NISP
Northern Water
Northern Integrated Supply Project

Fish and Wildlife Mitigation and Enhancement Plan

Prepared for:
The Colorado Parks and Wildlife Commission
in accordance with C.R.S. 37-60-122.2

Applicant:
Northern Water

acting by and through

Northern Integrated Supply Project
Water Activity Enterprise
Northern Colorado Water Conservancy District

October 10, 2017

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CONTENTS

CONTENTS iii

LIST OF TABLES vi

LIST OF FIGURES vii

EXECUTIVE SUMMARY 1

NORTHERN INTEGRATED SUPPLY PROJECT FISH AND WILDLIFE MITIGATION AND ENHANCEMENT PLAN 4

1.0 INTRODUCTION 4

2.0 NISP BACKGROUND 5

2.1. Glade Reservoir Complex 5

2.2. South Platte Water Conservation Project 7

2.3. Water Supplies 7

2.4. Conveyance to NISP Participants 8

2.5. Estimated Project Cost 10

2.6. Conservation 10

2.7. Supplemental Draft EIS Conceptual Mitigation Plan 12

2.8. Adaptive Management 14

3.0 OTHER CONCURRENT OR RELATED ACTIVITIES 16

3.1. Halligan and Seaman Water Supply Projects 16

3.2. Poudre Runs Through It Flows Committee 16

3.2.1. Flows 17

3.2.2. Funding 18

3.2.3. Poudre River Forum 18

3.3. City of Fort Collins Natural Resources Projects 18

3.3.1. Poudre River Downtown Master Plan 18

3.3.2. Natural Areas Master Plan 18

3.3.3. Ecosystem Response Model 19

3.3.4. Poudre River Health Assessment Framework 19

3.3.5. McMurry Natural Area Restoration Project 19

3.4. Poudre River Trail 20

3.5. Cache La Poudre River at Greeley Flood Risk Mitigation and Ecosystem Restoration 20

4.0 REGULATORY PROCESS 22

4.1. Clean Water Act Section 404 Permit 22

4.2. National Environmental Policy Act Review 22

4.3. Endangered Species Act 23

4.4. Colorado Fish and Wildlife Mitigation Plan 24

4.4.1. Mitigation and Enhancement Plans 24
4.4.2. Consultation, Coordination and Public Input 25

5.0 PROPOSED FISH AND WILDLIFE MITIGATION PLAN 27
5.1. NISP Project Area 27
5.2. Avoidance and Minimization 29
5.2.1. Design Commitments 29
5.2.1.1. NISP Configuration 30
5.2.1.2. Poudre Valley Canal Diversion Structure (AG-04) 30
5.2.1.3. SPWCP Diversion Design (AG-07) 32
5.2.1.4. Multi-Level Outlet Tower for Glade Reservoir Releases (WQ-01) 32
5.2.1.5. Glade Reservoir Release Structure (WQ-02) 35
5.2.2. Operational Commitments 36
5.2.2.1. Avoid Munroe Canal Diversions (FW-01) 37
5.2.2.2. Curtail Diversions for Non-Consumptive Water Rights (FW-02) 37
5.2.2.3. Summer and Winter Diversion Curtailments (FW-03) 39
5.2.2.4. Conveyance Refinement (FW-04) 39
5.2.2.5. Poudre River Flow Augmentation Protection (FW-05) 46
5.2.2.6. Peak Flow Operations Program (FW-08) 46
5.2.2.7. Temperature Mitigation (WQ-06) 53
5.2.2.8. Ramp NISP Diversions at PVC (FW-09) 57
5.2.3. Construction BMP Commitments 57
5.2.3.1. Noxious Weed Control Plan (NW-01) 57
5.2.3.2. Migrating Birds and Raptors (TW-03, TW-04, TW-05) 59
5.3. Compensatory Mitigation 59
5.3.1. Aquatic Resource and Water Quality Mitigation 59
5.3.1.1. Stream Channel and Habitat Improvement Plan (AG-01) 60
5.3.1.2. Channel and Habitat Improvements (AG-02) 61
5.3.1.3. Riparian Vegetation (RV-01, RV-02) 64
5.3.1.4. Eaton Draw Water Quality Wetlands (WQ-03) 67
5.3.1.5. Streamflow and Water Quality Monitoring (WQ-04) 69
5.3.1.6. Mercury Bioaccumulation Mitigation (WQ-07) 74
5.3.2. Terrestrial Wildlife Mitigation 75
5.3.2.1. U.S. Highway 287 Realignment Design for Wildlife Protection (TW-01) 75
5.3.2.2. U.S. Highway 287 Realignment Big Game Movement Adaptive Management Program (TW-02) 78
5.3.2.3. Wildlife Habitat – Glade Reservoir Conservation Mitigation (TW-06) 79
5.3.3. Special Status Species Mitigation 81
5.3.3.1. Bald Eagle (SS-02) 81
5.3.3.2. Colorado Butterfly Plant (SS-03) 84
5.3.3.3. Ute Ladies Tresses Orchid (SS-04) 84
5.3.3.4. Platte River Target Species (SS-05) 85

5.3.3.5. Black-footed Ferret (SS-06) 85
5.3.3.6. Black-tailed Prairie Dog (SS-07) 85
5.3.3.7. Swift Fox (SS-08) 86
5.3.3.8. Burrowing Owl (SS-09) 86
5.3.3.9. Other Riparian Species (SS-10) 87
5.3.3.10. Bell's Twinpod (SS-11) 87
5.3.3.11. Townsend's Big-Eared Bat (SS-12) 87
5.3.4. Recreation and Public Access Mitigation 88
5.3.4.1. Glade Reservoir and State Land Hunting Access (RC-02) 88
5.3.4.2. Mitani-Tokuyasu State Wildlife Area and Confluence Area (RC-04, RC-05) 88
5.3.4.3. Glade Reservoir Poudre River Recreator Parking (RC-06) 90
5.3.4.4. Glade Reservoir Visitor's Center (RC-07) 90
5.4. Mitigation Costs and Schedule 90

6.0 PROPOSED FISH AND WILDLIFE ENHANCEMENT PLAN 94
6.1. Enhancement 94
6.1.1. Aquatic Resource Enhancement 94
6.1.1.1. Poudre River Adaptive Management Program (AG-03) 95
6.1.1.2. Multi-Objective Diversion Structure Retrofits (AG-05) 98
6.1.1.3. Galeton Reservoir Native Fish Rearing (AG-08) 104
6.1.1.4. Ramp Hansen Supply Canal Releases (FW-07) 104
6.1.1.5. Coalition for the Poudre River Watershed (WQ-05) 105
6.1.2. Terrestrial Resource Enhancement 106
6.1.2.1. Wildlife Habitat – Glade Reservoir Conservation Enhancement (TW-07) 107
6.1.3. Recreation and Public Access Enhancement 107
6.1.3.1. Glade Reservoir Fishery (AG-06) 107
6.1.3.2. Glade Reservoir Recreation (RC-01) 108
6.1.3.3. Glade Reservoir Recreation and Wildlife Adaptive Management Program (RC-03) 111
6.2. Enhancement Costs and Schedule 112

REFERENCES 115

APPENDIX A – FISH AND WILDLIFE MITIGATION AND ENHANCEMENT PLAN SUMMARY TABLES 1

LIST OF TABLES

Table 1. Estimated NISP Project Cost (2017 Dollars) 10
Table 2. Approximate Demarcation of Resource Study Reaches of the Cache la Poudre 28
Table 3. Decreed and Stipulated Flow Commitments by NISP for Non-Consumptive Water Rights..... 39
Table 4. Monthly Poudre River Intake Diversions..... 40
Table 5. Summary of Key Flow Criteria and Metrics..... 42
Table 6. Peak Flow Operations Program by Peak Flow Operational Year 48
Table 7. Peak Flow Recurrence Intervals with Peak Flow Operations Program 51
Table 8. Existing Acute and Chronic Temperature Standards for the Poudre River..... 56
Table 9. List of Potential Water Quality Monitoring Parameters for Initial Data Collection 73
Table 10. Summary of National Bald Eagle Management Guidelines (Activity Specific) (FHWA 2017) 83
Table 11. NISP Mitigation Plan Schedule and Cost Summary..... 92
Table 12. Glade Reservoir Cool Water Fishery Management Plan..... 108
Table 13. NISP Enhancement Plan Schedule and Cost Summary 114

LIST OF FIGURES

Figure 1. NISP Infrastructure and Features 6
Figure 2. Annual Weighted Gallons Per Capita per Day of Combined NISP Participants (Harvey Economics 2017) 11
Figure 3. NISP Participant GPCD as Compared with Other Similar Colorado and Western U.S. Water Providers (Harvey Economics 2017) 12
Figure 4. Adaptive Management Cycle Adopted for NISP Fish and Wildlife Mitigation Plan (Tasmania 2016) 15
Figure 5. Line Diagram of Poudre River from Munroe Canal to Fossil Creek Reservoir Outlet (Northern Water 1996) 29
Figure 6. Existing Poudre Valley Canal Diversion on Poudre River near Canyon Mouth 31
Figure 7. Glade Reservoir Release Point to Poudre River 34
Figure 8. Multi-Level Outlet Tower at Carter Lake 35
Figure 9. Hansen Supply Canal Discharge Structure to Poudre River 36
Figure 10. Poudre River Fish Hatchery and Recreational Minimum Flow Points (CDM Smith 2014) 38
Figure 11. NISP Conveyance Refinement – Regional Facilities 41
Figure 12. Shields Street - Conveyance Refinement Monthly Hydrologic Analysis 43
Figure 13. Lincoln Street Gage - Conveyance Refinement Monthly Hydrologic Analysis 44
Figure 14. Peak Flow Operations Program Decision Tree 49
Figure 15. Tier Classification Using CTP Model Run 3a2 (Current Conditions with NISP) 50
Figure 16. Poudre River at Canyon Gage Average Daily Peak Flow 51
Figure 17. Poudre River at Canyon Gage 3-Day Average Daily Peak Flow 52
Figure 18. Poudre River Average Daily Peak Flow at Canyon, Lincoln Street and Greeley Gages 53
Figure 19. CLAFTCCO (Canyon Gage, Upstream of Hansen Canal) Temperature Gage Maximum Weekly Average Temperature Results Compared to Relevant Standards (Hydros 2014a) 54
Figure 20. HSC-PRU (Below Hansen Canal) Temperature Gage Maximum Weekly Average Temperature Results Compared to Relevant Standards (Hydros 2014a) 54
Figure 21. Poudre Valley Canal Mitigation Reach 62
Figure 22. Watson Lake Mitigation Reach 63
Figure 23. Frank State Wildlife Area Proposed Mitigation Activities 66
Figure 24. Eastman Park Proposed Mitigation Activities 67
Figure 25. Eaton Draw Constructed Wetlands General Location 69
Figure 26. Potential Water Quality Monitoring Sites for Initial Data Collection 72
Figure 27. Movement of Mule Deer, Moose, Elk and Pronghorn Through a Wildlife Underpass in Nugget Canyon on U.S. Highway 30 west of Kemmerer, WY (Western EcoSystems 2011) 76
Figure 28. Potential Location and Alternate Locations for Wildlife Underpass 77
Figure 29. Habitat Conservation Area 80
Figure 30. SPWCP Diversion Facilities (GEI 2006) and Mitani-Tokuyasu SWA 89
Figure 31. Existing Watson Lake Fish Hatchery Diversion 100
Figure 32. Existing Larimer-Weld Diversion Structure 100
Figure 33. Existing Whitney Ditch Diversion Structure 102

Figure 34. Existing B.H. Eaton Ditch Diversion Structure with Whitney Diversion in Background 102
Figure 35. Whitney and B.H. Eaton Diversions 103
Figure 36. CPRW Watershed Map (CPRW 2017) 106
Figure 37. Habitat Conservation Area Trail Buffer 110

EXECUTIVE SUMMARY

The Northern Colorado Water Conservancy District (Northern Water), acting by and through the Northern Integrated Supply Project (NISP) Water Activity Enterprise), on behalf of 15 East Slope towns, municipalities and rural domestic water providers (Participants), is pursuing NISP to provide 40,000 acre feet of new, reliable water supplies. NISP would deliver water from the Cache la Poudre (Poudre) and South Platte rivers to two new reservoirs, and deliver that water via pipelines and the Poudre River for Participants' use. The purpose of this Fish and Wildlife Mitigation and Enhancement Plan (FWMEP) is to comply with the requirements of Colorado State law (C.R.S. 37-60-122.2), including the Procedural Rules for the Wildlife Commission (Chapter 16), for NISP.

Northern Water is the applicant for a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (Corps) as part of federal regulatory compliance for NISP. In conjunction with that, the Corps is required to comply with the National Environmental Policy Act (NEPA) by preparing a Final Environmental Impact Statement (EIS) and with Section 404(b) (1) of the Clean Water Act. As part of the 404 permit process, a 401 water quality certification from the Colorado Department of Public Health and Environment is also required and is being pursued.

The FWMEP includes both a Mitigation Plan, which mitigates fish and wildlife related impacts of NISP, as well as an Enhancement Plan, which outlines fish and wildlife related environmental commitments that go above and beyond direct mitigation of project effects. The Participants are committed to comply with the mitigation measures developed as part of this FWMEP, as well as those identified in the 401 certification and the Corps' 404 permit and associated Record of Decision. It is anticipated that the compensatory mitigation measures developed through these processes will be incorporated into the Record of Decision and 404 permit issued by the Corps as conditions of the permit. It is currently envisioned that compliance with the Mitigation Plan portion of this FWMEP will be attached as permit conditions by the Corps on the Record of Decision and 404 permit, while the Enhancement Plan portion of this FWMEP will be covered under an Intergovernmental Agreement between Northern Water, on behalf of the Participants, and Colorado Parks and Wildlife (CPW).

The goal of Northern Water and the Participants through this FWMEP is to mitigate the fish and wildlife related environmental impacts identified in the Draft EIS (Corps 2008), Supplemental Draft EIS (Corps 2015) and subsequent investigations, and to improve the aquatic and riparian habitat of the Poudre River, regional wildlife habitat, and regional recreational opportunities with measures identified in the enhancement plan, while at the same time meeting the water supply needs of the Participants.

Effects on the Poudre and South Platte rivers primarily occur due to diversions and operations of the proposed Glade Reservoir, a new 170,000 acre-foot reservoir located off-channel north of Ted's Place near the mouth of the Poudre Canyon, and operations of the South Platte Water Conservation Project (SPWCP), which diverts water to a new reservoir located northeast of Greeley and exchanges this water into Glade Reservoir through two existing irrigation systems. Fish and wildlife impacts from

infrastructure construction and project operations primarily occur at and near the Glade Reservoir site, which is adjacent to state lands that provide big game and small game hunting opportunities, and at the SPWCP diversion site near the confluence of the Poudre and South Platte rivers, which is located on the existing Mitani-Tokuyasu State Wildlife Area.

Key avoidance and minimization mitigation measures described in the Mitigation Plan include NISP design commitments that avoid and minimize aquatic habitat and water quality effects; flow commitments that result in establishment of a year-round base flow in the Poudre River at all points upstream and through the City of Fort Collins (which currently experiences numerous "dry-up" points) as well as a peak flow operations program that results in no effects on peak flows or peak flow bypasses during 90 percent of years to avoid impacts that could result from diversions of those peak flows; and construction best management practices that avoid and minimize effects on wildlife and plant communities.

The compensatory mitigation portion of the Mitigation Plan includes development of a stream channel and habitat improvement plan for the Poudre River; implementing stream channel, habitat, and riparian vegetation improvements in certain reaches of the Poudre River; commitments to avoid diversions when stream water temperatures approach or exceed standards that are designed to protect fish; implementing wildlife protection measures into the design and construction of the U.S. Highway 287 realignment; conserving land around Glade Reservoir for wildlife habitat; protection of special status wildlife species during and after construction; replacing existing recreation and public access facilities at Glade Reservoir and the SPWCP forebay; and constructing new wetlands to improve water quality.

The proposed Enhancement Plan was developed in response to discussions with CPW staff, discussions with other regional governmental and non-governmental agencies, and review of comments on the Draft EIS and Supplemental Draft EIS. Key components of the Enhancement Plan include developing and funding a recreational cool water fishery at Glade Reservoir, commitments to adaptive management programs for the Poudre River and recreation surrounding Glade Reservoir, multi-objective diversion structure retrofits at existing diversion structures on the Poudre River (i.e. installation of facilities that allow fish passage and measure bypassed flow), protecting additional lands west of Glade Reservoir for wildlife habitat, and participation in the Coalition for the Poudre River Watershed.

The total project cost for NISP, including costs for mitigation and enhancement commitments in this plan and those required outside of this plan, is estimated at $857 million. The total estimated capitalized costs of commitments in the Mitigation Plan are approximately $40.2 million, while total estimated capitalized costs of commitments in the Enhancement Plan are approximately $13.1 million. Capitalized costs are the sum of the capital cost plus any annual operations and maintenance costs capitalized over the life of the commitment, or 50 years for those commitments that are perpetual. The mitigation costs are exclusive of costs for other mitigation requirements that will be developed for and required by the Final EIS, 401 certification, and 404 permit.

The FWMEP was approved by the Colorado Parks and Wildlife Commission at its regularly scheduled meeting on September 7, 2017, and approved by the Colorado Water Conservation Board at its regularly

scheduled meeting on September 20, 2017. This final version of the FWMEP is identical to the Draft Final version of the FWMEP (dated August 22, 2017) approved by both the Commission and Board, with modifications made to the Consultation, Coordination and Public Input section to reflect final approvals and submittal of this final plan, and to costs for the Poudre River Adaptive Management Program shown in Table 13 consistent with verbal testimony provided to the Commission during the September 7 meeting. Minor formatting changes were also made in certain areas.

NORTHERN INTEGRATED SUPPLY PROJECT FISH AND WILDLIFE MITIGATION AND ENHANCEMENT PLAN

1.0 INTRODUCTION

The Northern Integrated Supply Project (NISP) is a proposed water storage and distribution project that will supply 15 Northern Front Range water providers (Participants) with 40,000 acre feet of new, reliable water supplies. As proposed, NISP would consist of two new reservoirs; forebay reservoirs and pumping plants to deliver water from the Cache la Poudre (Poudre) and South Platte rivers to the reservoirs; pipelines to deliver water for exchange with irrigation companies and to deliver water to water users; and improvements to existing canals that divert water from the Poudre River near the canyon mouth west of Fort Collins. NISP is being managed by the Northern Colorado Water Conservancy District (Northern Water) Northern Integrated Supply Project Water Activity Enterprise, which is referred to as Northern Water throughout the remainder of this document. Northern Water is the applicant for a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (Corps) as part of federal regulatory compliance for NISP.

The Participants are a group of rapidly growing communities and domestic water districts located throughout Northern Water district boundaries, and include Central Weld County Water District, Town of Dacono, Town of Eaton, Town of Erie, City of Evans, Town of Firestone, Fort Collins-Loveland Water District, City of Fort Lupton, City of Fort Morgan, Town of Frederick, City of Lafayette, Left Hand Water District, Morgan County Quality Water District, Town of Severance, and the Town of Windsor. NISP would be constructed and owned by Northern Water. While Northern Water would retain ownership and operational responsibility of NISP, the Participants would own a perpetual contractual right to a defined portion of NISP facilities and a defined portion of the water diverted by NISP.

This Fish and Wildlife Mitigation and Enhancement Plan (FWMEP) was developed to satisfy the requirements of Colorado Revised Statute (C.R.S.) 37-60-122.2 and outlines the actions that Participants will implement to mitigate the impacts that NISP may have on fish and wildlife resources. The FWMEP also addresses concerns regarding NISP impacts that were identified by Colorado Parks and Wildlife (CPW) staff in a detailed review of the Draft Environmental Impact Statement (EIS, Corps 2008) and Supplemental Draft EIS (Corps 2015) information. This FWMEP includes both a Mitigation Plan and an Enhancement Plan. The Enhancement Plan addresses issues raised by CPW and other stakeholders regarding the current condition of the aquatic environment on the Poudre River, and includes proposed enhancement measures to enhance fish and wildlife resources over and above levels existing without NISP.

2.0 NISP BACKGROUND

The two primary components of NISP are the Glade Reservoir Complex and the South Platte Water Conservation Project (SPWCP). Glade Reservoir would be a new off-channel reservoir, and is the primary water supply reservoir from which all deliveries to the Participants would be made. Diversions from the Poudre River into Glade Reservoir would be made via the existing Poudre Valley Canal diversion structure and canal, a new forebay reservoir, and new pump station from the forebay reservoir into Glade Reservoir. Conveyance to the Participants will be made from Glade Reservoir via a Colorado-Big Thompson Project (C-BT) exchange, Poudre River intake, and pipelines.

The SPWCP would divert and store water from the South Platte River. Stored water would be delivered to the existing Larimer and Weld Irrigation Company (Larimer-Weld) and the New Cache la Poudre Irrigating Company (New Cache). NISP would then exchange and convey a like amount of water from the diversion structures of these irrigation companies for storage in Glade Reservoir and/or delivery to the Participants. SPWCP facilities would include a new off-channel reservoir, Galeton Reservoir; a new diversion, forebay reservoir, and pump station just downstream of the confluence of the Poudre and South Platte rivers; and pipelines from the pump station to Galeton Reservoir and from Galeton Reservoir to the existing ditches.

Each of the project components is further described below and shown in Figure 1.

2.1. Glade Reservoir Complex

Glade Reservoir will be located northwest of Fort Collins near the intersection of U.S. Highway 287 and State Highway 14. It will be 5 miles long, 250 feet deep and have the capacity to store 170,000 acre-feet of water, slightly larger than the existing Horsetooth Reservoir. The reservoir surface area at full capacity would be approximately 1,600 acres (2.5 square miles). The dam would be approximately 275 feet high, and be a zoned earth fill dam[1]. The dam would include a spillway structure, low level inlet/outlet works, and a multi-level outlet tower.

The existing Poudre Valley Canal would convey NISP diversions from the Poudre River to the Glade Reservoir Forebay. The existing diversion structure would be removed and replaced – additional information on the Poudre Valley Canal diversion structure is contained in Section 5.2.1.2 as its design features are part of the avoidance and minimization commitments of this plan. The capacity of the diversion structure and approximately 10,800 feet (2.0 miles) of canal would be expanded by 1,200 cubic feet per second (cfs) to accommodate NISP diversions.

[1] The description of dam height, reservoir depth and reservoir surface area are based on preliminary designs and subject to change.

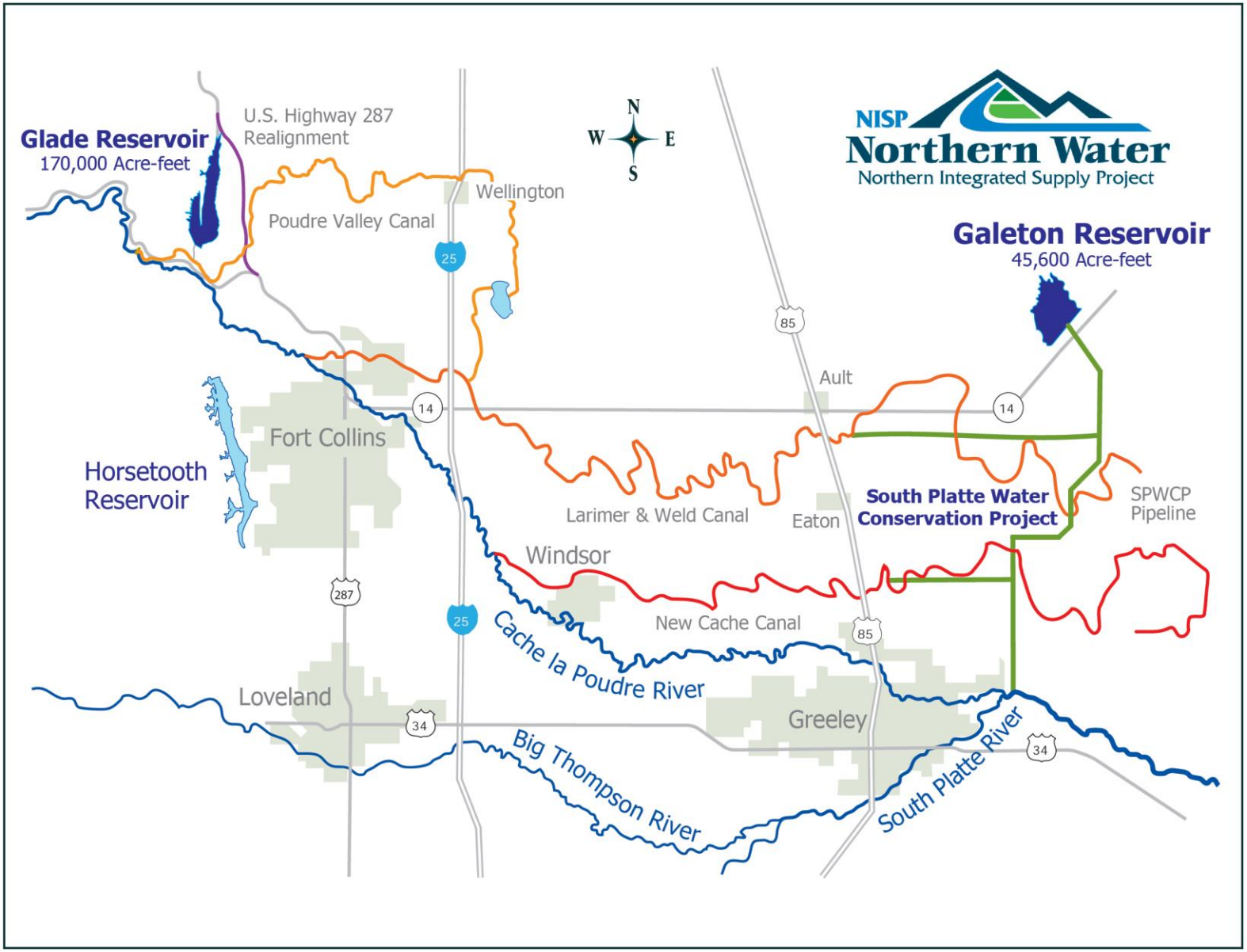


Figure 1. NISP Infrastructure and Features

Diversions made through the Poudre Valley Canal would be delivered to the Glade forebay reservoir, where they would then be pumped into Glade Reservoir itself. The forebay reservoir would have a capacity of approximately 2,000 acre-feet, with a surface area of approximately 100 acres. The pump station from the forebay reservoir would be approximately 30,000 horsepower, with a capacity of approximately 1,200 cfs when reservoir storage levels are low to 800 cfs when reservoir storage levels are high.

Because the reservoir would inundate a portion of the existing Poudre Valley Supply Canal (aka Munroe Canal), facilities would be constructed to convey the canal through the reservoir through a buried pipeline and tunnels.

The reservoir site is divided by U.S. Highway 287 that travels between Fort Collins and Wyoming. Therefore, about seven miles of the highway will be relocated to the east. The relocated road will primarily be aligned along an abandoned haul road for the former Holcim cement plant mining operation. A "cut" will be required through the "hogback" geologic formation at the North End of the alignment. The "cut alignment" was the alignment chosen by the Colorado Department of Transportation (CDOT) as its preferred route. Northern Water is currently developing the preliminary and final design of the roadway alignment, and is coordinating with CDOT staff.

2.2. South Platte Water Conservation Project

Galeton Reservoir will be located east of Ault and northeast of Greeley, just north of Highway 14. It will store about 45,600 acre-feet of water at full capacity. The surface area at full capacity would be approximately 1,700 acres, with a depth of 75 feet. Galeton Dam would be approximately 90 feet high and be constructed of primarily on-site materials with imported filter/drain material and rip-rap. The dam would include an inlet/outlet and a spillway.

The water to fill Galeton will be diverted from the South Platte River downstream from Greeley. A new diversion structure would be located on the South Platte and would divert water into a forebay reservoir. Water would be pumped from the forebay reservoir to Galeton Reservoir via a 15,000-horsepower pump station and nearly 83,000 feet (15.7 miles) of mostly 70-inch pipe with a total capacity of 200 cfs.

Water stored in Galeton Reservoir would be delivered to the Larimer-Weld and New Cache irrigation companies in exchange for a portion of the Poudre River water they currently use. Pipelines from Galeton Reservoir would be used to deliver water to each ditch system east of Highway 85 at a maximum rate of 100 cfs each.

2.3. Water Supplies

Operations of NISP primarily rely upon 2 groups of associated water rights: the Grey Mountain water rights and the SPWCP water rights. NISP has made numerous flow-related mitigation commitments within the decrees associated with these water rights and/or as outlined in later sections of this document to protect and improve aquatic and stream related environmental and recreational resources.

Northern Water and the Cache la Poudre Water Users Association hold 1980 conditional storage rights on the Poudre River for the Poudre Project, which includes 220,000 acre-feet for the Grey Mountain Dam and Reservoir and a forebay reservoir. Northern Water owns a 7/8 interest in these water rights, bringing its total ownership to 192,500 acre-feet. In 2006, Northern Water completed a change of water rights to allow three alternate points of diversion on the Poudre River and storage in Glade Reservoir. The water right allows up to 3,000 cfs of diversions from the Poudre River, although as explained above, NISP would only utilize a maximum diversion of 1,200 cfs. The Grey Mountain water right would supply approximately half of the total NISP yield.

The SPWCP water rights were originally filed in 1992, and amended in 1997 and 2003. These water rights include direct flow and storage rights from the South Platte River, as well as exchanges on the Poudre River from the Larimer-Weld and New Cache canals upstream to numerous points including the Poudre Valley Canal. Unlike the Grey Mountain water right, which is limited to a single use, the SPWCP water rights allow these water supplies to be used to extinction. The SPWCP would supply roughly half of the total NISP yield.

2.4. Conveyance to NISP Participants

The Supplemental Draft EIS analyzed two options for conveyance of water from Glade Reservoir to the Participants: the Reclamation Action Option, which would convey water to the Participants through an exchange within C-BT; and the No Reclamation Action Option, which would convey water from Glade Reservoir to the Participants via a pipeline generally following a foothills route (Corps 2015). Following review of agency and public comment on the Supplemental Draft EIS, the Participants are proposing a "refined conveyance" concept with the goal of keeping more flows in the Poudre River year-round. As described in later sections of this document, the proposal avoids, minimizes and enhances the aquatic environment while mitigating other environmental effects.

Under the refined conveyance concept, water would be delivered from Glade Reservoir to the Participants through the following means:

- C-BT Exchange - Due to locations of their existing and projected future demands and water supply infrastructure, some Participants require delivery of NISP yield from C-BT facilities to effectuate deliveries to their water supply systems. A C-BT exchange volume of 10,000 acre-feet per year would allow delivery for these participants, and would also fall within a volume that could be reliably delivered from C-BT facilities. The C-BT exchange would work by delivering up to 10,000 acre-feet per year of C-BT deliveries that are currently made to the Poudre River from Glade Reservoir instead. In exchange, the NISP exchange participants would be delivered 10,000 acre-feet of water from C-BT facilities. This exchange would require a conveyance contract and special use permit from the Bureau of Reclamation for this operation.

- Pipeline Deliveries (see Figure 11 in section 5.2.2.4) – The remaining Participants would be delivered NISP water from Glade Reservoir via a pipeline. The main delivery pipeline is the County Line pipeline, which generally follows the Larimer-Weld County Line and Weld County

Road 13 south to the existing Southern Water Supply Pipeline just north of Highway 66. Additional pumping will be required on the existing Southern Water Supply Pipeline to provide for additional delivery capacity. Water would be delivered from Glade Reservoir to the County Line Pipeline using two mechanisms:

- North Tier Pipeline – The North Tier Pipeline would deliver water directly from Glade Reservoir to the County Line Pipeline. The North Tier Pipeline would be a 45-inch to 54-inch diameter pipeline capable of conveying 81 to 106 cfs of water to the NISP Participants, depending upon the need for redundancy. The need for redundancy will be determined following additional analyses.

- Poudre River Intake and Pipeline - The Poudre River Intake would be located at the Timnath Reservoir Inlet Canal diversion (or alternative location upstream of this point as described in later sections of this document), and constructed to allow for 18 to 25 cfs, or approximately 14,000 acre-feet annually, of NISP delivery. The Poudre River Intake would have a diversion structure, sedimentation basin, and pump station (1,000 to 1,300 horsepower). Water would be delivered from the intake to the County Line pipeline via the 32-inch diameter Poudre Intake Pipeline.

Northern Water desires that diversion of NISP water at or near the Timnath Inlet diversion be located upstream of the City of Fort Collins Mulberry Water Reclamation Facility (MWRF) effluent discharge. The MWRF is located north of Mulberry Street and west of Lemay Avenue. It has rated capacity of 6 million gallons per day (mgd), and is a 3-stage activated sludge process with UV disinfection. The MWRF currently discharges treated effluent to the Poudre River upstream of Mulberry Street, or approximately one mile upstream of the Timnath Inlet diversion. Location of NISP diversions upstream of MWRF effluent discharge would avoid diversion of contaminants which may be present in MWRF effluent and cannot be treated by conventional wastewater treatment processes (such as emerging contaminants).

Two options are proposed for diversion of water at the Poudre River Intake. Option A would divert water from the Timnath Inlet near its existing diversion from the Poudre River, and pump NISP deliveries into the new NISP pipeline. The existing MWRF effluent discharge would be relocated downstream of NISP diversions. Option B would construct a new diversion and pump station from the Poudre River upstream of the current MWRF. In conjunction with the City of Fort Collins, Northern Water is currently analyzing these options. Option A is the preferred approach by Northern Water, as it would result in the longest reach of river benefitting from the releases and utilizes an existing diversion location. However, due to regulatory uncertainties associated with relocating the MWRF effluent discharge outfall, Northern Water has requested that the Corps analyze and permit Option B.

The conveyance refinement delivery components and analyses (in particular the hydrologic benefits of the Poudre River Diversion) are further described in later sections of this document, as this conveyance mechanism comprises an important part of the Avoidance and Minimization portion of the NISP Fish and Wildlife Mitigation Plan.

2.5. Estimated Project Cost

The estimated cost to construct NISP (2017 dollars), including design, permitting, and construction management, is $857 million (Table 1). Of this total, approximately $746 million is the cost for construction of the Glade Reservoir complex and the SPWCP (sections 2.1 and 2.2). The remaining $111 million is for construction of the conveyance system, including the Poudre River Intake (see Section 2.4). Mitigation costs shown in the table are for mitigation activities that are not already included in the construction costs.

Table 1. Estimated NISP Project Cost (2017 Dollars)

Activity	Glade Complex ($M)	SPWCP ($M)	Conveyance [2] ($M)	Total ($M)
Design/Permitting [1]	$29	$12	$5	$46
Property/ROW	$14	$4	$7	$25
Construction	$460	$192	$99	$751
Mitigation and Enhancement [3]	$20	$15	$0	$35
Total	**$523**	**$223**	**$111**	**$857**

Notes:

[1] Does not include cost of NEPA, 404 permit, 401 certification, FWMEP or pre-construction processes.

[2] Does not include cost of Poudre River Intake or Pipeline. These costs are included in Glade Complex design.

[3] Includes only the cost of mitigation and enhancement activities that are not already included in construction costs. Mitigation and enhancement activities that are design elements are included in construction costs. Includes mitigation activities that may be outside of the State FWMEP (e.g. 404 permit, NEPA, 401 certification). See sections 5.4 and 6.2 for additional cost details regarding estimated mitigation and enhancement costs described in this FWMEP.

2.6. Conservation

Similar to Colorado's Water Plan for the State as a whole (CWCB 2015), water conservation for the Participants is an important component to meeting their future water supply needs. Water conservation measures are those programs that are consistently applied every year to reduce water demands or to increase supplies. These measures are distinguished from drought restrictions that are special, more severe measures that are implemented temporarily to avoid an imminent water shortage. Water conservation is being practiced by all 15 NISP Participants. Thirteen of the 15 Participants have a water conservation plan or water efficiency plan that has been reviewed and approved by the Colorado Water Conservation Board, while the other two are developing those plans. Since 1988, NISP Participants have reduced water use by approximately 22 percent, and trends continue to decrease (Figure 2).

