates, which resulted in the reservoir being held lower than the standard operating levels until the first phase of repairs was complete, in early 2014 (Figure 4).

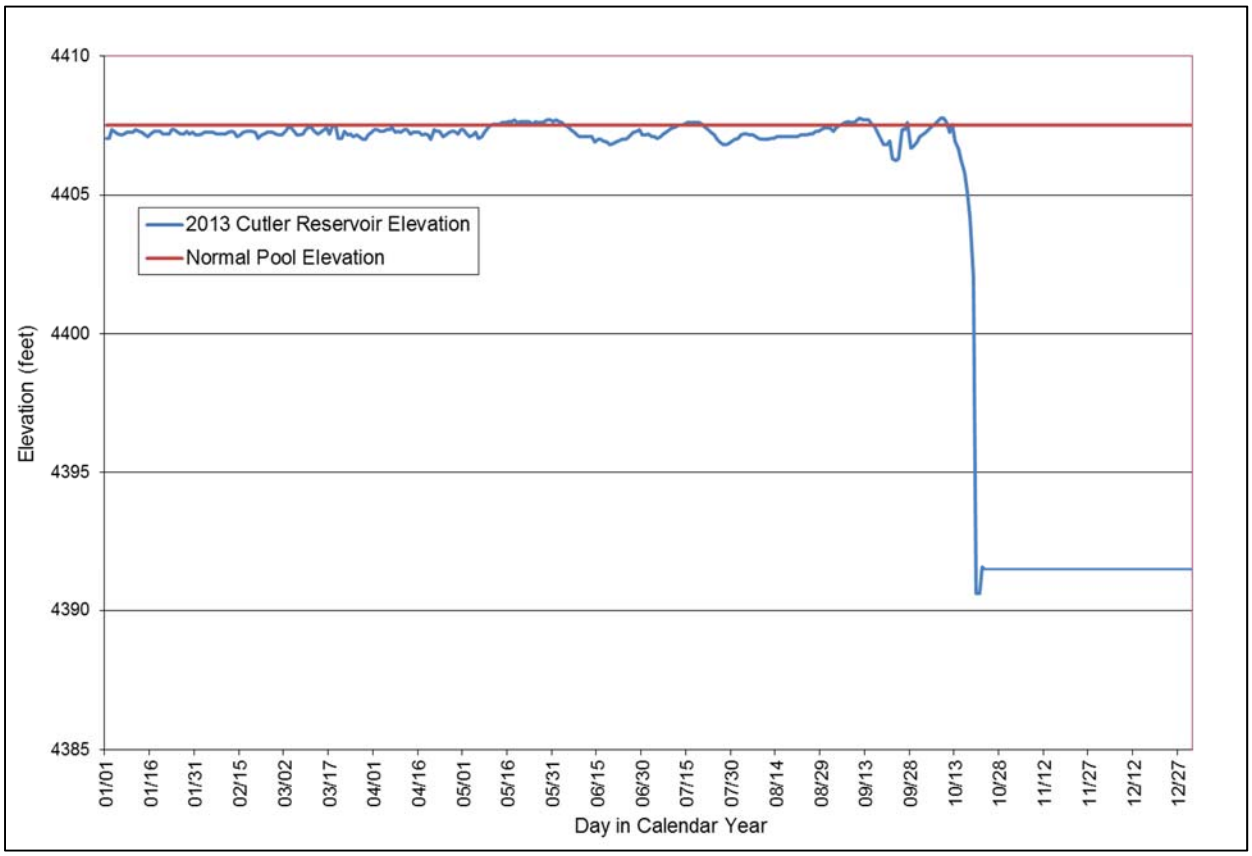

Figure 4. Cutler Reservoir surface elevations during 2013.

During this drawdown, the 2013 winter baseflow samples were collected (December 11, 2013). Because of the potential biochemical changes associated with the drawdown, the 2013 winter baseflow results from the three reservoir sample locations were compared to the 2013 spring, summer, and fall baseflow results. Additionally, the 2013 winter baseflow results were compared to winter baseflow samples from the three other monitoring periods. This comparison included results for the following parameters: *E. coli*, total phosphorus, orthophosphate as phosphorus, and total inorganic nitrogen. This was done to determine if the 2013 winter baseflow results should be included in subsequent analyses and discussions, or if there was a need to repeat the winter baseflow sample in 2014. A table of these results is presented in Appendix A. On average, the standard deviation for 2013 sample results including winter baseflow was 11.06, compared to 11.88 excluding winter baseflow. Comparing the single site sampled during all monitoring periods (Cutler Reservoir Benson Marina) shows an average difference in the standard deviation between excluding and including the 2013 winter baseflow data of 2.72. Although these differences in standard deviations appear significant, they reflect expected high variability in bacteria results. High variability was not observed when comparing nutrient data across seasons and years. Based on these results, the 2013 winter baseflow samples were not excluded from subsequent analyses.

Temperature

Water temperature determines whether or not a water body can support warm- cool- or cold-water aquatic species. High water temperatures can be harmful to fish at all life stages, especially if those temperatures occur in combination with other habitat limitations such as low DO or poor food supply (Dodds 2002; Dodds and Whiles 2010). 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 adults (Dodds 2002: Dodds and Whiles 2010). Sensitivity can also vary by species (Dodds 2002 Dodds and Whiles 2010) 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. Average annual temperatures in the Cutler Reservoir system during the four monitoring periods were highest in 2008, and lowest during the 1996–1998 period (Table 7); note the inverse relationship between temperature and flow (Table 6) at Cutler Reservoir.

Table 7. Temperature (°C) in the Cutler Reservoir System from 1996 to 2013

	Spring Baseflow	Spring Runoff	Summer Baseflow	Fall Baseflow	Fall Storm	Winter Baseflow	Annual Average	Annual Maximum	Annual Minimum	Annual Standard Deviation
1996–1998										
Logan River	5.2		13.3	7.9		5.0	7.5	13.3	3.3	3.4
Little Bear River	5.4		17.2	9.8		7.1	9.2	17.2	3.0	4.8
Spring Creek	6.8		18.1	9.5		6.1	9.5	18.1	4.2	4.8
Cutler Reservoir at Benson Marina	7.2		27.5	10.9		7.2	11.7	27.5	4.7	8.3
Bear River at Summit Creek	5.4		23.3	9.8		5.9	9.9	23.3	3.3	7.3
Bear River below dam	5.8		24.2	10.3		5.9	10.4	24.2	3.5	7.4
2000–2003										
Logan River	10.8		11.9	14.1		2.7	7.7	14.5	1.8	5.5
Little Bear River	15.9		20.2	15.1		2.6	9.6	20.2	1.7	7.7
Spring Creek	15.7		18.2	14.4		3.9	9.8	18.2	3.1	6.4
Cutler Reservoir at Benson Marina	21.5		21.2	20.7		1.8	11.4	21.5	0.3	10.3
Bear River at Summit Creek	17.8		20.9	17.9		1.0	9.8	20.9	–	9.5
Bear River below dam	20.8		22.0	19.5		2.2	11.3	22.0	1.2	9.9
2008										
Logan River	9.9	7.0	17.3	10.9	9.7	2.5	9.5	17.3	2.5	4.9
Little Bear River	17.4	6.9	19.7	11.4	10.7	1.3	11.2	19.7	1.3	6.7
Spring Creek	17.4	8.5	20.1	12.1	11.1	3.2	12.0	20.1	3.2	6.1
Cutler Reservoir south of Swift Slough	–	–	–	14.1	–	–	14.1	14.1	14.1	–
Cutler Reservoir at Benson Marina	20.0	9.4	24.9	15.2	11.0	0.9	13.6	24.9	0.9	8.4

Table 7. Temperature (°C) in the Cutler Reservoir System from 1996 to 2013

	Spring Baseflow	Spring Runoff	Summer Baseflow	Fall Baseflow	Fall Storm	Winter Baseflow	Annual Average	Annual Maximum	Annual Minimum	Annual Standard Deviation
Bear River at Summit Creek	15.5	8.5	23.3	14.6	10.6	0.9	12.2	23.3	0.9	7.5
Cutler Reservoir at Highway 23	19.0	9.3	24.9	16.0	10.9		16.0	24.9	9.3	6.3
Bear River below dam	18.4	10.0	27.0	17.5	10.6	0.1	13.9	27.0	0.1	9.2
2013										
Logan River	5.4	9.6	18.0	10.9	9.3	0.0	8.9	18.0	0.0	6.0
Little Bear River	5.3	15.4	18.6	12.0	9.0	0.2	10.1	18.6	0.2	6.7
Spring Creek	6.7	14.4	18.6	11.3	9.5	0.2	10.1	18.6	0.2	6.4
Cutler Reservoir south of Swift Slough	9.2	16.3	21.9	12.7	-	0.7	12.2	21.9	0.7	8.0
Cutler Reservoir at Benson Marina	6.1	19.2	22.9	13.9	11.6	0.1	12.3	22.9	0.1	8.4
Bear River at Summit Creek	7.0	14.6	21.0	14.3	11.6	0.7	11.5	21.0	0.7	7.0
Cutler Reservoir at Highway 23	5.5	18.9	22.0	13.5	11.8	0.2	12.0	22.0	0.2	8.2
Bear River below dam	7.4	20.4	21.8	13.0	13.8	0.1	12.7	21.8	0.1	8.1

The Logan River was the coolest of the sites sampled across all monitoring periods, as it represents the most intact riparian habitat in the study area and directly drains a high-elevation watershed. The warmest water temperatures occurred in the northern and northeastern part of Cutler Reservoir, with little to no riparian cover or shading. There is only one recorded exceedance of the state standard of 27ºC for warm-water fisheries, which occurred at Cutler Reservoir at Benson Marina during 1996 – 1998 monitoring period. Temperature values fluctuated by season and by hydroperiod throughout the Cutler Reservoir system. Hydroperiod results show, as expected, that winter baseflow temperatures are the lowest followed by temperatures during fall storm events, while summer baseflow and fall baseflow have the highest average temperatures, which correspond to periods of high or low flow. Annual average temperatures across hydroperiods were lowest during the 1996–1998 (9.7˚C) and 2000–2003 (9.9˚C) periods, followed by 2013 (11.2 ˚C), and were highest in 2008 (12.8˚C).

pH

The pH of a water body is a measure of its acidity or alkalinity. A pH value of 7 is neutral, values 0 to 7 are acidic, and 7 to 14 are alkaline. Extremely acidic or alkaline waters can be problematic for fisheries. Extreme levels of pH can be directly toxic to aquatic life. Each species of fish has a distinct range of pH tolerance, and levels outside that range can cause aluminum toxicity, reproductive problems, and death (Dodds 2002). 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. Measured pH values in the 6.5–9.0 range are generally supportive of aquatic life (Utah Water Quality Standards, Rule R317-2-14). Results for pH by hydroperiod, including summary statistics for monitoring periods, are presented in Table 8, where 6% of samples exceeded 9.0, with a maximum value of 9.2 at Cutler Reservoir north of Benson Marina.