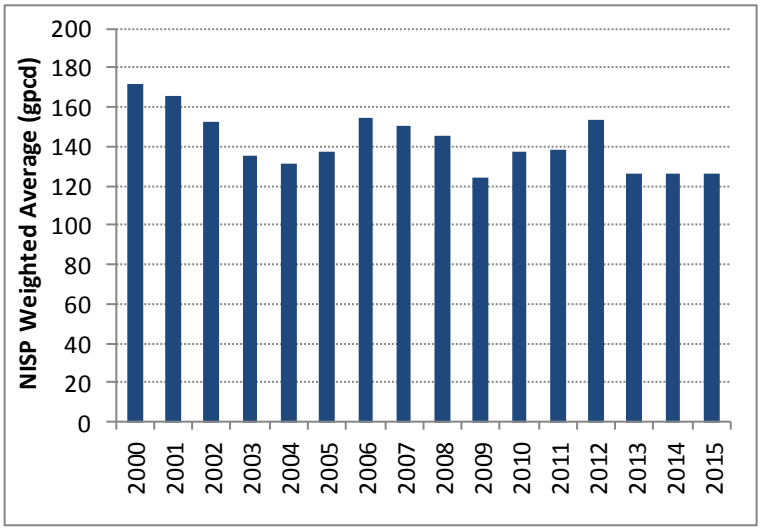


Figure 2. Annual Weighted Gallons Per Capita per Day of Combined NISP Participants (Harvey Economics 2017)

A study completed by Harvey Economics in 2017 evaluated NISP Participant's past, existing and future water conservation programs and efforts, and concluded the following (Harvey Economics 2017):

> *All Participants have active conservation programs in place and each include a host of measures. Conservation programs have been expanded and strengthened since 2004. Programs emphasizing price signals appear to be emphasized by Participants. Conservation programs appear to have had an effect in reducing water use among the Participants, although trend data is limited. To the extent there is a NISP water use benchmark, water use patterns of the Participants are not considered excessive. The relatively higher water using Participants are rural water districts that serve large agribusinesses whose effects on water use patterns are magnified by a relatively small population base. This finding suggests that a reasonable level of efficient water use is being practiced by most Participants' customers.*

Data compiled by Harvey Economics shows that aggregated average per person water use for the Participants is approximately 121 gallons per person per day, while the weighted average per person water use is 126 gallons per person per day. This compares favorably to other similarly sized western U.S. water providers (Figure 3; Harvey Economics 2017). The South Platte Basin Roundtable and the Colorado Water Plan "recommends conservation programs that would reduce per-capita water use from a baseline of 188 in 2010, to 146 gpcd [gallons per capita per day] by 2050" (CWCB 2015). As shown, the Participants as a whole already meet the 2050 per capita water use goals set out by the Colorado Water Plan.

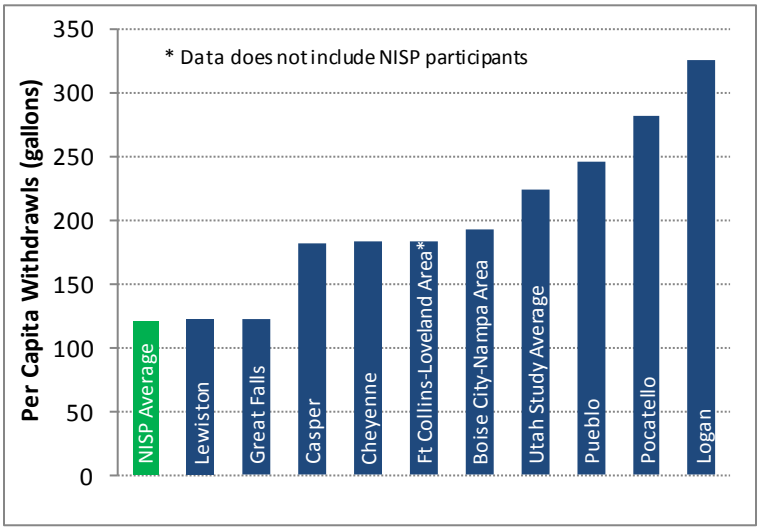


Figure 3. NISP Participant GPCD as Compared with Other Similar Colorado and Western U.S. Water Providers (Harvey Economics 2017)

Although the Participants will continue to implement conservation measures in the future, including continuing those that are developed through Colorado Water Conservation Board water conservation planning efforts, water conservation alone will not meet the Participants' future demand. The Participants require approximately 75,100 acre-feet of additional firm water supplies by 2060 (Harvey Economics 2017). NISP will provide 40,000 acre-feet, or approximately 53 percent, of the additional firm water supply required. Filling the remaining gap in water supplies will likely be a combination of additional conservation, other new water supplies and projects, and alternative transfer mechanisms.

2.7. Supplemental Draft EIS Conceptual Mitigation Plan

As previously described, the Supplemental Draft EIS (Corps 2015) presented a Conceptual Mitigation Plan prepared by Northern Water (Northern Water 2015). This FWMEP builds upon and/or replaces many of the aquatic life, terrestrial wildlife, and recreational components of the Conceptual Mitigation Plan. In some cases, this FWMEP does not cover certain effects not related to aquatic life, terrestrial wildlife, and recreation, and thus these measures are not described in this document or included in summary tables in the appendices. The mitigation actions included in the Conceptual Mitigation Plan but not covered or described in this FWMEP include:

Air Quality

- AQ-01 Air Quality and Emission Control Plan

Cultural and Paleontological Resources

- CR-01 Cultural Resources Programmatic Agreement
- CR-02 Class III Cultural Resource Surveys
- CR-03 Cultural Resource Treatment Plans
- CR-04 U.S. Highway 287 Paleontological Resource Mitigation Plan with Colorado Department of Transportation (CDOT)
- CR-05 U.S. Highway 287 Paleontological Resource Monitoring

Energy Use/Greenhouse Gases

- EG-01 Maximize System Efficiencies and Small Hydropower Assessment

General Construction

- GC-01 General Construction BMPs
- GC-02 Stormwater Management Plan
- GC-03 CDOT Criteria and Manuals for U.S. Highway 287 Realignment
- GC-04 Rock Cuts, Soil Cut, Fills and Retaining Wall BMPs
- GC-05 Intelligent Transportation Technologies

Hazardous Sites

- HZ-01 TCE Remedial Actions, Monitoring and Forebay Lining
- HZ-02 Oil and Gas Well Plans, Monitoring and Protocols

Land Use

- LU-01 Private Residence Notification and Compensation

Socioeconomics

- SE-01 SPWCP Water Quality Monitoring and Blending
- SE-02 Ditch Company Compensation

Special Status Species

- SS-01 Preble's Meadow Jumping Mouse

Visual

- VS-01 Native Plant Revegetation and Screening

Wetlands and Other Waters

- WL-01 Glade Reservoir Wetlands Mitigation
- WL-02 U.S. Highway 287 Realignment Wetlands Mitigation

It should be noted that this listing of mitigation actions only includes those in the Conceptual Mitigation Plan that are not covered in this FWMEP. These actions may be modified, supplemented or eliminated in the Final EIS, 401 certification process or other permitting process.

Additionally, for the reasons described, the following mitigation measures originally described in the Conceptual Mitigation Plan related to fish and wildlife mitigation are no longer proposed:

Aquatic Life and Stream Morphology

- AG-09 Galeton Reservoir Fish Screening – This commitment was removed from final mitigation plans because use of Galeton Reservoir for native fish rearing has not been formally committed to, and because the technology does not currently exist to provide the level of screening necessary to exclude the desired non-native predatory species from Galeton Reservoir.

Streamflow Commitments

- FW-06 Glade Reservoir Enlargement for Water Quality Commitments – This commitment was removed from final mitigation plans because full curtailment of diversions during late summer months would result in additional diversions during other months, and because of public comment against this concept during the Supplemental Draft EIS on this mitigation commitment.

2.8. Adaptive Management

Throughout the Draft EIS and Supplemental Draft EIS, analyses performed by resource specialists show that the likely response of and changes to some resources associated with NISP are anticipated to be within the historical range of changes that have occurred and continue to occur, making development of a detailed and quantitative mitigation plan for some NISP effects difficult. Because of this, Northern Water proposes that certain components of NISP mitigation and enhancement would most effectively be guided and maximized by adaptive management programs. Such programs would be implemented pursuant to the parameters outlined in later sections of this document.

Most adaptive management frameworks have four key components. "In the first phase, plans are framed, based on existing knowledge, organizational goals, current technology, and existing inventories. In phase two, on-the-ground actions are initiated. Phase three involves monitoring results of those actions and, in phase four, results are evaluated. The cycle could then reinitiate, driven by emerging knowledge and experience. Results could validate existing practices and policies or reveal the need for alterations in the allocations, S&Gs [standards and guidelines], or both" (Stankey et al 2005).

For purposes of describing adaptive management plans proposed in this document, a hybrid approach is used to describe and illustrate implementation of adaptive management actions (Figure 4; Tasmania 2016). This model generally contains the typical four phases of adaptive management described above. However, it allows more flexibility and expediency in allowing adjustments in management actions based on monitoring actions. Although this approach is used to describe the adaptive management process for the purposes of this document, it is possible that adjustments in the process may be made as the adaptive management processes are further defined and developed.

One of the key components of an adaptive management process is convening an adaptive management committee that will guide the activities of each adaptive management program. For the adaptive management programs described in this FWMEP, the adaptive management committee for each adaptive management program would operate within the bounds of the financial and resource commitments for NISP-related adaptive management efforts. The adaptive management committees would implement the adaptive management programs through the development of specific resource management objectives and key desired outcomes for the adaptive management program, development of joint scopes of work for activities directed by the adaptive management committee, development and implementation of monitoring programs, evaluation of the effectiveness of adaptive management program activities, and the adjustment of activities to better meet NISP mitigation and

enhancement goals. Additionally, Northern Water expects that the adaptive management committee would seek additional funding outside of funding provided by NISP to better achieve the program goals.

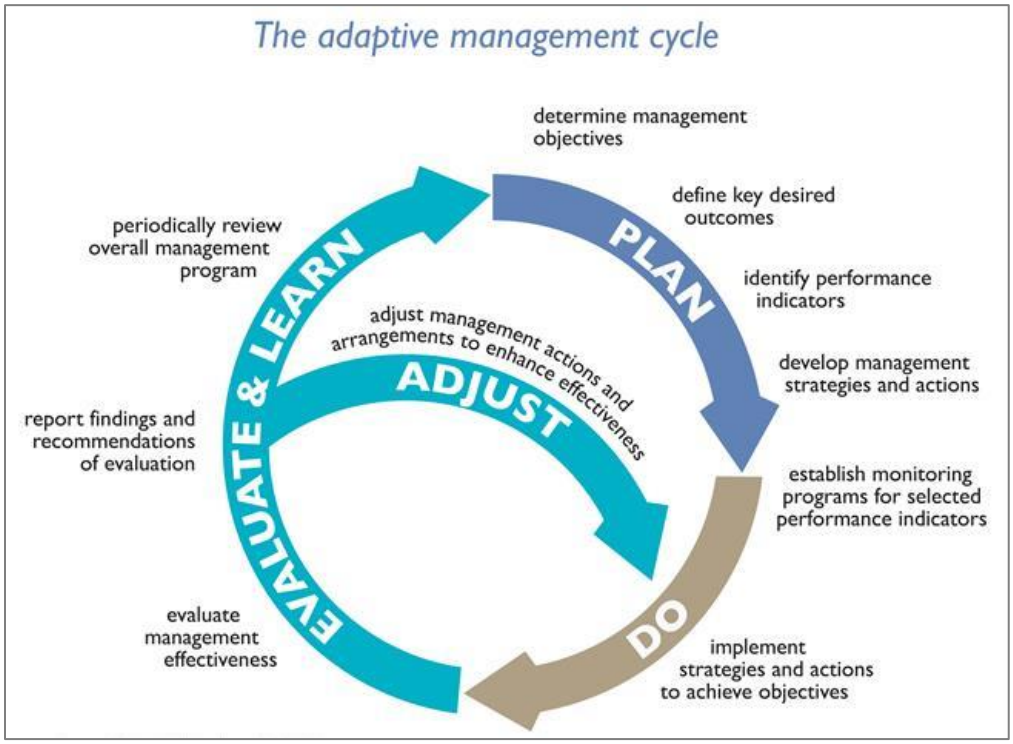


Figure 4. Adaptive Management Cycle Adopted for NISP Fish and Wildlife Mitigation Plan (Tasmania 2016)

3.0 OTHER CONCURRENT OR RELATED ACTIVITIES

Several other local and federal projects and processes are on-going within the NISP study area that influenced development of the mitigation actions described in this FWMEP.

3.1. Halligan and Seaman Water Supply Projects

The City of Fort Collins is proposing to expand its existing Halligan Reservoir, located on the North Fork Cache la Poudre River approximately 9 miles northwest of Livermore, from approximately 6,400 acre-feet to approximately 14,525 acre feet to provide additional municipal and industrial water supply. The City of Greeley is proposing to expand its existing Milton Seaman Reservoir, located on the North Fork Cache la Poudre River approximately 4 miles northwest of Ted's Place, from approximately 5,000 acre-feet to approximately 53,000 acre feet to provide additional municipal and industrial water supply. In order to fill and operate the additional storage space, the projects will have flow-related effects on the Poudre River in similar reaches as NISP.

Fort Collins and Greeley are currently undergoing separate NEPA compliance efforts for these projects, which will result in two separate Section 404 permits from the Corps, if permits are issued. The Corps is the lead federal agency for both projects. The Draft EIS for the Halligan project is currently scheduled to be released in late 2017, while the Draft EIS for the Seaman project is currently scheduled to be released in 2018 (Corps 2017).

The Corps developed the Common Technical Platform to assist in the assessment of impacts associated with NISP, the Halligan project, and the Seaman project. The Common Technical Platform developed baseline study conditions for NEPA analyses by these projects, including hydrologic modeling, geomorphology, aquatic, water quality, and riparian resources. Cumulative effects hydrologic model runs (Future Conditions runs) and corresponding resource analyses consider operations of NISP, the Halligan project, and the Seaman project, in addition to other reasonably foreseeable future actions.

Because the Draft EISs for the Halligan and Seaman projects have not yet been released, it is not known at this time the location or significance of environmental effects or corresponding mitigation measures that will be required to offset these effects. Northern Water is likely to develop and begin implementation of mitigation activities sooner than these projects. Until more details are available on the Halligan and Seaman projects, it is unknown exactly how mitigation activities will be coordinated between the projects.

3.2. Poudre Runs Through It Flows Committee

The Poudre Runs Through It Study/Action Work Group is made up of about 25 citizen experts representing diverse interests who were selected to study the Poudre River and formulate cooperative actions based on what they learn. The group is organized and facilitated by the Colorado Water Institute and Colorado State University. The group is trying to find broadly acceptable ways to meet multiple objectives: to have both a working Poudre and a healthier Poudre. The group's goal is not to return the river to its pre-development condition, but rather to focus on areas for mutual gain

without letting divisive issues inhibit thinking. The group has launched three initiatives towards these goals that fall under the categories of Flows, Funding, and Forum (The Poudre Runs Through It 2014). Northern Water actively participates in the group.

3.2.1. Flows

The Poudre Runs Through It group has investigated two distinct approaches to keep more water in the Poudre River. The key to each is using the river, instead of canals or pipelines, as a conveyance to move water from upstream to a downstream beneficial use, and moving that water in a way that minimizes losses, does not interfere with water rights, can be administered under Colorado water law, and is market driven.

> **Approach A: Instream Flow Designation** – This approach involves requesting that the Colorado Water Conservation Board secure instream flow water rights for a specific reach of the Poudre River. Minimum flow designation is recognized by Colorado law, established by the Colorado Water Conservation Board in conjunction with CPW, and water dedicated to such a reach is administered within the state's water right priority system. One potential reach would be the Poudre River through Fort Collins. Water leased or otherwise acquired upstream of Fort Collins could then be run through the designated instream flow reach, applied to the beneficial use created by an instream flow right in the designated reach, and used in turn by downstream agricultural or other users (The Poudre Runs Through It 2014).
>
> The instream flow water right would be junior to all existing perfected and conditionally decreed water rights on the river, including NISP water rights. However, it would provide the mechanism for the lease and/or purchase of water rights to be dedicated for instream flow purposes.
>
> **Approach B: Regional Conveyance Cooperation** – This approach would involve the cooperation and coordination of water users and stakeholders to modify operations with the goal of leaving more water in the river during critical low-flow periods. For example, cities or water districts that currently divert water from the Poudre River upstream from Fort Collins or plan to do so in the future could, during certain times or under certain conditions, move all or part of that water further downstream in the Poudre through Fort Collins and perhaps Windsor before diverting it to other uses. Using the river as a conveyance could add water back into a portion of the Poudre (The Poudre Runs Through It 2014b).

Both approaches would require replacement, retrofitting, enhancement, or construction of major infrastructure at treatment plants, diversions, and head gates, as well as adding telemetered flow measurement. Both would also require new cooperative agreements among water rights holders to maximize the efficiency of the river for both working and healthy river goals.

Any approach to improving flows will involve considerable expense and therefore require public support. The group has identified as a priority broadening public understanding of key water management concepts (The Poudre Runs Through It 2014).

3.2.2. Funding

Improvements being envisioned by the Poudre Runs Through It group will require funding for implementation, including engineering and legal fees, retrofit of infrastructure, flow measurement, extensive educational campaigns, and/or the lease or purchase of water rights. The Poudre Runs Through It has undertaken an initiative to investigate how such funding could be generated, including looking at models such as Larimer County's Open Space Tax or the State of Colorado's GOCO fund, and others (The Poudre Runs Through It 2014).

3.2.3. Poudre River Forum

The Poudre Runs Through It has established an annual Poudre River Forum to bring together all the communities that benefit from the Poudre to celebrate and cooperate. The Forum features presentations and panels, think-tank topics, and other educational and community building activities. The purpose of the forum is to convene diverse stakeholders and community to collaborate on meeting the dual goals of a working river and healthy river (The Poudre Runs Through It 2014).

3.3. City of Fort Collins Natural Resources Projects

The City of Fort Collins has performed land use and environmental planning for the Poudre River corridor for many years. Among the planning documents available are the Framework for Environmental Action in 1992, Cache la Poudre River Master Plans, and Natural Areas Management Plans in 2001 and 2011. A summary of these documents can be found in the Poudre River Downtown Master Plan (Fort Collins 2014a). The more recent planning and analysis documents developed by the City as they pertain to the Poudre River are summarized below. Additionally, one more recent project completed by the City, the McMurray Natural Area Restoration Project, is described.

3.3.1. Poudre River Downtown Master Plan

The City of Fort Collins Poudre River Downtown Master Plan envisions nearly three miles of sustainable river corridor (Shields Street to Mulberry Street) that provides habitat, recreation, and flood mitigation benefits. This is a long-term plan consisting of numerous elements that will take many years to complete. The plan integrates improvements to support many high-quality and safe recreational experiences, better protection against flood damage, and restored habitat connectivity for optimal river health and resiliency. Physical improvements, which support sustainable use of the river corridor by the community, will allow people to continue to enjoy the Poudre River, but in a way that supports a functioning ecosystem by providing connected habitat for fish, terrestrial wildlife, trees, and plants, while also enhancing protection of the community during floods (Fort Collins 2014a).

3.3.2. Natural Areas Master Plan

Also in July 2014, the City of Fort Collins Natural Areas Department released a Natural Areas Master Plan for public review. The City of Fort Collins has conserved several natural areas along the Poudre River within and outside of the Fort Collins city limits, with properties ranging in size from 1 acre to

more than 22,000 acres. Among the principles identified in the document is to maintain the Department's core focus on biologically significant lands, or lands that have the potential to contribute to biological integrity and richness, and to acquire water in order to enhance and sustain habitat, link it to appropriate lands (such as productive farmland), and to satisfy administrative obligations. Lands along the Poudre River, in the Bellvue area, and in the adjoining foothills have been identified as priority areas for conservation. Conservation goals of the Poudre River corridor include sustaining and improving water flows, implementing restoration projects that connect the river to its floodplain, creating rich wildlife habitat, improving aesthetics, and providing appropriate recreational activities (Fort Collins 2014b).

3.3.3. Ecosystem Response Model

In 2011, the City of Fort Collins initiated the Ecosystem Response Model to help in understanding Poudre River ecosystems from Overland Trail Road to Interstate 25. The Ecosystem Response Model project has two overarching goals: to quantitatively inform a flow management scenario that most closely helps the community vision of a healthy river, and to provide a coarse-scale evaluation of future river conditions. The model contains a network of hydrologic and non-hydrologic drivers that are related to ecosystem functions and river conditions, expressed with a probability of influence (Fort Collins 2014c).

The Ecosystem Response Model and associated documentation were recently released (Fort Collins 2014d). Although an exhaustive review of the model and results were not performed by Northern Water as part of this FWMEP, the City of Fort Collins did make a presentation of the model to Northern Water staff, and staff has reviewed the model results in general. While Northern Water has concerns with certain aspects of this model and its utility, information from the report was used to inform the development of aspects of this FWMEP.

3.3.4. Poudre River Health Assessment Framework

The City of Fort Collins' Natural Areas and Utilities departments are collaborating on an assessment tool for supporting and sustaining the health of the Poudre River. The River Health Assessment Framework articulates the City's vision for a healthy and resilient river by setting recommended ranges and an A-F grading system for the key physical, chemical and biological indicators of the river. The Framework will be used to create a Poudre River Report Card and the State of the River Report (Fort Collins 2017), and to evaluate the river health impacts of internal and external projects (Fort Collins 2015). Information from the River Health Assessment Framework was used to help develop certain mitigation measures identified in this FWMEP, primarily flow-related aspects of conveyance refinement (section 5.2.2.4).

3.3.5. McMurry Natural Area Restoration Project

In 2013, the City of Fort Collins began construction of the McMurry Natural Area Restoration Project. The purpose of this project was to lower river banks to reconnect the river to its floodplain, promote native cottonwood forests, create a variety of wetland habitats in the east pond, and enhance

recreation with safe access to ponds, the river, and improved trails. The project physically lowered the riverbank to permit higher flows to safely spill onto adjacent low-lying areas within the natural areas. Additionally, the Josh Ames diversion structure was removed in order to permit fish passage, reduce downstream "dry-up", and improve river-based recreation (Fort Collins 2014d). The Josh Ames Ditch water rights were transferred to the City of Fort Collins many years ago and delivered at an alternate point of diversion, thus the ditch had already been abandoned.

3.4. Poudre River Trail

The Poudre River Trail Corridor, Inc. is a local non-profit organization that has managed a cooperative effort with the City of Greeley, the Town of Windsor, and Weld County to develop the Poudre River Trail. The Poudre River Trail is 21 miles of a well-maintained paved pathway for walking, cycling, running, roller-blading, and more. The trail extends from Island Grove Regional Park in Greeley to Colorado Highway 392 in Windsor where it connects to the paved trail in Larimer County's River Bluff's Open Space. The Poudre River Trail Corridor Board was created by the City of Greeley, Weld County, and the Town of Windsor via an intergovernmental agreement, and incorporated to its current form in January of 1997. Funding is raised through grants from Great Outdoors Colorado, Colorado State Trails, and North Front Range Metropolitan Planning Organization, with matching contributions from local foundations, businesses, individuals, and governments. The Trail Board continues to oversee maintenance and additional development (Poudre River Trail Corridor Inc. 2014).

In 2016, the Town of Windsor completed an updated Parks, Recreation, Trails and Open Lands Master Plan Update (Windsor 2016). The Master Plan is a resource for the Windsor Parks, Recreation, and Culture Department to provide direction for future development, programming, and services decisions over the next 5-10 years. The document provides broad-based visioning to guide operations and potential expansion of services as the Town of Windsor continues to build out. The plan identifies the Poudre River corridor as a key area for greenway trails, natural areas, and river access for recreational activities.

3.5. Cache La Poudre River at Greeley Flood Risk Mitigation and Ecosystem Restoration

The Cache la Poudre integrated feasibility study and environmental assessment includes both flood risk management and ecosystem restoration. The project area is located along the Cache la Poudre River near Greeley, in the northeastern part of Colorado, north of Denver. Most of the land surrounding Greeley is used for agricultural purposes, and gravel mining occupies a sizable portion of the floodplain. The project reach extends from the confluence of the Cache la Poudre and South Platte rivers, 17 miles upstream along the Cache la Poudre River, through the northern corporate limits of the City of Greeley.

Floodplain areas covering 8,400 acres in the 17-mile study reach were assessed to identify best opportunities to restore riparian and wetland habitats benefitting migratory birds and other native species. Screening and prioritization identified approximately 460 acres in nine areas spanning eight miles. In these areas, opportunities were assessed for diverting river water or stormwater onto

floodplain areas, excavating to restore river connections to oxbows or to restore meanders, excavating into or near groundwater, seeding and planting, and removal of exotic vegetation. Combinations of these were evaluated in each of the nine areas. One of the nine areas was eventually screened out due to high real estate costs and potential for contaminated soils. Alternative plans within each of the other eight areas were evaluated and compared to one another using the cost effectiveness/incremental cost analysis technique. The resulting proposed plan consists of an alternative at each of the eight areas, a total of approximately 446 acres. Within these total acres, ecological improvement is accomplished by increasing riparian forest from 80 acres to 198 acres and wetlands from 11 acres to 179 acres. It would reduce acres of ruderal rangeland, other agricultural land, and disturbed areas an equivalent amount, approximately 286 acres. The plan calls for excavation, grading, plantings, and seeding, at a first cost of $29.1 million, including real estate interests.

Recreation related to the ecosystem restoration was evaluated and was found to be justified. The proposed recreation plan involves features at five of the eight restoration areas. It would include roughly seven miles of trails, ½-mile of wetland boardwalk, two trailheads with parking lots, shelters, and signage, with a first cost of $771,000.

Greeley served as the cost-share sponsor of this study, and the City would be the cost-share sponsor for implementation. The Corps has coordinated with Greeley throughout the study, and Greeley has endorsed the proposed plan and indicated its intent to sponsor implementation of the project (Corps 2014).

4.0 REGULATORY PROCESS

NISP is required to obtain numerous federal and state permits, licenses, and approvals. The primary regulatory processes related to the C.R.S. 37-60-122.2 requirement for fish and wildlife mitigation are described below.

4.1. Clean Water Act Section 404 Permit

Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands. Northern Water is the applicant for a permit under Section 404 for construction and operation of the proposed NISP facilities. The U.S. Environmental Protection Agency (EPA) and the Corps have articulated the policy and procedures to be used in the determination of the type and level of mitigation necessary to demonstrate compliance with the Section 404(b)(1) Guidelines of the Clean Water Act in the Mitigation Rule (33 CFR Part 332). Among other things, the Mitigation Rule states that "the district engineer will issue an individual section 404 permit only upon a determination that the proposed discharge complies with applicable provisions of 40 CFR Part 230, including those which require the permit applicant to take all appropriate and practicable steps to avoid and minimize adverse impacts to waters of the United States. Practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. Compensatory mitigation for unavoidable impacts may be required to ensure that an activity requiring a section 404 permit complies with the Section 404(b)(1) Guidelines."

4.2. National Environmental Policy Act Review

Based on a review of NISP, the Corps determined that NISP is likely to significantly affect the quality of the human environment and therefore an EIS should be prepared. The Corps is the lead federal agency for compliance with the National Environmental Policy Act (NEPA) and will use the EIS in rendering a final permit decision.

A Draft EIS (dated April 2008, Corps 2008) and Supplemental Draft EIS (dated June 2015, Corps 2015) have been prepared by the Corps in accordance with NEPA and applicable NEPA implementation regulations (43 U.S.C. § 4321 *et. seq*.; 40 CFR 1500, as amended; 33 CFR 325, Appendices B and C). A third-party consulting team led by ERO Resources Corporation (ERO), working under the direction of, and in cooperation with, the Corps, assisted the Corps in data collection, effects analysis, and document production in accordance with guidance from the Chief of Engineers regarding EIS preparation. The third-party consulting team included, but was not limited to the following:

- ERO Resources – Project management, wetlands, wildlife, riparian vegetation, geology and soils, hazardous materials, groundwater
- CDM Smith – Water Resources, Hydrologic Modeling, Hydrology
- Anderson Consulting - Geomorphology
- GEI Consulting Engineers and Scientists – Aquatic Resources, Water Quality
- Hydros Consulting – Water Quality

- BBC Research and Consulting – Socioeconomics

The Corps requested that six agencies and one local government with statutory authority or special expertise with an environmental issue participate in the EIS process as cooperating agencies (40 CFR 1501.6 and 1508.5): U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service (Service), U.S. Environmental Protection Agency, CDOT, Colorado Department of Natural Resources (which includes CPW), Colorado Department of Public Health and Environment, and Larimer County. Reclamation is a cooperating agency because Northern Water would need a Reclamation contract and special use permit to facilitate water delivery to the Participants for one option under its Preferred Alternative.

Impacts identified in the Draft EIS (Corps 2008), Supplemental Draft EIS (Corps 2015), associated technical analyses, and an updated flushing flow analysis (Anderson 2017) were used as the basis for mitigation in this FWMEP. A Final EIS is expected to be published in late 2017 (Corps 2017). If impacts to fish and wildlife are identified in the Final EIS that were not identified in the Draft EIS or Supplemental Draft EIS, Northern Water will coordinate with CPW and other state agencies as required under the Fish and Wildlife Coordination Act and will adjust the proposed mitigation as appropriate.

4.3. Endangered Species Act

Section 7(a)(2) of the Endangered Species Act requires that federal agencies consult with the Service to ensure that effects of actions that the federal agencies authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or adversely modify designated critical habitat. During this consultation, the federal agency receives a biological opinion or concurrence letter addressing the proposed action (Service 2014).

The Corps submitted a biological assessment to the Service for the NISP proposed action (alternative 2; Corps 2007) and has consulted with the Service under Section 7. The Service issued a biological opinion on NISP on October 5, 2007 (Service 2007a). The opinion concurs with the biological assessment that NISP is "not likely to adversely affect" the Colorado butterfly plant (Gaura neomexicana ssp. Coloradensis), the Ute ladies'-tresses orchid (Spiranthes diluvialis), and the black-footed ferret (Mustela nigripes). The opinion requests that suitable habitat for the Colorado butterfly plant and the Ute ladies'-tresses orchid be resurveyed prior to disturbance. The opinion concludes that the NISP proposed action is not likely to jeopardize the continued existence of the threatened Preble's meadow jumping mouse (Zapus hunsonius preblei), because 1) permanent and temporary impacts to available habitat are not likely to preclude recovery of the species; and 2) NISP would implement proposed compensatory mitigation measures through enhancement of existing habitat and creation of new habitat below the proposed Glade Reservoir. The opinion also authorizes incidental take and identifies reasonable and prudent measures, terms and conditions, and reporting requirements for such take. Because Preble's meadow jumping mouse mitigation is performed under federal regulations, this mitigation is not further described in this document (see Conceptual Mitigation Plan, Northern Water 2015).

The opinion also concurs with the assessment of effects on listed species that use the Platte River in Nebraska, including the endangered whooping crane (Grus Americana), the interior least tern (Sternula antillarum), the pallid sturgeon (Scaphirynchus albus), the piping plover (Charadrius melodus), and the

western prairie fringed orchid (Platanthera praeclara). The opinion concludes that the NISP proposed action is consistent with the Tier 1 Programmatic Biological Opinion on the Platte River Recovery Implementation Program, and is not likely to jeopardize the continued existence of these federally listed species and is not likely to destroy or adversely modify designated critical habitat for the whooping crane. The opinion also addresses reasonable and prudent measures and terms and conditions in the Tier 1 Programmatic Biological Opinion regarding incidental take, and conservation measures.

4.4. Colorado Fish and Wildlife Mitigation Plan

This FWMEP is prepared to satisfy the requirements of C.R.S. 37-60-122.2. The first portion of this statute states:

> (1)(a) The general assembly hereby recognizes the responsibility of the state for fish and wildlife resources found in and around state waters which are affected by the construction, operation, or maintenance of water diversion, delivery, or storage facilities. The general assembly hereby declares that such fish and wildlife resources are a matter of state-wide concern and that impacts on such resources should be mitigated by the project applicants in a reasonable manner. It is the intent of the general assembly that fish and wildlife resources that are affected by the construction, operation, or maintenance of water diversion, delivery, or storage facilities should be mitigated to the extent, and in a manner, that is economically reasonable and maintains a balance between the development of the state's water resources and the protection of the state's fish and wildlife resources.

FWMEPs for water projects considered under C.R.S. 37-60-122.2 are to be developed by the project applicant, working in cooperation with CPW staff, and submitted to the Colorado Parks and Wildlife Commission (Commission). If the Commission and applicant agree on the mitigation plan, the Commission forwards the mitigation plan to the Colorado Water Conservation Board for adoption as the official state position on the mitigation actions required of the applicant.

4.4.1. Mitigation and Enhancement Plans

C.R.S. 37-60-122.2 makes a specific distinction between mitigation of impacts caused by the proposed project, and enhancement of fish and wildlife resources over existing conditions. This distinction is further defined in the Procedural Rules for the Commission (Chapter 16) and clarified in a memorandum dated December 9, 2010 to the Director of the Colorado Division of Wildlife and the Commission from the First Assistant Attorney General, Natural Resources and Environment Section. Accordingly, this FWMEP includes both a Mitigation Plan that contains mitigation measures to address the direct impacts that have been identified for the NISP, and an Enhancement Plan that addresses issues raised by CPW and other stakeholders regarding the current condition of the aquatic environment on the Poudre River and includes proposed enhancement measures to enhance fish and wildlife resources over and above levels existing without NISP. Northern Water, as an applicant for one or more federal permits or licenses, is required by C.R.S. 37-60-122.2 to submit a proposed mitigation plan, but submittal of an enhancement plan is voluntary.

4.4.2. Consultation, Coordination and Public Input

Northern Water consulted with CPW and the Service representatives during preparation of this Plan. In addition, CPW and the Service reviewed and commented on the Supplemental Draft EIS and associated documents prepared as part of the EIS process. These documents provide additional details on the impacts of the alternatives evaluated in the Supplemental Draft EIS.

C.R.S. 37-60-122.2 requires CPW and Colorado Water Conservation Board review and input on mitigation for fish and wildlife impacts resulting from a federally approved water project. The review process is intended to provide a balanced review between fish and wildlife protection and water development.[2] Although the procedures for C.R.S. 37-60-122.2 do not require public review and input, Northern Water and CPW have developed a process to allow for extensive public participation. To date, the Corps (through the NEPA process), Northern Water, and CPW have provided and will continue to provide the following public meetings and opportunities to solicit input on the potential impacts and mitigation for NISP:

- Corps, NISP Public Scoping Meetings, September 20-22, 2004 – Description of alternatives and receipt of comments on scope of EIS analyses
- Corps, NISP Draft EIS Public Comment Period, April 30 - September 13, 2008 – Receipt of written comments on the Draft EIS
- Corps, NISP Draft EIS Public Hearings, June 17 (Fort Collins) and June 19 (Greeley), 2008 – Receipt of oral and written comments on the Draft EIS
- Corps, NISP Supplemental Draft EIS Public Comment Period, June 19 - September 3, 2015 – Receipt of written comments on the Supplemental Draft EIS
- Corps, NISP Supplemental Draft EIS Public Hearings, July 22 (Fort Collins) and 23 (Greeley), 2015 – Receipt of oral and written comments on the Supplemental Draft EIS
- Commission Meeting, May 4-5, 2017 (Grand Junction) – CPW staff presentation and acceptance of Public Comment on the NISP
- Commission Meeting, June 8-9, 2017 (Pagosa Springs) – Northern Water presentation of FWMEP Applicant Proposal to Commission
- Northern Water, June 9, 2017 – Northern Water release of FWMEP Applicant Proposal to public via Northern Water/NISP website
- Northern Water Open House, June 27, 2017 (Loveland) – Northern Water presentation of FWMEP Applicant Proposal to the public and receipt of comment in open house-style format
- Commission Meeting, August 10-11, 2017 (Trinidad) – CPW staff comment to Commission on FWMEP Applicant Proposal
- Northern Water, August 22, 2017 – Northern Water submittal of Draft Final FWMEP to Commission and release to public via Northern Water/NISP website

[2] See Testimony of Clyde Martz, Direction of the Department of Natural Resources, Senate Testimony HB 87-1158, April 9, 1987.

- Commission Meeting, September 7-8, 2017 (Steamboat Springs) – Commission approval of FWMEP
- Colorado Water Conservation Board (Board) Meeting, September 19-21 (Walden) – Northern Water presentation of Draft Final FWMEP to Board, and Board approval of FWMEP
- Northern Water, October 10, 2017 – Northern Water release of Final FWMEP

Input from these processes has been used to help prepare the draft plan and final plan. This final version of the FWMEP is identical to the Draft Final version of the FWMEP approved by both the Commission and Board, with modifications made to this section (section 4.4.2) to reflect final approvals and submission of this final FWMEP, and to Poudre River Adaptive Management Program costs (including the total Enhancement Plan cost) shown in Table 13 (section 6.2) consistent with verbal testimony provided to the Commission during the September 7 meeting. Minor formatting changes were also made in certain areas.

5.0 PROPOSED FISH AND WILDLIFE MITIGATION PLAN

This section constitutes the proposed Mitigation Plan for fish and wildlife impacts that are expected to be caused by NISP. Mitigation measures have been developed to address impacts identified in the Draft and Supplemental Draft EIS. The mitigation measures are also intended to address concerns regarding NISP impacts that were identified by CPW staff in a detailed review of the Draft EIS and Supplemental Draft EIS technical analyses. Some mitigation measures also have an enhancement component, and if so, the enhancement component is described for such measures. Impacts are based on a comparison of the existing conditions scenario to the Preferred Alternative, which consists of a 170,000 AF Glade Reservoir with the Poudre River Intake conveyance refinement as described in Section 2.0, and the SPWCP. A detailed description of existing conditions and the analysis and identification of impacts are included in the Draft EIS and Supplemental Draft EIS. Information analyzing the incremental impacts of NISP in the Draft EIS (Corps 2008), Supplemental Draft EIS and associated Technical Reports (Corps 2015), and a subsequent Corps assessment of flushing flows on the Poudre River (Anderson 2017) was used in the development of this FWMEP.

As previously described, the Supplemental Draft EIS (Corps 2015) presented a Conceptual Mitigation Plan prepared by Northern Water (Northern Water 2015) that includes both mitigation and enhancement. This Mitigation Plan portion of the FWMEP builds upon and/or replaces many of the aquatic life, terrestrial wildlife, and recreational components of the Conceptual Mitigation Plan. The mitigation measures described in this FWMEP use the same alpha-numerical measure number convention as used in the Conceptual Mitigation Plan for those mitigation actions that are similar to or directly replace mitigation measures described in the Conceptual Mitigation Plan. In some cases, as noted in the text, new mitigation measures were developed through the FWMEP process (i.e. are not described in the Conceptual Mitigation Plan) and were given new measure numbers.

Some mitigation measures described in this section involve providing funding to state agencies, primarily CPW, to manage programs relating to this Mitigation Plan. This funding is proposed to be in addition to funding already received by state agencies, and not to replace any source of funding. Northern Water expects the agencies to continue seeking current funding sources and not rely on funding from this Mitigation Plan to replace current funding.

Components of the FWMEP are summarized in the tables contained in Appendix A of this document. Table A2 notes those environmental effects that are not covered under this FWMEP. The alpha-numerical notations at the end of each mitigation item description correspond to the alpha-numeric mitigation item numbers in Tables A1 and A2.

5.1. NISP Project Area

NISP would have site specific effects at proposed reservoir locations and along pipeline routes, and hydrologic effects on the Poudre River downstream of the canyon mouth and the South Platte River downstream of its confluence with the Poudre River. Additional effects would occur at Horsetooth Reservoir and Carter Lake due to the proposed C-BT exchange.

In general, the location of mitigation activities is developed as close as possible to the location at which the effect occurs. For site specific mitigation activities, such as disturbance of a specific quantity of wetlands at a construction site, the disturbance is mitigated on the same site if the site is amenable to the activity. On-site, in the case of NISP, applies to land that is owned by Northern Water, such as land at the reservoir sites. On-site mitigation provides assurance that the land can be acquired and the mitigation fully implemented as conceptualized.

For NISP, most of the effects and associated mitigation activities occur in the river channels. These effects are indirectly caused by a change in hydrology rather than directly by a construction activity. Under this Mitigation Plan, environmental effects in one reach of river are generally mitigated in the same reach of river. For instance, mitigation of riparian effects that occur in Segment E is generally mitigated in Segment E. It should be noted that the resource specialists used differing reaches for analyses tailored to the nature of each resource. A general summary of the reaches is presented in Table 2, while a more detailed line diagram covering Segments A through D is presented in Figure 5.

For physical mitigation projects, especially those that involve habitat or channel improvements, reaches in which a public entity owns land on either or both sides of the river channel were prioritized. This results in a streamlined implementation process, and allows public access to these improvements in most cases.

Table 2. Approximate Demarcation of Resource Study Reaches of the Cache la Poudre

General Area	Aquatic and Riparian Vegetation Segment [1]	Geomorphic and Sediment Transport Study Reach	Approximate Upstream Demarcation [1]		
			Data Delivery Mile [2]	Diversion or Water Feature	Major Road/Landmark
La Porte	A	La Porte	5.12	Poudre Valley Canal	Canyon mouth
Fort Collins Upstream	B	Fort Collins 1-4	13.92	Larimer & Weld Canal	Taft Hill Road
Fort Collins Downstream	C	Fort Collins 5-6	18.71	Timnath Inlet	Prospect Road/Spring Creek
Timnath	D	Timnath	27.81	New Cache la Poudre Ditch	Kechter Road (5 river miles downstream of I-25)
Windsor	E	Windsor	31.61	Whitney Ditch	Weld County Road 17/7th Avenue (Windsor)
Greeley	F	Greeley (Upstream, Channelized, Downstream)	40.79	Jones Ditch	Weld County Road 25/95th Avenue (Greeley)

[1] See Supplemental Draft EIS Aquatic Effects Report (GEI 2014), Riparian Vegetation Effects Report (ERO 2013) and other associated reports for detailed mapping and descriptions of these reaches.
[2] See Supplemental Draft EIS Geomorphology Effects Report (Anderson 2014) and other associated technical reports for detailed mapping and description of these reaches.
[3] Because reach definitions differ by resource, the specific upstream demarcation between reaches differs by resource. This table is an approximation only – see specific resource reports for exact demarcations.
[4] DDM = Data Delivery Mile; distance downstream of Munroe Canal diversion.

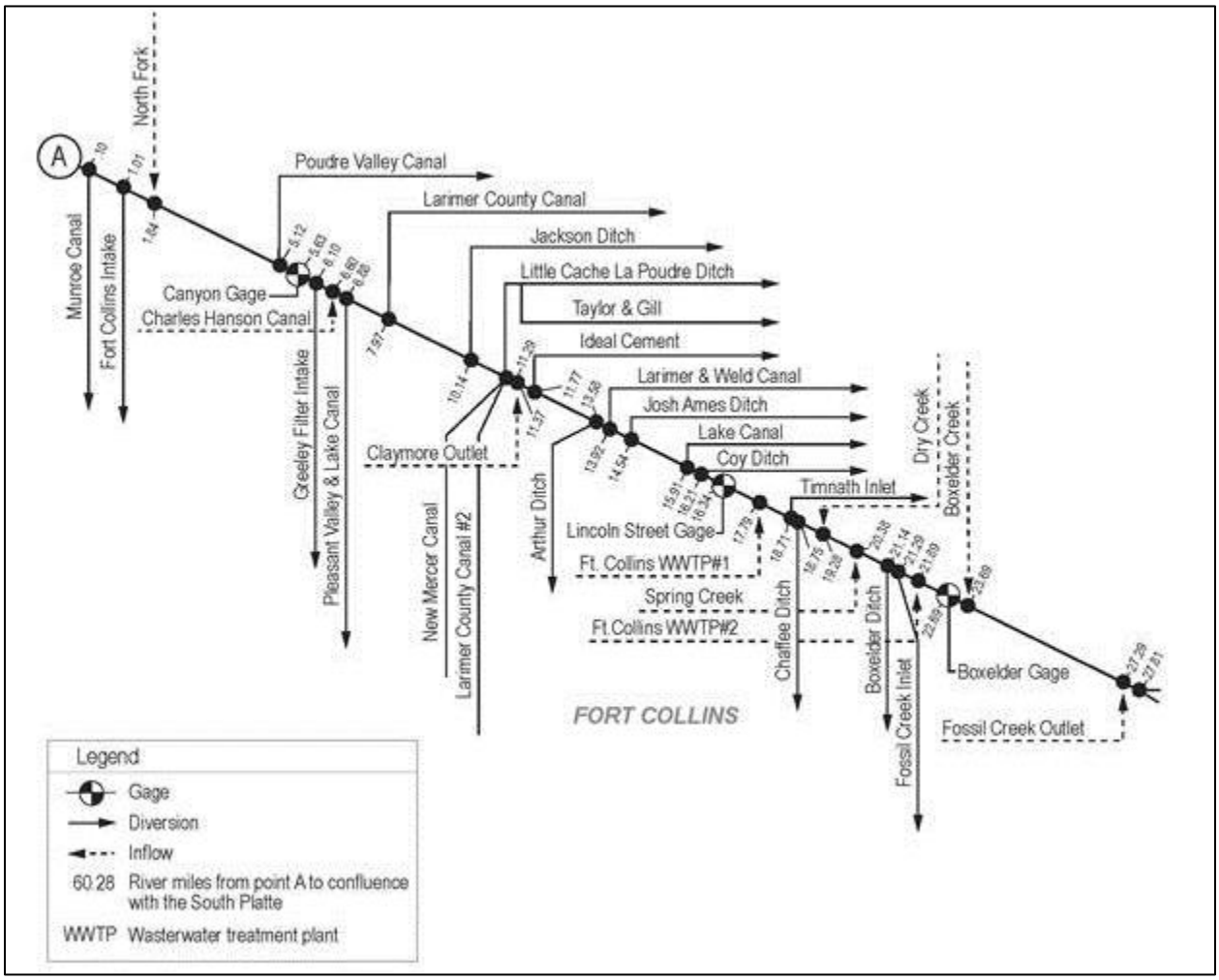


Figure 5. Line Diagram of Poudre River from Munroe Canal to Fossil Creek Reservoir Outlet (Northern Water 1996)

5.2. Avoidance and Minimization

Throughout the development of NISP, from the initial NISP concepts through the conceptual designs now being analyzed, Northern Water has incorporated design and operational components that are intended to avoid and minimize environmental effects. These actions are a result of more than 30 years of planning, and reflect the more recent conceptual design and analysis of the NISP alternatives, including analyses performed during the Draft EIS and Supplemental Draft EIS. This section summarizes aquatic life, terrestrial wildlife, and recreation related avoidance and minimization techniques.

5.2.1. Design Commitments

This section provides information on specific design features of NISP infrastructure that are proposed to avoid or minimize environmental effects.

5.2.1.1. NISP Configuration

The NISP and Glade Reservoir concepts have more than a 30-year history of evolution from their original configuration to the configuration currently being proposed. Throughout this evolutionary period, NISP has evolved based on changing public values regarding the environment. Two of the most significant changes in the NISP/Glade Reservoir that avoid environmental effects are the movement of the proposed reservoir from an on-channel reservoir site to an off-channel reservoir site, and the elimination of a potential point-of-diversion that would have been upstream of the North Fork confluence with the Poudre River.

Water development in the Poudre River Basin has been formally studied since the mid-1960's when Reclamation first considered formation of the Poudre Unit. In 1980, the Cache la Poudre Water Users Association filed water rights for a proposed 220,000 acre-foot reservoir located on the Poudre River channel at the Grey Mountain site, approximately 3 miles west of Ted's Place in the Poudre Canyon. In 1985, Northern Water acquired a 7/8 share in the conditional water right. Since that time, Northern Water has conducted and participated in many studies for storing unappropriated flows on the Poudre River (MWH 2004), including a basin study conducted with the Colorado Water Resources & Power Development Authority in 1987 (Harza) and extension of that study in 1990 (EBASCO, Harza, et al.). Through these processes, Northern Water determined that an on-channel reservoir was not environmentally or publicly acceptable, and moved its preferred alternative to its current location at Glade Reservoir. Although not studied in detail, this change undeniably avoided and minimized many environmental effects of the originally proposed reservoir. All on-channel reservoirs were eliminated through the NISP screening process.

Another feature of NISP that has been informally studied by Northern Water is construction of a new tunnel that would divert water from the Poudre River upstream of the confluence with the North Fork, or diverting water into the reservoir using the existing Munroe Canal (section 5.2.2.1), which also diverts water upstream of the confluence with the North Fork. Constructing a diversion tunnel could allow conveyance of diverted streamflow to Glade Reservoir without pumping, while use of the Munroe Canal could reduce pumping during lower reservoir elevations. These options were eliminated due to environmental effects, partially because these options would dewater a reach of the Poudre River that is a popular river recreation area.

5.2.1.2. Poudre Valley Canal Diversion Structure (AG-04)

As part of NISP construction, the existing Poudre Valley Canal diversion structure (Figure 6) would be replaced with a structure to minimize effects on sediment transport by allowing diversion of excessive sediment into the forebay, to enhance fish passage and boater safety from existing conditions, and to avoid fish entrainment. The existing structure consists of a concrete overflow weir in the Poudre River, a headgate structure with three radial gates, a trash rack, and a gated sluiceway back to the river. The existing weir in the river is in poor condition and the headgate structure leaks (MWH 2004).

Figure 6. Existing Poudre Valley Canal Diversion on Poudre River near Canyon Mouth

The replacement structure would be a similar configuration to the existing structure, with the diversion capacity of the structure increased to approximately 1,700 cfs (1,200 cfs for NISP diversions, and 500 cfs for existing decreed water rights in the Poudre Valley Canal). Conceptual designs of the headgate structure include a diversion structure with four 15-foot wide radial gates, trash rack, and gated sluiceway (MWH 2004). The gates would be configured with vanes and floor elevations that allow selective diversion of bed load and sediment that may be required as part of the geomorphology adaptive management program (section 2.8).

The existing diversion weir in the Poudre River would be replaced with a weir that maintains similar upstream water levels as the existing structure, but has been modified as a multi-objective diversion structure. The diversion dam structure would contain fish passage capabilities (see Section 6.1.1.2 for additional information on fish passage capabilities). Additionally, design of the diversion dam crest would consider options for improved boater safety at the structure to reduce the possibility of boaters becoming trapped in the "roller" that occurs downstream of the existing ogee crest. The new structure would not materially increase the water surface elevation of the pool upstream of the structure, and would enhance aquatic habitat connectivity upstream and downstream of the structure by allowing for fish passage. Potential fish entrainment measures are further described in section 5.2.1.3.

CPW staff will be consulted with and serve on a design review committee to ensure that the design appropriately allows both fish passage and boater safety, and avoids fish entrainment, as described herein. The Poudre River adaptive management committee would make recommendations on how the diversion is operated in terms of the diversion of sediment from the Poudre River (section 6.1.1.1).

5.2.1.3. SPWCP Diversion Design (AG-07)

The SPWCP would divert water from the South Platte River just downstream of its confluence with the Poudre River. The diversion structure from the South Platte would consist of a new diversion dam across the South Platte River and an intake located on the north river bank. The intake would divert water into a 150-foot long concrete box flume or conduit that would convey water to the forebay reservoir. This water would then be pumped into Galeton Reservoir via a pump station and pipelines.

The new diversion dam across the South Platte River would consist of a fixed concrete weir, weir sections with Obermeyer crest gates at the main river channel, a radial gate section near the north river bank, and short embankment sections at each end of the weir. The Obermeyer crest gates would allow fish migration in the South Platte during most times of the year when the SPWCP is not diverting, or when the flow in the river is high enough that the Obermeyer crest gates do not need to be raised to provide adequate head for diversion. The SPWCP diversion structure would only nominally increase upstream water depth, and the pool would be contained entirely within the existing channel and would not affect wetlands.

Without avoidance and minimization actions, the diversion could entrain fish from the river and affect the South Platte fish community. However, Northern Water has committed to work with CPW to design and operate the diversion to minimize or avoid fish entrainment. The most common type of practice to reduce fish entrainment at diversion structures is a positive barrier fish screen, which essentially consists of a screening mesh that is sized to prevent entrainment of the target fish species while still allowing adequate flow capacity through the structure. These structures are highly effective, but need to have regular maintenance to clean trash, debris and sediment from the screens (Reclamation 2006).

Behavioral methods have also been studied and implemented on some structures. Behavioral methods may include louvers to create turbulence, startle-response techniques such as lights (strobes), sound, and electrical fields. However, these types of techniques have typically had considerably less than 100 percent fish exclusion efficiency (Reclamation 2006).

Ultimately, techniques will be incorporated into the diversion structure in coordination with CPW during final design. The specific techniques depend on several factors that will not be known with certainty until the design commences. CPW staff will be consulted with and serve on a design review committee to ensure that the design appropriately allows both fish passage and boater safety as described herein.

5.2.1.4. Multi-Level Outlet Tower for Glade Reservoir Releases (WQ-01)

Glade Reservoir would be designed and constructed with a multi-level outlet tower that would allow selective withdrawals from specific locations in the reservoir water column to tailor the water quality of the releases from Glade Reservoir as they relate to the water quality in the Poudre River (Figure 7). To the extent possible, release of flows from the reservoir back to the Poudre River as part of conveyance refinement (see section 5.2.2.4) would be made from the hypolimnion in Glade Reservoir if such releases would benefit water temperature downstream of the release point. These releases would not only avoid and minimize increases in temperatures during certain times of the year due to NISP

operations, but would improve stream temperatures from existing conditions, particularly during the late spring, late summer and early fall months when stream temperatures currently approach or exceed water quality standards that are protective of aquatic species. Releases from the multi-level outlet may be managed to mitigate potential adverse impacts to the narrative temperature criteria and avoid unseasonal cooling effects.

Northern Water recently completed a similar multi-level outlet tower at Carter Lake (Figure 8). This tower was constructed as a redundant year-round outlet for municipal deliveries out of Carter Lake, and to allow municipal deliveries to be drawn from multiple levels of Carter Lake. The exact configuration of a multi-level outlet tower at Glade Reservoir, including gate spacing, screening requirements, and flow requirements, will be determined after consultation with CPW and the Colorado Division of Water Resources Dam Safety Branch.

As described in the Supplemental Draft EIS (Corps 2015), during initial fill of Glade Reservoir, water quality conditions in the reservoir may be affected by the release of nutrients and organic matter in the soil. Thus, during this period, water quality may be affected by high suspended solids, elevated nutrient concentrations, and potentially high concentrations of algae. Northern Water will develop a reservoir water quality management plan that will describe and monitor water quality conditions in the reservoir, and outline how water will be released to the river using the multi-level outlet tower given ambient conditions in the Poudre River, for both short-term (initial fill) and long-term operations.

Implementation of this avoidance technique would require establishment of real-time water quality monitoring points in the Poudre River upstream and downstream of the discharge points into the river, as well as monitoring of the discharge itself. The streamflow and water quality monitoring plan is further described in Section 5.3.1.5.

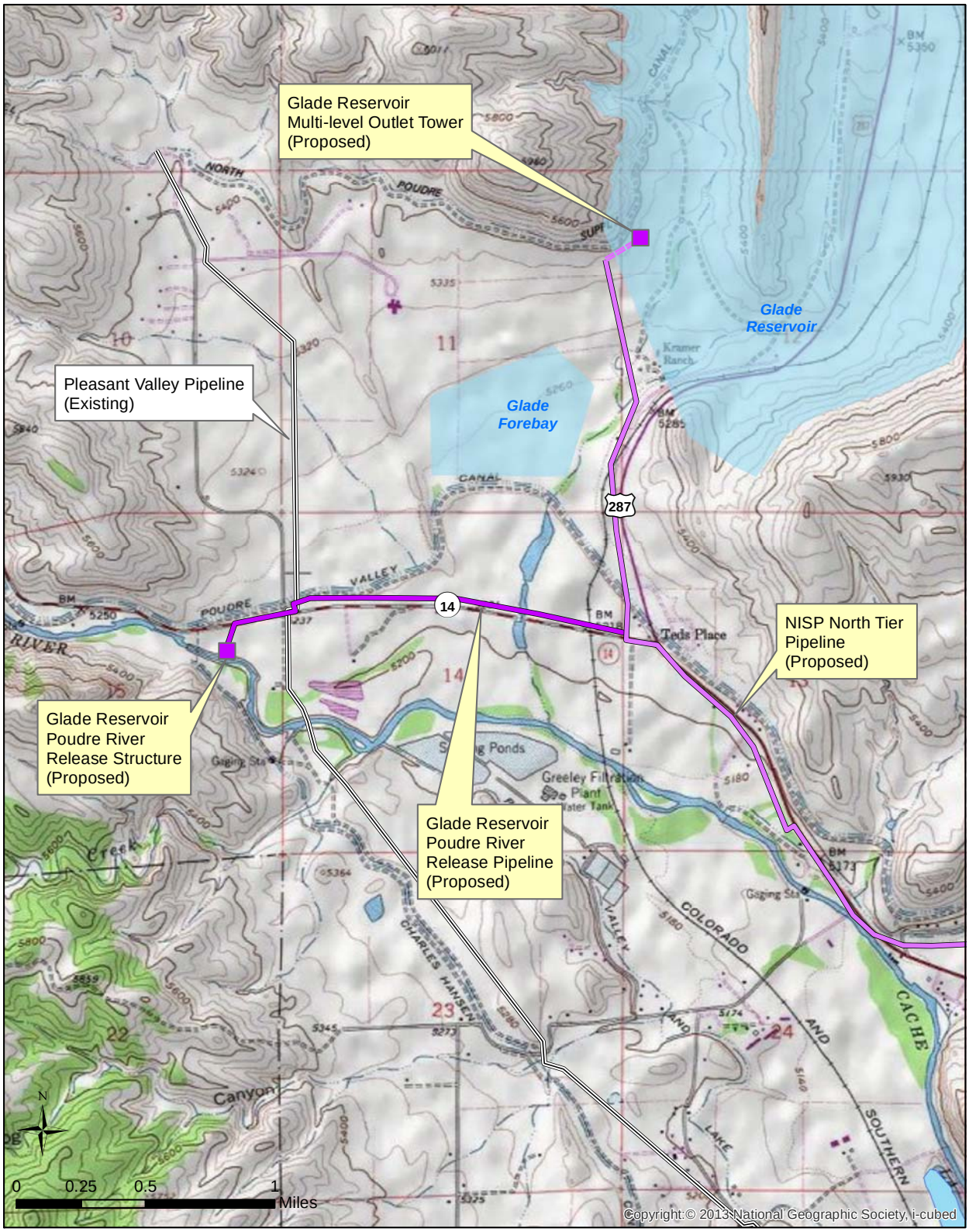


Figure 7. Glade Reservoir Release Point to Poudre River

Figure 8. Multi-Level Outlet Tower at Carter Lake

5.2.1.5. Glade Reservoir Release Structure (WQ-02)

The Glade Reservoir complex would incorporate two means of releasing water back to the Poudre River. Low flow releases up to approximately 112 cfs, which would be the primary release from the reservoir, would be made through a pipeline connected to a multi-level outlet structure (section 5.2.1.4) that would convey water back to the Poudre near the mouth of the canyon, entering the Poudre River approximately ¼ mile upstream of the County Road 29C intersection with Highway 14, or approximately 1 ¼ miles west of Ted's Place (previously shown on Figure 7). Higher emergency flow releases, which would rarely if ever occur, would be made directly into Owl Creek, which is tributary to the Poudre River approximately ¾ miles southwest of Ted's Place. The structures for releasing water from Glade Reservoir to the Poudre River would be designed to aerate the water to increase the dissolved oxygen concentration of the water discharged to the river. This will avoid effects on the Poudre River that may otherwise occur by releasing water from lower parts of the reservoir column that may have lower dissolved oxygen levels.

The ability to aerate and increase dissolved oxygen through the design of hydraulic structures has been studied and known for quite some time, and study continues on how to better design hydraulic structures to increase dissolved oxygen in water released from dams (Falvey and Ervine 1988; Wahl and Young c1994). The California State Water Resources Control Board provides a list of best management practices to improve dissolved oxygen levels in dam impoundments, tailwaters, and/or reservoirs including the use of gated conduits, spillway modifications, reregulation and labyrinth weirs, pumping and injection systems, and selective withdrawal (California 2014). Studies are also on-going that investigate the influence of stepped chute slopes on dissolved oxygen content (Baylar et al. 2009).

Currently, it is expected that both the low flow pipeline release and the high flow canal release would incorporate a chute feature at their outfalls into the Poudre River that contain either baffles or steps to increase dissolved oxygen and dissipate energy to prevent channel erosion, or contain in channel rock structures that would serve the same purposes. Studies by Baylar et al. (2009) show that "stepped cascade aerators are very efficient at oxygen transfer because of the strong turbulent mixing associated with substantial air bubble entrainment" and the increasing channel slope of the chutes provides better entrainment. A similar type of structure is contained at the terminus of the Hansen Supply Canal as it conveys water from Horsetooth Reservoir and discharges into the Poudre River (Figure 9). If a baffle or step structure is selected, it is likely that NISP structures would incorporate increased baffling or steps beyond that designed for the Hansen Supply Canal chute structure.

Figure 9. Hansen Supply Canal Discharge Structure to Poudre River

5.2.2. Operational Commitments

This section provides information on operational commitments that Northern Water has made for NISP through various mechanisms, including water rights decrees, the Conceptual Mitigation Plan, and this FWMEP, that are proposed to avoid or minimize environmental effects.

For flow commitments described in this FWMEP, Northern Water is making these commitments to mitigate, and in many cases enhance, the environment. Northern Water is working to ensure that all flow commitments described herein are protected from a water rights perspective so that bypassed or released flows remain in the river through the reaches described in this Mitigation Plan. If during actual operations, administration of water rights on the river results in the flow commitments not reaching the targeted flows or reaches (i.e. operations by others result in the bypassed or released flows not

remaining in the river through the intended reach), Northern Water would cease operation of the flow commitment and seek administrative and legal solutions to ensure that these operations would result in the intended flows being met. Section 5.2.2.5 contains additional information on measures already being undertaken to protect these flows.

5.2.2.1. Avoid Munroe Canal Diversions (FW-01)

The original Draft EIS (Corps 2008) considered using the Munroe Canal for two operations associated with NISP. First, it was proposed that during certain situations, the Munroe Canal would serve as a secondary diversion from the Poudre River to fill Glade Reservoir. Second, it was proposed that deliveries could be made from Glade Reservoir to the Pleasant Valley Pipeline via the Munroe Canal to Participants that are delivered treated water from the Soldier Canyon Filter Plant. This exchange would have reduced flow in the Poudre River from the Munroe Canal diversion to the Glade Reservoir release point.

Based on comments received on the Draft EIS, Northern Water is no longer proposing either of these operations, and their effects are not included in the Supplemental Draft EIS (Corps 2015). The exchange has been eliminated in the Supplemental Draft EIS analysis, and replaced with a new pipeline directly from Glade Reservoir to the Pleasant Valley Pipeline (for Fort Collins-Loveland Water District) and a new pipeline directly from Glade Reservoir to the Soldier Canyon Filter Plant (for Eaton, Severance and Windsor). This avoids streamflow depletions in Poudre River streamflow between the Munroe Canal diversion and the Glade Reservoir release point.

5.2.2.2. Curtail Diversions for Non-Consumptive Water Rights (FW-02)

Northern Water would make diversions to NISP under its Grey Mountain storage right and under storage and exchange rights associated with the SPWCP. There are currently three water rights decreed on the Poudre River for non-consumptive purposes: the Watson Fish Hatchery water right[3], Fort Collins Boat Chute water right, and the Fort Collins Nature Center water right (Figure 10).

Based on its water right priority, exchange rights for the SPWCP are junior to these three non-consumptive water rights. Additionally, through water rights stipulations, although the Grey Mountain water right is senior to all three non-consumptive water rights, Northern Water has agreed to curtail in-priority NISP diversions under the Grey Mountain storage right to the extent that these curtailments would help satisfy the Watson Lake Fish Hatchery and Fort Collins Boat Chute water rights (Table 3). These commitments are designed to avoid and minimize the effects of NISP operations during low-flow conditions on the Poudre River at those locations, which in turn avoids and minimizes many potential aquatic and water quality effects at those locations.

Further description and simulation of these curtailments is contained in the NISP Operations Plan Report (CDM Smith 2014).

[3] Technically, the Watson Fish Hatchery water right is not a non-consumptive water right, as CPW is required to provide augmentation to replace evaporative loss. It is included in this section and described as non-consumptive for ease of presentation only.

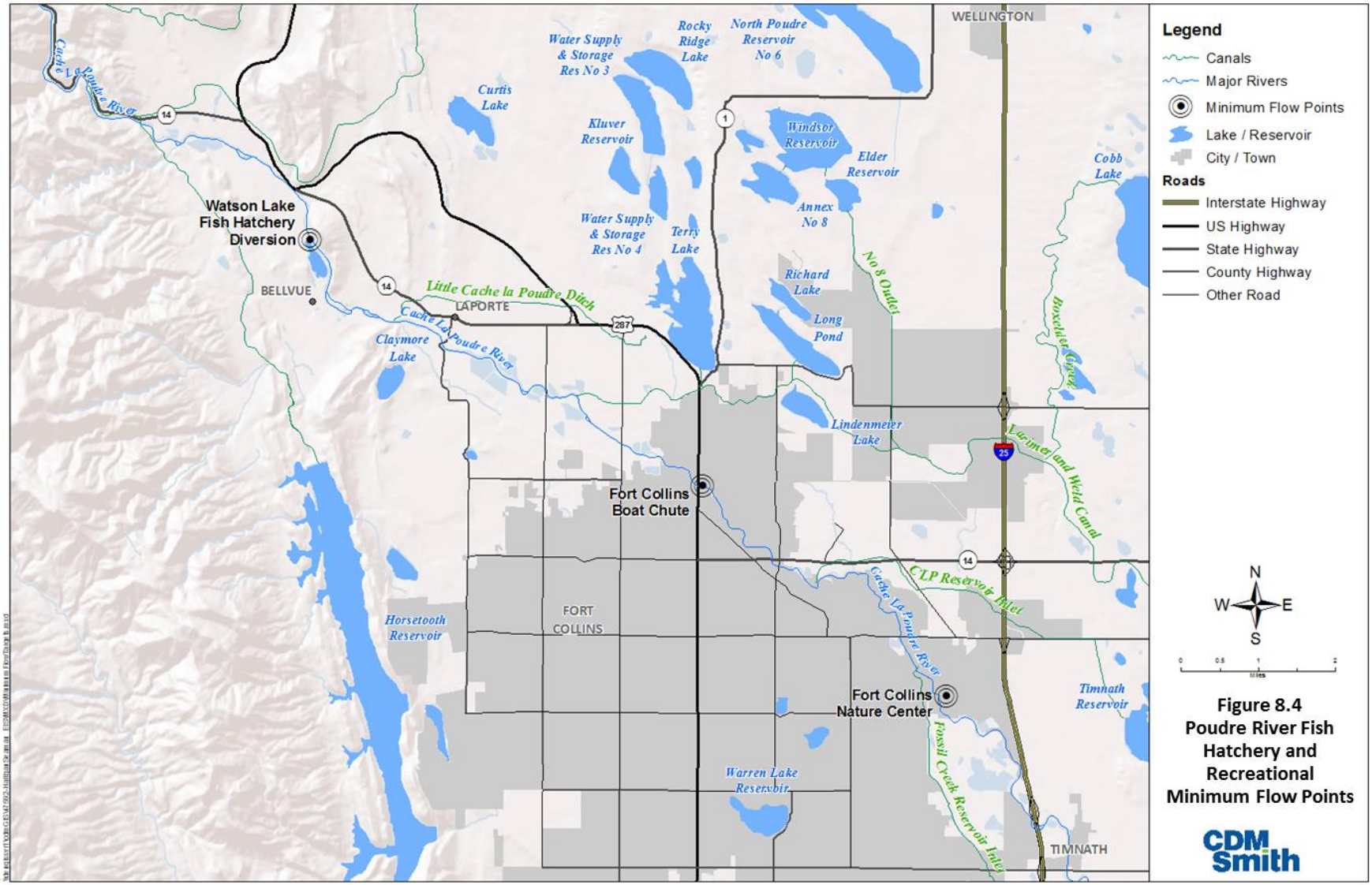


Figure 10. Poudre River Fish Hatchery and Recreational Minimum Flow Points (CDM Smith 2014)

Table 3. Decreed and Stipulated Flow Commitments by NISP for Non-Consumptive Water Rights

Water Right	NISP Flow Commitment (Summer/Winter, cfs)	
	Grey Mountain Water Right [1]	SPWCP Water Rights [2]
Watson Lake Fish Hatchery [3]	50/25 (Apr 15-Oct 14 / Oct 15-Apr 14)	50/25 (Apr 15-Oct 14 / Oct 15-Apr 14)
Fort Collins Boat Chute		30/5 [4] (May 1-Aug 31 / Sep 1-Apr 30)
Fort Collins Nature Center	50/25 [5] (Apr 15-Oct 14 / Oct 15-Apr 14)	50/25 [5] (Apr 15-Oct 14 / Oct 15-Apr 14)

[1] As decreed in 80CW355 and stipulated in Consolidated Case Nos. 85CW206, 85CW207, 85CW208, 85CW209, 85CW210, and 89CW122.
[2] As decreed in 92CW130.
[3] As measured immediately upstream of the Watson Lake Fish Hatchery diversion.
[4] All river flows between 5 cfs and 25 cfs to be shared equally between Fort Collins and the City of Thornton, and Fort Collins is entitled to no more than 15 cfs (September 1 - April 30).
[5] Fort Collins Nature Center flow requirements to be measured at the Boxelder Gage, and requires that the Fossil Creek inlet is operated according to Fossil Creek low flow operational procedures (see Supplemental Draft EIS for additional information).

5.2.2.3. Summer and Winter Diversion Curtailments (FW-03)

To further avoid effects of NISP operations during low-flow conditions at all locations on the Poudre River affected by those operations, Northern Water would curtail NISP water rights operations on the Poudre River as follows:

- Grey Mountain water right – Diversions would be curtailed to maintain an average daily flow of 50 cfs from April 16 to October 31, and 25 cfs from November 1 to April 15, at any gaging station on the Poudre River below the Poudre Valley Canal.
- SPWCP water right – Exchanges would be curtailed to maintain an average daily flow of 50 cfs from April 16 to October 31, and 25 cfs from November 1 to April 15, at any gaging station on the Poudre River between the Poudre Valley Canal and the New Cache diversion.

The flow commitments would be made provided Northern Water can be assured that the passed water would flow through the reaches described and not be diverted by junior appropriators. Additional gaging stations that Northern Water commits to installing as part of this commitment are described in section 5.3.1.5.

5.2.2.4. Conveyance Refinement (FW-04)

The Conceptual Mitigation Plan (Northern Water 2015) described a low flow augmentation release program (FW-04) in which releases would be made from Glade Reservoir to maintain at least 10 cfs in the Poudre River from the release point near the canyon mouth through Fort Collins from November through March and September. Based on comments received on the Supplemental Draft EIS, this low flow augmentation program has been replaced with the Conveyance Refinement Concept described in this section.

The Supplemental Draft EIS (Corps 2015) analyzed two options for conveyance of water from Glade Reservoir to the Participants: the Reclamation Action Option, which would convey water to the Participants through a C-BT exchange; and, the No Reclamation Action Option, which would convey water from Glade Reservoir to the Participants via a pipeline generally following a foothills route. Following review of agency and public comment on the Supplemental Draft EIS, the Participants are proposing a refined conveyance concept with the goal of keeping more flows in the Poudre River year-round (Figure 11). The refined conveyance approach is intended to avoid, minimize and enhance water quality and the aquatic and riparian environments. Section 2.4 described the physical layout of the conveyance refinement. This section summarizes the operational commitments and streamflow benefits.

As described in Section 2.4, water would be released from Glade Reservoir to the Poudre River near the existing C-BT Hansen Supply Canal delivery structure to the Poudre River near the mouth of the Poudre Canyon (section 5.2.1.5). Releases would range from 18 cfs during the winter months to 25 cfs during the summer months, or 14,350 acre-feet annually (Table 4). The Poudre River Intake would be located at the Timnath Reservoir Inlet Canal diversion (or alternative location upstream of this point as described in later sections of this document), and constructed to divert water released from Glade Reservoir for delivery to the Participants.

Table 4. Monthly Poudre River Intake Diversions

	Total NISP Delivery		Poudre River Intake Diversion		
Month	(acre-feet)	(cfs)	(acre-feet)	(cfs)	% of Total NISP Delivery
Nov	2,310	39	1,100	18	48%
Dec	2,310	38	1,100	18	48%
Jan	2,100	34	1,100	18	52%
Feb	1,890	33	1,050	18	56%
Mar	2,310	38	1,100	18	48%
Apr	3,360	56	1,100	18	33%
May	4,200	68	1,100	18	26%
Jun	5,250	88	1,200	20	23%
Jul	5,880	96	1,550	25	26%
Aug	4,830	79	1,550	25	32%
Sep	4,200	71	1,300	22	31%
Oct	3,360	55	1,100	18	33%
Total	**42,000**		**14,350**		**34%**

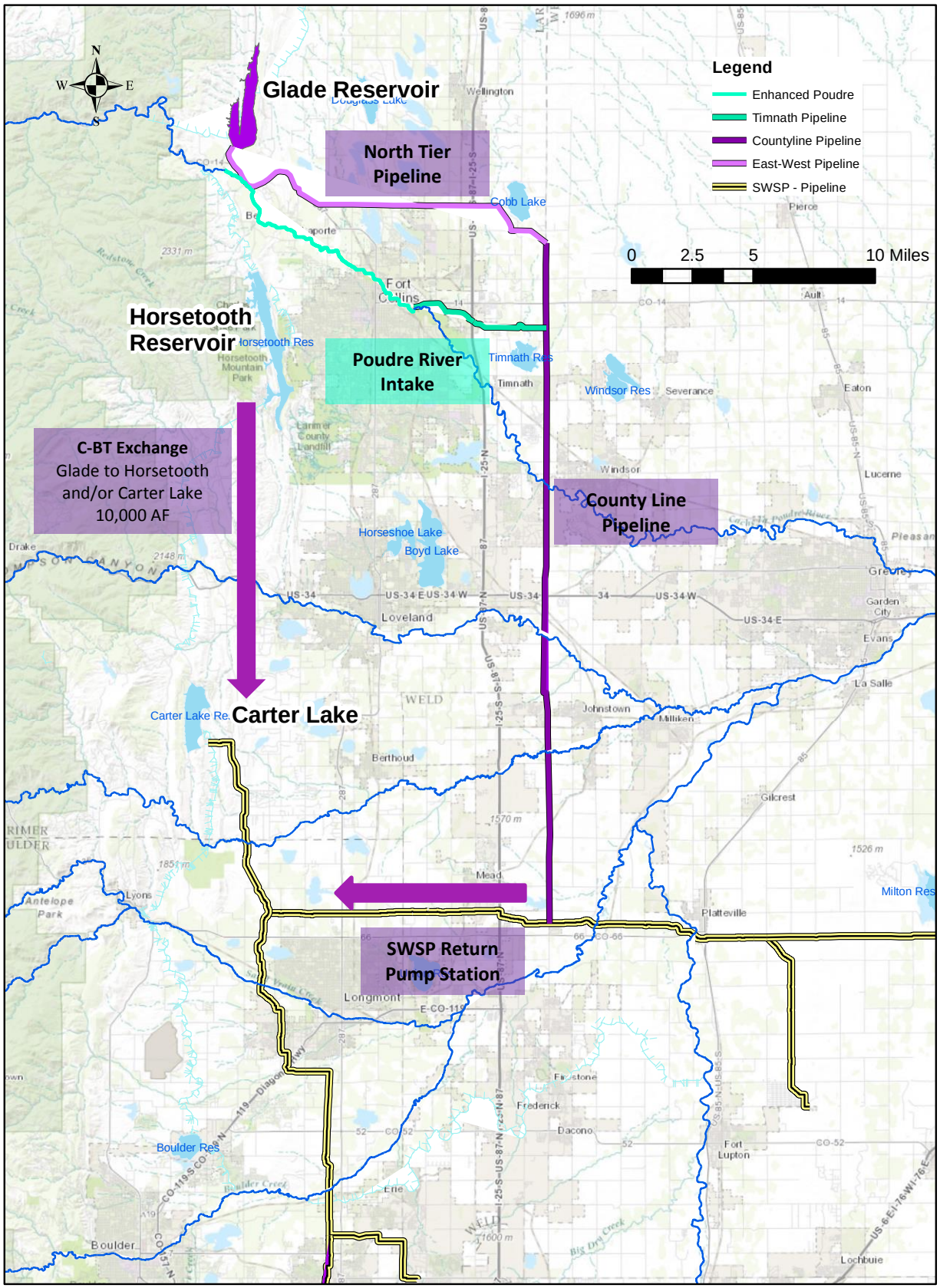


Figure 11. NISP Conveyance Refinement – Regional Facilities

Key flow metrics and targets from available studies, including weighted useable area curves (GEI 2013; Nelson 1987) and information from the Fort Collins River Health Assessment Framework (Fort Collins 2015), were consulted and compared against hydrologic results from various flow configurations of the conveyance refinement to design the conveyance refinement in manner that provides meaningful beneficial impacts on Poudre River aquatic habitat. Consequently, the conveyance refinement provides significant improvement in low-flow metrics. Most importantly for aquatic habitat and connectivity, river dry-up points within the conveyance reach are eliminated; a flow equal to or greater than 20 cfs is provided at the Lincoln Street Gage in 97 percent of days (with all locations in the conveyance refinement reach exceeding the minimum proposed Poudre River Intake diversion rate of at least 18 cfs); average winter flows at the Lincoln Street gate are nearly doubled; and the target range of 25 to 35 cfs during the winter is met during 92 percent of the years (Table 9, Figure 12, Figure 13)[4].