Table 8. pH values in the Cutler Reservoir System from 1996 to 2013

	Spring Baseflow	Spring Runoff	Summer Baseflow	Fall Baseflow	Fall Storm	Winter Baseflow	Annual Average	Annual Max	Annual Min	Annual Standard Deviation
1996–1998										
Logan River	7.7		7.9	8.2		7.8	8.0	8.3	7.5	0.3
Little Bear River	8.0		7.7	8.1		8.2	8.0	8.2	7.7	0.2
Spring Creek	7.7		7.6	8.0		8.0	7.9	8.1	7.6	0.2
Cutler Reservoir at Benson Marina	8.2		8.4	8.3		8.4	8.3	8.4	8.0	0.2
Bear River at Summit Creek	8.0		8.0	8.2		8.3	8.1	8.3	7.9	0.2
Bear River below dam	8.0		8.0	8.2		8.3	8.1	8.3	7.9	0.2
2000–2003										
Logan River	8.1		8.1	7.8		8.2	8.1	8.3	7.6	0.2
Little Bear River	8.0		7.8	7.9		8.1	8.0	8.3	7.8	0.2
Spring Creek	7.8		7.8	7.6		8.0	7.9	8.1	7.6	0.2
Cutler Reservoir at Benson Marina	8.3		8.4	8.5		8.1	8.2	8.7	7.7	0.3
Bear River at Summit Creek	8.1		7.9	7.9		8.1	8.0	8.4	7.7	0.3
Bear River below dam	8.1		7.9	7.9		8.1	8.0	8.4	7.7	0.3
2008										
Logan River	8.7	8.7		8.5	8.0	–	8.5	8.7	8.0	0.3
Little Bear River	8.5	8.8	8.8	8.4	7.9	–	8.5	8.8	7.9	0.3
Spring Creek	8.5	8.7	8.7	8.4	7.8	–	8.4	8.7	7.8	0.3
Cutler Reservoir south of Swift Slough	–	–	–	8.9	–	–	8.9	8.9	8.9	–
Cutler Reservoir at Benson Marina	8.8	8.9	9.2	8.5	8.4	–	8.8	9.2	8.4	0.3
Bear River at Summit Creek	8.8	8.8	9.1	8.8	8.3	–	8.7	9.1	8.3	0.3
Cutler Reservoir at Highway 23	9.0	8.9	9.0	9.1	8.5	–	8.9	9.1	8.5	0.2
Bear River below dam	8.5	8.8	8.5	9.0	8.5	–	8.6	9.0	8.5	0.2
2013										
Logan River	8.4	8.3	7.9	8.3	8.3	8.3	8.3	8.4	7.9	0.2
Little Bear River	8.3	8.1	8.2	8.2	8.3	8.0	8.2	8.3	8.0	0.1
Spring Creek	8.3	8.1	8.1	8.1	8.2	8.2	8.2	8.3	8.1	0.1
Cutler Reservoir south of Swift Slough	8.5	8.2	8.2	8.3	–	8.1	8.3	8.5	8.1	0.2
Cutler Reservoir at Benson Marina	8.6	8.4	8.7	8.7	8.8	8.2	8.5	8.8	8.2	0.2
Bear River at Summit Creek	8.5	8.3	8.5	8.6	8.6	8.3	8.5	8.6	8.3	0.1
Cutler Reservoir at Highway 23	8.5	8.5	8.6	8.7	8.8	8.2	8.6	8.8	8.2	0.2
Bear River below dam	8.6	8.4	8.5	8.7	8.5	8.3	8.5	8.7	8.3	0.1

Bacteria

Waterborne pathogenic organisms include bacteria (e.g., dysentery), viruses (e.g., hepatitis), protists (e.g., *Giardia*), and parasites. Some pathogens and indicator bacteria can live in bottom sediments of streams and be resuspended during high flows. Pathogenic organisms are costly and difficult to test for in natural waters due to their low concentrations and diversity.

Escherichia coli (E. coli) is a species of fecal coliform that is used as an indicator of fecal contamination. The majority of *E. coli* strains are not pathogenic to humans (Nataro and Kaper 1998). However, some strains of *E. coli*, such as *E. coli* 157:H7, are responsible for hemorrhagic colitis (severe diarrhea) and hemolytic uremic syndrome (kidney failure) (Nataro and Kaper 1998), both of which cause mild to extreme symptoms in humans and can be fatal if left untreated. *E. coli* has recently been found to be a more reliable indicator of pathogens originating from fecal matter than fecal coliforms. In 1986, the EPA recommended that *E. coli* or enterococci replace fecal-coliform bacteria in state water-quality standards (EPA 1986). The EPA's recommendation for *E. coli* as an indicator of fecal contamination in water and wastewater is because 1) *E. coli* occurs in human and warm-blooded animal feces in greater quantities than pathogens, 2) it shows minimal growth in aquatic systems, 3) it is easily detectable, and 4) it is consistently present when pathogens are present (Elmund et al. 1999).

Based on the previous coliform standards established by the State of Utah in assessing water quality, high total coliform would be those greater than 5,000 organisms per 100 mL (org/100mL). The pathogen standard for the State of Utah relates to *E. coli* and requires water bodies designated for secondary recreation (i.e., Cutler Reservoir) not to exceed *E. coli* values of 668 org/100 mL. The 30-day standard for the same waters is a geometric mean of *E. coli* not to exceed 206 org/100 mL.

There are noteworthy differences for coliform bacteria and *E. coli* in the Cutler Reservoir system between monitoring periods, season, and hydroperiod. These differences are discussed in the sections that follow. Pathogen data collected prior to 2008 were sampled as total coliform or fecal coliform, but due to the change to *E. coli* standards, many laboratories no longer perform fecal coliform analyses. Although *E. coli* was collected in 2008 and 2013, fecal coliform results prior to this were converted to *E. coli* using a standard conversion by dividing fecal coliform results by1.59 as identified by the Utah Division of Water Quality (UDWQ 2005). Collection of *E. coli* data is recommended for future monitoring periods in order to assess compliance with new state water quality criteria.

Differences in Detected Bacteria between Monitoring Periods

A comparison of *E. coli* (for baseflow samples only) across the four monitoring periods suggests that bacteria concentrations generally decreased from the first monitoring period (1996–1998) to the second monitoring period (2000–2003), increased in the third monitoring period (2008), then decreased slightly in the fourth monitoring period (2013) (Figure 5; Table 9). This comparison of baseflow samples allows for a comparison of bacteria concentrations during similar hydrologic conditions. Wet years (such as 1996) can result in the dilution of bacteria concentrations in surface waters. 2008 and 2013 were relatively dry years, and it is possible that the dryer conditions resulted in less dilution and higher *E. coli* concentrations. The highest average concentrations were collected at Spring Creek, which is near the EA Miller meat-packing plant, and at Cutler Reservoir at Benson Marina (which is the first monitoring point downstream of the Logan City effluent stream where it is released into the Swift Slough portion of Cutler Reservoir). Point sources such as EA Miller can be a continuous source of pollution to surface waters; however, little is known about the changes in management or production at the facility. Nonpoint sources also contribute to *E. coli* concentrations in Spring Creek. The other large point source is the Logan Regional Wastewater Treatment Plant located near Swift Slough on Cutler Reservoir. Slight increases in *E. coli* were observed at this site between 2008 and 2013, but it is unclear if this is due to changes at the

plant, management practices, or from some other source. Although average *E. coli* concentrations in 2013 did not exceed the State of Utah pathogen instantaneous maximum standard of 668 org/100mL designated for secondary recreation, samples collected from spring Creek, Little Bear River and Logan River exceed the 30-day standard. Additional sampling over a 30-day period is needed to determine if the waterbody exceeds that standard.

Average total coliform concentrations during baseflow conditions vary through time but were generally higher in 2013 than in previous years. Average total coliform concentrations across sites were highest in 2013 (1,762 org/100mL), followed by 1996–1998 (1,019 org/100mL), followed by 2000–2003 (450 org/100mL), and lowest in 2008 (220 org/100mL) (Table 10). Of the 53 total coliform samples collected across sites in 2013, twenty of the sample results (38%) had total coliform concentrations exceeding the detection limit of >2,400 org/100mL. The highest average total coliform concentrations were taken at Spring Creek. The cause of the overall increase in total coliform concentrations seen in 2013 is unclear, but additional sampling locations over different hydrologic conditions could aid in identifying sources.

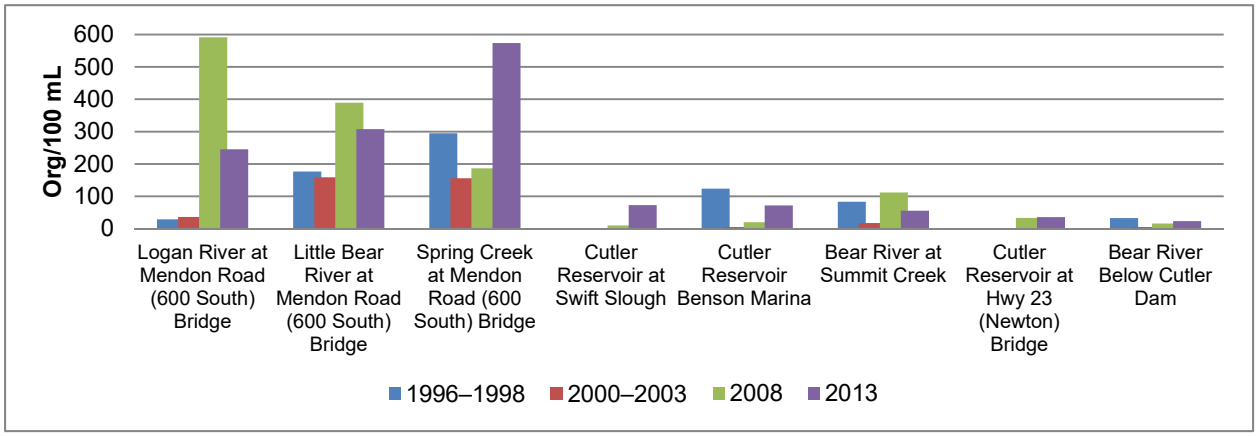

Figure 5. *E. coli* concentrations in the Cutler Reservoir system during baseflow for all monitoring periods.

Table 9 Average *E. coli* Concentrations during baseflow in the Cutler Reservoir System during all monitoring periods

Station Name	1996–1998	2000–2003	2008	2013
Logan River at Mendon Road (600 South) Bridge	29	36	591	246
Little Bear River at Mendon Road (600 South) Bridge	177	159	389	308
Spring Creek at Mendon Road (600 South) Bridge	295	156	186	574
Cutler Reservoir at Swift Slough	NA*	NA*	10	73
Cutler Reservoir Benson Marina	124	5	20	72
Bear River at Summit Creek	84	18	112	56
Cutler Reservoir at Hwy 23 (Newton) Bridge	NA*	NA*	33	36
Bear River Below Cutler Dam	33	5	16	24

*Site not included during sampling periods prior to 2008

Table 10. Average Total Coliform Concentrations during baseflow in the Cutler Reservoir System During all Monitoring Periods

Station Name	1996–1998	2000–2003	2008	2013
Logan River at Mendon Road (600 South) Bridge	281	407	245	1,586
Little Bear River at Mendon Road (600 South) Bridge	860	448	325	1,926
Spring Creek at Mendon Road (600 South) Bridge	2,537	1,278	205	2,543
Cutler Reservoir at Swift Slough	NA*	NA*	410	1,356
Cutler Reservoir Benson Marina	1,702	115	84	1,275
Bear River at Summit Creek	499	208	220	1,476
Cutler Reservoir at Hwy 23 (Newton) Bridge	NA*	NA*	103	1,723
Bear River Below Cutler Dam	237	246	167	2,211

*Site not included during sampling period

Seasonal Variation of Bacteria

E. coli concentrations in the Cutler Reservoir system varied throughout the 2013 sampling period. In general, average *E. coli* concentrations were lowest during baseflow periods, and increased during runoff and storm conditions by 16% and 42%, respectively (Figure 6). The general increase in *E. coli* from baseflow conditions is expected because surface runoff, including storms, is the process that can transport bacteria to surface waters (e.g., runoff from agricultural sources). Additionally, high concentrations during fall storms are also expected due to surface runoff and warmer temperatures, which increase the survivability of bacteria relative to colder runoff conditions. However, at three of the sampling sites, baseflow concentrations were greater than runoff or storm concentrations. The most notable of these sites is Spring Creek, which, as discussed, is located near the EA Miller meat-packing plant. Average *E. coli* concentrations at tributary sites during baseflow, runoff, and storm events were 391%, 400%, and 664% higher than the average concentrations at Cutler Reservoir sites during the same conditions. These results suggest that the flushing of terrestrial areas, especially during storms, can concentrate bacteria prior to subsequent dilution in Cutler Reservoir.

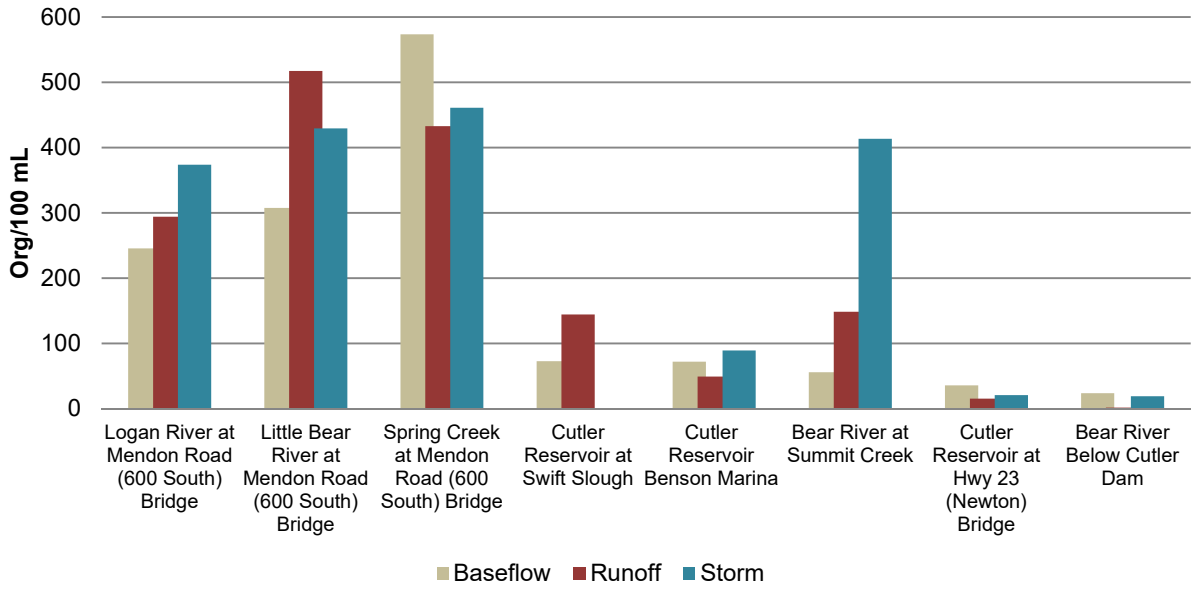

Figure 6. *E. coli* concentrations in the Cutler Reservoir system during the 2013 sampling period.

Nutrients

Concerns associated with excessive nutrient concentrations in freshwaters 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 (though Cutler Reservoir is not used as a drinking water source). The 2010 Cutler Reservoir TMDL defined seasonal (May – October) total phosphorus targets for the northern reservoir and southern reservoir as 0.07 mg/l, and 0.09 mg/l, respectively, and an annual target of 0.075 mg/l for reservoir outfall. The northern reservoir includes the areas around Clay Slough, Cutler Reservoir north of Benson Marina, the Bear River and Newton Creek. The southern reservoir includes the areas of Swift Slough, Cutler Reservoir south of Benson Marina, Little Bear River, Spring Creek, and the Logan River (Figure 2). Similarly, the TMDL defined dissolved oxygen targets as 1day minimum (3.0 mg/l), 7-day average (> 4.0 mg/l), and a 30-day average (> 5.5 mg/l) needed to support beneficial uses (UDWQ 2010). Nuisance algae growth, including phytoplankton (water column algae), periphyton (attached algae), and macrophytes (rooted plants) 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. The nutrient levels necessary for algae growth may occur at concentrations well below the identified water quality thresholds and criteria. 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. These blooms can appear as layers or algal mats on the surface of the water.

Algal blooms often create objectionable odors in waters for recreation use and can produce intense coloration of both the water and shorelines. Water bodies demonstrating sufficient nutrient concentrations can cause excessive algal growth and are said to be eutrophic. However, algae is not always damaging to water quality. 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 through the water column and collect in bottom sediments. As the algae decompose, the biochemical processes remove oxygen from the surrounding water (known as Biological Oxygen Demand or BOD). Because most of the decomposition occurs near the bottom of the water column, dissolved oxygen concentrations near the bottom of lakes and reservoirs can be depleted. Low DO in these areas can lead to decreased fish habitat and even fish kills if other areas of water with sufficient DO are not available for fish to take refuge.