Table 5. Summary of Key Flow Criteria and Metrics

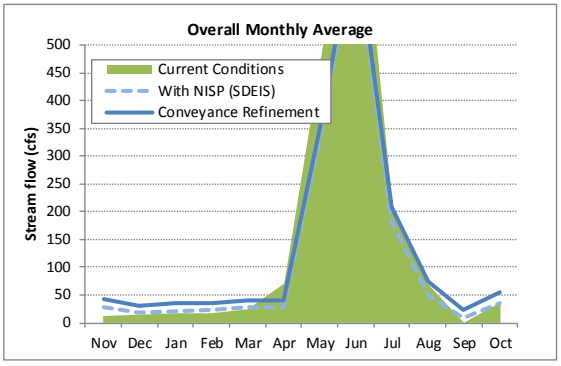
Row	Source	Criteria	Measure	Current Conditions	With NISP (Supplemental Draft EIS)	Conveyance Refinement
1	WUA Curves; 1987 Nelson Study	Minimum flows in the range of 25-35 cfs at Lincoln St. Gage	Percent of Days with Flow >= 25 cfs at Lincoln St. Gage	48%	54%	**82%**
2			Percent of Years with Average Winter Flow >= 25 cfs at Lincoln St. Gage	27%	46%	**92%**
3	Fort Collins River Health Assessment Framework	No Dry-Up Points	Percent of Days with Flow >= 1 cfs below Larimer-Weld	64%	98%	**100%**
4		Daily average minimum streamflow of 20 cfs	Percent of Days with Flow >= 20 cfs at Lincoln Street Gage	52%	63%	**97%**
5			Percent of Winter Days with Flow >= 20 cfs at Lincoln St. Gage	30%	48%	**96%**
6		Winter daily average streamflow of 35 cfs	Average Winter Flow at Lincoln St. Gage (cfs)	26 cfs	33 cfs	**46 cfs**
7			Percent of Years with Average Winter Flow >= 35 cfs at Lincoln St. Gage	27%	27%	**50%**
8	Poudre Whitewater Park Website	100 cfs or less for a Beginner Playpark	Percent of Summer Days with >= 60 cfs at Lincoln St. Gage (minimum boatable at other Front Range parks)	67%	54%	**72%**
9			Percent of Summer Days with >= 100 cfs at Lincoln St. Gage	54%	39%	46%

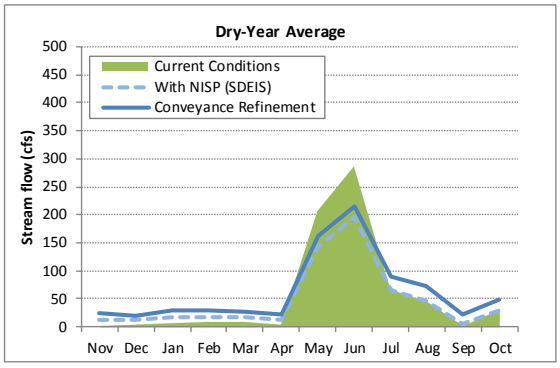
Note: For purposes of this table: winter is Nov-Mar; summer is May-Aug.
Bold Indicates metrics in which conveyance refinement value exceeds current conditions.

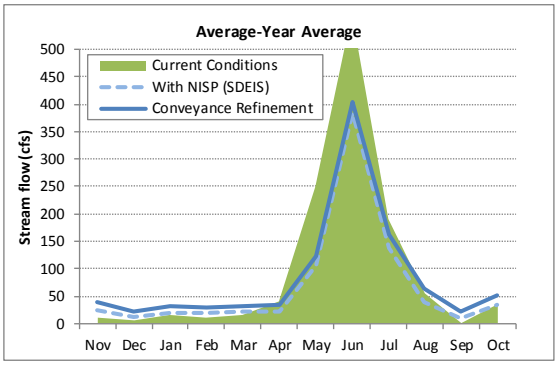
[4] For purposes of illustrative hydrology in this document, the hydrologic analysis in the Supplemental Draft EIS was used. The Final EIS will contain a full description of the hydrologic effects of the conveyance refinement. The columns entitled "With NISP (SDEIS)" are results for Alternative 2 as proposed in the Supplemental Draft EIS.

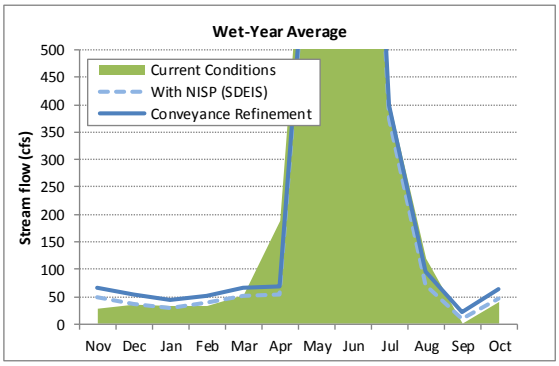
Shields Street

	Current Conditions	With NISP (SDEIS)	Conveyance Refinement
Overall Monthly Average (cfs)			
Nov	13	28	**44**
Dec	14	20	**32**
Jan	18	22	**35**
Feb	16	24	**36**
Mar	25	28	**40**
Apr	71	28	40
May	458	335	353
Jun	880	680	700
Jul	214	182	207
Aug	70	50	**75**
Sep	1	9	**22**
Oct	36	36	**54**
Avg	151	120	136
Dry-Year Average (cfs)			
Nov	1	12	**23**
Dec	3	11	**21**
Jan	6	17	**29**
Feb	9	18	**30**
Mar	9	17	**28**
Apr	5	11	**21**
May	206	144	162
Jun	287	195	215
Jul	66	65	**90**
Aug	46	47	**72**
Sep	1	6	**23**
Oct	30	30	**48**
Avg	56	48	**64**
Average-Year Average (cfs)			
Nov	10	24	**40**
Dec	5	12	**23**
Jan	16	20	**32**
Feb	10	19	**30**
Mar	17	22	**32**
Apr	41	22	35
May	249	105	123
Jun	566	385	405
Jul	190	138	163
Aug	57	39	**64**
Sep	0	9	**22**
Oct	36	34	**52**
Avg	100	69	85
Wet-Year Average (cfs)			
Nov	28	48	**66**
Dec	36	37	**53**
Jan	34	30	**45**
Feb	34	39	**52**
Mar	54	51	**65**
Apr	187	55	69
May	1069	920	938
Jun	2010	1670	1690
Jul	405	374	399
Aug	119	71	96
Sep	1	10	**23**
Oct	41	47	**65**
Avg	335	279	297







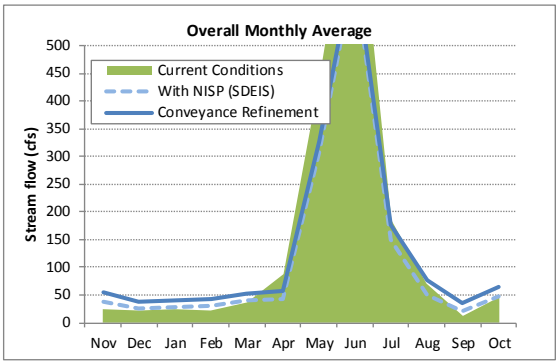


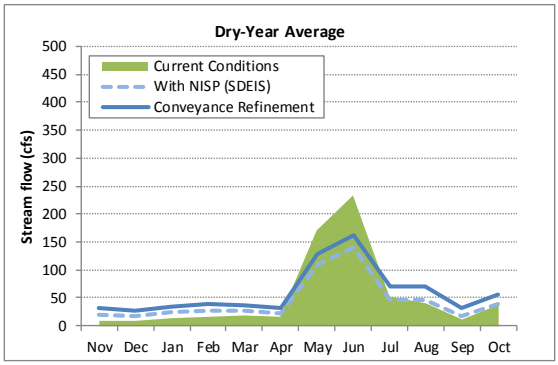
Bold Periods when Conveyance Refinement flow exceeds Current Conditions

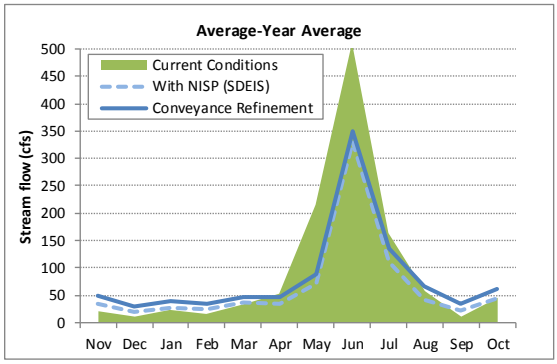
Figure 12. Shields Street - Conveyance Refinement Monthly Hydrologic Analysis

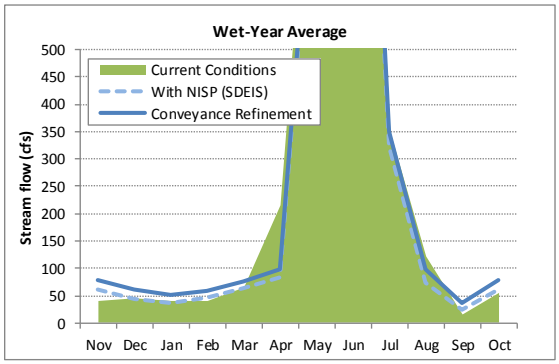
Lincoln St. Gage

	Current Conditions	With NISP (SDEIS)	Conveyance Refinement
Overall Monthly Average (cfs)			
Nov	24	39	**54**
Dec	21	27	**39**
Jan	25	29	**41**
Feb	23	31	**42**
Mar	37	41	**53**
Apr	87	44	56
May	432	309	327
Jun	831	631	651
Jul	185	151	176
Aug	70	51	**76**
Sep	12	20	**34**
Oct	46	46	**64**
Avg	149	118	134
Dry-Year Average (cfs)			
Nov	9	20	**32**
Dec	9	17	**26**
Jan	13	23	**35**
Feb	17	26	**38**
Mar	18	26	**37**
Apr	15	22	**31**
May	172	110	128
Jun	234	141	161
Jul	52	46	**71**
Aug	40	46	**71**
Sep	11	16	**33**
Oct	38	38	**56**
Avg	52	44	**60**
Average-Year Average (cfs)			
Nov	20	34	**50**
Dec	12	19	**30**
Jan	23	27	**39**
Feb	16	24	**35**
Mar	32	37	**47**
Apr	53	34	47
May	216	71	89
Jun	511	329	350
Jul	163	111	136
Aug	59	41	**66**
Sep	12	21	**34**
Oct	45	43	**61**
Avg	97	66	82
Wet-Year Average (cfs)			
Nov	40	60	**79**
Dec	45	45	**61**
Jan	41	37	**52**
Feb	41	46	**59**
Mar	65	63	**77**
Apr	216	83	97
May	1063	914	932
Jun	1977	1636	1656
Jul	355	324	349
Aug	121	74	99
Sep	15	24	**37**
Oct	55	60	**78**
Avg	336	280	298









Bold Periods when Conveyance Refinement flow exceeds Current Conditions

Figure 13. Lincoln Street Gage - Conveyance Refinement Monthly Hydrologic Analysis

The conveyance refinement was also developed to mitigate water quality effects described in the Supplemental Draft EIS (Corps 2015), including temperature and other constituents. Water quality modeling being conducted as part of the Final EIS will describe the effectiveness of this mitigation.

The following is noted regarding refined conveyance operations:

- Conveyance refinement operations within this document generally described Poudre River Intake diversions as being released from Glade Reservoir. However, in some cases, to minimize "double pumping" of water supplies (pumping from the Glade forebay into Glade Reservoir, then pumping released water again at the Poudre River Intake), when SPWCP exchanges are occurring or when the Grey Mountain water rights are in priority, water may be bypassed at either the Poudre Valley Canal diversion (in the case of the Grey Mountain water rights) or the Larimer-Weld diversion (in the case of Larimer-Weld SPWCP exchange), or exchanged from the New Cache diversion directly to the Timnath Inlet diversion (in the case of New Cache SPWCP exchanges). Initial analyses show that releases from Glade Reservoir would be made 2/3 of the time, while bypasses or direct exchanges would be made approximately 1/3 of the time. These operations all result in the same effects on the river. Northern Water is continuing to analyze these operations.

- As previously described, source water quality, and the ability to treat any water delivered via NISP facilities, is imperative to the Participants. If NISP deliveries cannot be treated by Participant water treatment facilities, then the NISP deliveries cannot be used. As designed, it is expected that diversions made through the Poudre River Intake will be treatable by Participant water treatment plants during normal streamflow and watershed conditions. However, there may be times when water quality within the river prevents diversions by the Poudre River Intake. These times may include short durations during spring peak runoff when turbidity and TOCs are high, storm events in the City of Fort Collins that result in significant urban runoff to the Poudre River, runoff after wildfire events, chemical spills into the river, and other typical and unforeseen events. Northern Water will install real time water quality monitoring equipment in the Poudre River to ensure that the Poudre River Intake temporarily ceases diversions during these times.

- As previously described, diversions at the Poudre River Intake, and through the refined conveyance system as a whole, are demand driven. Diversions cannot be made through the Poudre River Intake if there is insufficient demand from the Participants. Therefore, there may individual days when the delivery rates cannot be reached, and deliveries to the Poudre River Intake cannot be made. At full operations, this should not be the case per the design methodologies described above, but could infrequently occur. However, during initial NISP operations before full NISP demands are met, this may happen more frequently. An interim delivery schedule for conveyance refinement will be developed and modified as NISP is brought on line and delivery schedules change. The interim delivery schedule will be coordinated with CPW and through the Adaptive Management Program (section 6.1.1.1).

Conveyance refinement flow rates previously described in Table 4 are for full buildout conditions when NISP participants are consistently taking their full NISP yield. The 14,350 acre-feet per year of Poudre River Intake diversions represent approximately 36 percent of the 40,000 acre-feet total deliveries during full buildout conditions. Prior to full buildout conditions, NISP commits to conveying no less than 36 percent of total NISP deliveries through the Poudre River Intake. It is likely that initial deliveries through the Poudre River Intake may be higher than this percentage (likely exceeding 50 percent) for water quality and operational purposes. This commitment will require that the Poudre River Intake be constructed and operational before any deliveries can be made to NISP participants.

CPW and the Division Engineer will be notified if a previously planned diversion through the Poudre River Intake does not occur due to water quality concerns or inadequate demand.

5.2.2.5. Poudre River Flow Augmentation Protection (FW-05)

Legal protection of flow augmentation on the Poudre through Fort Collins would be advantageous to many of the flow commitments described in this plan. While presently, there are no existing abilities for exchange within the river reach that NISP will enhance, protections against potential future exchanges would provide additional certainty that the flow commitments will remain in the river for environmental benefits. As previously described in Section 3.2, the Flows initiative of the Poudre Runs Through It working group is discussing and investigating legal mechanisms to protect flow augmentation through the City of Fort Collins, including a formal instream flow water right through the Colorado Water Conservation Board. Northern Water is currently working with this group regarding these options. Northern Water commits to continuing this dialog and supporting a legal mechanism for this protection as long as the legal protection is not potentially injurious to water rights associated with C-BT, Windy Gap, NISP, or other water rights held by Northern Water.

If the actions described above are unsuccessful, or are not ultimately configured in a manner that can be used to protect the flow commitments described in this plan, Northern Water commits to pursuing other legal options, as necessary, to protect flow commitments in this plan.

Additional streamflow measurement will be required to administer many of the streamflow commitments in this plan. Additional streamflow measurement is proposed as part of the multi-objective diversion structure retrofits (section 6.1.1.2) and as part of the streamflow and water quality monitoring program (section 5.3.1.5).

5.2.2.6. Peak Flow Operations Program (FW-08)

The Supplemental Draft EIS concluded that NISP would have minor detectable changes in channel morphology and sediment transport upstream of I-25 (Corps 2015). Several comments were received on the Supplemental Draft EIS geomorphic analysis, including comments from CPW staff. Thus, the Corps has conducted additional geomorphic analyses that will be included in the Final EIS. The technical report prepared for the additional geomorphic analyses indicates that “based on the results of the initiation of motion analysis, agency representatives agreed that the flows to flush coarse and very coarse gravels, having a maximum flow magnitude of 2,800 cfs, would optimize benefit to aquatic

species in the study area. Similarly, a frequency of occurrence of 1.5 to 2 years was also noted by this group as optimal for maintaining spawning habitat" (Anderson 2017). Discussions with CPW staff confirmed those conclusions, and concluded that ideally, the minimum beneficial duration of a typical peak flow operation would be approximately 72 hours.

Based on information in the Supplemental Draft EIS (Corps 2015), the additional geomorphic analyses, guidelines provided by CPW staff, review of comments provided on the Supplemental Draft EIS, and discussions with other organizations, Northern Water has developed a Peak Flow Operations Program (Table 6, Figure 13a) in which Northern Water's operations during peak flow conditions would be contingent upon general hydrologic conditions and NISP conditions. This program avoids and minimizes potential effects of NISP operations on peak flows and flushing flows in the Poudre River.

In the spring of each year, Northern Water will classify the runoff year as either a Tier 1, Tier 2 or Tier 3 year, with applicable sub-tiers, based on May 1 storage contents in Glade Reservoir, water supply conditions (i.e. whether Glade is likely to fill based on forecasted runoff and above average or below average forecasted runoff), whether target peak flows were reached in the previous year, and whether NISP bypassed flows in the previous year. Classifications may be updated in the weeks leading up to peak flow occurrence if hydrologic conditions warrant. Likely to fill calculations shall consider and include bypasses of the Grey Mountain water right and curtailment of SPWCP exchanges made as part of this program.

For all tiers and during all years, NISP would curtail SPWCP exchanges for the peak 3 days of the year. NISP diversions of the Grey Mountain water right during peak flow conditions would be dependent upon the tier classification for that year. For Tier 1 conditions, NISP would bypass Grey Mountain water right diversions for a period of 3 days regardless of the anticipated peak flow value. For Tier 2 conditions, NISP would either bypass Grey Mountain water right diversions for a period of 2 days to meet a target flow of 2,800 cfs (Tier 2a conditions), or at a volume not to exceed 1,200 acre-feet during the peak three days as coordinated by CPW (Tier 2b conditions). The methods of Grey Mountain water right bypass for Tier 2b conditions are flexible as long as the 1,200 acre-foot volumetric amount is not exceeded. Thus, the bypass could last the entire 3 days at a reduced rate, for 1 day at a higher rate, or vary hourly to provide more natural pulse flow conditions. For Tier 3 conditions, NISP would not have an obligation to bypass Grey Mountain water right diversions except if Tier 3a or 3b conditions are met. Tier 3a and 3b conditions are met if the 2,800 cfs flow target has not been met in the previous 3 years, and there has not been a tier 3a or 3b bypass in the previous 3 years.

Several terms and conditions are contained at the bottom of Table 6 that protect the environmental intention of bypassed flows, protect public safety, and protect against significant adverse effects on NISP water supply yield. Northern Water is working with the Division of Water Resources, Department of Natural Resources, and the Attorney General's office to develop a protocol for administration of the program.

Table 6. Peak Flow Operations Program by Peak Flow Operational Year

Measure	Tier 1	Tier 2a		Tier 2b	Tier 3	Tier 3a	Tier 3b
Trigger Conditions							
Glade Storage and Frequency Trigger	> 130,000 ac-ft (76% of capacity) and likely to fill	>130,0000 ac-ft (76% of capacity) and not likely to fill	> 85,000 ac-ft (50% of capacity) and neither 2,800 cfs trigger met or Tier 2b bypass in previous year	> 85,000 ac-ft (50% of capacity) and tier 2a criteria for this storage level not met	< 85,000 ac-ft (50% of capacity) and Tier3a/3b criteria not met	< 85,000 ac-ft (< 50% capacity) and neither 2,800 cfs trigger met or Tier3a/3b bypass in previous 3 years	
Streamflow Forecast	N/A	N/A	> average	< average	N/A	> average	< average
Peak Flow Operations Program Action							
Grey Mountain Water Rights	Fully bypass all NISP diversions for 3 days	Bypass to meet average daily flow of 2,800 cfs for 2 days		Bypass up to 1,200 ac-ft within peak 3 days, as directed by CPW	No obligation to bypass.	Bypass to meet average daily flow of 2,200 cfs for 1 day	Bypass to meet average daily flow of 1,600 cfs for 1 day
SPWCP Exchanges	Curtail SPWCP exchanges for the peak 3 days every year, regardless of tier						
Notes	• All flow measurements and commitments described in this program shall be measured at the Canyon Gage • 2,800 cfs trigger flow target is average daily flow over a 3-day period as measured at the Canyon Gage • If the Grey Mountain water right is not in priority during peak streamflow, and bypass of the Grey Mountain water right would not result in streamflow that exceeds the peak streamflow already experienced during the year, then no Grey Mountain water right bypass will be required under the program. If the Grey Mountain water right was in priority during peak streamflow, and forecasting of the peak streamflow was such that the Grey Mountain water right was not bypassed during the peak as required under the program, then peak flow bypasses can be allowed to occur to coincide with a forecasted secondary peak. • If forecasting of the peak streamflow was such that SPWCP exchanges were not curtailed during the peak, then a 3-day exchange curtailment can be implemented and coordinated to approximately coincide with a forecasted secondary peak. • All ramping or diversions shall be consistent with mitigation measure FW-09 (section 5.2.2.8) and done outside of the bypass duration described above, except that the volumetric bypass limit described for Tier 2b shall include any bypasses required for ramping.						
Other Terms / Conditions	• Bypass will not be required if bypassed flow diverted by another upstream or downstream water right in Poudre River basin • Bypass will not be required if bypassed flow contributes to downstream flooding such that public safety or infrastructure is jeopardized. • Bypass will not be required if bypassed flow counts against Glade Reservoir fill. • Adaptive management plan to include coordinated operations with other water users, monitoring and adjustment. • Northern Water will be allowed to seek a waiver from the provisions of this peak flow operations program during extreme drought conditions. For purposes of this definition only, extreme drought conditions are defined as follows: • A majority of NISP participants are currently under drought restrictions; • and, streamflow forecasts for the Poudre Basin are forecast to be below average; • and either May 1 Glade Reservoir storage is 40,000 acre-feet or less, or NISP has been in Tier 3 conditions (including Tier 3a or 3b) for the previous 5 years or longer						

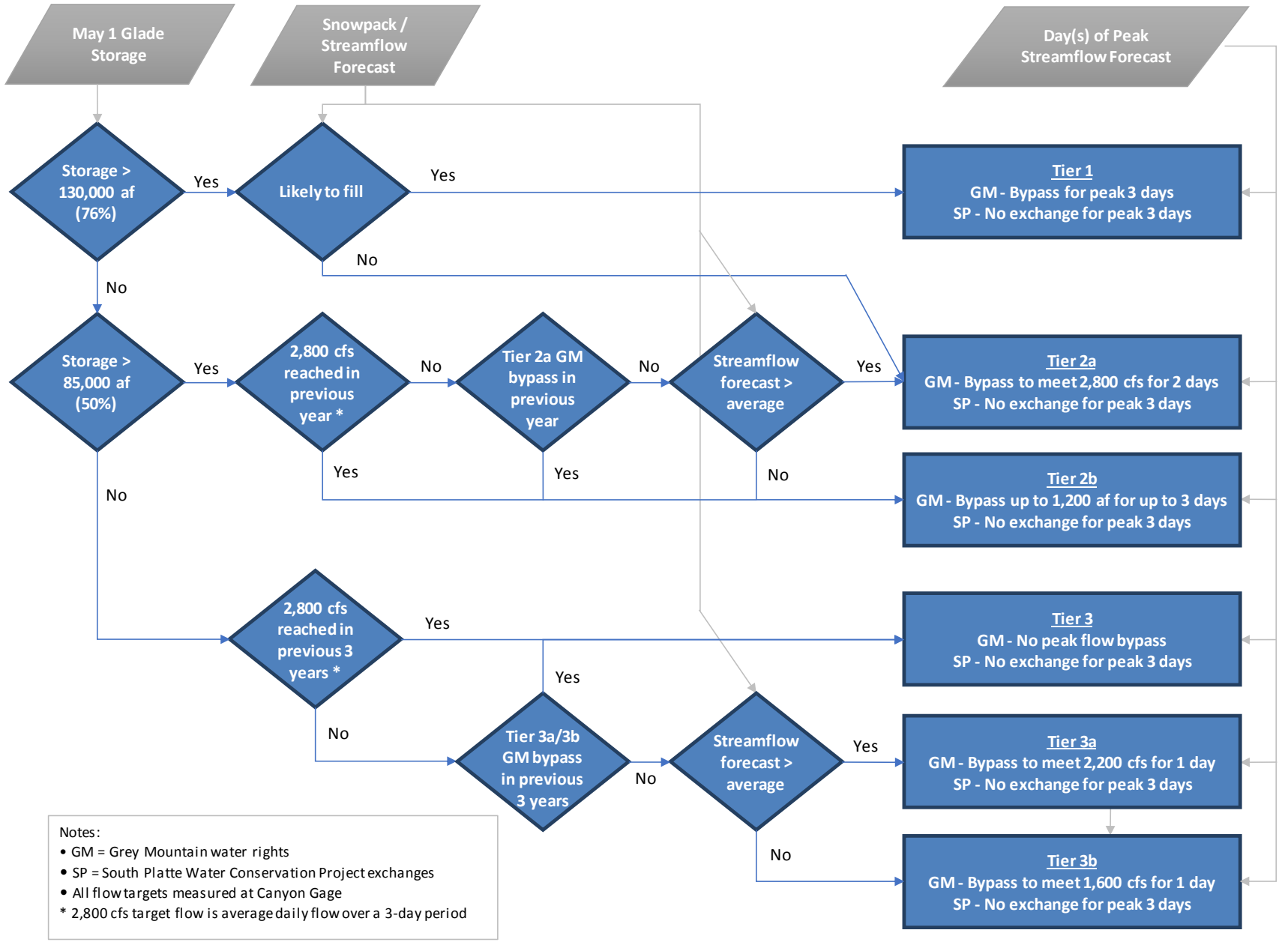


Figure 14. Peak Flow Operations Program Decision Tree

Using Supplemental Draft EIS hydrology results (Corps 2015), Northern Water has analyzed potential operations of the program. The first aspect of the analysis is the tier classification for each year. Using the CTP hydrology results, and assuming that the likelihood of fill can be perfectly predicted, approximately 43 percent of years would be classified as Tier 1, 37 percent classified as Tier 2, and 20 percent classified as Tier 3 (Figure 15). As expected, during extended wet periods, Tier 1 conditions can persist for many consecutive years. Similarly, during extended dry periods, Tier 3 conditions can persist for many consecutive years.

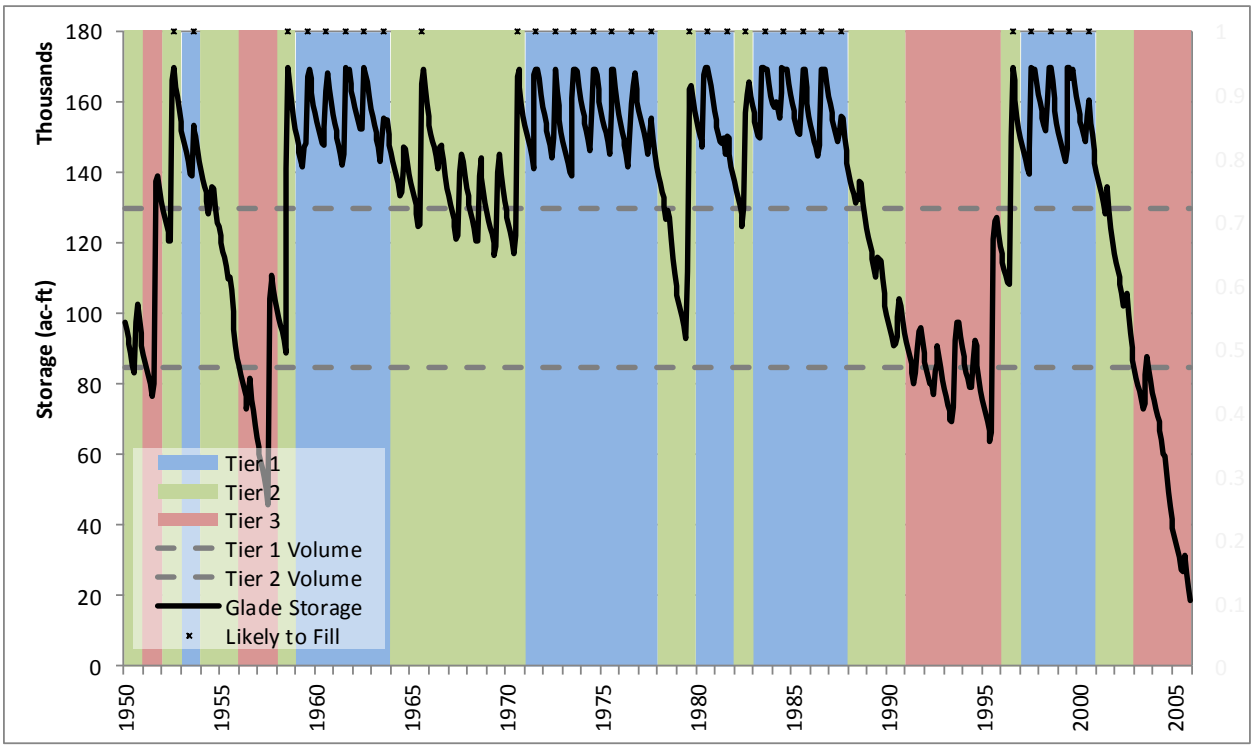


Figure 15. Tier Classification Using CTP Model Run 3a2 (Current Conditions with NISP)

Simulated peak flow operations show that the program would substantially improve peak flow characteristics at the Canyon Gage (Colorado Division of Water Resources ID CLAFTCCO) from unmitigated NISP operations. For the 2,800 cfs target flow at the Canyon Gage, the 1950-2005 CTP modeling period shows a historical recurrence interval for the 1-day peak streamflow of 2.9 years. With NISP in place and without the Peak Flow Operations Program, this increases to 7.1 years. With the Peak Flow Operations Program in place, this decreases back down to 3.4 years (Table 7, Figure 16). Similarly, for the 3-day peak flow (average daily flow for 3 consecutive days), the historical recurrence interval for 2,800 cfs target flow at the Canyon Gage is 3.6 years. With NISP in place and without the Peak Flow Operations Program, this increases to 28.5 years. With the program in place, this decreases to 7.1 years (Table 7, Figure 17). As shown, recurrence intervals at lower flow rates (2,200 cfs and especially 1,600 cfs) are nearly completely mitigated. Overall, the peak flow operations program would result in peak flows being unaffected by NISP operations during about 70 percent of years, and during the remaining 30 percent that are affected, approximately 2/3 of the years have some type of peak flow bypass.

Table 7. Peak Flow Recurrence Intervals with Peak Flow Operations Program

Canyon Gage Flow (cfs)	Recurrence Interval (years)		
	Observed	NISP Without Peak Flow Operations Program	NISP With Peak Flow Operation Program
1-day average flow of 2,800 cfs	2.9	7.1	3.4
2-day average flow of 2,800 cfs	3.2	14.3	4.1
3-day average flow of 2,800 cfs	3.6	28.5	7.1
1-day average flow of 2,200 cfs	1.8	3.8	2.0
2-day average flow of 2,200 cfs	1.9	4.1	2.3
3-day average flow of 2,200 cfs	1.9	4.4	2.3
1-day average flow of 1,600 cfs	1.4	2.0	1.4
2-day average flow of 1,600 cfs	1.4	2.0	1.4
3-day average flow of 1,600 cfs	1.4	2.0	1.5

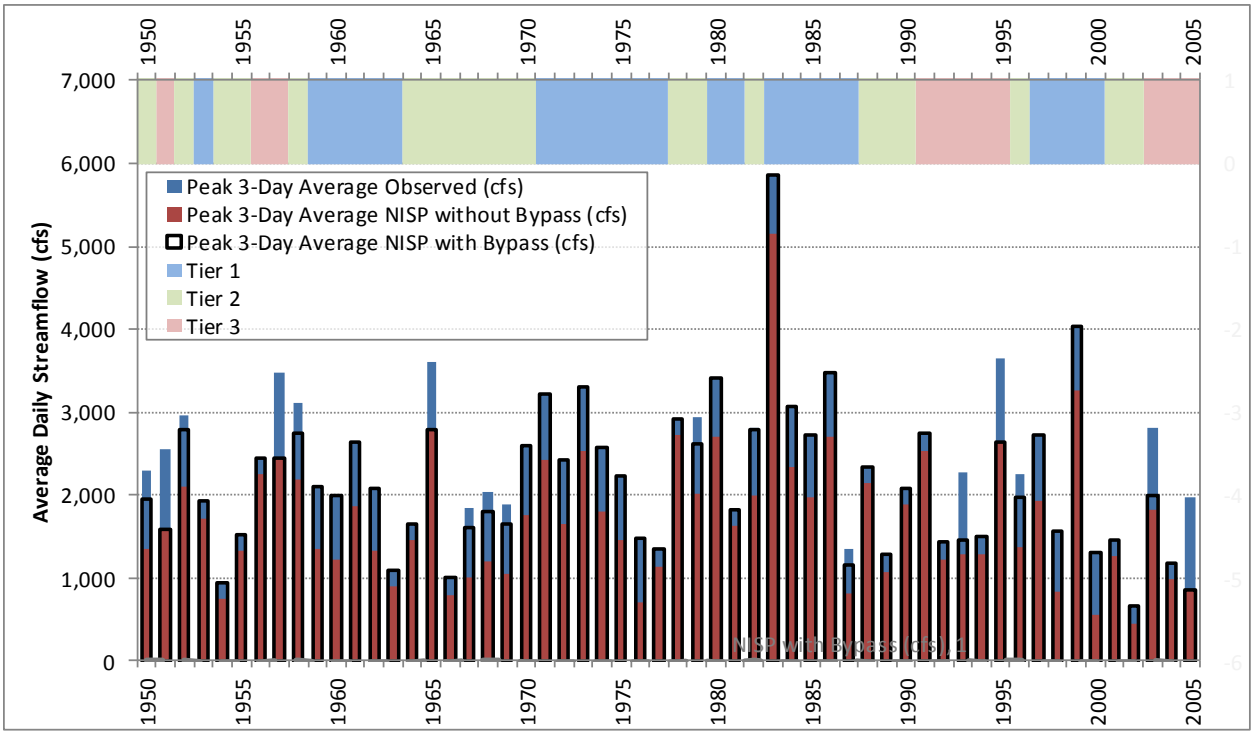


Figure 16. Poudre River at Canyon Gage Average Daily Peak Flow

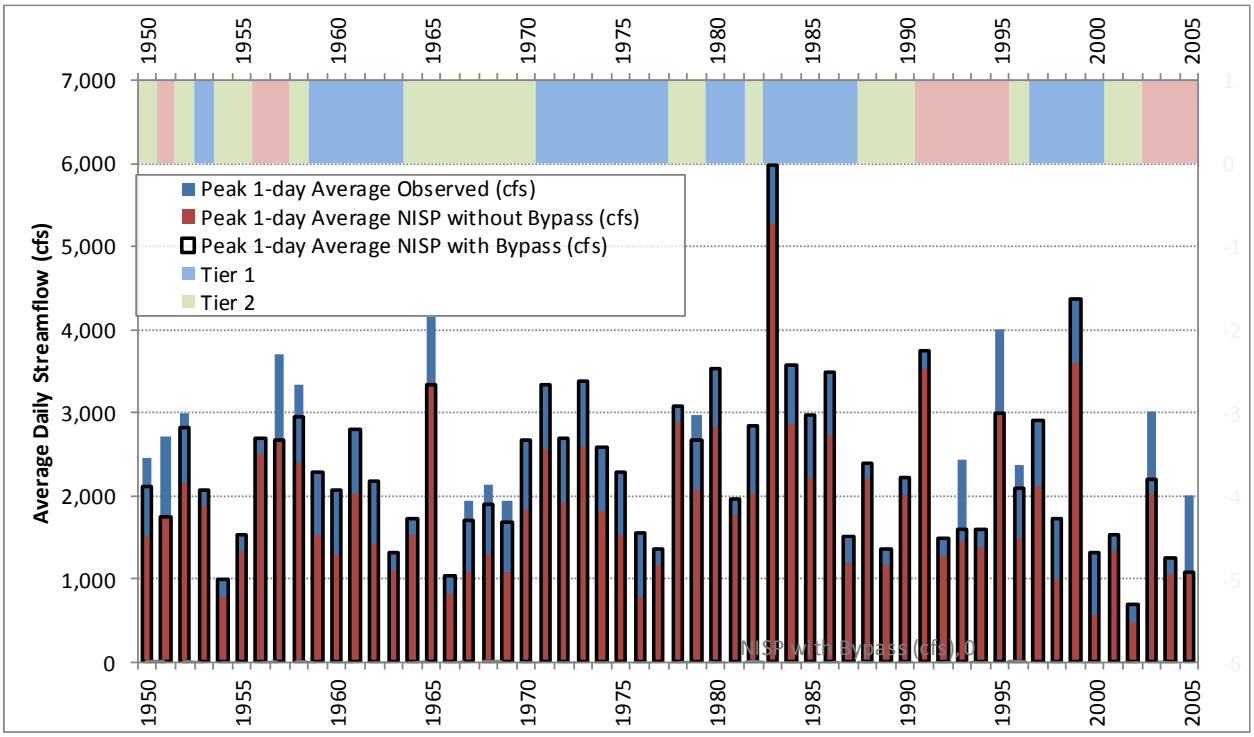


Figure 17. Poudre River at Canyon Gage 3-Day Average Daily Peak Flow

Although the peak flow commitment only applies at the Canyon Gage, it will benefit all other reaches of the Poudre River. Historically, during years with peak flows that exceed the 2,800 cfs target flow at the Canyon Gage, peak flows are also high at downstream locations (Figure 18). Between 1975 and 2016 (years in which data for the Lincoln Street Gage is available), the average daily peak flow exceeded the 2,800 cfs target during 19 of the 42 years. During that same period, the average daily peak flow exceeded 2,000 cfs during 14 of the 42 years at the Lincoln Street Gage (U.S. Geological Survey Station ID 06752260, Cache La Poudre River at Fort Collins, CO), and during 16 of the 42 years at the Greeley Gage. Although this indicates that there are typically (but not always) reductions in peak streamflows downstream of the Canyon Gage, peak streamflows have historically remained high downstream of the Canyon Gage, and would expect to continue following this pattern during the Peak Flow Operations Program.