Nutrient Differences between Monitoring Periods at Cutler Reservoir

Total phosphorus data collected in 2013 show an overall decrease across all sites from data collected in previous monitoring periods (Figure 7). Phosphorus concentrations decreases between 2008 and 2013, ranging from an 83% decrease at the Hwy 23 (Newton) Bridge site on Cutler Reservoir to a 48% decrease at the Logan River (Mendon Road Bridge) site. Comparing 2013 data to 1996–1998 data also shows a general decrease, ranging from 81% at the Bear River below Cutler Reservoir to 6% at the Logan River. Nitrate nitrogen concentrations have generally stayed the same or have slightly decreased across sampling (Figure 8). A notable spike of 0.36 mg/l was observed at the Spring Creek site during the 2000 – 2003 monitoring period but decreased considerably during subsequent monitoring periods. Total nitrogen in the Cutler Reservoir system during baseflow conditions increased slightly from 2008 to 2013, with average concentrations of 1.10 mg/l and 1.36 mg/l, respectively (Figure 9). Note that total nitrogen was not collected prior to 2008. This increase in total nitrogen occurred at both Cutler Reservoir sampling sites (42%) and at tributary sites (24%). It is important to note that 92% of the 2013 total phosphorus results were below the detection limit of 0.05 mg/l. Additionally, between 25% (nitrogen, nitrate as N) and 57% (nitrogen, ammonia as N) of nitrogen constituents were below the laboratories' detection limit (see section 2.3.2). As previously discussed, observed values below the detection limit are presented as half of the detection limit. The variability in nutrient results through time might be partially explained by the range of detection limits for individual constituents used by different labs across the four sampling periods. On average, the only site with detectable phosphorus was Cutler Reservoir at Benson Marina, which might be explained by stagnant water that occurs at this site and to more prevalent anoxic reducing environments that can lead to the release of dissolved phosphorus from precipitated ferric phosphates when the iron is reduced from Fe (III) to Fe (II) (Young and Ross 2001). However, total phosphorus was not generally detected at the other Cutler Reservoir sites where stagnant conditions also exist. The most notable increase in total nitrogen was on Cutler Reservoir near the Swift Slough, which is affected by effluent from the Logan City wastewater treatment plant. The highest average total nitrogen concentration was at Spring Creek, which can be affected by the aforementioned land use practices and the JBS (formerly known as EA Miller) meat-processing facility. Based on the changes in phosphorus and nitrogen over time, these results suggest a reduction in nutrient concentrations, which is likely the result of nutrient management plans in the Cutler Reservoir system associated with implementation of the Cutler Reservoir TMDL, and especially the actions associated with implementation of other TMDLs from tributary sites, including the Spring Creek and Bear River/Malad TMDLs (UDWQ 2010). Most notably, total phosphorus was significantly lower in 2013 throughout the Cutler Reservoir system than it has been in the previous monitoring periods. This new data was perplexing and even seemed questionable at first but information provided by UDWQ staff said it may be attributable to installation of a tertiary treatment facility in 2012 on the south fork of Spring Creek which has dramatically reduced the phosphorus loading from the JBS plant (M. Allred, pers. comm., 2018). Additional data sampling by Utah DEQ in 2014-2016 (2017 DEQ data may also be available to augment the 2014-2016 data prior to the future analysis of PacifiCorp 2018 water quality data) showed some correlated decreases in phosphorus, but also several increases in phosphorus, potentially correlated with times that the JBS plant was offline (M. Allred, pers. comm., 2018). Although the 2013 PacifiCorp data and the 2014-2016 DEQ data show different trends

depending on the collection date, they do suggest a marked decrease in phosphorus loading of Cutler Reservoir, as compared to previous monitoring periods. The 2018 PacifiCorp data collection currently underway will be reviewed specifically in light of this question regarding potential phosphorus load decreases in Cutler. The 2013 results may also be anomalous; future Cutler water quality monitoring periods conducted in 2018 and 2023 will help to address this question.

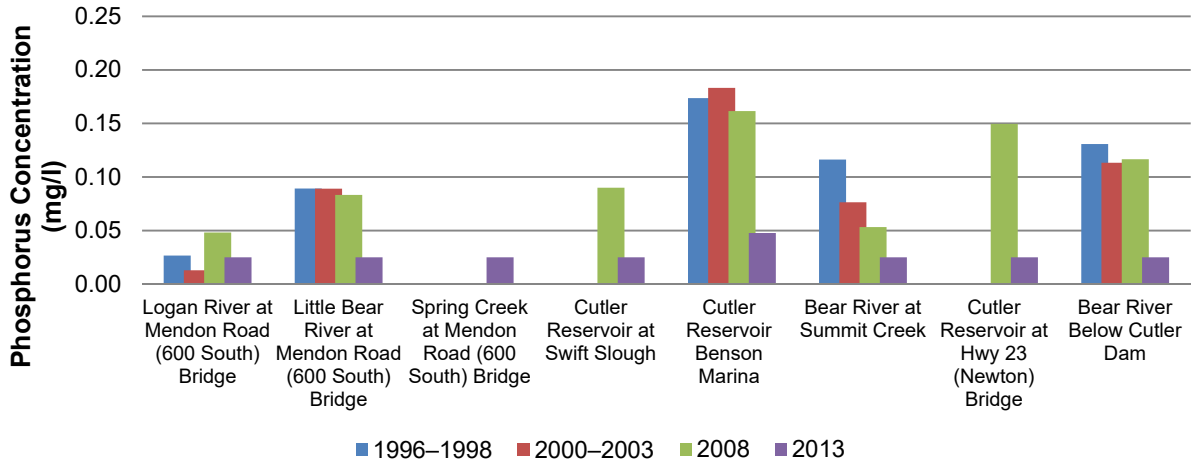

Figure 7. Total phosphorus concentrations in the Cutler Reservoir system during baseflow for all monitoring periods. The TMDL standard in Cutler Reservoir for total phosphorus targets is 0.07 mg/l for the northern reservoir and 0.09 mg/l for southern reservoir the and an annual target of 0.075 mg/l for reservoir outfall.

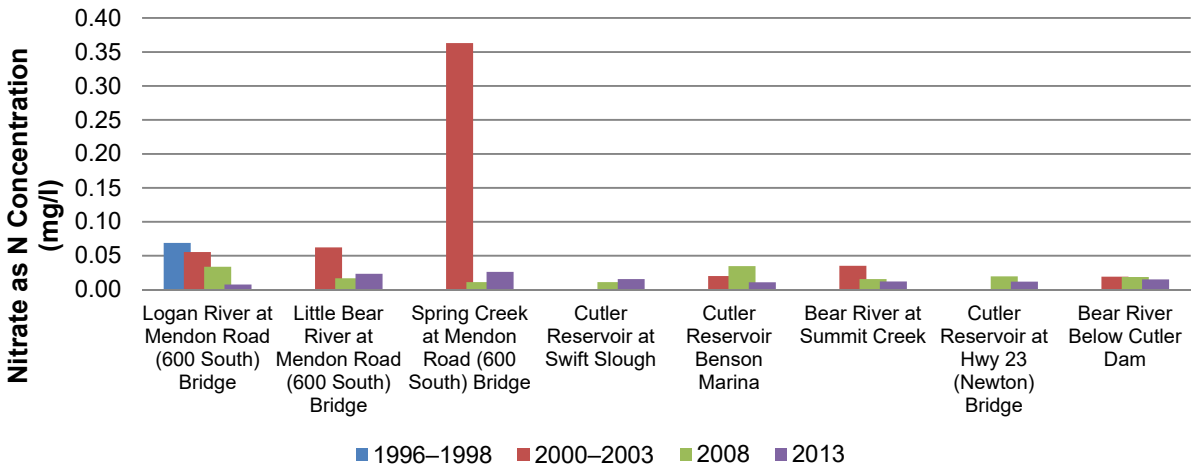

Figure 8. Nitrate-Nitrogen concentrations in the Cutler Reservoir system during baseflow for the 2008 and 2013 monitoring periods. The Utah state standard is no greater than 4 mg/L.

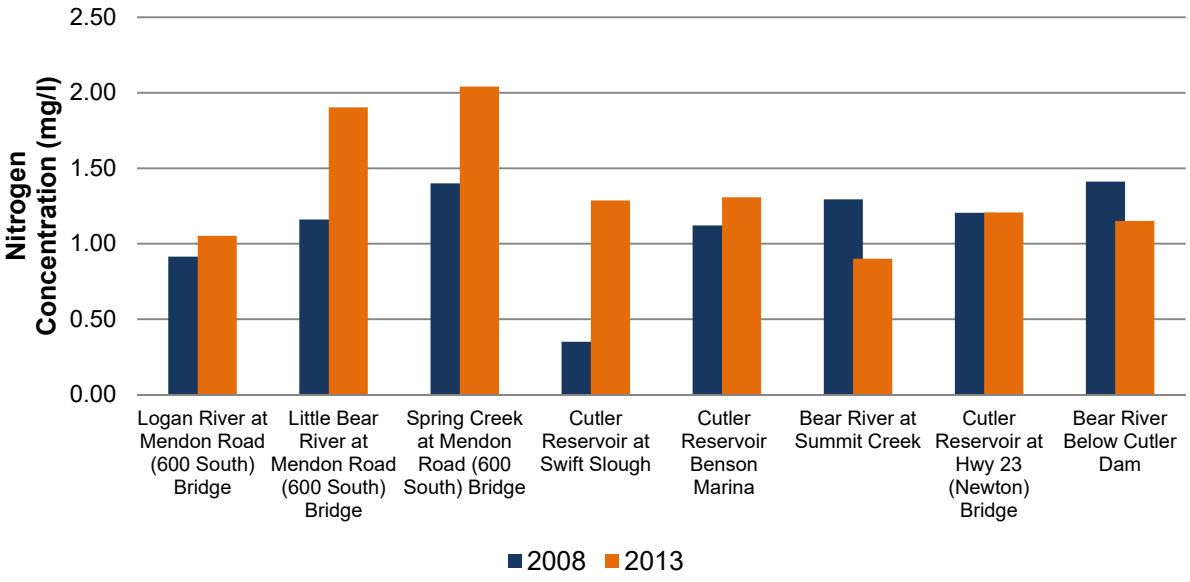

Figure 9. Total nitrogen concentrations in the Cutler Reservoir system during baseflow for the 2008 and 2013 monitoring periods.

Dissolved Oxygen

Dissolved oxygen 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 wetlands and tributaries 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 water 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 in hours with no daylight and produce oxygen during daylight hours (D'Avanzo and Kremer 1994). So there are circumstances where algae presence could be beneficial or detrimental to aquatic organisms depending on time of day and proximity of fish and other aquatic organisms to the low-DO region of the water body. Organic sediment inputs and algae generated in a reservoir also result in reduced DO levels. When algae die and settle to the bottom of the water column or when organic matter enters a reservoir, aerobic decomposition depletes the oxygen supply in the overlying water (high BOD).

Dissolved oxygen measurements were taken during all water quality sampling events, except during summer baseflow and the fall storm in 2008 due to equipment failure, and during the fall storm in 2013 at Swift Slough because the site was not accessible. Additionally, the data suggest equipment failure during the 2013 summer baseflow sampling event, where all sample values were between 2.1 and 2.3 mg DO/l, thus these values were not used to calculate summary statistics (Table 11). Dissolved oxygen values were generally highest below Cutler Dam and throughout the Cutler Reservoir system at all sampling times, but the highest levels were observed during winter baseflow. The lowest values recorded were in Spring

Creek and the Little Bear River during the 1996–1998 period and the 2000–2003 period, and in the Cutler Reservoir system south of Swift Slough in 2013. However, even these minimum values are considered to be safe for fish and other aquatic organisms.

It should be noted that all of the DO sampling occurred during the daylight hours when oxygen levels are expected to be elevated from photosynthetic activity. Conversely, DO levels drop during the nighttime when phytoplankton and macrophytes use available DO for respiration and no photosynthetic activity is occurring to replenish the oxygen supply. Thus, values of 6 mg/L during daylight hours could correlate to nighttime DO concentrations that are harmful to biota.

As expected, DO values fluctuated throughout the water year in the Cutler Reservoir system. In 2008 the DO increased from spring baseflow to spring runoff, likely related to oxygenation associated with colder water temperatures, high flows and increased turbulence. However, in 2013 DO decreased from spring baseflow to spring runoff, which might be related to timing of the spring runoff sampling, which occurred during the rising limb of the May runoff event. This event did not peak as high as the April runoff and therefore had less potential for oxygenation related to the higher flows in 2008, and higher temperatures with decreased oxygen holding capacity relative to the colder temperatures that occurred in 2008.

Table 11. Dissolved Oxygen (mg/L) in the Cutler Reservoir System from 1996 to 2013. Note the Utah state minimum standard for dissolved oxygen is a one-day average of 4 mg/L.

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

Table 11. Dissolved Oxygen (mg/L) in the Cutler Reservoir System from 1996 to 2013. Note the Utah state minimum standard for dissolved oxygen is a one-day average of 4 mg/L.

	Spring Baseflow	Spring Runoff	Summer Baseflow	Fall Baseflow	Fall Storm	Winter Baseflow	Annual Average	Annual Maximum	Annual Minimum	Annual Standard Deviation
2008										
Logan River	8.4	10.5	–	8.8	–	11.6	9.8	11.6	8.4	1.5
Little Bear River	7.6	9.7	–	8.3	–	11.2	9.2	11.2	7.6	1.6
Spring Creek	7.1	9.9	–	8.2	–	10.3	8.9	10.3	7.1	1.5
Cutler Reservoir south of Swift Slough	–	–	–	13.1	–	–	13.1	13.1	13.1	–
Cutler Reservoir at Benson Marina	8.7	9.8	–	10.8	–	5.5	8.7	10.8	5.5	2.3
Bear River at Summit Creek	7.5	9.4	–	8.1	–	11.0	8.8	11.0	7.5	1.4
Cutler Reservoir at Highway 23	8.6	10.1	–	10.9	–	–	9.9	10.9	8.6	1.2
Bear River below dam	8.3	10.3	–	10.5	–	12.8	10.5	12.8	8.3	1.8
2013										
Logan River	8.5	7.0	*	8.1	7.5	10.5	8.3	10.5	7.0	1.4
Little Bear River	9.1	6.1	*	8.1	8.2	10.7	8.4	10.7	6.1	1.7
Spring Creek	9.5	6.3	*	7.9	7.4	9.8	8.2	9.8	6.3	1.5
Cutler Reservoir south of Swift Slough	7.7	5.6	*	9.6	–	8.0	7.7	9.6	5.6	1.6
Cutler Reservoir at Benson Marina	9.7	6.0	*	8.4	7.6	11.0	8.5	11.0	6.0	1.9
Bear River at Summit Creek	8.9	7.3	*	8.4	7.6	9.8	8.4	9.8	7.3	1.0
Cutler Reservoir at Highway 23	10.0	7.2	*	8.8	7.0	10.4	8.7	10.4	7.0	1.6
Bear River below dam	11.5	8.3	*	9.2	7.0	10.9	9.4	11.5	7.0	1.9

* Indicates potential equipment failure; – indicates samples not taken

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 can also be correlated with phytoplankton density in very productive aquatic systems (Wetzel 2001). In that situation, high turbidity is not caused by sediment input but rather the sheer density of phytoplankton. Turbidity is often reported in nephelometric turbidity units (NTUs) or Formazin Nephelometric Units (FNUs), which represent the degree to which light is scattered in water. Prior to 2013, the field meters used to measure turbidity recorded values as NTUs, which changed to FNU in 2013 with the use of a new meter. Although no conversion exists between these units, they are directly comparable (personal communication, telephone conversation with Pat Noteboom, senior chemist, American West Analytical Laboratories, with Andrew Myers, SWCA, February 7, 2014).

Sediment is the most visible pollutant in freshwaters, leading to increased turbidity in water. It is usually reflected in measurements of TSS in mg/L. Erosion of upland soils and stream banks are the primary causes of elevated sediment levels in rivers and reservoirs, and both 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).

Turbidity and Sediment Differences between Hydroperiods at Cutler Reservoir

Turbidity samples were collected during all hydroperiods in 2008 and in 2013. A comparison of turbidity results during baseflow, runoff, and storm conditions in 2008 and 2013 is presented in Figure 10. The data show that, in general, runoff conditions resulted in the highest turbidity at the Cutler Reservoir sites compared to tributary sites. The highest values occurred during the 2008 runoff at Spring Creek, with turbidity values of 199.8 NTUs. In comparison to other hydroperiods, runoff conditions are expected to create high turbidity due to the magnitude of terrestrial and streambed and bank disturbance and erosion related to storm conditions.

Chlorophyll *a* , a photosynthetic pigment in algae, is often used as a surrogate for periphyton biomass or suspended algae, and was collected during the 2013 sampling period to improve our understanding of causes and source of turbidity. Regression analyses between turbidity and chl *a* during baseflow, runoff, and storm conditions only resulted in R^2 factors of less than 0.21 ($p>0.05$). These results do not improve the understanding of the relationship between turbidity and chl *a*. Additional sampling over these hydroperiods should help in understanding this relationship further.

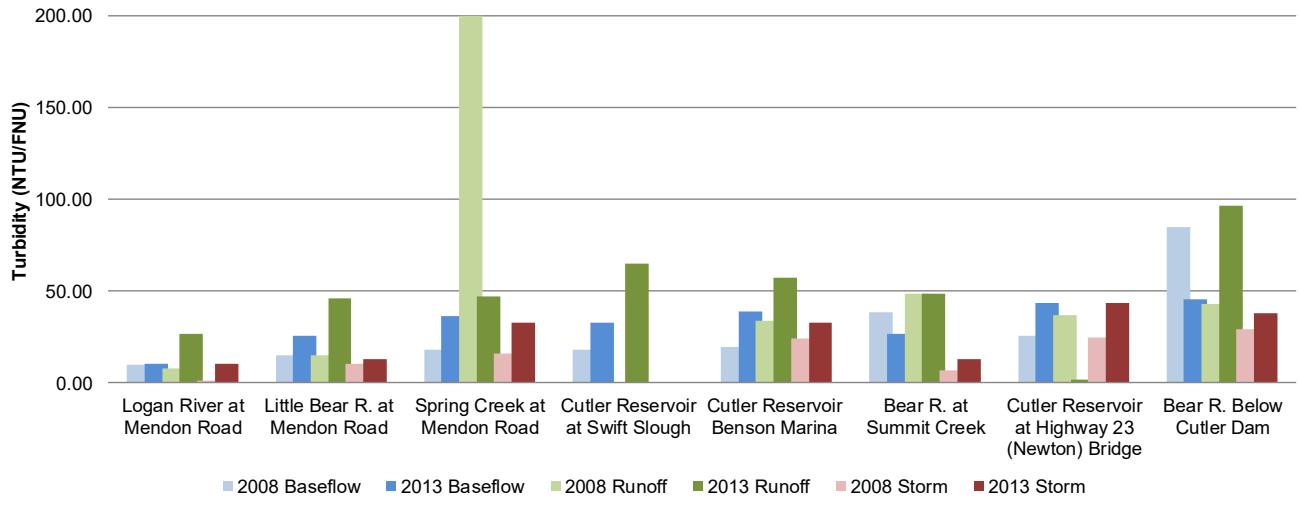

Figure 10. Average turbidity for sampling sites by 2008 and 2013 hydroperiod.