Northern Water will coordinate with the District 3 water commissioner, CPW, and other water users based on the best available information to operate in a manner that peak flows meet the goals described herein. However, given natural diurnal hydrologic variability, the actual streamflow and duration may differ slightly from those described here. Northern Water would expect to coordinate peak flow operations with other water users in the basin, and seek opportunities to enhance the beneficial aspects of the program.

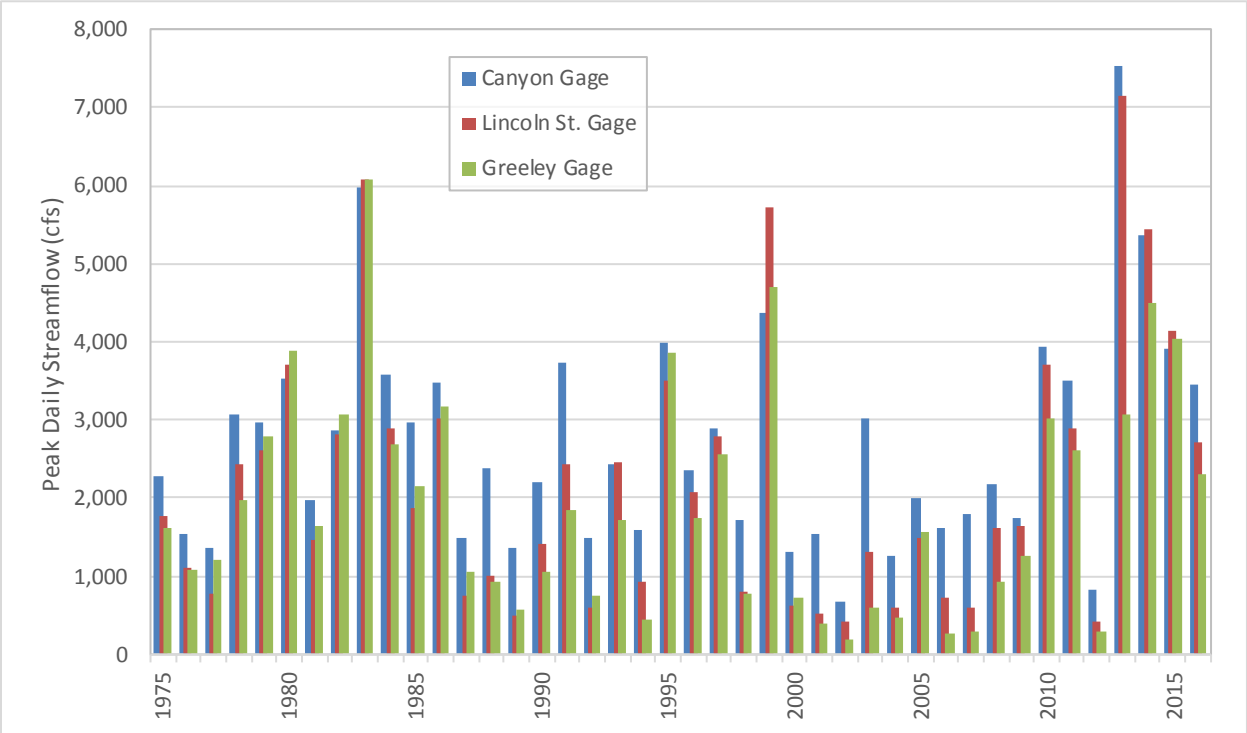


Figure 18. Poudre River Average Daily Peak Flow at Canyon, Lincoln Street and Greeley Gages

The operations described for this program would apply to diversions filling storage space in Glade Reservoir that has already once been filled and is no longer under any type of initial fill restrictions (which limit the rate at which the reservoir can be initially filled). For the interim period, NISP effects on peak flows will be lessened as the initial rate of fill will be reduced from maximum project operations. During this interim initial fill period, filling of storage space that remains under fill restrictions will be consistent with Tier 3 conditions (including Tier 3a and 3b conditions). A bypass could be considered as part of the Adaptive Management Program (see section 6.1.1.1).

5.2.2.7. Temperature Mitigation (WQ-06)

Phase I of the Supplemental Draft EIS water quality analysis shows that temperature standards are currently frequently exceeded during late summer and occasionally during other times of the year in the cold-water reach upstream of Shields Street, particularly upstream of Hansen Supply Canal deliveries to the Poudre River (Figure 19; Hydros 2014a). Downstream of the Hansen Supply Canal, which releases colder water from Horsetooth Reservoir into the Poudre River, exceedances are fewer but still frequently occur during later summer months (Figure 20; Hydros 2014a). NISP diversions could increase the magnitude and frequency of potential excursions in July and August. Water quality modeling being performed as part of the Phase II water quality evaluations being conducted for the Final EIS will determine the extent to which NISP operations could exacerbate these excursions.

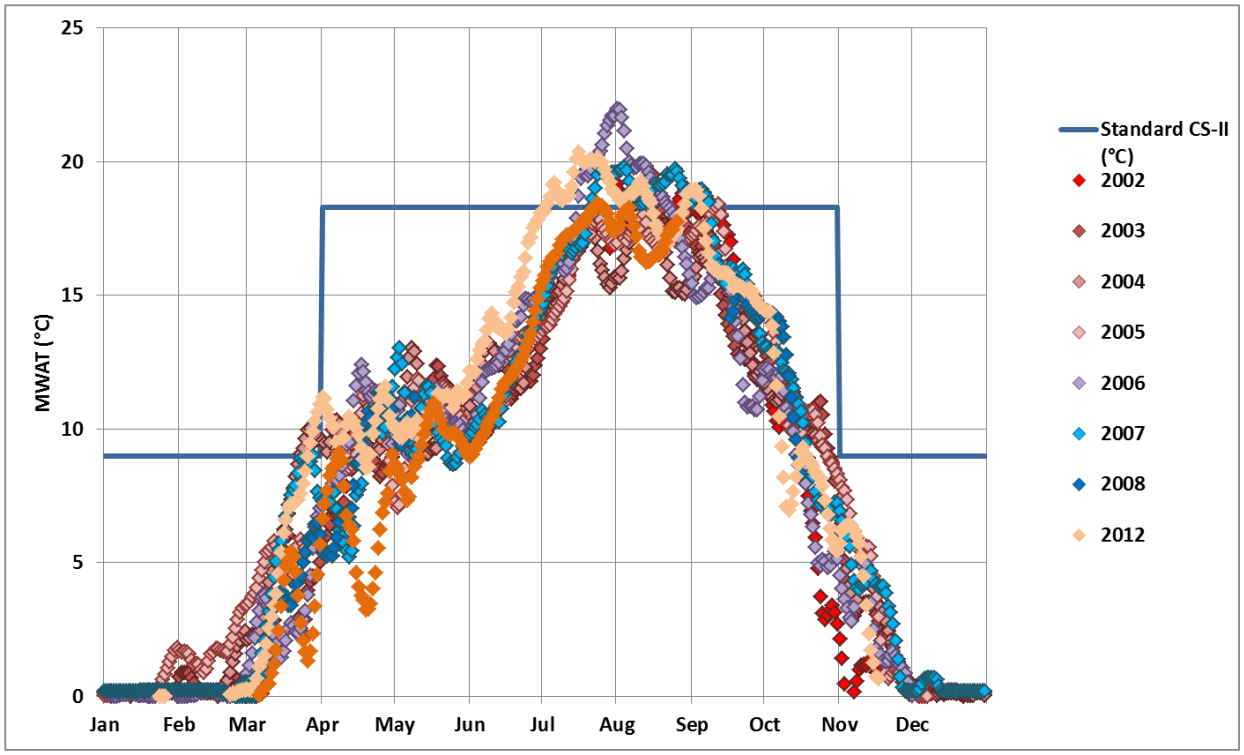


Figure 19. CLAFTCCO (Canyon Gage, Upstream of Hansen Canal) Temperature Gage Maximum Weekly Average Temperature Results Compared to Relevant Standards (Hydros 2014a)

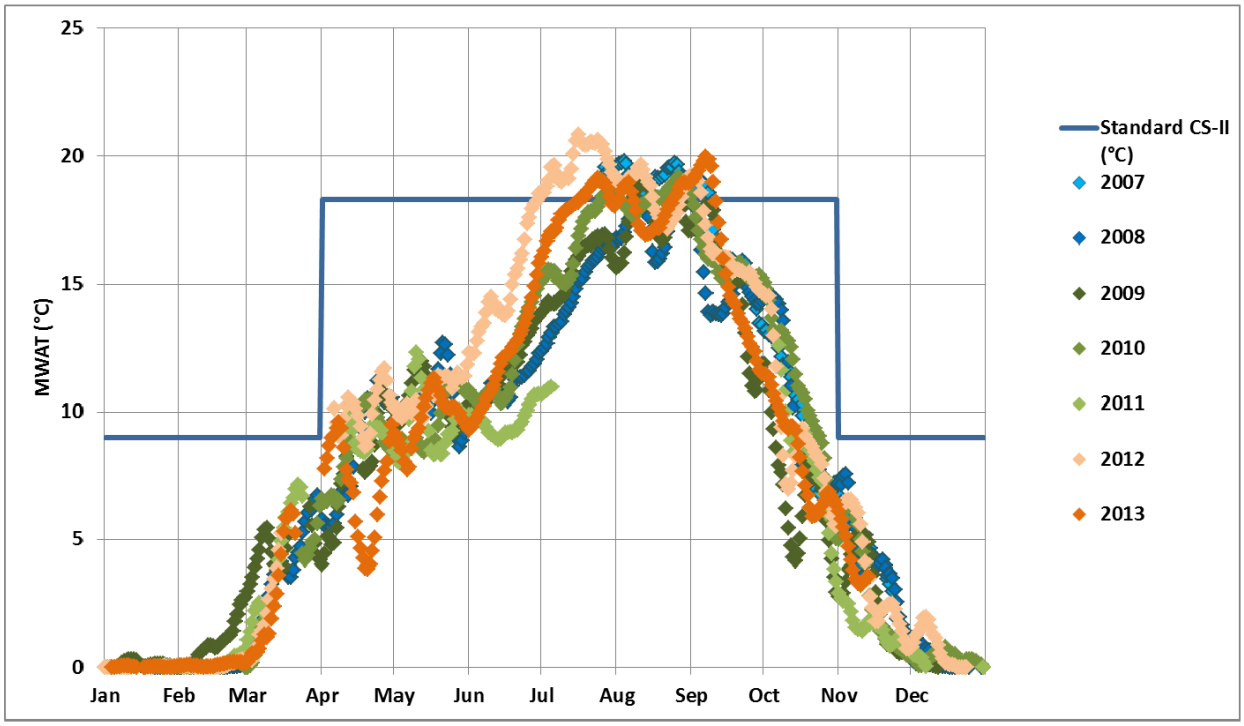


Figure 20. HSC-PRU (Below Hansen Canal) Temperature Gage Maximum Weekly Average Temperature Results Compared to Relevant Standards (Hydros 2014a)

Northern Water has made several commitments within this plan to operate NISP in a manner that will likely avoid or minimize adverse stream temperature impacts, and in some instances Northern Water's operation of NISP should benefit stream temperatures. These include avoiding diversions during critical low flow periods (FW-01 Avoid Munroe Canal Diversions, Section 5.2.2.1; FW-02 Curtail Diversions for Non-Consumptive Water Rights, section 5.2.2.2; FW-03 Summer and Winter Diversion Curtailments, section 5.2.2.3); introducing cooler water into the river (FW-04 Conveyance Refinement, section 5.2.2.4); and performing mitigation activities that will mitigate temperature effects in critical reaches of the river (Stream Channel and Habitat Improvement Plan, section 5.3.1.1; Channel and Habitat Improvements, section 5.3.1.2; Poudre River Adaptive Management Program, section 6.1.1.1).

Despite these commitments, there remain times when diversions into NISP facilities may exacerbate an existing temperature exceedance, or cause a temperature exceedance that may not otherwise occur. Therefore, to further avoid and minimize effects of NISP operations on water temperature in the Poudre River, Northern Water commits to the following protocols for operating NISP in manner that will not exacerbate an existing temperature exceedance or cause a new temperature exceedance to occur in the Poudre River:

- **Monitoring Stations –** To implement the actions described in this mitigation action, Northern Water shall ensure that continuous real-time instantaneous temperature monitoring continues at the Canyon Gage. Additionally, to assist in the adaptive management process, Northern Water will install, operate and maintain continuous real-time temperature-monitoring stations at each of the multi-objective diversion structure retrofits identified in section 6.1.1.2, at the Poudre Valley Canal Diversion Structure identified in section 5.2.1.2, and at a site located between the existing Fossil Creek Reservoir Inlet Ditch and the New Cache Canal diversion structure.

- **Temperature Thresholds** - For the purposes of this mitigation action, the threshold temperatures will be the standards in place by the Colorado Water Quality Control Division (Table 8). Northern Water is currently part of a workgroup that is investigating site specific standards for transitional reaches of the Poudre River. If this workgroup concludes that different standards are appropriate for the transitional reaches, the standards developed by that workgroup will become the temperature thresholds for this mitigation. If standards change in the future, Northern Water will evaluate whether these new standards can be met without a loss in NISP yield. If Northern Water evaluations shown that the new standards can be met without a loss in yield, the new standards shall become the temperature thresholds. If the evaluation show that the new standards cannot be met without a loss in yield, Northern Water will discuss options with CPW through the Poudre River Adaptive Management Program.

Table 8. Existing Acute and Chronic Temperature Standards for the Poudre River

Segment	Segment Descriptions	Acute (°C)		Chronic (°C)	
10	Munroe Canal diversion to Shields Street	Apr – Oct 23.9	Nov – Mar 13.0	Apr - Oct 18.3	Nov – Mar 9.0

Note: The Canyon Gage is located within segment 10.

- **Maximum Weekly Average Temperature (MWAT) Chronic Threshold Exceedances** - For the period after July 15th of each year, at such times as the Weekly Average Temperature (WAT) comes within 0.3 C of the MWAT Chronic Threshold at the Canyon Gage, Northern Water will initiate the Poudre River Adaptive Management process for temperature mitigation.

- **Daily Maximum (DM) Acute Threshold Exceedances** - At such times as the Daily Maximum temperature is within 1°C of the DM Acute Threshold at the Canyon Gage, Northern Water will initiate the Poudre River Adaptive Management Process for Temperature Mitigation. In the future, the 1 degree buffer may be altered, based on experience, to maintain compliance with the DM Threshold.

- **Poudre River Adaptive Management Process for Temperature Mitigation –** Approaching or exceeding the temperature thresholds at the Canyon Gage as described above will initiate immediate discussions between Northern Water, CPW, and other Poudre River Adaptive Management Program parties (section 6.1.1.1) to determine potential causes for and contributions to temperature exceedances. If these discussions conclude that NISP diversions may be contributing to temperature exceedances, Northern Water will initiate actions under the Poudre River Adaptive Management Program (section 6.1.1.1) to mitigate the contribution. Management actions by NISP may include but are not limited to a reduction or curtailment of NISP diversions, or other changes in NISP operations that do not affect NISP yield or the ability to make NISP deliveries to Participants.

- **Limitations on Reduction or Curtailment of NISP Diversions** - The temperature mitigation measures identified above will be suspended in the event that and at such times as there is no material causal relationship between NISP operations and any exceedance of the MWAT Chronic threshold or DM Acute threshold at the monitoring stations identified above. For the purposes of this paragraph a "material causal relationship" is defined as either an actual measurable impact on temperature using readily available monitoring technology or a modeled impact on temperature that is not insignificant and is based on a computer model or studies accepted by the Colorado Division of Wildlife. Northern Water will cooperate with future studies to determine what factors, other than flow changes, have effects on water temperatures in the Poudre River.

Northern Water and CPW understand that additional temperature analyses are being conducted by the Corps as part of the EIS Phase II water quality analyses. If these analyses show a more significant or wider range of temperature effects than those described in the Supplemental Draft, Northern Water and CPW will amend this FWMEP with appropriate measures to mitigate these effects.

5.2.2.8. Ramp NISP Diversions at PVC (FW-09)

It is possible that, due to the size of diversion facilities and water rights priorities, NISP could be operated in a manner that results in streamflow variations at the Canyon Gage of several hundred cfs over a short window of time. These types of operations can be detrimental to fish, especially during spawning periods. Northern Water commits to operating in manner that will not cause NISP diversions at the PVC canal headgate to fluctuate more than 500 cfs in 24 hours, including under commitments previously described in this plan for the Peak Flow Operations Program (section 5.2.2.6). This ramping rate may be the subject of the Poudre River Adaptive Management Program (section 6.1.1.1). However, NISP shall not be obligated to operate at a ramping rate of less than 500 cfs in 24 hours if impacts on yield are expected.

5.2.3. Construction BMP Commitments

Large construction projects like NISP typically have a long list of Best Management Practices (BMPs) that accompany Federal, State and local permitting activities. The following lists more significant BMPs and/or those that are particular to NISP that are committed to as part of this FWMEP. Additional construction BMPs are contained in the Conceptual Mitigation Plan and may be prescribed as part of other future permitting activities.

5.2.3.1. Noxious Weed Control Plan (NW-01)

NISP will be responsible for avoiding and minimizing the spread of noxious[5] or invasive weeds associated with construction activities and water level fluctuations and exposed shorelines in Glade and Galeton reservoirs. Prior to construction activities, a noxious and invasive weed control plan will be developed for construction activities and general as required by local and state agencies. A separate specific noxious and invasive weed control plan for Glade and Galeton reservoirs will submitted to CPW for approval.

BMPs will be used to minimize the spread of noxious weeds (List A, B, and C species) at all areas where spreading of noxious weeds might occur. Implementing these BMPs will minimize the dispersal of noxious weeds and reduce the need for future weed control actions. The following BMPs will be implemented with compensatory mitigation actions that involve land disturbance:

- Major equipment (e.g., track equipment, rubber tire loaders, and backhoes) will be cleaned by high pressure air or water spray before being delivered to the project area to avoid introducing undesirable plants and noxious weeds.
- Topsoil containing any noxious weeds (List A, B, or C species) will not be used or otherwise will be strictly managed to preclude the spread of seeds and noxious weed species.
- Fertilizer or other soil amendments will not be used unless recommended by a re-vegetation specialist based on site-specific conditions. The use of fertilizers will be restricted because they can promote noxious weeds and can be detrimental to the native species in the seed mix.

[5] For the purposes of this plan, “noxious weeds” are those weeds listed in the Colorado Noxious Weed Act.

- Disturbed areas will be reclaimed as soon as practicable after completion of construction and seeded with an appropriate native seed mix (certified as noxious weed-free).
- Certified weed-free mulch will be used for re-vegetation. Weed-free straw bales will be used for sediment barriers.
- Locally or regionally available seed and mulch will be used when practicable.
- Domestic goats or sheep shall not be used for weed control purposes, or allowed to graze upon any land owned, leased or managed by NISP at or surrounding the Glade Reservoir Complex.

The project area will be monitored to determine if noxious weeds have invaded. Any noxious weeds found will be controlled as soon as practicable to prevent establishment.

Each disturbance of a vegetated upland will require the restoration and re-vegetation of the disturbance according to established re-vegetation guidelines. The general re-vegetation requirements will be described in the noxious and invasive weed control plan. Detailed, construction-level specifications that follow these guidelines will be included in the construction plans for any activity that temporarily disturbs upland vegetation and/or soil. These plans will be subject to review by CPW.

The re-vegetated sites at Glade and Galeton reservoirs will be monitored annually, during the growing season. The first two years of monitoring will be qualitative to determine if re-vegetation is progressing. Following the first two full growing seasons, monitoring at Glade and Galeton reservoirs will consist of the following:

- A visual inspection to determine if the areas seeded have germinated and are becoming established;
- A determination of the presence and distribution of bare areas[6] greater than 400 square feet;
- A determination of the presence and distribution of noxious weeds comprising 10 percent or more of the estimated vegetative ground cover or any area greater than 400 square feet dominated by noxious weeds; and
- Photographic documentation of representative re-vegetated areas taken from fixed points for year- to-year comparisons.

The presence of bare areas greater than 400 square feet at Glade or Galeton reservoirs will require reseeding the bare areas per the re-vegetation guidelines. The presence of noxious weeds greater than 400 square feet will require weed control measures.

The noxious and invasive weed control plan for Glade and Galeton reservoirs will include success criteria to measure compliance with the plan. CPW will be consulted to develop appropriate success criteria for NISP. The success criteria for vegetation mitigation may include:

- Average ground cover is 90 percent or greater than the selected reference area;
- The relative cover of native species is 90 percent or greater than the reference area;

[6] For the purposes of the qualitative monitoring, “bare areas” are defined as areas where seed has not germinated or on average there is less than one desirable plant per square foot.

- Noxious weeds comprise less than 20 percent of the average estimated vegetated ground cover; and
- No area greater than 800 square feet is dominated by noxious weeds.

5.2.3.2. Migrating Birds and Raptors (TW-03, TW-04, TW-05)

Northern Water will avoid, minimize and provide compensatory mitigation for migrating birds and raptors in accordance with requirements under the Migratory Bird Treaty Act (MBTA). Where possible, vegetation clearing would occur during the nonbreeding period, prior to construction. If active nests are found during preconstruction surveys, they would be left undisturbed and "no-work" zones would be established around the nests until the breeding season is over. The installation of nesting deterrents to prevent nesting before April 1, and removal of these deterrents no more than 24 hours before initiation of construction, is an acceptable alternative to prohibiting construction activity during the breeding season. In cases where removal of a nest is necessary, a permit would be requested from the Service. Nesting surveys would be conducted prior to the initiation of construction activities to identify migratory bird nests in the construction right-of-way.

CPW developed recommended buffer zones and seasonal restrictions for new surface occupancy within certain distances of nest sites of several raptor species. Surface occupancy is defined as human-occupied buildings and other structures such as oil and gas wells, roads, railroad tracks, and trails. The Service typically considers that implementation of the CPW buffers and seasonal restrictions fulfill compliance requirements of MBTA for raptors.

A raptor nest survey would be conducted prior to construction to identify raptor nests in the vicinity of construction activities. If an active raptor nest is found on-site, CPW recommended buffers and seasonal restrictions for raptors would be established during construction to avoid nest abandonment.

If disturbance of raptor nests is unavoidable, mitigation measures could include the construction of artificial nests in suitable habitat or enhancement of prey habitat. If raptor nests could be impacted by construction activities, specific mitigation measures for impacts to nesting raptors would be developed by Northern Water in coordination with CPW and the Service prior to construction.

If a take of migratory birds or raptors occurs incidentally or cannot be avoided, MBTA permits and requirements will be followed.

5.3. Compensatory Mitigation

As would be expected for a project with the scope of NISP, not all environmental effects can be avoided or minimized. Therefore, compensatory mitigation is required to mitigate certain effects of NISP. This section describes the development of compensatory mitigation plans for impacted resources.

5.3.1. Aquatic Resource and Water Quality Mitigation

NISP would affect several environmental resources that are connected to the Poudre River channel from the Poudre Valley Canal diversion at the mouth of the canyon to its confluence with the South Platte

east of Greeley, including water quality, stream morphology, fish and aquatic life, riparian vegetation, and wetlands. A series of improvements to the channel corridor are proposed as a comprehensive mitigation strategy for mitigation of effects and improvements to the Poudre River channel.

Phase I of the water quality analysis shows that temperature standards are currently frequently exceeded during late summer and occasionally during other times of the year in the cold-water reach upstream of Shields Street (particularly upstream of Hansen Supply Canal deliveries to the Poudre River), and states that NISP diversions could increase the magnitude and frequency of potential excursions in July and August. Water quality modeling being performed as part of the Phase II water quality evaluations will determine the extent to which NISP operations could exacerbate these excursions.

To mitigate these potential effects, the Conceptual Mitigation Plan (Northern Water 2015) contained a mitigation action item to evaluate the feasibility of enlarging Glade Reservoir, which would allow the potential curtailment of late summer diversions. Based on agency and public comment received on the Supplemental Draft EIS, Northern water is no longer considering enlargement of Glade Reservoir for this purpose or any other purpose – the proposed Glade Reservoir capacity remains at 170,000 acre-feet.

Sections 5.2.2.4 and 5.2.2.7 of this document contain new avoidance and minimization measures to address potential exacerbation of temperature excursions that may result from Glade Reservoir diversions.

5.3.1.1. Stream Channel and Habitat Improvement Plan (AG-01)

Northern Water would provide funding to facilitate/assist in development of a stream channel and habitat improvement plan for the Poudre River from the Poudre Valley Canal to its mouth at the South Platte River. The stream channel and habitat improvement plan would provide compensatory mitigation for Poudre River water related resources, including aquatic, stream morphology, water quality, riparian, and special status species. The stream channel and habitat improvement plan will be developed as part of the adaptive management program (see section 5.3.2.2) in cooperation with CPW, City of Fort Collins, Town of Windsor, City of Greeley, and other parties, and incorporate the concepts and projects being planned and implemented by those entities.

Goals of the stream channel and habitat improvement plan would include:

- Collect additional data, perform a river corridor inventory, and document current conditions.
- Develop baseline geomorphic conditions for use in the Adaptive Management Plan.
- Develop a river-wide master plan and prioritization for maintaining and improving the following river functions:
    - Irrigation and municipal water supply diversions;
    - Channel and overbank capacity and connectivity;
    - Aquatic habitat and species;
    - Riparian habitat and wildlife species;
    - Flood risk to land and infrastructure;

    - Recreation.
- Develop a long-term monitoring and maintenance plan.
- Ensure that a long-term funding and implementation group is in place to leverage funding provided by NISP with other governmental or grant funding that may be available to perform this type of work.

To the extent practical, the stream channel and habitat improvement plan would build upon data and analyses conducted for the EIS.

NISP commits to spending up to $1.0 million to develop the stream channel habitat and improvement plan. This funding is in addition to other commitments made in this FWMEP. Funding for implementation of site specific stream channel and habitat improvements is described in separate sections of this FWMEP, while funding of more general recommendations of the stream channel and habitat improvement plan is described as part of the Poudre River Adaptive Management Program (section 6.1.1.1).

5.3.1.2. Channel and Habitat Improvements (AG-02)

As part of compensatory mitigation for resource effects throughout the Poudre River, Northern Water would implement improvements in the stream channel at two locations of slightly more than one mile each in affected reaches of the Poudre River. Initially, Northern Water has identified the following reaches for these improvements. These locations were selected based on their ability to provide multi-objective mitigation and enhancement benefits, and because these reaches are at least partially publicly accessible. The location and types of work that are funded by Northern Water would be verified with the stream channel habitat improvement plan and adjusted as necessary to be consistent with the plan.

- Approximately 1.2 miles within a 2.1-mile reach of the Poudre between PVC and the Hansen Supply Canal inflows (Figure 21)
- Approximately 1.2 miles of stream in the Watson Lake area (Figure 22)

Key components of a stream habitat improvement project would likely include constructing in-channel structures made of natural materials to create riffles and pools with a defined low-flow channel which would increase channel depth, especially during low-flows; reconnecting the channel to the floodplain and old oxbows; encouraging regeneration of native vegetation; and, removing areas of non-native vegetation. Providing better connectivity throughout the river is one key aspect that would likely be included in any plan to improve aquatic habitat. Improving connectivity through diversion structure bypass facilities is discussed in Section 6.1.1.2.

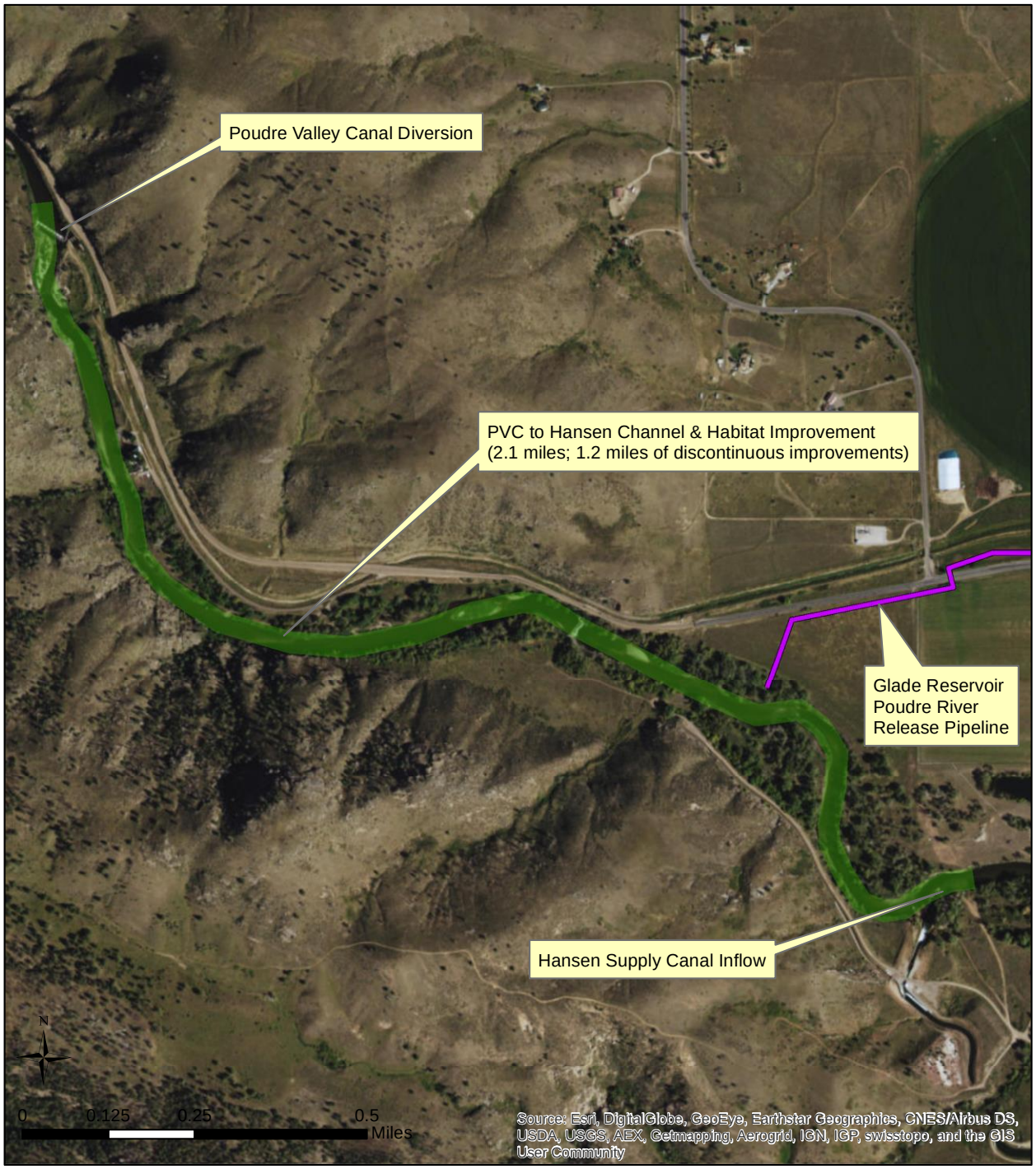


Figure 21. Poudre Valley Canal Mitigation Reach

Figure 22. Watson Lake Mitigation Reach

In addition to aquatic habitat and stream morphology effects, the PVC to Hansen Supply Canal reach is also intended to mitigate water quality effects, specifically temperature effects. The water quality effects analyses show that even under current conditions, this reach frequently exceeds coldwater temperature standards. With additional depletions from NISP within this reach, it is possible that there would be increased temperature standard excursions. Downstream of the Hansen Supply Canal inflows, temperature standard excursions are less problematic because Hansen Supply Canal inflows cool downstream river water. Channel improvements in this reach would seek to narrow and deepen the

current channel to be more consistent with current and future low-flow conditions and increase riparian vegetation, including larger plains cottonwoods that would shade the river channel. The effectiveness of these proposed improvements to cool water temperature would be assessed during the detailed water quality modeling.

CPW shall have final approval regarding any channel and habitat improvement plans and projects implemented as part of this FWMEP.

5.3.1.3. Riparian Vegetation (RV-01, RV-02)

Improvements in existing riparian vegetation would be incorporated as part of the stream channel habitat and improvement reaches that are described above. Additionally, Northern Water has identified additional areas in which to improve existing riparian vegetation. Riparian vegetation improvements would directly mitigate impacts on riparian vegetation resources, impacts of reduced peak flows, and would also mitigate effects on water temperature in certain reaches. Areas under consideration include the following:

- City of Fort Collins (10 acres)
- Frank State Wildlife Area (34 acres)
- Eastman Park Area (14 acres)
- Adjacent to all channel improvement reaches (54 acres)

Riparian vegetation mitigation through Fort Collins will be coordinated with current planning efforts by the City, including its Poudre River Downtown Master Plan. The Poudre River Downtown Master Plan includes much of the nearly 5-mile reach of Segment B, in which approximately 10 acres of riparian vegetation may be affected by NISP. NISP would fund at least a compensatory amount of riparian vegetation improvements within this reach. Locations in the Poudre River Downtown Master Plan that may be candidates for riparian vegetation include improvements at the Gustav Swanson Natural Area, a natural area east of Linden Street, and at a new 31-acre natural area north of the Mulberry Wastewater Treatment Plant (Fort Collins 2014a).

The Frank State Wildlife Area is located along the Poudre River on the west side of the Town of Windsor (Figure 23). This area has potential for expanding cottonwood woodlands, establishing riparian wetlands, and reconnecting and enhancing the oxbow to provide aquatic habitat and sediment storage. Non-native vegetation would also be removed. Two sites for potential riparian vegetation mitigation have been identified. The primary site is located on the west edge of the site near the parking area. The primary site currently is vegetated primarily by grassland, and is approximately 9 acres in size. The secondary site is located farther east. This site is 25 acres, but already has some mature cottonwood. The Frank State Wildlife area could be part of the stream enhancement mitigation for Segments E and F that is discussed in Section 5.3.1.1. The river reach through this area is approximately 1.2 miles long; only a portion of this reach, likely the west edge of the property along County Line Road adjacent to the riparian mitigation sites, would be included in this project. One key aspect of a channel improvement project conducted along with the riparian vegetation mitigation would be reconnecting the channel to

the floodplain to ensure adequate water is available to sustain cottonwood growth and addressing channel capacity and providing opportunities for sediment storage.