Turbidity samples were also collected during all hydroperiods in 2008 and in 2013. A comparison of TSS results during baseflow, runoff, and storm conditions in 2008 and 2013 is presented in Figure 11. In

general, TSS follows a similar seasonal trend as turbidity, with the highest values collected during runoff conditions, and at Cutler Reservoir sites. These results also suggest that storms have the potential to increase TSS more than turbidity in this system, which can result in higher nutrient inputs. These results also suggest that turbidity and TSS only correlate at some sites, such as the Bear River below the dam and Bear River below Summit Creek, and the mechanism driving these processes varies spatially and seasonally.

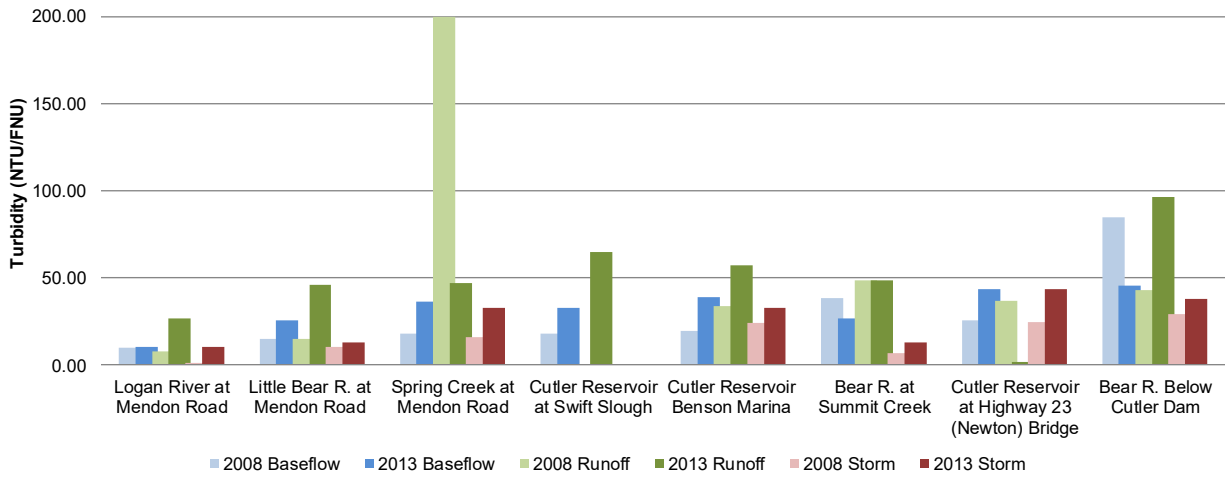

Figure 11. Average total suspended solids (TSS) for sampling sites by 2008 and 2013 hydroperiod.

Trophic State Index

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 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).

The TSI analysis presented here is limited to trophic state predictions related to total phosphorus, and is calculated using the following equation:

$$TSI\ TP = 14.42\ Ln\ (TP) + 4.15$$

Table 12 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 12. Trophic State Index 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)

Table 12. Trophic State Index Values and Status Indicators

TSI	Trophic Status and Water Quality Indicators
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

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 in 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. Figure 12 illustrates a decrease in TSI values over time at three sites from a eutrophic state in 1996–1998, 2000–2003, and 2008 to borderline mesotrophic conditions in 2013.

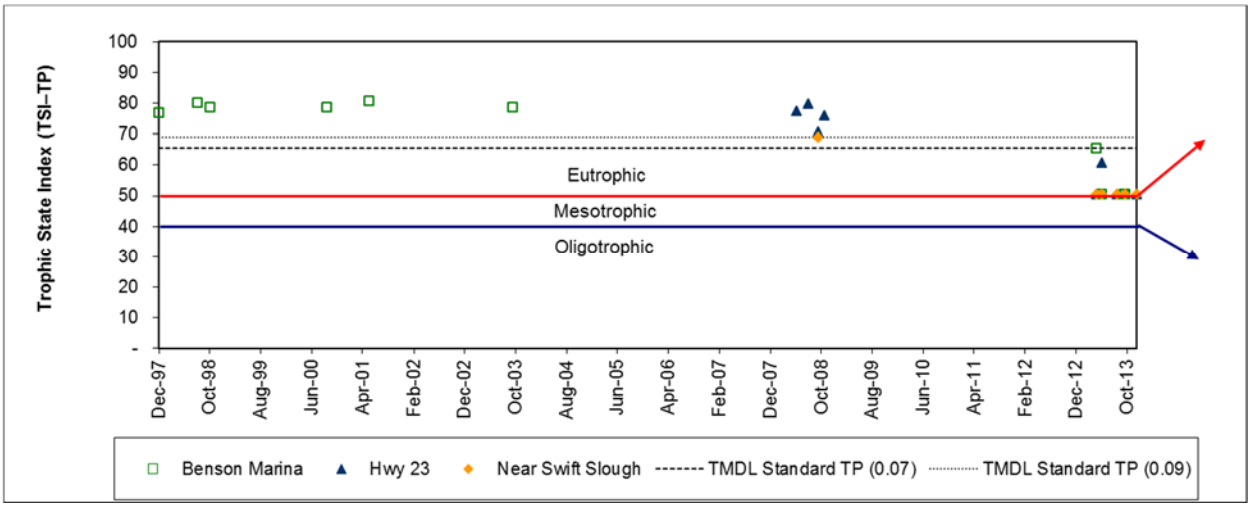

Figure 12. TSI predicted based on total phosphorus concentrations in Cutler Reservoir.

Summary of Spatial Data

Consistent with previous water quality results, data collected in 2013 indicate that water quality in all the tributaries to Cutler Reservoir introduce nutrients and turbidity and have significant impacts on water quality throughout Cutler Reservoir. These tributaries continue to have elevated nutrient and bacteria concentrations compared to the other sampling locations in the watershed. *E. coli* and nitrogen concentrations were highest in the southern tributaries and corresponding sections of the reservoir (Figures 13 through 15). This is partially explained by the shallow nature of the southern arm of the reservoir and the limited flow-through that occurs, as well as land use practices in the area. Conversely, total phosphorus concentrations were highest in the northern end of Cutler Reservoir near Benson Marina which is just downstream of the City of Logan wastewater stream, but overall total phosphorus had decreased

considerably over the previous sampling periods (the 2018 water quality monitoring dataset will help to address whether this result is anomalous).

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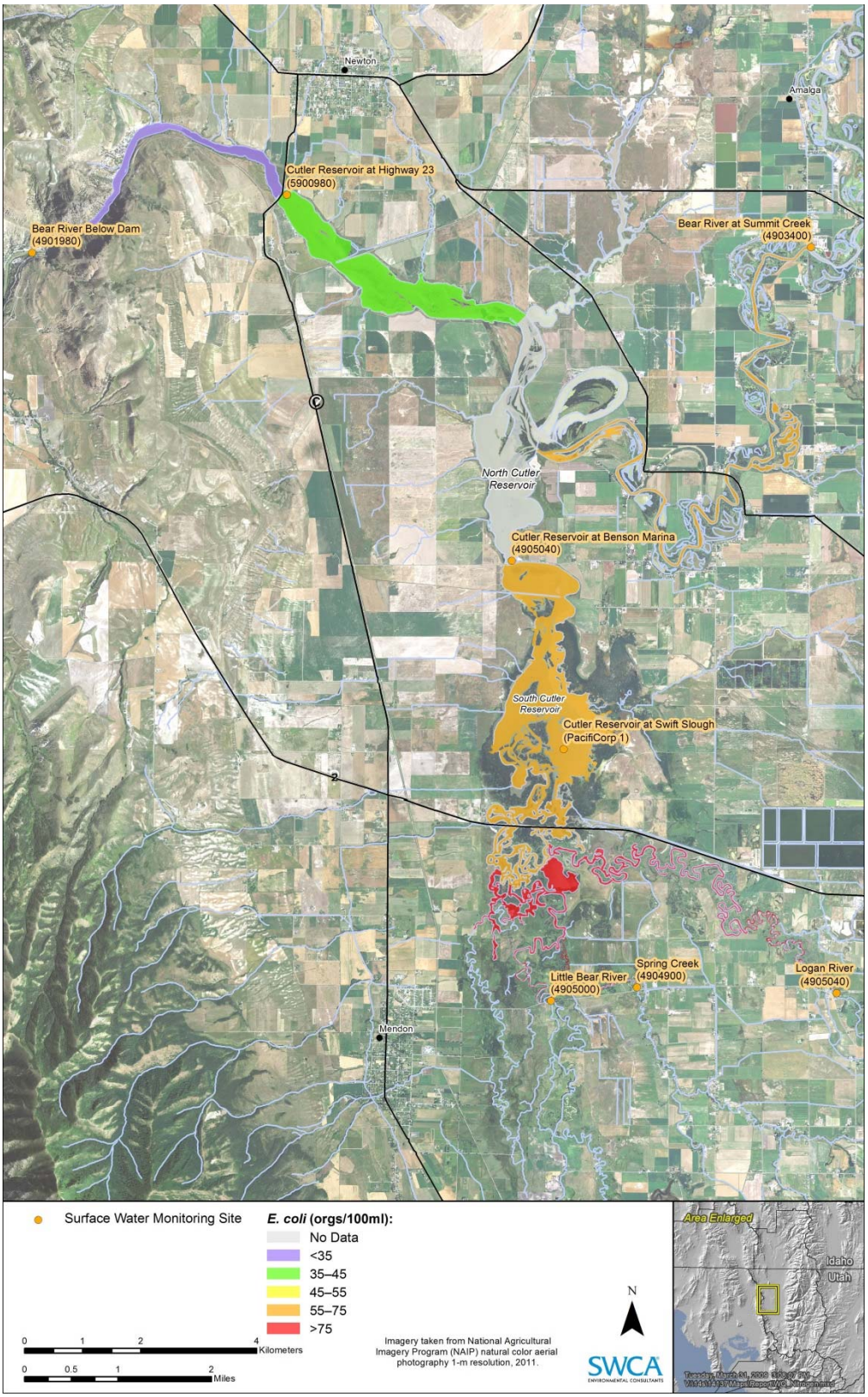

Figure 13. *E. coli* concentrations in the Cutler Reservoir system for 2013 baseflow samples.