Eastman Park is located along the Poudre River on the south side of Windsor (Figure 24). As with the Frank State Wildlife Area, this area has potential for expanding cottonwood woodlands and establishing riparian wetlands, but may not have as much opportunity to reconnect oxbows. Approximately 14 acres on the south side of the river have been identified for riparian mitigation improvements. Again, this project could be part of the stream enhancement mitigation for Segments E and F that is discussed in Section 5.3.1.1. This land is owned by the Town of Windsor. The river reach in this area is slightly less than one mile in length, but only a portion of the reach would be rehabilitated as part of the Mitigation Plan.

Northern Water has had initial conversations with the Town of Windsor regarding the applicability of these proposed improvements with its long-term vision for the river corridor. The town is currently updating planning in these areas and feels that the proposed improvements, particularly in the Eastman Park area, are consistent with its overall vision for these corridors (Windsor 2016).

Opportunities for cottonwood regeneration would be incorporated into the approximately 2.4 miles of stream channel and habitat improvement reaches described in section 5.3.1.1. To fully mitigate the 112 acres of affected riparian and woodland shrubland, approximately 54 acres of regeneration areas would be developed, which results in an average developed riparian width along the improvement reaches of roughly 185 feet. Opportunities would be sought to locate these regeneration areas along reaches that would provide shading of the river channel to reduce water temperatures during low-flow summer time conditions. Results of the Phase II water quality modeling will provide additional information on the magnitude and timing of benefits that enhanced riparian areas, coupled with stream channel enhancements that are discussed in other portions of this plan, would have on stream temperature.

In cottonwood regeneration areas, the final grades and hydrology would be conducive to the establishment of a combination of cottonwood seedlings and planted trees. Cottonwood seedling areas would consist of gravely and sandy soils saturated during the early portion of the growing season. Surface water would be diverted to seedling areas until the root systems are developed enough to reach the ground water table.

Figure 23. Frank State Wildlife Area Proposed Mitigation Activities

Figure 24. Eastman Park Proposed Mitigation Activities

5.3.1.4. Eaton Draw Water Quality Wetlands (WQ-03)

As expected in a typical transition from a mountain river to plains river system along the Front Range, currently, water quality generally deteriorates in the Poudre River in a downstream direction. In Segment 12, which is the Poudre River downstream of Boxelder Creek (generally downstream of I-25), standard exceedances occur for total phosphorous, ammonia, total recoverable iron and dissolved

selenium. Data for the South Platte shows standards exceedances for many of the same water quality parameters. The water quality effects analysis shows a minor to moderate effect of NISP on nutrients and inorganics/metals within segment 12 and the South Platte due to reductions in streamflow.

Eaton Draw is a tributary to the Poudre River that generally parallels Highway 85 from the north and conveys agricultural return flows and effluent from several treatment lagoons that discharge to the draw. Although additional data is needed to show with certainty, it is thought that Eaton Draw contributes loading to this reach. Because Eaton Draw is a point discharge into the Poudre River, it offers an opportunity to provide a constructed wetland treatment area that could assist in reducing loading to the Poudre River from Eaton Draw for certain constituents.

To mitigate potential impacts of NISP on water quality in the lower reaches of the Poudre River, Northern Water would construct a wetland in Eaton Draw near the stream's confluence with the Poudre River near Greeley (Figure 26). Additional water quality and quantity data is required to properly size the wetlands to provide meaningful levels of water quality constituent reductions in the wetlands complex, but based on anecdotal data and information, it is estimated that the wetlands would be approximately 10 acres. The wetlands would be located near the mouth of the draw, near "O" Street and Highway 85 north of Greeley. The wetlands could be located on undeveloped land either west or east of the Highway. The site is not located near major residential areas.

The wetlands would be designed and constructed to remove key water quality constituents from Eaton Draw influent prior to this water being discharged into the Poudre River. Constructed wetlands are typically very effective at removing sediments and solids, moderately effective at removing nutrients, and good at removing total metals (Urban Drainage 2010). Excess nutrients, including nitrogen and phosphorous, are deposited into wetlands and often absorbed by wetland soils and taken up by plants and microorganisms (EPA 2004). However, phosphorous removal in wetlands is limited by plant uptake (EPA 1999). Additional data collection and wetland design would be required to determine the expected levels of phosphorous removal. Metals, including selenium, would be removed by the wetlands through sedimentation. Design of the constructed wetland would account for this sedimentation by providing the ability to periodically remove the sediment from the wetland.

The constructed wetland would be designed and maintained to control mosquito populations.

The Eaton Draw constructed wetland site would serve as the compensatory wetland for Galeton Reservoir and Upper Galeton Reservoir. Additionally, this site could potentially serve as a wetlands mitigation bank for other incidental wetlands disturbance that may occur during pipeline construction (although currently, no permanent effects to wetlands from pipeline construction are anticipated). Northern Water will finalize these aspects of the constructed wetlands through the Corps environmental review and permitting processes.

Figure 25. Eaton Draw Constructed Wetlands General Location

5.3.1.5. Streamflow and Water Quality Monitoring (WQ-04)

Implementation of several mitigation actions described in this plan would require development of a more extensive streamflow and water quality monitoring network in the Poudre River Basin. Monitoring would be required at low-flow points in the Poudre River from the canyon mouth to its confluence with the South Platte River near Greeley, and at inflow and outflow points of NISP facilities, including Glade Reservoir releases. The final monitoring plan will be coordinated with the Colorado Division of Water Resources, CPW, and the Colorado Department of Public Health and the Environment through the

section 401 certification process and this FWMEP. Northern Water would provide staffing and/or funding for installation and operation of the monitoring network.

Operation of continuous real-time temperature sites associated with temperature mitigation commitments is described in section 5.2.2.7.

Streamflow Monitoring

To provide additional data necessary to operate NISP and to meet the flow related commitments of this FWMEP, Northern Water anticipates the need to install additional streamflow monitoring stations along the Poudre River and as part of NISP facilities.

- Poudre River upstream of the North Fork – The Poudre River mainstem currently is not gaged upstream of the Canyon Gage. The Colorado Division of Water Resources maintains a streamflow gage on the North Fork below Seaman Reservoir (State ID no. CLANSECO). At various times, the Poudre River mainstem has been gaged at several locations upstream of the North Fork, including the Rustic Gage (CLARUSCO), the Log Cabin Gage (CLALOGCO), and the Elkhorn Creek Gage (CLAELKCO). The Elkhorn Creek Gage is above the South Fork, while the Rustic and Log Cabin gages are upstream of the South Fork. Additionally, several sites have previously been gaged on the South Fork.
- Northern Water would work with the State of Colorado and other water users in the basin to identify a gaging site, or group of gaging sites, that can be used to monitor streamflow and have better predictive ability for streamflow that would occur at the Canyon Gage.
- Poudre River at Shields Street – A gaging station is needed downstream of the Larimer and Weld diversion, as this location is often a dry-up point on the river. There is already water quality monitoring performed at this site.
- NISP Operational Sites – A full range of gaging would be installed to operate NISP, including stations that monitor Glade Reservoir and Galeton Reservoir stage and storage contents, inflows, and releases. This operational data would be made publicly available.

In addition to these formal gaging station sites, the multi-objective diversion structure retrofits (section 6.1.1.2) would have streamflow measurement capabilities in the low-flow portion of the structure.

Northern Water's field services program currently operates streamflow gaging stations in cooperation several agencies including the Bureau of Reclamation, Colorado Division of Water Resources, and U.S. Geological Survey. Northern Water would install and maintain these gaging stations, and incorporate data into its water data storage system already developed and work in conjunction with the systems operated by these agencies.

Water Quality Monitoring

Northern Water has implemented an extensive monitoring program on the Poudre River to provide baseline water quality data. These water quality monitoring efforts would continue to be performed to more fully characterize and understand the effects of NISP operations on Poudre River water quality

before and after NISP components are built and implemented, and to meet the water quality commitments of this FWMEP. Water quality monitoring would consist of an initial data collection effort, and long-term water quality monitoring:

- **Baseline Data Collection** – Pre-NISP water quality data collection would focus on developing a baseline water quality dataset to verify water quality modeling assumptions and results. The water quality reports and modeling performed as part of the Final EIS, and State 401 water quality certification process will determine the critical sites, constituents, and frequency of the initial data collection effort. Data would be collected before NISP is operational, and for a period of years after NISP is operational until water quality changes are validated.
- **Long-Term Monitoring** – The extent of long-term water quality monitoring would be based on that required to meet the specific requirements of this FWMEP and the 401 certification, and those constituents and sites that the initial data collection effort identifies as necessary to monitor long-term water quality resulting from NISP operations.
- **Mitigation Monitoring** – This monitoring effort will be done to evaluate the effectiveness of mitigation measures and would inform the adaptive management. Some monitoring may be short term, once mitigation effectiveness is validated or long-term depending on the mitigation measure evaluated.

Baseline data collection will continue to focus on the mainstem of the Poudre River, tributary inflows, groundwater inflows, gravel pits, and agricultural point discharges to the Poudre River. Northern Water currently conducts baseline monitoring at 17 sites that cover the previously mentioned focus areas (Figure 26). Parameters monitored are included in Northern Water's longitudinal analysis (Table 9). The list of parameters sampled in the future will be informed by results from the Phase 2 water quality modeling, and 401 certification requirements. The list may evolve through the adaptive management process as well, including the possible reduction and/or removal of certain locations, parameters and sampling frequencies as water quality conditions and effects become more defined.

As is standard practice, the measurement of field parameters would be conducted at each site during each sampling event (temperature, dissolved oxygen, specific conductance, pH, and turbidity). Flow would be measured at all surface water sites where a gage value is not available or where flow cannot be computed based on other gages. Computed flows will have field measurements to verify accuracy and will be calibrated as needed. The details of the final sites, parameter list, and frequency for the initial data collection effort will be determined based on the analyses and modeling being conducted for the Final EIS and State 401 water quality certification process.

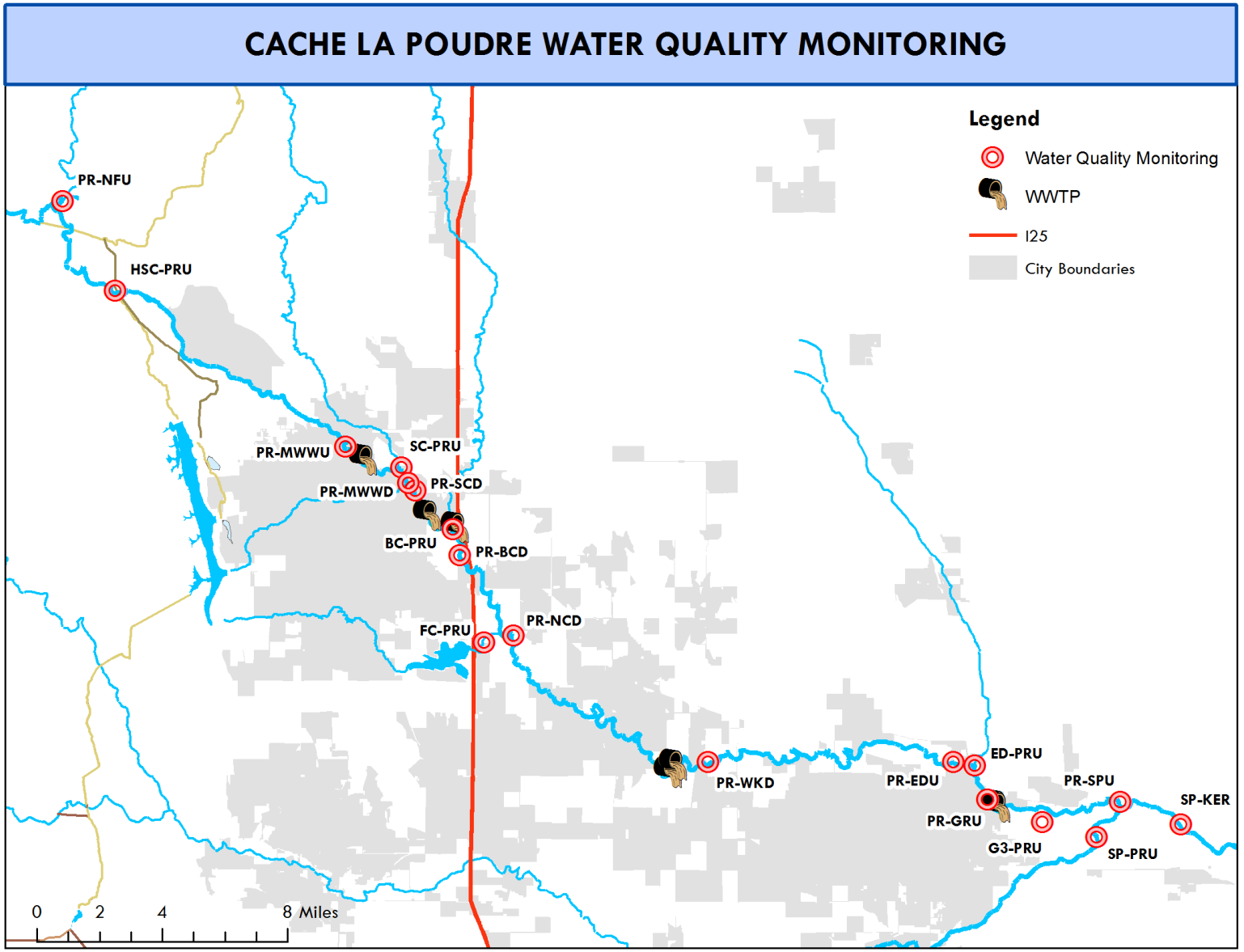


Figure 26. Potential Water Quality Monitoring Sites for Initial Data Collection

Table 9. List of Potential Water Quality Monitoring Parameters for Initial Data Collection

	Parameter	Potential Lab	Method	Method Detection Limit
Field Parameters	pH	--	YSI 6600 or 6820 multi-parameter sonde	
	Temp (°C)	--		
	Specific Conductance (µS/cm)	--		
	D.O. (mg/L)	--		
	Turbidity (ntu)	--		
	Flow (cfs)	--	Measured instantaneous, or flow gage	
	Water level (monitoring wells)	--		
General Parameters	Total Dissolved Solids (mg/L)	High Sierra	EPA 160.1	1
	Total Suspended Solids (mg/L)	High Sierra	EPA 160.2	0.3
	Hardness (mg/L as $CaCO_3$)	Huffman	Calculated from Ca & Mg	
	E. Coli (#/100 mL)[1]	Industrial Laboratories		0/100 mL
Major Ions	Calcium (mg/L)	Huffman	EPA 200.7 (ICP-AES)	0.003
	Magnesium (mg/L)	Huffman	EPA 200.7 (ICP-AES)	0.001
	Chloride (mg/L)	Huffman	EPA 300.1 (Ion-exchange chromatography)	0.03
	Sulfate (mg/L)	Huffman		0.03
Nutrients	Total Phosphorus (mg/L)	High Sierra	EPA 365.3	0.001
	Nitrate + Nitrite (mg/L)	High Sierra	EPA 353.1 modified	0.001
	Ammonia (mg/L)	High Sierra	EPA 350.1 modified	0.001
	Total Kjeldahl Nitrogen (TKN) (mg/L)	High Sierra	EPA 351.2 modified	0.035
Metals	Arsenic, dis (ug/L)	Huffman	EPA 200.8 (ICP-MS)	
	Copper, dis (µg/L)	Huffman	EPA 200.8 (ICP-MS)	0.03
	Iron, dis (µg/L)	Huffman	EPA 200.8 (ICP-MS)	0.04
	Iron, total recoverable (µg/L)	Huffman	EPA 200.8 (ICP-MS)	1.8
	Manganese, dis (µg/L)	Huffman	EPA 200.8 (ICP-MS)	0.02
	Manganese, total recoverable (µg/L)	Huffman	EPA 200.8 (ICP-MS)	0.02
	Selenium, dis (µg/L)	Huffman	EPA 200.8 (ICP-MS)	0.02
	Zinc, dis (ug/L)	Huffman	EPA 200.8 (ICP-MS)	

Notes:

[1] Logistics of the time required to meet maximum holding times before lab testing may limit the locations and frequency of *E. Coli* data collection.

Based on commitments in this plan, real-time temperature data would be required upstream and downstream of NISP releases, both for the initial data collection effort and during long-term monitoring (see section 5.2.2.7). Because the methods used to collect temperature data can also be used to collect other field parameters (dissolved oxygen, turbidity, specific conductivity, and pH), it is likely that long-term monitoring would include some of those constituents. Long-term water quality monitoring sites, lab analyses, and frequency of sampling events for other parameters would be based on parameters in the baseline data collection effort that show sensitivity to NISP operations. Monitoring of the

effectiveness of mitigation measures will be designed on case-by-case basis depending on the location and nature of the mitigation measure.

In addition to Poudre River and tributary sites, it is anticipated (although not required by this plan) that water quality data will continue to be collected as part of Northern Water's current baseline water quality program in existing C-BT facilities, such as Carter Lake and Horsetooth Reservoir. Water quality monitoring in new NISP facilities, such as Glade Reservoir, Galeton Reservoir, and NISP releases to the Poudre River, would be incorporated into this long-term program. All water quality data would be stored in Northern Water's existing water quality databases. Dissemination and reporting would be based on requirements in environmental permits issued for NISP.

5.3.1.6. Mercury Bioaccumulation Mitigation (WQ-07)

The Supplemental Draft EIS (Corps 2015) concluded that operations of Glade Reservoir are likely to result in elevated levels of mercury in fish tissue similar to existing Front Range foothills reservoir such as Carter Lake and Horsetooth Reservoir, both of which are listed as impaired for mercury on the State 303(d) listing (Hydros 2014b; Colorado Water Quality Control Commission 2016). The problem of mercury in fish tissue is widespread in Colorado and has typically been addressed through monitoring and posting of Fish Consumption Advisory signage, as appropriate. This type of approach, in addition to supporting management actions that may be undertaken by CPW to manage mercury bioaccumulation, will be undertaken at Glade Reservoir to avoid, minimize, and compensate for these effects.

Northern Water will work with CPW to support a program to monitor mercury in fish tissue in Glade Reservoir and the Glade Reservoir Forebay. Field work to collect the fish will be performed as directed by CPW, and the goal will be to obtain adequate representation of the important species as per the CPW's protocol. The sampling effort for Glade Reservoir will begin in the first field season after the reservoir has filled and will continue annually until five years after NISP becomes fully operational. In the event that there is impairment for mercury, the obligation for monitoring will be extended for an additional five years or until mercury levels fall below the level of concern for three consecutive years.

CPW will attempt to manage bioaccumulation of mercury in fish tissue using a variety of techniques that research has shown may be effective. These techniques include, but are not limited to, using smelt as a key forage base for larger fish, elimination or minimization of crayfish as a forage base for larger fish, and management of possession limits.

If the fish tissue analyses show that a Fish Consumption Advisory is required, Northern Water will work with the Technical Advisory Team of the Colorado Fish Consumption Advisory Committee to provide public education including the posting of signs with associated consumption advisories. The Technical Advisory Team will determine design of the signs and the information to be included. Northern Water will incur the costs of the signs and be responsible for proper posting of such signs.

5.3.2. Terrestrial Wildlife Mitigation

Terrestrial wildlife would be affected by the construction of NISP facilities. Temporary disturbances would occur during the construction process, while permanent effects would result primarily from the inundation of land by reservoirs and by the U.S. Highway 287 realignment. Temporary disturbances would be mitigated by best management practices during and following construction, and are described in the Final EIS.

Construction of NISP facilities would result in the permanent loss of overall habitat for elk, mule deer, white-tailed deer, and pronghorn, and winter habitat for mule deer. Bird species would be affected by the loss of nesting, migratory, winter, and year-round habitat, and the potential destruction of nests. Agricultural land displaced by NISP facilities supports waterfowl, songbirds, raptors, reptiles, amphibians, and other wildlife. Loss of grassland and shrub and cliff habitat could also affect reptiles, amphibians, and other small mammal species.

This section describes mitigation for permanent impacts on terrestrial wildlife.

5.3.2.1. U.S. Highway 287 Realignment Design for Wildlife Protection (TW-01)

Construction of the proposed Glade Reservoir and the U.S. Highway 287 realignment would result in the loss of overall habitat for elk, mule deer, white-tailed deer, and pronghorn, and winter habitat for mule deer. Although eastward movement of deer and elk in this area is currently limited by U.S. Highway 287 and the Holcim Mine, inundation of this portion of U.S. Highway 287 would likely disrupt traditional east-west movement of deer and elk across the highway, displacing movement primarily to the north of the proposed Glade Reservoir. Such a shift in current big game movement patterns could result in more frequent crossings in more concentrated areas, exacerbating the risks of deer or elk collisions with vehicles.

To facilitate east-west movement of deer and elk across U.S. Highway 287 and compensate for these effects, Northern Water will work with CPW and CDOT to identify locations within the U.S. Highway 287 realignment design that can be used as a stand-alone wildlife underpass (which would likely have a secondary purpose for drainage conveyance) or for dual purposes of both drainage conveyance and a wildlife underpass. Northern Water will construct one stand-alone wildlife underpass as part of the U.S. Highway 287 realignment, and incorporate dual purpose facilities (such as at drainage facilities) where these facilities can be reasonably and economically incorporated into the design.

Studies have shown that careful consideration should be given to the location of underpasses; underpasses can effectively be used underneath a two-lane highway; continuous fencing should be used to funnel wildlife movement to the underpasses; snow and ice buildup can affect the effectiveness of the underpasses; wildlife should not feel confined while in use; and monitoring is valuable to evaluate the use of underpasses (Figure 27; Western EcoSystems 2011, Capson 2014). Although wildlife overpasses have also been constructed and can be effective, the approach grades east and west of the hogback provide a more effective location for underpass facilities as they are along expected wildlife movement routes and will be more economical to construct.

Figure 27. Movement of Mule Deer, Moose, Elk and Pronghorn Through a Wildlife Underpass in Nugget Canyon on U.S. Highway 30 west of Kemmerer, WY (Western EcoSystems 2011)

At this time, it is likely that the structure used to span Owl Creek just north of Glade Reservoir will be designed as the stand-alone wildlife underpass (Figure 28). The underpass would be designed in coordination with the CDOT and CPW, and would provide sufficient width and height to facilitate movements by big game underneath the highway. During design of the U.S. Highway 287 realignment, Northern Water will investigate other opportunities for economical dual-purpose facilities to accommodate wildlife movement.

In conjunction with the actual wildlife underpass itself, Northern Water will install exclusion fencing at the entrance and exits to the underpasses and culverts to guide wildlife movement towards these locations. Northern Water will also install trail monitoring cameras at key sites around Glade Reservoir and along the U.S. Highway 287 realignment corridor to collect data and monitor general big-game movement patterns.

An adaptive management program for wildlife movement on the U.S. Highway 287 realignment has been developed and is described in section 5.3.2.2.

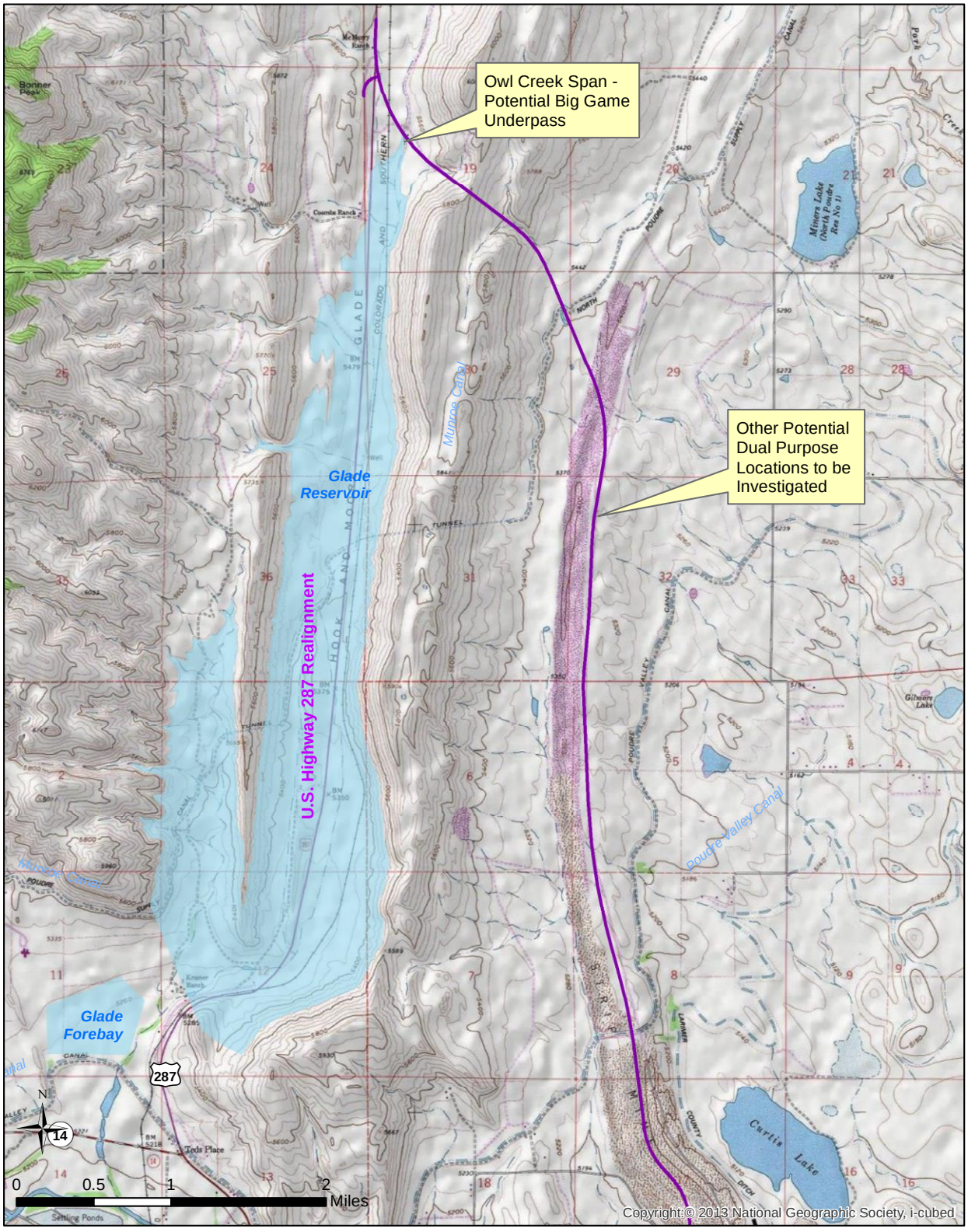


Figure 28. Potential Location and Alternate Locations for Wildlife Underpass

5.3.2.2. U.S. Highway 287 Realignment Big Game Movement Adaptive Management Program (TW-02)

Northern Water has proposed mitigation related to the big game habitat and big game roadkill along the U.S. Highway 287 corridor (Sections 5.3.2.1 and 5.3.2.2). However, because it is not known for certainty how both Glade Reservoir and the U.S. Highway 287 realignment will affect big game movement in the area, an adaptive management program will be initiated to implement the currently proposed compensatory mitigation actions, monitor the effects of those actions on wildlife movement and roadkill, and modify the actions as necessary to facilitate movement.

The following describes components of the U.S. Highway 287 Realignment Big Game Movement Adaptive Management Program using the framework and terminology described in section 2.8.

- **Adaptive Management Parties:** Northern Water, CPW, CDOT.
- **Scope of Adaptive Management:** U.S. Highway 287 realignment corridor; resources include big-game, primarily focused on elk and mule deer.
- **Management Objectives:** Maintain and improve historical big-game movement patterns around Glade Reservoir and protect the safety of U.S. Highway 287 traffic.
- **Key Desired Outcomes:** Reduce or eliminate big game-vehicle collisions and road-kill along the U.S. Highway 287 realignment corridor to below 10 roadkills per year.
- **Performance Indicators:** Number of reported big-game road-kill along the U.S. Highway 287 realignment corridor. Big-game in the area of Glade Reservoir primarily consist of elk and mule deer, but could also occasionally include pronghorn.
- **Management Strategies and Actions:** Initial strategies and actions considered are the construction of big-game underpasses as they can be reasonably incorporated into the U.S. Highway 287 realignment design, necessary fencing to funnel big-game towards these features, and installation of trail monitoring cameras. Commitments are described in Section 5.3.2.1.
- **Implementation Strategies and Actions:** Strategies will be designed and constructed concurrently with the design and construction of the U.S. Highway 287 realignment.
- **Evaluation of Management Effectiveness (Monitoring):** Northern Water will monitor road kills and the wildlife underpass starting when the U.S. Highway 287 realignment opens for travel through the first 10 years after Glade Reservoir startup using Colorado Department of Transportation and Colorado State Patrol data. Trail monitoring cameras will also be consulted to identify general movement patterns around the reservoir and U.S. Highway 287 realignment corridor.
- **Reporting of Findings and Recommendations of Evaluation:** Northern Water will annually provide a report to the parties. Using a 2-year average of road kill data, additional evaluations will occur under the following circumstances:
    - 10 roadkills per year: The parties agree to review data and meet to discuss options.

  - 15 roadkills per year: The parties agree to discuss additional adaptive management alternatives.

- **Adjustment of Management Actions and Arrangements**: Potential alternatives to reduce road kill and increase big game movement potential may include installing additional big game fencing to funnel movement to existing underpasses, installing other types of devices to direct big game movement, or retrofitting one or more drainage structures along the U.S. Highway 287 corridor with big game underpass capabilities.

- **Review of Overall Program Management**: At the conclusion of the initial 10-year monitoring program, if roadkill data shows roadkill at less than the key desired outcomes, or if the parties conclude that no additional actions are necessary, then this adaptive management program will be concluded. If additional adaptive management alternatives are necessary and implemented, then the adaptive management program will continue until the key desired outcomes are met, or until the parties conclude that the adaptive management program is no longer required.

- **NISP Budget:** In addition to the other commitments made in this FWMEP, NISP commits to spend the following to establish, develop and implement the adaptive management program:
  - $10,000 per year for the first 10 years of NISP operations to fund data collection and reporting. This does not include Northern Water staff time for coordination of the program.
  - $200,000 set aside in an escrow account to implement adaptive management actions.

5.3.2.3. Wildlife Habitat – Glade Reservoir Conservation Mitigation (TW-06)

Glade Reservoir and associated facilities will permanently affect approximately 1,880 acres of overall range for both elk and mule deer. Perhaps more importantly, Glade Reservoir would permanently displace approximately 124 acres of elk winter concentration area and 70 acres of mule deer winter concentration area. Glade Reservoir is at the eastern edge of a resident elk population area where individual elk can be found in any part of the area at any time of the year.

To compensate for the loss of overall and winter concentration area big game and other wildlife habitat at Glade Reservoir and associated facilities, Northern Water would conserve land it already owns, as well as land that will be purchased for reservoir inundation and temporary construction purposes, as a wildlife habitat conservation area (Figure 29). The total compensatory mitigation area amounts to approximately 1,080 acres, appraised at approximately $2.9 million.

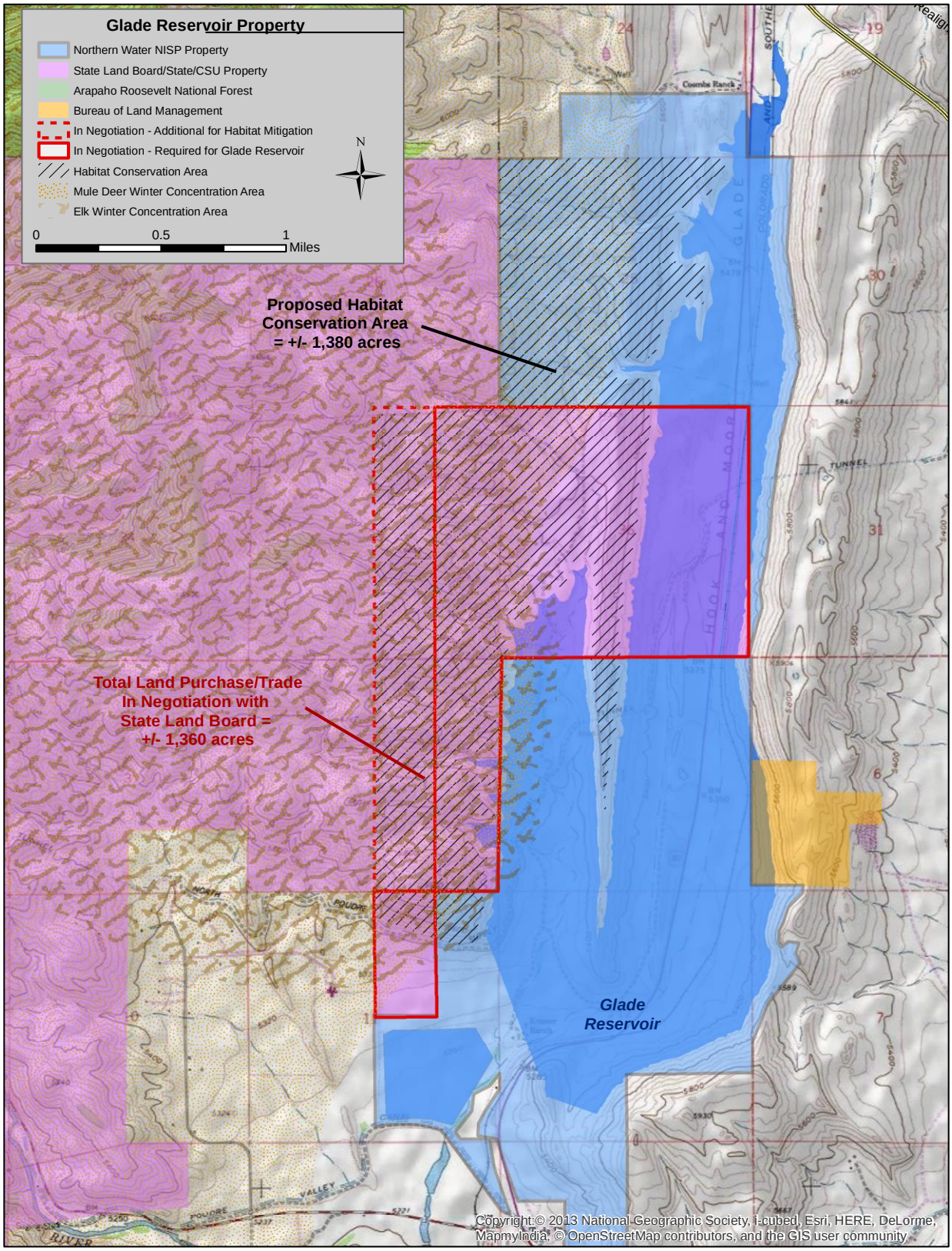


Figure 29. Habitat Conservation Area

As an enhancement to these lands, Northern Water commits to purchasing or otherwise conserving approximately 300 additional acres immediately west of these lands for these same purposes (see section 6.1.2.1). This would bring the total amount of habitat conservation area west of the reservoir to approximately 1,380 acres. The estimated total appraised value of land included in the habitat conservation area is approximately $3.7 million. Northern Water will permanently protect this land for wildlife habitat through legal instrument, and is currently discussing options with CPW, including conservation easements and deed restrictions. As described in 6.1.2.1, Northern Water will work with CPW and other agencies to permanently protect additional lands west of Glade Reservoir.

In order to ensure that this land provides suitable big game and other wildlife habitat mitigation, trail access to these parcels will be limited as described in section 6.1.3.2.

5.3.3. Special Status Species Mitigation

Northern Water has developed the following proposed mitigation activities associated with Special Status Species (for all those other than Preble's, which is addressed as part of the federal Section 7 consultation process as described in Section 4.3). Because both wetlands and Preble's habitat mitigation are covered under federal statutes with specific jurisdictional requirements, these mitigation activities are not further covered under this State FWMEP. Additional details on wetlands and Preble's habitat mitigation are contained in the Conceptual Mitigation Plan, and will be further refined as part of the Final EIS and Record of Decision.

5.3.3.1. Bald Eagle (SS-02)

The Draft EIS reported that an active bald eagle nest mapped by CPW was located on the Poudre River on private land south of the Glade Reservoir study area across from the City of Greeley's water filtration plant (Corps 2008). The Supplemental Draft EIS reports that the original tree containing this nest fell down in 2013, and a new replacement nest was constructed by eagles approximately ¾ of a mile west of the original location, southwest of the proposed Glade Reservoir site in 2015 (Corps 2015). In addition, bald eagle winter roost sites occur along the Poudre River south of the Glade Reservoir study area. Bald eagles from the nest or roost sites may occasionally forage in the Glade Reservoir study area. To avoid and minimize effects on bald eagles, Northern Water will follow requirements of the Bald and Golden Eagle Protection Act (Eagle Act) and the Migratory Bird Treaty Act (MBTA) during and following construction activities.