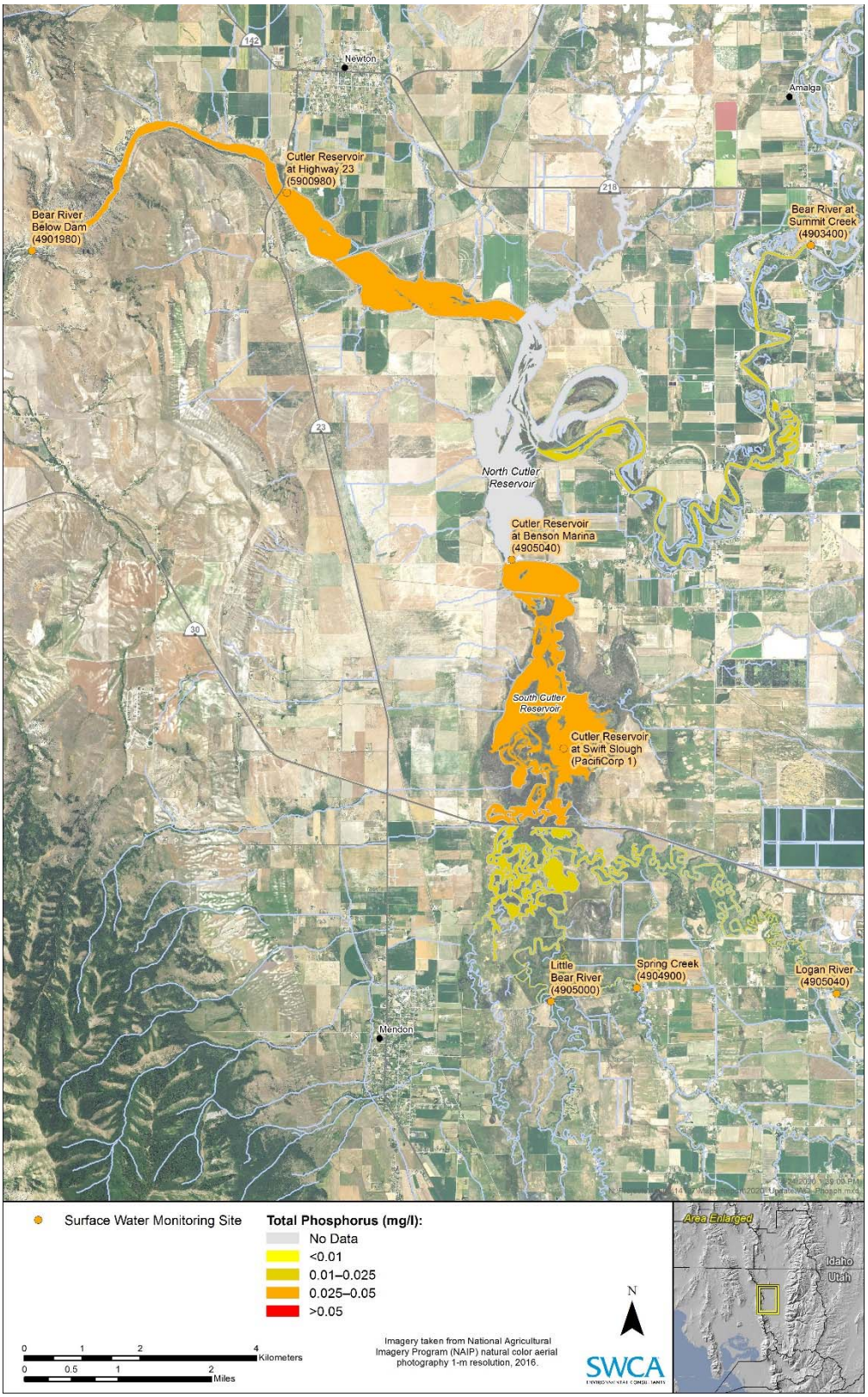

Figure 14. Total phosphorus concentrations in the Cutler Reservoir system for 2013 baseflow samples.

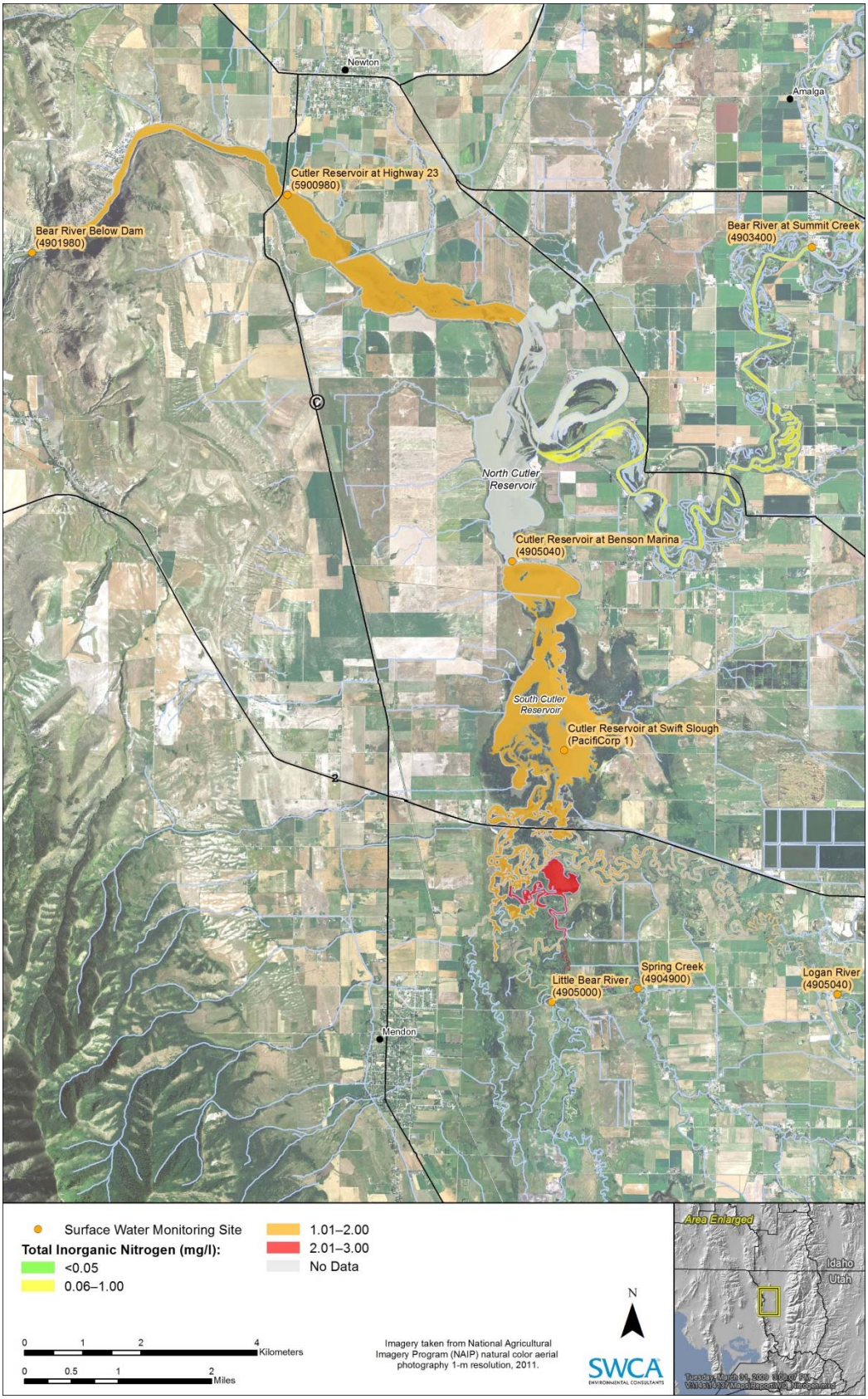

Figure 15. Total nitrogen concentrations in the Cutler Reservoir system for 2013 baseflow samples.

The fact that 92% of phosphorus and between 25% and 57% of nitrogen samples were below laboratory detection limits is interesting and possibly the result of nutrient management strategies. Regardless, follow-up monitoring will help in understanding bacteria and nutrient trends throughout the system

CUTLER RESERVOIR RECLAMATION PROJECTS

PacifiCorp has numerous mitigation projects planned and constructed within the watershed, as outlined in the Cutler RMP and elsewhere (PacifiCorp 2002, 2008). Included in the implemented Cutler RMP are shoreline buffers, bank stabilization, shrub plantings, fencing for livestock restrictions, grazing management practice improvements, and fish habitat enhancement. Initial monitoring results for the Cutler RMP implementation efforts have rated most of the mitigation/reclamaation work as good to excellent on the majority of the implementation sites. Limited sites were rated as poor or destroyed, or which had failed to establish per the standards detailed in the Cutler RMP. The majority of PacifiCorp's reclamation work around Cutler Reservoir has taken place along the southern tributaries and the reservoir unit, therefore potentially directly affecting water quality in the South Marsh, the North Marsh, and the Reservoir management units of Cutler Reservoir. Although this work is valuable for many reasons, it pales in comparison to the effect other basin efforts have had towards improving water quality of the various tributaries to Cutler Reservoir, including the existing TMDLs.