Bald eagles were removed from the endangered species list in August 2007 because their populations recovered sufficiently. However, both bald eagles and golden eagles are protected by the Eagle Act and MBTA. The Service has developed National Bald Eagle Management Guidelines to advise when and under what circumstances the protective provisions of the Eagle Act may apply to activities (Service 2007b). A variety of human activities can potentially interfere with bald eagles, affecting their ability to forage, nest, roost, breed, or raise young. Bald eagles are particularly sensitive to human activities during the breeding season. The Guidelines are intended to help people minimize such impacts to bald eagles, particularly where they may constitute a "disturbance" within the meaning of the Eagle Act (Table 10).

CPW has more extensive buffer zones and seasonal restrictions for bald eagles than the federal requirements shown in Table 10, as well as buffer zones for other raptors (CPW 2008). The buffer zones for Bald Eagles include:

Nest Site:
No surface occupancy (beyond that which historically occurred in the area; see 'Definitions' below) within ¼ mile radius of active nests (see 'Definitions' below). Seasonal restriction to human encroachment (see 'Definitions' below) within ½ mile radius of active nests from October 15 through July 31. This closure is more extensive than the National Bald Eagle Management Guidelines (USFWS 2007) due to the generally open habitat used by Colorado's nesting bald eagles.

Winter Night Roost:
No human encroachment from November 15 through March 15 within ¼ mile radius of an active winter night roost (see 'Definitions' below) if there is no direct line of sight between the roost and the encroachment activities. No human encroachment from November 15 through March 15 within ½ mile radius of an active winter night roost if there is a direct line of sight between the roost and the encroachment activities. If periodic visits (such as oil well maintenance work) are required within the buffer zone after development, activity should be restricted to the period between 1000 and 1400 hours from November 15 to March 15.

Hunting Perch:
Diurnal hunting perches associated with important foraging areas should also be protected from human encroachment. Preferred perches may be at varying distances from human encroachment and buffer areas will vary. Consult the Colorado Division of Wildlife for recommendations for specific hunting perches.

Northern Water would perform future surveys for bald eagle nests and roosts. Because bald eagles may select new nest or roost sites, potentially impacted areas would be reevaluated prior to construction for the presence of bald eagle nest and roost sites within the CPW recommended disturbance buffers in effect at that time.

Table 10. Summary of National Bald Eagle Management Guidelines (Activity Specific) (FHWA 2017)

Permitted Activities	Specific Considerations	Nest Site Visible	Nest Site Not Visible	Timing of Restriction
1. Buildings (½ acre or less) 2. Linear Construction (roads, utilities, trails) 3. Alteration of Wetlands 4. Water impoundment	No existing Similar activity within 1 mile	660 ft buffers recommended	330 ft or as close as existing tolerated activity of similar scope between 330 and 660 ft*	*clearing external construction and landscaping outside breeding season
	Existing similar activity closer than 1 mile	660 ft or as close as existing tolerated activity of similar scope	330 ft or as close as existing tolerated activity of similar scope within 660 ft*	* clearing external construction and landscaping outside breeding season
1. Construction of 3+story building 2. Project footprint greater than ½ acre 3. Marina (6 or more boats)	No existing similar activity within 1 mile	660 ft buffers recommended	660 ft	
	Existing similar activity within 1 mile	660 ft or as close as existing tolerated activity of similar scope	330 ft or as close as existing tolerated activity of similar scope within 660 ft*	* clearing external construction and landscaping outside breeding season
Motorized Water Craft		330ft	330 ft	During breeding season avoid concentrations and attempt to minimize trips except where eagles have demonstrated tolerance to such activities
Non-motorized recreation use (hiking, camping, trail use)		330ft (or far enough not to be audible)	(far enough not to be audible)	Breeding particularly where eagles are unaccustomed to such activities
Helicopter or Aircraft	Except for biologist trained in survey techniques	1000 ft	1000 ft	During breeding season except where eagles have demonstrated tolerance to such activities
Blasting or other loud intermittent noises		½ mile	½ mile	Away from active nest unless greater tolerance to the activity (similar) has been demonstrated by eagles in that nesting area

Note: This table was developed by the Federal Highway Administration from information in the National Bald Eagle Management Guidelines (FHWA 2017).

As part of implementing and enforcing the Eagle Act and MBTA, the Service monitors the health of bald and golden eagle populations. In April 2016, the Service issued a report titled "Bald and Golden Eagles: Status, trends, and estimation of sustainable take rates in the United States," a compilation of the most current research on the population status and trends of bald and golden eagles (Service 2016). The report estimates population sizes, productivity, and survival rates; cumulative effects to local area populations; and effects of unauthorized take of golden eagles. This report serves as the biological basis for the Service's regulatory management framework.

On December 14, 2016, the Service announced a final rule revising the regulations for permits for incidental take of eagles and take of eagle nests. The Service analyzed various alternative management options and rule revisions, including the final rule revisions, in a programmatic environmental impact statement. Among other revisions, the final rule addresses criteria for eagle take permit issuance, compensatory mitigation requirements, permit duration, and data standards for submitting permit applications. If avoidance and minimization techniques are unsuccessful and a taking is necessary, Northern Water will follow these permit and mitigation requirements for such taking, or other applicable permit and mitigation requirements at the time of the taking.

5.3.3.2. Colorado Butterfly Plant (SS-03)

The Service concurred that surveys for Colorado butterfly plant would not be required for portions of the Glade Reservoir; U.S. Highway 287 realignment; SPWCP forebay; and diversion study areas where no suitable habitat was found. The Service has requested that suitable Colorado butterfly plant habitat in the Glade Reservoir and U.S. Highway 287 realignment study areas be resurveyed for two years during the Fort Collins blooming period. In addition, although no known populations of Colorado butterfly plant occur in any of the study areas, prior to construction, Colorado butterfly plant habitat assessments and/or final surveys will be conducted for potential habitat in the Poudre Valley Canal, SPWCP pipeline, and Glade to Horsetooth pipeline study areas. If Colorado butterfly plant is found within the construction footprint, specific conservation measures would be developed in coordination with the Service. Conservation measures could include avoiding impacts by establishing a "no-work" zone or, in the event of unavoidable impacts, protecting or enhancing adjacent or off-site habitat. Other mitigation methods include reestablishing populations in areas with suitable habitat.

5.3.3.3. Ute Ladies Tresses Orchid (SS-04)

The Service concurred that surveys for Ute ladies tresses orchid would not be required for portions of the Glade Reservoir; U.S. Highway 287 realignment; Glade to Horsetooth, Carter, and Cactus Hill pipelines; SPWCP forebay; and diversion study areas where no suitable habitat was found. The Service has requested that suitable Ute ladies tresses orchid habitat in the Glade Reservoir and U.S. Highway 287 realignment study areas be resurveyed for two years during the Fort Collins blooming period. In addition, although no known populations of Ute ladies tresses orchid occur in any of the study areas, prior to construction, Ute ladies tresses orchid habitat assessments and/or final surveys will be conducted for potential habitat in the Poudre Valley Canal, SPWCP pipeline, and Glade to Horsetooth pipeline study areas. If Ute ladies tresses orchid is found within the construction footprint, specific

conservation measures would be developed in coordination with the Service. Conservation measures could include avoiding impacts by establishing a "no-work" zone or, in the event of unavoidable impacts, protecting or enhancing adjacent or off-site habitat.

5.3.3.4. Platte River Target Species (SS-05)

The Service has determined that historical and new depletions to the South Platte River Basin adversely affect federally listed species and their designated critical habitat along the Platte River in central Nebraska. These species are the American burying beetle, least tern, pallid sturgeon, piping plover, Western prairie fringed orchid, and whooping crane, as well as the designated critical habitat for whooping crane and piping plover.

To avoid and compensate for these effects, all NISP Participants will be members in good standing of the South Platte Water Related Activities Program, Inc. The operation of Colorado's Future Depletions Plan under the Platte River Recovery Implementation Program would offset new depletions to the South Platte River Basin associated with NISP and its effects to the target species, whooping crane critical habitat, and other listed species in the central and lower Platte River addressed in the Platte River Programmatic Biological Opinion.

5.3.3.5. Black-footed Ferret (SS-06)

The Service in coordination with Colorado Parks and Wildlife, block-cleared various areas of Colorado (including all of Weld County and all of Larimer County in proximity to NISP facilities), after determining that these areas no longer contain any wild, free-ranging black-footed ferrets. Block clearance means that activities within these areas that result in the removal of black-tailed prairie dogs or their habitat will no longer be required to meet the Service survey guidelines for black-footed ferrets, or undergo consultation under section 7 of the ESA (Service 2009).

In recent years, CPW in conjunction with other local, state and federal agencies, has reintroduced black footed ferrets into various habitats throughout the state (CPW 2015). None of the reintroduction habitats are close to NISP facilities; the closest reintroduction habitat is the Soapstone Prairie in far northern Larimer County. Although it is unlikely that these populations would migrate into NISP construction areas, it is possible that migration from the reintroduction habitats could occur. Thus, to avoid and minimize any potential effects to black-footed ferrets, Northern Water will consult with CPW immediately prior to NISP construction to determine whether prairie dog colonies potentially impacted during NISP construction may contain black footed ferrets. If requested by CPW, Northern Water will survey prairie dog colonies for black-footed ferrets according to the protocol in effect at the time. Northern Water will follow applicable mitigation requirements if black-footed ferrets are found.

5.3.3.6. Black-tailed Prairie Dog (SS-07)

Prairie dogs potentially impacted by construction of reservoir, pipelines, or other NISP facilities will be removed prior to construction. Two options typically exist for prairie dog removal: relocation and extermination. Controlling prairie dogs by removal and relocation requires a permit from the CPW.

Prairie dogs cannot be moved to another county without the approval of the board of county commissioners of that county.

Options for removing prairie dogs are summarized in order of preference, as follows:

- Relocation to a suitable on-site location.
- Relocation to an off-site location. This option may be suitable if greater than 25 animals are to be removed and a suitable release site has been identified and approved by the CPW.
- Passive relocation, a nonlethal land management activity designed to encourage prairie dogs to relocate to areas outside of the disturbance footprint. This option is most effective when only a small area of a prairie dog colony would be impacted, such as for trail construction. It should only be considered if sufficient suitable habitat is found adjacent to the area to be disturbed. This option should not be considered if it could result in the colonization of lands not in the project area, or if the impacted area is greater than a few acres.
- Live capture and donation to the Service's black-footed ferret recovery program or an approved raptor rehabilitation program as a food source. The services of a professional or qualified volunteer organization should be retained to capture and transport the animals to the designated location.
- Lethal control. Prairie dogs are euthanized in their burrows with the use of a chemical fumigant or asphyxiant. This option should be used only as a last resort. Extermination should be conducted by a professional prairie dog exterminator.

For the U.S. Highway 287 realignment, in areas where avoidance of prairie dog colonies is not possible, CDOT guidelines for mitigating impacts would be followed, which include the identification of suitable prairie dog relocation sites, as well as coordination with CPW on approved removal methods (CDOT 2005). To facilitate determining adequate mitigation measures, an assessment of habitat quality and number of individual prairie dogs would be conducted for prairie dog colonies that would be directly affected by NISP construction. Prairie dogs would only be removed in areas where they might be directly affected, leaving them in the remainder of the construction ROW. In addition, some areas temporarily disturbed during construction would likely be recolonized by prairie dogs.

5.3.3.7. Swift Fox (SS-08)

Preconstruction surveys for swift fox den sites within appropriate habitat at dam sites and along pipeline corridors and proposed reservoir sites would be conducted based on protocols approved by CPW. If active swift fox dens are found, CPW would be contacted to determine if conservation measures are necessary and can be developed and implemented. Construction activities would not commence within 250 yards of active dens until after appropriate conservation measures have been developed and implemented.

5.3.3.8. Burrowing Owl (SS-09)

Prairie dog colonies would be surveyed for burrowing owls prior to any work that would disturb them between March 15 and October 31. Where burrowing owls are present, prairie dog removal would be

scheduled to occur from November 1 to March 14. If burrowing owls are found within the construction footprint, nests would be left undisturbed during construction. If burrowing owls are found during preconstruction surveys, additional avoidance mitigation measures would be developed in coordination with the CPW.

5.3.3.9. Other Riparian Species (SS-10)

Mitigation measures described in this document and the Conceptual Mitigation Plan for Preble's meadow jumping mouse, wetlands, riparian areas, and aquatic habitat, such as habitat reconstruction and/or replacement, would also benefit the common gartersnake, northern leopard frog, smokey-eyed brown butterfly, twospotted skipper, and American currant. Implementation of water quality mitigation would also reduce potential impacts to these species.

5.3.3.10. Bell's Twinpod (SS-11)

Bell's twinpod would be impacted by the U.S. Highway 287 realignment. Recommended mitigation measures for Bell's twinpod include avoiding densely populated areas and large patches (density categories 3 and 4) as much as possible. For areas with Bell's twinpod that are unavoidably impacted, populations would be reestablished as much as possible after construction. The following revegetation measures would be used to reestablish this species in areas disturbed by construction:

- Establish Bell's twinpod restoration areas in shale areas to be disturbed by construction.
- Prior to construction, harvest Bell's twinpod seed during the appropriate season (mid to late summer).
- During construction, do not grade Bell's twinpod restoration areas to a uniform 3:1 or 4:1 slope. Leave shelves of shale and uneven slopes similar to existing undisturbed outcrops.
- After construction, do not place topsoil on Bell's twinpod restoration areas; leave the shale substrate on the surface.
- Spread the harvested Bell's twinpod seed either sparsely mixed with other associated native species or by itself. Do not reseed these areas with the grass mix used on other revegetated slopes because Bell's twinpod only grows in sparsely vegetated areas.

5.3.3.11. Townsend's Big-Eared Bat (SS-12)

The inundation by Glade Reservoir may approach a known roost site for the Townsend's big-eared bat (Corynorhinus townsendii), a State Species of Special Concern. The bat is quite sensitive to changes in temperature and humidity within the hibernaculum and may arouse to move to a more favorable location. Disturbance during hibernation can cause accidental arousal and depletion of energy stores, preventing arousal in spring. Populations, especially in the nursery and hibernaculum, are highly susceptible to disturbance.

Further ground surveys for additional roost sites will be conducted across the area to be inundated. Northern Water will protect the entrance of the known cave and surrounding area, as well as any other

roost sites found, during construction. Adaptive management approaches for protecting the cave from human disturbance will be employed if needed. Any closure structure will not impede bat use.

5.3.4. Recreation and Public Access Mitigation

Recreation and public access mitigation activities describe those recreational commitments other than flow-related commitments previously described in section 5.2.2. These commitments primarily apply to recreation in and around Glade Reservoir. The overall goal of terrestrial wildlife, recreation, and public access strategies at Glade Reservoir is to provide habitat for affected fish and terrestrial species, while allowing the public to have reasonable and financially sustainable access for recreation throughout the area. Sections are generally broken down into commitments for the fishery at Glade Reservoir, Glade Reservoir recreation in general, and access and recreation surrounding Glade Reservoir. Commitments are also described for mitigation at the existing Mitani-Tokuyasu State Wildlife Area east of Greeley.

5.3.4.1. Glade Reservoir and State Land Hunting Access (RC-02)

Public big game, small game, and waterfowl hunting provide recreational opportunities that are in demand, but are becoming more limited on Colorado's Front Range as large agricultural properties are subdivided for suburban development or become open space. In addition, hunting is the primary tool to manage deer, elk, bear, and lion populations to sustainable levels prescribed in CPW's herd management plans. A portion of the land that will be inundated by Glade Reservoir (approximately 1,635 acres) and lands immediately to the west are currently open to hunting as a State Trust Land in a lease agreement between CPW and the State Land Board. CPW desires that the current level of hunting access and opportunity be maintained on lands that are currently in the Poudre River State Trust Land.

Currently, in addition to access points along Highway 14 in the Poudre Canyon, the Poudre River State Trust Land can be accessed via a parking area along the west side of U.S. Highway 287 approximately three miles north of Teds Place. This parking area will be inundated by the reservoir. Northern Water will relocate and reconstruct this parking area and walk-in access point at the far northwest side of the Glade Reservoir high water mark. The parking area will be accessed off U.S. Highway 287, likely along an existing ranch access road. The hunting access road and parking area will be separate and distinct from roads, access gates, fee booths, and other infrastructure associated with recreation management at Glade Reservoir (see section 6.1.3.2).

The hunting access road and parking area, along with the habitat conservation area on the west side of the reservoir (see section 5.3.2.2), will be open to hunting from the beginning of the archery deer season (typically beginning in late August) through the close of spring turkey season (in May). This includes big game, small game, turkey, and waterfowl hunting seasons.

5.3.4.2. Mitani-Tokuyasu State Wildlife Area and Confluence Area (RC-04, RC-05)

The SPWCP diversion, forebay, and pump station will occupy much of the land that is currently leased by CPW for the Mitani-Tokuyasu State Wildlife Area (Figure 30). This wildlife area generally offers walk-in access for waterfowl, dove, and squirrel hunting, and recreational wildlife viewing primarily immediately

adjacent to the South Platte and Poudre confluence. To mitigate impacts to the wildlife area, the SPWCP pump station and forebay would be designed and operated as to continue allowing public access to the South Platte River. Additionally, NISP would provide substitute facilities comparable to any existing facilities that would be lost at the State Wildlife Area due to construction and operation of the SPWCP. At this time, the only facilities known to need replacement are public parking and a portion of the access road.

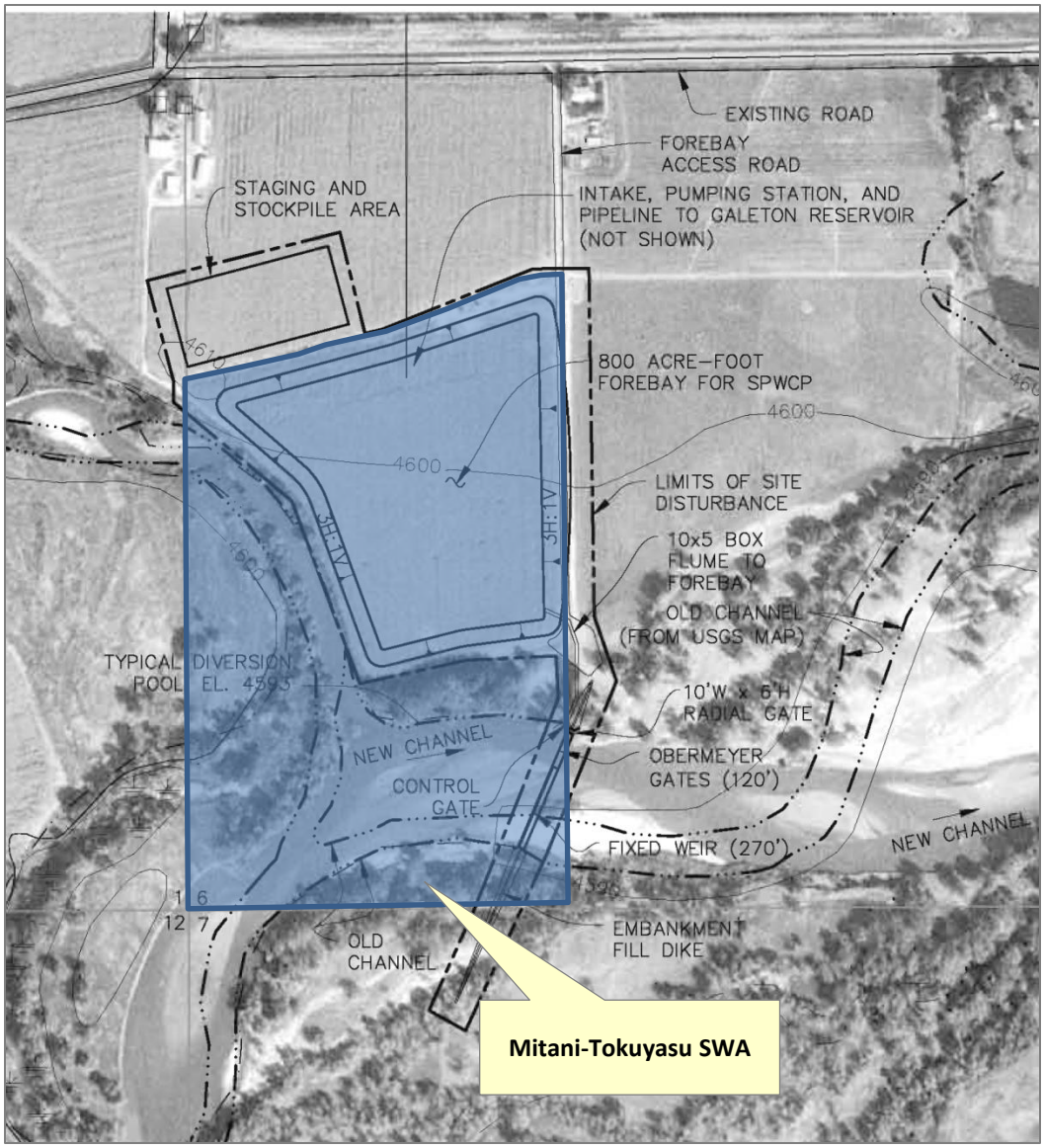


Figure 30. SPWCP Diversion Facilities (GEI 2006) and Mitani-Tokuyasu SWA

Northern Water and CPW have discussed the possibility of jointly pursuing purchase of additional property in the area of the South Platte and the Poudre confluence to further mitigate effects at the Mitani-Tokuyasu State Wildlife Area, as well as general impacts to wildlife habitat at Galeton Reservoir. Northern Water will provide up to $500,000 to assist in purchasing this land. Additionally, Northern Water will provide CPW assistance in securing this land, including pursuing additional funding

opportunities and giving consideration to owning this additional land in fee-title for purposes of mitigation, wildlife habitat, and public recreation.

5.3.4.3. Glade Reservoir Poudre River Recreator Parking (RC-06)

Discussions with and comments by commercial outfitters on the Poudre River indicate a desire to have large scale parking available near the mouth of the Poudre Canyon to provide a meeting area for large groups of people, primarily for those participating in non-commercial rafting trips and other recreational activities, to carpool to those activities and relieve traffic congestion in the canyon.

Northern Water owns land in the area immediately north of Ted's Place and south of the Glade Reservoir Dam that could be used for this purpose. Although the exact layout of appurtenant facilities in the Glade Reservoir complex, including access roads and parking areas, has not yet been finalized, Northern Water would commit to constructing a parking area for this purpose. The parking area would be located within ½ mile of Ted's place to increase drive-by traffic at Ted's Place businesses, with daily parking allowed at a reduced rate from the fees being charged by the managing agency for recreational access to Glade Reservoir and the forebay. The parking area would have a capacity of 100-200 cars.

5.3.4.4. Glade Reservoir Visitor's Center (RC-07)

The Glade Reservoir Complex will serve as a gateway to natural resources and recreation in Northern Colorado and the Poudre Canyon. Through the various permitting and mitigation requirements, several agencies have expressed an interest in having a visitor's center located at the Glade Reservoir Complex. Additional agencies that have recreational facilities in the area and could benefit from a visitor's center at Glade Reservoir could include the U.S. Forest Service, City of Fort Collins, Poudre Heritage Alliance, and others.

Through the Conceptual Mitigation Plan, Northern Water has committed to constructing a visitor's center at the Glade Reservoir complex. The visitor's center would include displays and information on NISP operations, regional geology, municipal and agricultural conservation, preserving irrigated lands, and NISP environmental commitments. Northern Water will commit up to $940,000 for construction of the visitor's center to meet these environmental commitments, which could be used to construct a 4,000 to 6,000 square foot facility, without staffing. Ideally, the staffing and use of the visitor's center will be tied to recreational uses at Glade Reservoir. Thus, Northern Water will coordinate and pursue funding from other partner agencies and outside funding sources (which could include but are not limited to Great Outdoors Colorado and other Colorado Lottery funded programs) to jointly fund construction of the facility and to provide full or part time staffing for this facility. The exact location and layout of this facility will be determined during final design of the facility.

5.4. Mitigation Costs and Schedule

Estimated costs and schedule for the Mitigation Plan portion of this FWMEP are shown in Table 11. Capitalized costs represent the sum of the capital cost for implementation, plus any annual operations and maintenance costs capitalized over the life of the commitment, or 50 years for those commitments

that are perpetual. As shown in the cost note column, cost types for the mitigation plan can be divided into the following categories:

- Cost type "a" – These costs represent a financially-based mitigation commitment. In general, Northern Water is either providing funding to or teaming with another group or organization to perform the mitigation commitment. The cost amount shown is Northern Water's maximum financial commitment for this mitigation activity.
- Cost type "b" – These costs represent an outcome-based mitigation commitment. Northern Water is committing to performing the activity as described, and the cost represents the estimated cost for this performance. In general, these are construction activities. For cost type "b" activities, Northern Water reserves the right to seek additional funding partners or sources for the activity.
- Cost type "c" – These costs have not been quantified for a variety of reasons. Fox example, these commitments may be primarily operational in nature without a clearly defined cost, or may be part of standard construction activities that are not easily separable.

As previously presented (Table 1), total estimated costs to construct NISP are approximately $857 million. This includes approximately $35 million for mitigation and enhancement costs that are not already included in the construction cost. Several of the larger mitigation commitments in Table 11 are included in the construction cost, including conveyance refinement costs (FW-04, $24.52 million), the U.S. Highway 287 big game underpass and fencing (TW-01, $0.5 million), Glade Reservoir multi-level outlet tower (WQ-01, $1.0 million), and Glade Reservoir release structure aeration (WQ-02, $0.2 million). Additionally, Glade Reservoir conservation mitigation (TW-06, $2.92 million) is already included in the property/ROW land acquisition cost. The total mitigation cost in Table 1 also includes costs for mitigation commitments that are not included in this FWMEP. These mitigation activities were previously described in the Conceptual Mitigation Plan and in section 2.7, and may be subject to change as the other various permitting processes are complete.

The mitigation schedule (Table 11) will be contingent on the issuance of permits and licenses, construction timetables, project completion, and the ability of the Northern Water to fill the reservoir. The schedule provided in the table provides an approximate timetable based on these activities.

Table 11. NISP Mitigation Plan Schedule and Cost Summary

Measure No.	Mitigation Measure	Capitalized Cost [1]	Cost Note [2]	Schedule
Aquatic Life and Stream Morphology				
AG-01	Stream Channel and Habitat Improvement Plan	$1,000,000	a	Prior to startup
AG-02	Stream Channel and Habitat Improvements	$1,800,000	b	
AG-04	Poudre Valley Canal Diversion Structure Reconstruction	$300,000	b	
AG-07	SPWCP Diversion Construction	$300,000	b	Construction feature
Streamflow Commitments				
FW-01	Avoid Munroe Canal Diversions	[3]	c	Perpetual operational commitment
FW-02	Curtail Diversions for Non-Consumptive Water Rights	[3]	c	
FW-03	Summer and Winter Diversion Curtailments	[3]	c	
FW-04	Conveyance Refinement - Poudre River Intake	$24,520,000	b	
FW-05	Poudre River Flow Augmentation Program	[3]	c	
FW-08	Peak Flow Mitigation	[3]	c	
FW-09	Ramp NISP Diversions at PVC	[3]	c	
Noxious Weeds				
NW-01	Noxious and Invasive Weed Control Plan	[3]	c	Prior to construction
Recreation				
RC-02	Glade Reservoir and State Land Hunting Access	[3]	c	Prior to construction
RC-04	Mitani-Tokuyasu State Wildlife Area	$50,000	b	Construction feature
RC-05	Land Acquisition in Confluence Area	$500,000	a	Prior to construction
RC-06	Glade Reservoir Poudre River Recreator Parking	$40,000	b	Construction feature
RC-07	Glade Reservoir Visitor's Center	$940,000	a	
Riparian Vegetation				
RV-01	Riparian Vegetation - Cottonwood Regeneration Areas	$130,000	b	Prior to startup
RV-02	Riparian Vegetation - Channel Improvements	$280,000	b	
Special Status Species				
SS-02	Bald Eagle	[3]	c	Prior to and during construction
SS-03	Colorado Butterfly Plant	[3]	c	
SS-04	Ute Ladies'-Tresses Orchid	[3]	c	
SS-05	Platte River Target Species	$1,550,000	b	
SS-06	Black-Footed Ferret	[3]	c	
SS-07	Black-Tailed Prairie Dog	[3]	c	
SS-08	Swift Fox	[3]	c	
SS-09	Burrowing Owl	[3]	c	
SS-10	Other Riparian Species	[3]	c	
SS-11	Bell's Twinpod	[3]	c	
SS-12	Townsend's Big-Eared Bat	[3]	c	
Terrestrial and Avian Wildlife				
TW-01	U.S. Highway 287 - Big Game Underpass and Fencing [4]	$500,000	b	Construction feature

Measure No.	Mitigation Measure	Capitalized Cost [1]	Cost Note [2]	Schedule
TW-02	U.S. Highway 287 - Big Game Movement Adaptive Management Plan	$280,000	a	Upon U.S. 287 realignment opening through first 10 years after Glade Reservoir startup
TW-03	Migrating Birds and Raptors - Surveys and No Work Zones	[3]	c	Prior to and during construction
TW-04	Migrating Birds and Raptors - Vegetation Clearing	[3]	c	
TW-05	Migrating Birds and Raptors - Buffer Zones	[3]	c	
TW-06	Wildlife Habitat – Glade Reservoir Conservation Mitigation [5]	$2,920,000	b	Prior to startup
Water Quality				
WQ-01	Glade Reservoir - Multi-Level Outlet Tower [4]	$1,000,000	b	Construction feature
WQ-02	Glade Reservoir - Release Structure Aeration	$200,000	b	
WQ-03	Eaton Draw Water Quality Wetlands	$1,340,000	b	Prior to startup
WQ-04	Streamflow and Water Quality Monitoring [6]	$2,310,000	b	Perpetual operational commitment
WQ-06	Stream Temperature Mitigation [6]	[3]	c	
WQ-07	Mercury Bioaccumulation Mitigation	$220,000	a	
Total		**$40,180,000**		

Notes:

[1] Capitalized cost is the sum of the capital cost plus any annual operations and maintenance costs capitalized over the life of the commitment, or 50 years for those commitments that are perpetual.

[2] Cost Notes: a = cost is a firm not-to-exceed monetary commitment in this amount, see text for details.
b = approximate implementation or construction cost of this commitment.
c = implementation cost has not been quantified.

[3] Implementation cost has not been quantified.

[4] Cost includes only the portion of the total construction cost for the project component that is required to meet the commitments in this plan.

[5] Northern Water already owns or is in the process of acquiring this land for the purpose of reservoir construction and inundation. Cost is calculated as the appraised value of the property.

[6] Costs for stream temperature monitoring associated with WQ-06 are contained in the costs for WQ-04.

6.0 PROPOSED FISH AND WILDLIFE ENHANCEMENT PLAN

This section constitutes the proposed NISP Enhancement Plan for fish and wildlife related resources in the NISP study area. Enhancement measures were identified based on public comments received on the Draft and Supplemental Draft EIS, discussions with CPW staff, and other discussions with stakeholders in the study area. Enhancement go above and beyond mitigating direct environmental effects, and seek to enhance existing conditions in the NISP study area.

As previously described, the Supplemental Draft EIS (Corps 2015) presented a Conceptual Mitigation Plan prepared by Northern Water (Northern Water 2015) that includes both mitigation and enhancement. This Enhancement Plan portion of this FWMEP builds upon and/or replaces many of the aquatic life, terrestrial wildlife, and recreational components of the Conceptual Mitigation Plan. The enhancement measures use the same alpha-numerical measure number convention as used in the Conceptual Mitigation Plan for those enhancement actions that are similar to or directly replace mitigation measures described in the Conceptual Mitigation Plan.

Some enhancement measures described in this section could result in providing funding to state agencies, primarily CPW, to manage programs relating to this Enhancement plan. This funding is proposed to be in addition to funding already received by state agencies, and not to replace any source of funding. Northern Water expects the agencies to continue seeking current funding sources and not rely on funding from this Enhancement Plan to replace current funding.

Enhancement components of the FWMEP are summarized in appendix Table A1 of this document, and are highlighted in green. The alpha-numerical notations at the end of each mitigation item description correspond to the alpha-numeric mitigation item numbers in Tables A1 and A2.

6.1. Enhancement

Enhancements include those fish and wildlife related environmental commitments that are above and beyond avoiding, minimizing, or compensating for effects of NISP. These enhancement activities were developed through review of comments on the Draft and Supplemental Draft EIS, through the FWMEP process, through discussions with various governmental agencies and community organizations, and as various opportunities presented themselves.

This section describes commitments that are solely related to fish and wildlife enhancement. In addition to these measures, several of the compensatory mitigation commitments have an enhancement component that is above and beyond what is required to mitigate an effect.

6.1.1. Aquatic Resource Enhancement

The Poudre River has been the focus of a large majority of the NISP comments. In the mitigation component of this FWMEP, Northern Water has committed to several mitigation measures that not only would avoid, minimize, or compensate for environmental effects on the Poudre River, but would also enhance the Poudre River. These measures include:

- AG-01 Stream Channel and Habitat Improvement Plan and AG-02 Stream Channel and Habitat Improvements: enhanced channel restoration, aquatic habitat, riparian vegetation, riverine special status species, temperature, and DO concentrations
- AG-04 Poudre Valley Canal Diversion Structure Reconstruction: enhanced Poudre River connectivity for aquatic migration, enhanced boater safety
- FW-04 Conveyance Refinement - Poudre River Intake and FW-05 Poudre River Flow Augmentation Program: enhancement of low flows in conveyance refinement reach.
- WQ-01 Glade Reservoir - Multi-Level Outlet Tower: enhancement of temperature and DO (through introduction of cooler water) in Poudre River
- WQ-03 Eaton Draw Water Quality Wetlands: enhancement of WQ concentrations in Poudre River near Greeley

In addition to these mitigation measures, the following additional enhancements to the channel corridor, water operations, and the Poudre River watershed are proposed as a comprehensive mitigation and enhancement strategy for the Poudre River channel.

6.1.1.1. Poudre River Adaptive Management Program (AG-03)

Throughout this FWMEP, and within the Conceptual Mitigation Plan, Northern Water has proposed several actions to avoid, minimize, and mitigate effects of NISP on the Poudre River. However, because the Poudre River is a dynamic system with many influences and impacts other than NISP, an adaptive management program for the Poudre River is proposed to guide the actions of NISP mitigation efforts on the Poudre River, as well as to coordinate these actions with other current and expected future actions by others. This will serve to not only mitigate, but enhance the overall aquatic, geomorphic, and riparian conditions on the river.

Northern Water and CPW will jointly lead the Poudre River Adaptive Management Program committee. It is envisioned that Northern Water and CPW will develop an MOU which will describe, among other items, other participants in the program, governance within the committee including decision making, and the overall adaptive management program framework. As the lead agencies, Northern Water and CPW would provide final concurrence on any actions to be implemented under the program.

The following describes anticipated components of the Poudre River Adaptive Management Plan using the framework and terminology described in section 2.8. These components, and specific actions to be implemented pursuant to the Poudre River Adaptive Management Plan, are all subject to and must operate within the funding limitations and operational constraints identified later in this section.

- **Adaptive Management Parties:** Led by Northern Water and CPW; possible participants include Larimer County, Weld County, cities along the river, environmental conservation organizations and other groups (collectively, this parties are the adaptive management committee).
- **Scope of Adaptive Management:** Poudre River from the Poudre Valley Canal diversion to its confluence with the South Platte east of Greeley; resources include stream geomorphology, aquatic resources, water quality and riparian resources.

- **Management Objectives:** Evaluate and make adjustments to mitigation and enhancement measures described in this FWMEP to meet the goals of those mitigation and enhancement measures; and, develop and implement other structural and/or physical measures in the Poudre River that support enhancement of its ecological condition.
- **Key Desired Outcomes:** An ecologically healthy and resilient Poudre River corridor that naturally sustains key resources given the "working aspects" of the Poudre River.
- **Performance Indicators:** Abundance and health of key resources as determined by and through adaptive management committee, including, but not limited to, aquatic resource abundance surveys, geomorphic behavior indicators, water temperature, and other measurable indicators.
- **Management Strategies and Actions:** The adaptive management committee would provide recommendations to Northern Water in developing the stream channel habitat and improvement plan (as described in Section 5.3.1.1) to identify mitigation actions for the Poudre River to address aspects of stream geomorphology, aquatic resources, and riparian resources. Implementation of mitigation actions identified in the plan would be conducted in stages. The design and implementation of projects in later stages of the program may be adjusted through the adaptive management program based on the performance of initial projects, including the operational commitments described in this document. Development and implementation of the plan would require data collection, which has already begun through the EIS process, and would continue by Northern Water through the duration of the program.

  Mitigation and enhancement measures enacted through this program may include, but are not limited to, the following:
  - Accelerate establishment of channel forming by managing in-channel or riparian vegetation;
  - Place structures to direct sediment to selected aggradation zones;
  - Install check structures or weirs to control the inundation of riparian vegetation;
  - Make recommendations to Northern Water to operate the Poudre Valley Canal/NISP diversion structure on the Poudre River to divert or not-divert excess sediment;
  - Identify and install measures to reduce sediment inflow from point and non-point sediment sources;
  - Place measures such as rocks, boulders or other natural materials in areas subject to bed and bank erosion;
  - Dredge or otherwise remove sediment from the channel mechanically;
  - Improve river-floodplain connectivity;
  - Perform additional stream channel habitat improvement;
  - Consider making space available in Glade Reservoir on an if-when basis for CPW or other groups to store water for environmental purposes[7];
  - Make releases from Glade Reservoir consistent with the Conveyance Refinement program identified in this document (section 5.2.2.4) to benefit aquatic habitat; and

[7] Subject to applicable environmental permitting.