RECOMMENDATIONS

To improve comparability across sampling periods, future monitoring should occur at the same sampling locations and following the same seasonal distribution as the samples collected in 2008 and 2013. In addition, samples should be analyzed with the same methods as those used in 2013. This will help exclude any potential data discrepancies in future analyses. Continued collection of chl *a* data would help identify potential causes of high turbidity during all hydroperiods. Storm samples have also been difficult to plan for and sample, but ensuring the collection of both spring and fall samples would aid in understanding water quality patterns throughout the system. Additionally, more frequent and spatially diverse (e.g. northern end of Cutler Reservoir between Benson Marina and highway 23) sampling would aid in understanding the sources of water quality issues (e.g., *E. coli*) throughout the Cutler Reservoir system. Total phosphorus and nitrogen decreased considerably between 2008 and 2013, in part because of results below laboratory detection limits. Continued sampling should help to clarify spatial and temporal changes in water quality at Cutler Reservoir. Finally, updated TMDL load analyses from each of the tributaries would aid in the understanding of their relative contributions, and how they affect the conditions throughout the reservoir.

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Appendix A
Comparison Charts

Appendix A: Comparison Charts

The charts below presents comparison of 2013 winter baseflow samples during reservoir drawdown with other 2013 baseflow samples and winter baseflow samples from previous monitoring periods.

Table A-1. Hydroperiod Comparison (2013)

E. coli

Station Name	Fall Baseflow	Spring Baseflow	Summer Baseflow	Winter Baseflow	STDEV All	STDEV No Winter	Difference
Cutler Reservoir at Swift Slough near Island	104.940	8.268	152.640	25.440	67.860	73.557	5.698
Cutler Reservoir North of Benson Marina Bridge	23.850	166.950	66.780	30.210	66.100	73.433	7.333
Cutler Reservoir at Hwy 23 (Newton) Bridge	20.670	75.207	36.570	9.540	28.703	28.047	-0.656

Total Phosphorus

Station Name	Fall Baseflow	Spring Baseflow	Summer Baseflow	Winter Baseflow	STDEV All	STDEV No Winter	Difference
Cutler Reservoir at Swift Slough near Island	0.025	0.025	0.025	0.025	0.000	0.000	0.000
Cutler Reservoir North of Benson Marina Bridge	0.025	0.070	0.346	0.274	0.155	0.174	0.018
Cutler Reservoir at Hwy 23 (Newton) Bridge	0.025	0.025	0.025	0.025	0.000	0.000	0.000

Orthophosphate as P

Station Name	Fall Baseflow	Spring Baseflow	Summer Baseflow	Winter Baseflow	STDEV All	STDEV No Winter	Difference
Cutler Reservoir at Swift Slough near Island	0.025	0.025	0.025	0.025	0.000	0.000	0.000
Cutler Reservoir North of Benson Marina Bridge	0.025	0.070	0.346	0.274	0.155	0.174	0.018
Cutler Reservoir at Hwy 23 (Newton) Bridge	0.025	0.025	0.025	0.025	0.000	0.000	0.000

Total Inorganic Nitrogen

Station Name	Fall Baseflow	Spring Baseflow	Summer Baseflow	Winter Baseflow	STDEV All	STDEV No Winter	Difference
Cutler Reservoir at Swift Slough near Island	0.929	0.879	0.035	1.275	0.527	0.502	-0.024
Cutler Reservoir North of Benson Marina Bridge	0.035	0.557	0.035	1.348	0.620	0.302	-0.319
Cutler Reservoir at Hwy 23 (Newton) Bridge	0.035	0.695	0.070	1.112	0.520	0.371	-0.149

Table A-1. Hydroperiod Comparison (2013)

Total Organic Nitrogen

Station Name	Fall Baseflow	Spring Baseflow	Summer Baseflow	Winter Baseflow	STDEV All	STDEV No Winter	Difference
Cutler Reservoir at Swift Slough near Island	0.194	0.195	1.165	0.472	0.458	0.560	0.102
Cutler Reservoir North of Benson Marina Bridge	0.494	0.569	1.525	0.666	0.480	0.575	0.095
Cutler Reservoir at Hwy 23 (Newton) Bridge	0.225	0.745	1.238	0.708	0.414	0.507	0.093

Table A-2. Winter Baseflow Compared to Previous Winter Monitoring Period (2013)

E. coli

Station Name	1996–1998 Winter	2000–2003 Winter	2008 Winter	2013 Winter	STDEV All	STDEV No Winter	Difference
Cutler Reservoir at Swift Slough near Island			10.00	25.44	10.92		
Cutler Reservoir North of Benson Marina Bridge	123.69	5.09	20.29	30.21	53.59	64.54	10.95
Cutler Reservoir at Hwy 23 (Newton) Bridge			33.25	9.54	16.77		

Total Phosphorus

Station Name	1996–98 Winter	2000–2003 Winter	2008 Winter	2013 Winter	STDEV All	STDEV No Winter	Difference
Cutler Reservoir at Swift Slough near Island			0.09	0.03	0.05		
Cutler Reservoir North of Benson Marina Bridge	0.23	0.43	0.27	0.27	0.09	0.11	0.02
Cutler Reservoir at Hwy 23 (Newton) Bridge			0.17	0.03	0.10		

Orthophosphate as P

Station Name	1996-98 Winter	2000-2003 Winter	2008 Winter	2013 Winter	STDEV All	STDEV No Winter	Difference
Cutler Reservoir at Swift Slough near Island			0.06	0.03	0.02		
Cutler Reservoir North of Benson Marina Bridge	0.13	0.23	0.16	0.27	0.07	0.05	-0.01
Cutler Reservoir at Hwy 23 (Newton) Bridge			0.05	0.03	0.02		

Table A-2. Winter Baseflow Compared to Previous Winter Monitoring Period (2013)

Total Inorganic Nitrogen

Station Name	1996-98 Winter	2000-2003 Winter	2008 Winter	2013 Winter	STDEV All	STDEV No Winter	Difference
Cutler Reservoir at Swift Slough near Island			0.33	1.28	0.67		
Cutler Reservoir North of Benson Marina Bridge	0.76	1.14	0.66	1.35	0.32	0.25	-0.07
Cutler Reservoir at Hwy 23 (Newton) Bridge			0.55	1.11	0.39		

Total Organic Nitrogen

Station Name	1996–98 Winter	2000–2003 Winter	2008 Winter	2013 Winter	STDEV All	STDEV No Winter	Difference
Cutler Reservoir at Swift Slough near Island			0.025	0.472	0.316		
Cutler Reservoir North of Benson Marina Bridge	N/A	N/A	0.461	0.666	0.145		
Cutler Reservoir at Hwy 23 (Newton) Bridge			0.651	0.708	0.040		

APPENDIX F

CUTLER RESERVOIR WATER LEVEL ANNUAL SUMMARIES LINK

APPENDIX F

RESERVOIR WATER LEVELS LINK

2017 https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20171222-5034
2016 https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20161222-5141
2015 http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20151229-5171
2014 http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20141224-5064
2013 http://elibrary.FERC.gov/idmws/file_list.asp?accession_num=20131231-5027

APPENDIX G

AGENCY CORRESPONDENCE

From: Davies, Eve [mailto:Eve.Davies@pacificorp.com]
Sent: Friday, February 23, 2018 7:30 PM
To: Larry_Crist@fws.gov; george_weekley@fws.gov; Justin Dolling <justindolling@utah.gov>; Chris Penne <chrispenne@utah.gov>; Scott Walker <scottwalker@utah.gov>; darin mcfarland (Darin@brcanal.com) <Darin@brcanal.com>; jparker@fs.fed.us; Chase, Paul -FS (pchase@fs.fed.us) <pchase@fs.fed.us>; Erica Gaddis <egaddis@utah.gov>; dstrong@utah.gov; Susan Zarekarizi <susanzarekarizi@utah.gov>; fredhayes@utah.gov; 'hugh_osborne@nps.gov' <hugh_osborne@nps.gov>
Cc: 'miriam.hugentobler@gmail.com' <miriam.hugentobler@gmail.com>; Davies, Eve <Eve.Davies@pacificorp.com>
Subject: Cutler FERC License-required Five-year Monitoring Plan Report Review by March 23, 2018

Dear Cutler License Stakeholder:

Enclosed please find a cover letter with additional detail regarding the Cutler monitoring report review period noted above, as well as the report itself (formatted for printing double-sided if you prefer hard copy to review), and a comment form. Please send all comments to both myself and the Project Coordinator, Miriam Hugentobler, cc'd above. Also, do not worry if you are unfamiliar with the Cutler Hydroelectric Project (FERC No.2420) and associated facilities—the 1994 FERC license article 402 required this report at five-year intervals, and specified the parties that need to be notified of the opportunity to comment. There are no USFS lands, or national or state park facilities affected by the Cutler Project (or even close by), but those agencies are included in the required review list—PacifiCorp welcomes any comment you care to make, but you are not required to do so. Thank you in advance for your time in regards to this matter; please do not hesitate to let me know if you have any comments or questions regarding the report or any related issues.

Eve

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From: Susan Zarekarizi [mailto:susanzarekarizi@utah.gov]
Sent: Thursday, March 08, 2018 3:22 PM
To: Davies, Eve <Eve.Davies@pacificorp.com>; miriam.hugentobler@gmail.com
Subject: [INTERNET] Re: Cutler FERC License-required Five-year Monitoring Plan Report Review by March 23, 2018

I reviewed your report with respect to recreation. I did not see any issues nor do I have any comments. I was sorry to read about the vandalism fire, such a wasteful act.

Thank you for letting us review your document.

Susan Zarekarizi
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