- Analyze appropriate ramping rates for NISP diversions;
- Conduct peak flow operations consistent with the Peak Flow Operations Program described in section 5.2.2.6; and
- Discuss and implement temperature mitigation actions as described in section 5.2.2.7.

- **Implementation Strategies and Actions:** Northern Water would implement initial projects identified by the program and agreed to through the program governance structure prior to initial NISP diversions from the Poudre River.
- **Evaluation of Management Effectiveness (Monitoring):** The adaptive management committee will use in-house expertise or hire outside consultants to perform annual monitoring required to test the performance indicators. Baseline data will be collected prior to project operations, soon after the 404 permit is received from the Corps. Baseline water quality information will be collected as described in section 5.3.1.5. Other baseline information will be collected through the funding available as part of this adaptive management program as developed by the adaptive management committee. Initial baseline conditions will be established by the adaptive management committee considering this baseline data.
- **Reporting of Findings and Recommendations of Evaluation:** The adaptive management committee will develop reporting, on a frequency to be determined by the committee, to report on the activities and results of these activities.
- **Adjustment of Management Actions and Arrangements**: The following set of conditions will guide the program:
    - Resources include stream geomorphology, aquatic resources, water quality and riparian resources;
    - Northern Water will consider NISP operational modifications only to the degree that long-term NISP yield is not compromised and the operations fit within operations allowed by the NISP Final EIS, Record of Decision, and NISP water rights;
    - Decisions on whether long-term NISP yield may be compromised by a particular operation and whether to implement a proposed operational modification would be made solely by Northern Water;
    - As several flow commitments described in this plan are based on full NISP buildout and delivery commitments, Northern Water will develop and coordinate interim commitments through the Adaptive Management committee;
    - Northern Water would make funding available for the program in the amounts described below to implement mitigation actions developed in the stream channel habitat and improvement plan;
    - Northern Water will seek additional funding from parties and/or outside sources to implement actions that would mitigate effects beyond those incurred from NISP; and

  - Funding and implementation of mitigation actions would take place throughout the program geographical boundaries.

- **Review of Overall Program Management**: The Poudre River Adaptive Management Program will begin once the 404 permit is received, and run for a period of 20 years following full buildout operations (defined as a period following full or nearly full storage in Glade Reservoir and Galeton Reservoir, and the consistent delivery of full or nearly full NISP yield to a majority of the NISP participants for a period of 5 years). Following completion of the Adaptive Management Program described in this section, NISP will continue to be involved in river and watershed issues through its involvement in the Coalition for the Poudre River Watershed or other similar organization (section 6.1.1.5).

- **NISP Budget:** In addition to the other commitments made in this FWMEP, NISP commits to spend the following to establish, develop, and implement the adaptive management program. This funding is in addition to funding for other commitments described for other mitigation commitments in this FWMEP:

  - $50,000 per year to fund data collection, additional analysis and studies, and maintenance of the mitigation actions. This does not include Northern Water staff time for coordination of the program. Northern Water will solicit funding contributions from other adaptive management committee participants to expand these efforts as needed.
  - $5.0 million set aside in an escrow account to implement actions developed in the stream channel habitat and improvement plan and adaptive management actions under this plan. Of this amount, $1.0 million would be used for projects identified in the Fort Collins Downtown Master Plan, or other planned activities by the City of Fort Collins on the Poudre River within the affected reaches. These funds are separate from and in addition to funding required for any other part of this FWMEP.

6.1.1.2. Multi-Objective Diversion Structure Retrofits (AG-05)

To further enhance the connectivity of the Poudre River for aquatic species and to maximize benefits of low-flow releases, Northern Water would fully or partially fund retrofits of existing diversion structures with multi-objective diversion structure facilities at four existing diversion structures along the Poudre River. These locations were chosen because they are often dry-up points on the river, the locations are strategic to connecting longer reaches of river and riparian habitat, and the locations are required to administer provisions of the FWMEP. Locations for these structures include:

- Watson Fish Hatchery Diversion
- Terry Lake Diversion
- Larimer-Weld Diversion
- Whitney and B.H. Eaton Diversions
- Lake Canal Diversion (alternate, see below)

Multi-objective diversion structures maintain the existing primary function of the structure to provide enough head in the river channel to make water diversions, while improving the function of the structure to convey low flows through the structure and provide for fish passage. The structures will be fitted with devices that monitor and count the use of the structures by fish. Details of the exact methods for constructing and implementing the multi-objective diversion structures will be coordinated with CPW, with potential peer reviews by Trout Unlimited and/or the U.S. Fish and Wildlife Service, and will be further developed in planning completed as described in Section 5.3.1.1.

Conveyance and measurement of low flows at these structures is critical to meet the goals and objectives of low flow commitments described in this FWMEP. Specifically, measurement of conveyance refinement releases from Glade Reservoir (section 5.2.2.4) is required to ensure that these releases remain in the river through the entire reach described for that program. Measurement of flows that are less than or equal to the flows that result in diversion curtailment is required to administer the provisions of the non-consumptive water right commitments (section 5.2.2.2) and summer and winter diversion curtailment commitment (section 5.2.2.3). The low flow bypass structures would be constructed in a manner that allows measurement within the structure, either through a flume, weir, or a rated section.

The existing diversion structures for the Watson Lake Fish Hatchery (Figure 31) and Larimer-Weld Canal (Figure 32) incorporate traditional ogee crest diversion structures, while the Terry Lake Inlet incorporates a stepped concrete drop structure. At the Watson Lake Fish Hatchery, retrofitting the existing structure may require removal of a portion of the overflow crest for either a rock ramp or traditional fish ladder design because the opposite bank from the actual diversion (right bank in the photo) abuts a steep hill. Construction of the Watson Fish Hatchery and Terry Lake diversion bypass structures would connect 5.5 miles of aquatic habitat between the Larimer County Canal diversion structure near Ted's Place and Overland Trail. The Larimer & Weld diversion lengthens an existing 2.5 mile reach of the river to nearly 3.0 miles, with additional work currently planned by the City of Fort Collins lengthening that reach further. The Larimer-Weld diversion is currently scheduled for major repair and replacement work. Northern water has been in contact with or is currently contacting the ditch company to ensure that designs can accommodate multi-objective diversion structure facilities.

Figure 31. Existing Watson Lake Fish Hatchery Diversion

Figure 32. Existing Larimer-Weld Diversion Structure

The Whitney (Figure 33) and B.H. Eaton (Figure 34) diversion structures are located on the Poudre River in the southwest portion of Windsor approximately 800 feet apart (Figure 35). Both of these are typical irrigation diversion structures that do not have fish or boat passage installed. The Poudre Runs Through It group is currently investigating opportunities to address fish passage at these structures. The fish passage structure would be designed to target passage primarily by smaller bodied native fish. This bypass structure(s) would connect a 3.8 mile reach upstream to the New Cache diversion structure with a 9.2 mile reach downstream to the Jones Ditch diversion structure, resulting in nearly 13 miles of connected habitat on the Poudre in this area.

Northern Water has had initial meetings and discussions with the key members of the Poudre Runs Through It working group regarding the project, and will continue to coordinate with the group. Additionally, Northern Water has provided in-kind services to the project by performing topographic surveying of the site. Due to timing of project implementation, it is possible that the project may be fully developed and implemented before the NISP Record of Decision is issued. NISP would provide a portion of the funding for the selected project, not to exceed $200,000 in in-kind services and capital outlay, as long as the NEPA process and Record of Decision progress in a manner in which this project would be considered as NISP mitigation.

Design of the diversion structure bypass facilities would be done to maximize the benefits of other flow commitments described in this document. This would likely require reshaping the channel upstream and downstream of the structure to create a defined low-flow channel in to and out of the bypass facility. This improvement would contribute to mitigating the loss of aquatic habitat in the lower part of the river due to changes in geomorphology in this part of the river.

Several organizations are currently investigating opportunities to provide fish passage facilities at diversion structures on the Poudre River, some of which may be the same structures considered in this Enhancement Plan. Northern Water will work with each of these groups to facilitate these retrofits, including providing funding. If the retrofits are completed by the other groups without substantive funding by Northern Water, or if retrofit of the chosen structures is not possible for other reasons, Northern Water will find other substitute diversions structures on the Poudre River to perform these retrofits that would allow these same goals to be met. The most likely substitute candidate at this time is the Lake Canal diversion structure just upstream of College Avenue. However, other substitute structures may be considered based upon which structures are not available for retrofit.

Figure 33. Existing Whitney Ditch Diversion Structure

Figure 34. Existing B.H. Eaton Ditch Diversion Structure with Whitney Diversion in Background

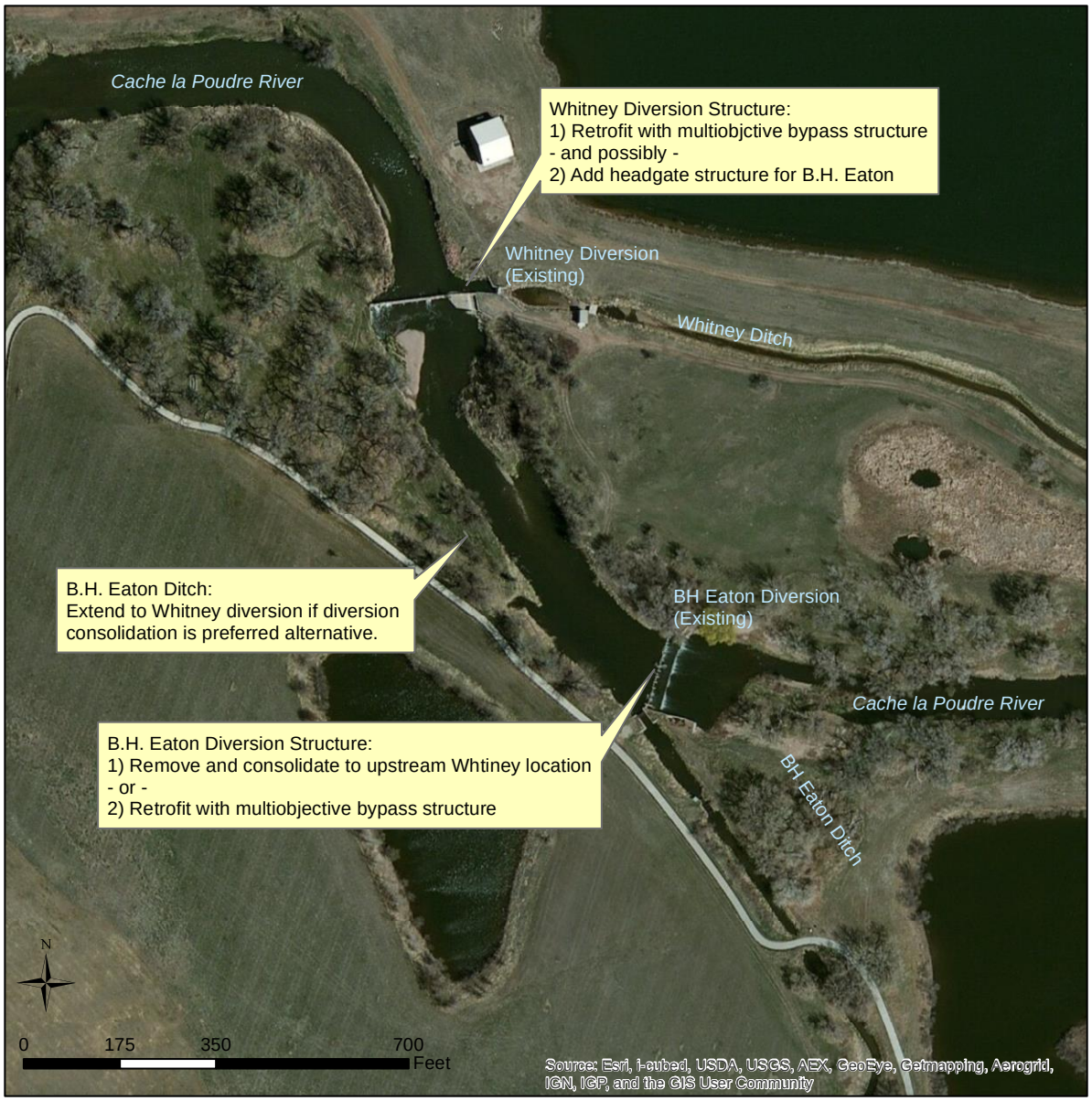


Figure 35. Whitney and B.H. Eaton Diversions

Due to interest in installation of multi-objective diversion structure retrofits in the Poudre River as a whole, it is possible that retrofits at one of the structures identified in this FWMEP may be progressed by other groups to implementation faster than NISP can provide funding for through this FWMEP (as final funding and implementation of the FWMEP will not begin until state and federal environmental permit processes have completed). This would most likely occur with the Whitney/B.H. Eaton diversion consolidation, as the multiple stakeholder group is already advancing this concept. Or, multi-objective diversion structure retrofits at the identified structures may not be reasonably possible for other reasons. In case this happens, to keep the total number of retrofit commitments the same, Northern Water has identified the Lake Canal diversion structure as an alternate structure for retrofit. The Lake Canal diversion structure is located on the Poudre River just upstream of the College Avenue bridge. A retrofit at the Lake Canal diversion structure would provide additional streamflow measurement within

the Conveyance Refinement reach (see section 5.2.2.4), and improve aquatic habitat connectivity through Fort Collins.

6.1.1.3. Galeton Reservoir Native Fish Rearing (AG-08)

As an enhancement to native fisheries, NISP would make Galeton Reservoir available to CPW for raising native warmwater fish for reintroduction into the Poudre River or other locations. At this time, there are no firm commitments as to whether Galeton Reservoir would be suitable for raising warmwater fish. For instance, Galeton Reservoir may periodically go dry and there is no way to guarantee a permanent water supply for raising native fish in the reservoir. Additionally, it is unknown whether, with current technology, non-native predatory fish could be adequately screened from introduction into the reservoir. If it is determined that Galeton Reservoir could be used for native fish rearing, Northern Water commits to providing up to $100,000 to retrofit the reservoir for these purposes.

If fish rearing at Galeton is successful, reintroductions to the Poudre River would likely be done in isolated off-channel habitats, such as backwater and floodplain pools, that give these species protection from nonnative species that would eat or out-compete native fish. Over time, the native species may escape from these areas and recolonize the Poudre River.

The Conceptual Mitigation Plan originally described a commitment to install appropriate screening at the inlet and outlet of Galeton Reservoir and the SPWCP forebay pump station to prevent introduction of non-native predatory species into the reservoir. However, it is unknown whether current technology would adequately screen non-native predatory fish, or whether the reservoir will be used for native fish rearing. Thus, this formal commitment has been removed from this FWMEP at this time. However, if Galeton Reservoir is used for this purpose, Northern Water will coordinate with CPW on the design of the fish screens.

6.1.1.4. Ramp Hansen Supply Canal Releases (FW-07)

Northern Water delivers C-BT water to irrigation water users in the Poudre River basin via Horsetooth Reservoir releases via the Hansen Supply Canal to the Poudre River. This water is then diverted at the irrigation water user's river headgate. These operations are coordinated daily with the District 3 water commissioner to ensure that water released from C-BT facilities is diverted at the correct location and time by the appropriate water user.

Occasionally, the timing of these operations can become inconsistent, resulting in dramatic swings in water levels upstream and downstream of diversion structures over a very short time. For instance, if water is delivered to the river and the water commissioner is not at the diversion structure at the exact time that that pulse of water reaches the diversion structure, there can be a very short period where high flows pass the diversion structure and then the water is nearly instantaneous reduced again as the diversion structure gates are adjusted by the water commissioner to divert the correct amount of water. These types of operations can be detrimental to fish, especially during spawning periods.

As an enhancement to operations in the Poudre River unrelated to NISP, Northern Water commits to working with CPW and the District 3 water commissioner, and water users, to improve existing delivery methods to minimize the effect of these operations on fish species. These improvements may include providing "ramping" of deliveries on both the increasing and decreasing limbs of the delivery hydrograph (over a period of minutes to hours), automating certain water user headgates to either be remotely controlled or have automatically adjusting gates to account for these deliveries, and improving communications between all parties.

6.1.1.5. Coalition for the Poudre River Watershed (WQ-05)

Several resources, including geomorphology and water quality, are dependent upon protecting and controlling runoff in the upstream Poudre River watershed. The Coalition for the Poudre River Watershed was formed as a 501 (c)(3) non-profit corporation in 2013 following the 2012 High Park Fire. The overall mission is to "promote the improvement of the ecological health of the Poudre River watershed through the collaboration of a broad range of stakeholders." The short-term work program of the CPRW focuses on post-fire management, while the long-range work program includes pre-fire forest management within the watershed (Bassinger 2013). The watershed generally includes the entire Poudre River watershed above the canyon mouth, including adjacent areas in Rist Canyon, the upper Buckhorn area, and Laramie River watershed (Figure 36). The projected annual budget of the coalition is $100,000. This amount is currently divided evenly between the City of Fort Collins, City of Greeley, and Larimer County (Bassinger 2013).

In order to enhance the capability of the coalition to help protect source water quality for the Poudre River watershed and NISP, Northern Water would begin contributing annually to support the coalition's annual operating budget. At this time, the exact contribution needed to provide this support is unclear. However, Northern Water proposes to match the contribution provided by the other agencies by contributing $35,000 annually, with adjustments allowed to account for inflationary increases.

If the Coalition for the Poudre River Watershed ceases to exist in the future, or changes its mission to be substantially different than its current mission, Northern Water would contribute to a non-profit organization with substantially the same mission as the current coalition. If that organization does not exist at that time, Northern Water would work with other Poudre River Basin water suppliers to form that organization to carry out the mission currently being implemented by the coalition.

Activities conducted by the Coalition for the Poudre River Watershed could decrease sediment load in the Poudre River, reduce non-point source pollution, and improve channel and conveyance conditions in the Poudre River. These types of activities may decrease conveyance of sediment to lower portions of the Poudre River, improve ambient water quality concentrations including temperature in reaches upstream of those affected by NISP thereby improving downstream reaches, and improve the quality of water stored in Glade Reservoir. Activities carried out by the Coalition also have overall ecological benefits to the Poudre River watershed, including restored and enhanced regional wildlife habitat.

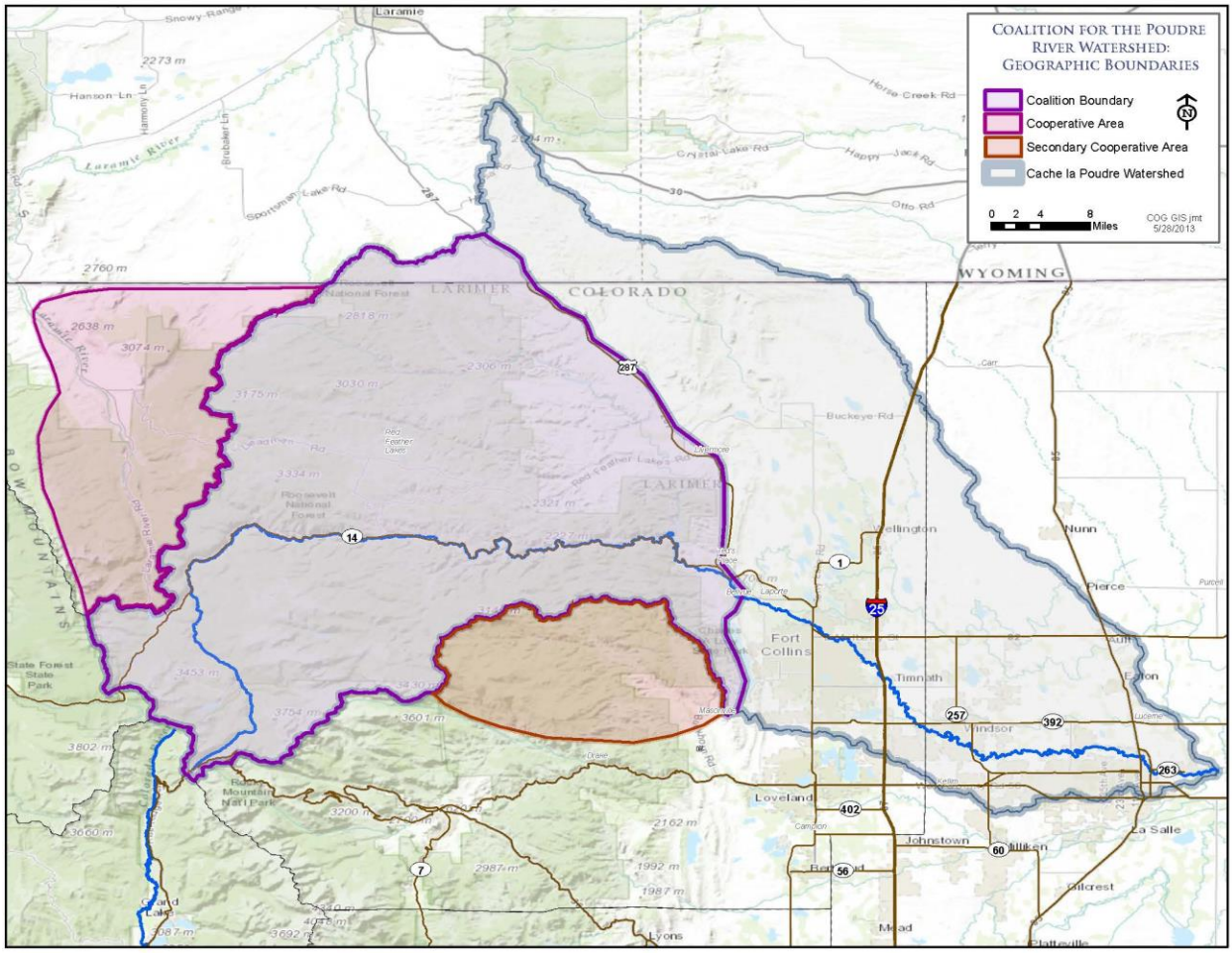


Figure 36. CPRW Watershed Map (CPRW 2017)

6.1.2. Terrestrial Resource Enhancement

Mitigation of direct wildlife habitat lost to NISP facilities was described in the Mitigation Plan portion of this FWMEP. These measures include:

- TW-01 U.S. Highway 287 - Big Game Underpass and Fencing: enhanced opportunities for big-game migration across the U.S. Highway 287 corridor
- TW-02 U.S. Highway 287 - Big Game Movement Adaptive Management Plan: enhanced habitat protection west of Glade Reservoir

To further enhance these mitigation and other mitigation measures, the following additional enhancements to wildlife habitat is proposed as a comprehensive mitigation and enhancement strategy for lands west of Glade Reservoir.

6.1.2.1. Wildlife Habitat – Glade Reservoir Conservation Enhancement (TW-07)

As previously described in section 5.3.2.3, Glade Reservoir and associated facilities would permanently affect overall range and winter concentration area for both elk and mule deer. Northern Water has committed to conserving lands it already owns, or is in the process of purchasing, to mitigate these effects. To further enhance the wildlife habitat conservation area around Glade Reservoir, Northern Water commits to purchasing or otherwise conserving approximately 300 additional acres immediately west of these lands (previously shown in Figure 29). The appraised value of the additional 300 acres is approximately $810,000, which represents Northern Water's maximum financial commitment to this enhancement activity. If the actual purchase price of the property exceeds $810,000 (or $2,700 per acre), Northern Water may reduce the number of acres purchased to so that the total purchase price does not exceed $810,000. Northern Water will permanently protect this land for wildlife habitat through legal instrument, and is currently discussing options with CPW, including conservation easements and deed restrictions.

In addition to land purchased directly by Northern Water, Northern Water will actively engage with partner agencies including CPW to pursue funding for protection of additional land to the west and north of Glade Reservoir for permanent habitat protection. Other partner agencies could include the City of Fort Collins and Larimer County. Funding sources could include but are not limited to Great Outdoors Colorado and other Colorado Lottery funded programs. Northern Water and CPW have had initial conversations with GOCO regarding a funding application, and Northern Water is aware of and would consent to GOCO's conservation easement language requirements and GOCO's requirement that GOCO approve easement amendments and transfers.

In order to ensure that this land provides suitable big game and other wildlife habitat enhancement, trail access to these parcels will be limited as described in section 6.1.3.2.

6.1.3. Recreation and Public Access Enhancement

Glade Reservoir and the surrounding area present an opportunity to enhance regional recreational amenities. The overall goal of terrestrial wildlife, recreation, and public access strategies at Glade Reservoir is to provide habitat for affected fish and terrestrial species, while allowing the public to have reasonable access for recreation. Most of the recreational commitments will be negotiated outside of the scope of this FWMEP. However, those portions of the recreational commitments that would be managed by CPW, including Glade Reservoir fishing and recreation access to land surrounding Glade Reservoir, are discussed in this section.

6.1.3.1. Glade Reservoir Fishery (AG-06)

The Supplemental Draft EIS concluded that Glade Reservoir would be suitable to support both cold water and cool water recreationally important fish species (Corps 2015, GEI 2015). Through consultation with CPW, in which both cold water and cool water fishery options were discussed, it was concluded for a variety of reasons that a coolwater fishery would be established and managed in Glade Reservoir. The cool water fishery option is similar to the fisheries currently found at Carter Lake and

Horsetooth Reservoir. An annual stocking plan was developed by CPW for maintenance of a cool water fishery in the reservoir (Table 12). CPW will manage the fishery using its best managed practices, thus the annual number of stocked species shown in the table is approximate.

Table 12. Glade Reservoir Cool Water Fishery Management Plan

Fish Stock	Fish Species	Annual Number Stocked (Approximate)	Density/Surface Area (fish/acre)
WAL-0.3"	Walleye (0.3-inch)	2,720,000	1600
WAL-1.2"	Walleye (1.2-inch)	11,900	7
SMB-0.2"	Smallmouth Bass (2-inch)	6,800	4
SXW-0.2"	Saugeye (0.2-inch)	255,000	150
SXW-1.3"	Saugeye (1.3-inch)	25,500	15
BCR-1"	Black Crappie (1-inch)	51,000	30
BGL-1"	Bluegill (1-inch)	51,000	30
RBT-10"	Rainbow Trout (10-inch)	17,000	10
YPE-2"	Yellow Perch (2-inch)	51,000	30
TGM-7"	Tiger Muskie (7-inch)	1,700	1

Because fish hatchery production of the species described above is near capacity, implementation of the fish stocking plan will require that current fish hatcheries be expanded to accommodate the production rates. Northern Water will provide CPW $3.0 million to expand current facilities. It is likely that the existing Wray and Chatfield hatcheries would be expanded to meet the needs of the stocking plan. Additionally, Northern Water will provide $50,000 annually for annual expenses related to implementation of the plan.

The Supplemental Draft EIS water quality analysis indicates that fish consumption advisories are likely at Glade Reservoir due to the bioaccumulation of mercury in fish tissues (Corps 2015). Northern Water has developed mitigation commitments to address potential mercury bioaccumulation (see section 5.3.1.6).

The Glade Reservoir forebay will be a separate fishery from that in Glade Reservoir. Due to its direct connection to the Poudre River, the forebay may support a cold water fishery, with species similar to those found in the Poudre River. The Glade Reservoir forebay fishery will be managed through the adaptive management process (see section 6.1.3.3).

6.1.3.2. Glade Reservoir Recreation (RC-01)

Northern Water is currently investigating potential opportunities for management of recreational facilities and activities at Glade Reservoir, including the Glade Reservoir forebay. As stated in the Supplemental Draft EIS (Corps 2015) and the Conceptual Mitigation Plan (Northern Water 2015), it is expected that recreational opportunities could be similar to those at Horsetooth Reservoir and Carter Lake, and may include recreational shoreline and boat-based fishing, motorized boating on Glade Reservoir, day use areas, and developed campgrounds. It should be noted, however, that due to site constraints (steep rocky terrain with limited access) and other commitments in this plan, opportunities for developed campgrounds immediately adjacent to the Glade Reservoir shoreline are very limited.

Details of land and water based recreation at and surrounding Glade Reservoir will be contained in a recreation plan developed in conjunction with the managing agency or agencies. Regardless of the plan developed, public access to the Glade Reservoir Fishery (section 6.1.3.1) will be maintained. Physical access to the reservoir facilities will most likely be from the south. Through the FWMEP, Northern Water commits up to $200,000 to construct facilities dedicated to providing access to the Glade Reservoir Fishery. This could be used for a variety of purposes, including parking, restroom facilities, and boat launch facilities. Details of the use of these funds will be coordinated with CPW through the Glade Reservoir Recreation and Wildlife Adaptive Management Program (section 6.1.3.3).

CPW has requested that recreational planning consider trail restrictions on the west side of the Glade Reservoir, and consider allowing seasonal waterfowl hunting on Glade Reservoir. These two commitments are further described below.

Trails on West Side of Glade Reservoir

Land surrounding Glade Reservoir, particularly on the west side of the reservoir, will also be conserved as wildlife habitat (see section 5.3.2.2). CPW has found increasing evidence that non-consumptive forms of recreation, including hiking, biking, dog walking, and cross country skiing (both on and off trails) may negatively impact wildlife species especially during vulnerable times on winter range and in spring when young are raised. Wildlife can be affected by recreation in a variety of ways, including direct and indirect mortality, lowered productivity, reduced use of preferred habitat, and changes in behavior and stress that in turn results in reduced survival or reproductive rates.

CPW has found that new trails may substantially increase human presence in areas previously much less accessible, thereby reducing the effectiveness of wildlife habitat. Research studies have documented a linear zone of impact to wildlife along trails. For birds, in studies on City of Boulder Open Space and elsewhere, the zone of influence is up to 100 meters perpendicular to the trail and results in lower nest success, general avoidance by many species, and an altered species composition. For ungulates, including elk, deer, and pronghorn, the area of influence is 200 meters or more with animals avoiding trail corridors and thus experiencing reduced available habitat. Off-trail use may have greater impacts on wildlife because it is less predictable than on-trail use, furthering the reduction in habitat effectiveness. Research has found that hikers accompanied by dogs and mountain bikes may have greater impacts to wildlife than hikers or horseback riders.

Based on this information, CPW has recommended and Northern Water concurs that one single trail on the west and north side of Glade Reservoir will be constructed within 50 meters of the high-water line to allow fishing access open to foot travel only (Figure 37). Lands on the side of the trail opposite of the reservoir will be closed to off-trail travel except for hunters actively hunting during an open season on foot. Horses, llamas, and mules can be allowed to pack out harvested game but only from the northern parking lot. Dogs are allowed as an aid to hunting small game or waterfowl. Northern Water will work with CPW to install initial signage to explain trail use rules to the public, with additional signage and potential fencing employed if required to aid trail use protocol.

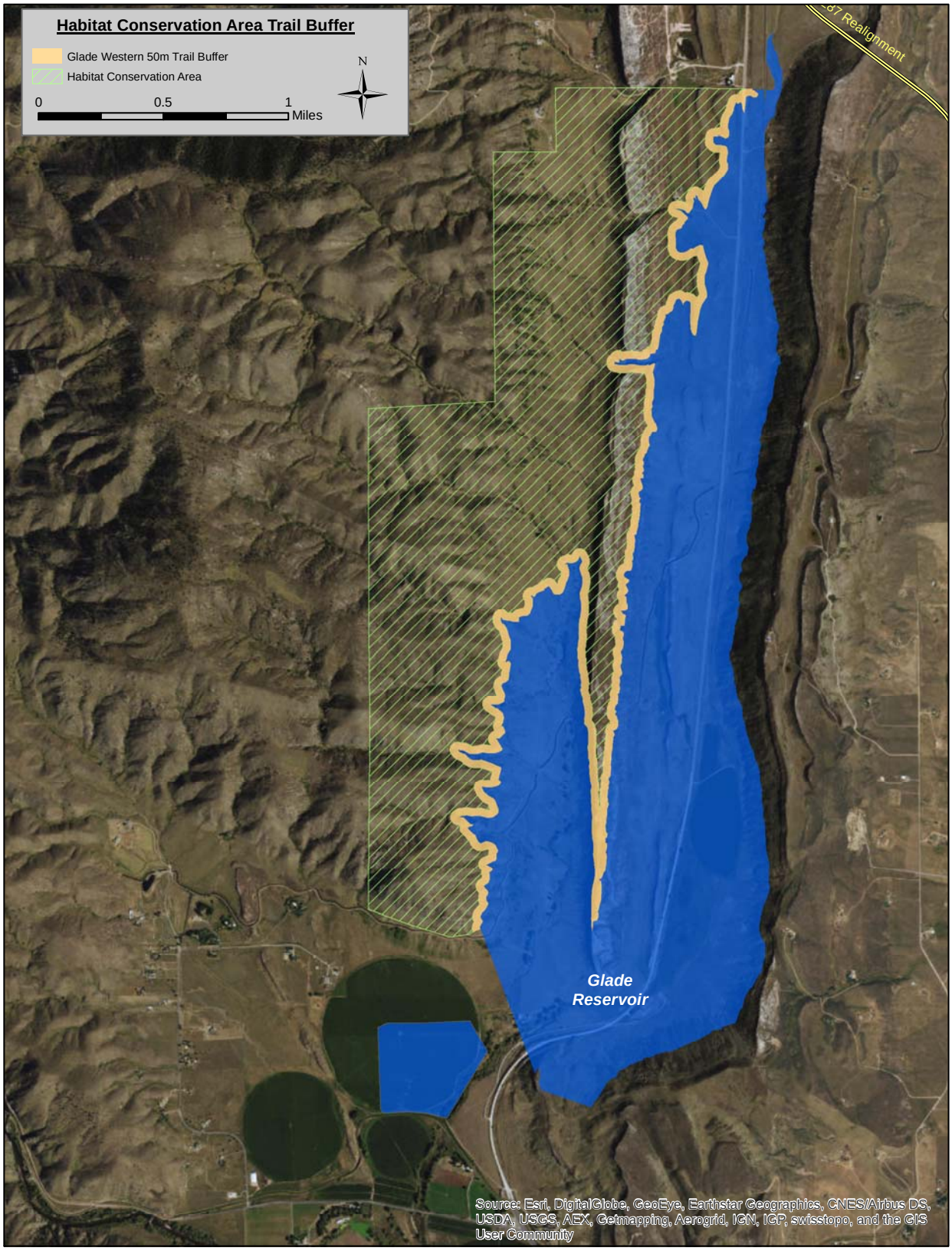


Figure 37. Habitat Conservation Area Trail Buffer

Waterfowl hunting

CPW has identified the need for additional waterfowl hunting opportunities in Northeastern Colorado. Currently, waterfowl hunting is not allowed on larger reservoirs in the area such as Horsetooth Reservoir and Carter Lake. However, several lakes managed by CPW in the area, including Lon Hagler Reservoir, Lonetree Reservoir, Boedecker Reservoir, and Boyd Lake, do allow waterfowl hunting. At these lakes, waterfowl hunting activities have generally been able to coexist with other recreational activities on park lands.

In order to meet the need for expanded waterfowl hunting opportunities in the region, Northern Water agrees to work with CPW and the recreational managing agency or agencies to develop a plan for allowing waterfowl hunting at certain locations in Glade Reservoir during waterfowl hunting seasons (generally October through February). The exact locations and details of a waterfowl hunting season at Glade Reservoir will be coordinated through the Glade Reservoir Recreation and Wildlife Adaptive Management Program (section 6.1.3.3).

6.1.3.3. Glade Reservoir Recreation and Wildlife Adaptive Management Program (RC-03)

As described throughout this plan, several mitigation and enhancement strategies have been described for recreation, fisheries, and wildlife habitat in and around Glade Reservoir. The overall goal of these strategies is to provide habitat for affected fish and terrestrial species, while allowing the public to have reasonable and financially sustainable access for recreation throughout the area. The strategies identified in this plan have been developed based on the best scientific data and experience available from CPW and other agencies. However, because this involves predicting how both wildlife and the public will react to and interact at the facilities, an adaptive management program for these mitigation actions is proposed to allow an adaptive management regime for these resources, as well as to coordinate actions annually by the management parties involved.

The following describes components of the Glade Reservoir Recreation and Wildlife Adaptive Management Program using the framework and terminology described in section 2.8.

- **Adaptive Management Parties:** Northern Water, CPW, and managing agency or agencies.
- **Scope of Adaptive Management:** Lands and facilities owned or managed by Northern Water, CPW and managing agency or agencies within and adjacent to Glade Reservoir.
- **Management Objectives:** Provide habitat for affected wildlife species while allowing the public to have reasonable access for recreation.
- **Key Desired Outcomes:** Co-existence of recreators and wildlife on all managed properties while meeting the mitigation objectives described in this plan.
- **Performance Indicators:** number of wildlife-person encounters; number of hunter-recreator encounters; size and movement of elk herd; size and movement of deer herd; big-game hunter success; waterfowl hunting success.

- **Management Strategies and Actions:** The parties would converse annually on the effectiveness of previous management strategies and actions, and plan new management strategies and actions to meet the goals and needs of recreators, wildlife, and fisheries at the reservoir.

  Mitigation and enhancement measures enacted through this program may include, but are not limited to, the following:
  - Consider establishing and managing fishing at the Glade Reservoir forebay.
  - Installing additional signage or a continuous wildlife friendly fence to prevent off-trail travel.
  - Protection of the existing bat cave from human disturbance.
  - Seasonal or permanent trail closures for specific uses or all uses.
  - Trail expansion for specific uses or all uses.

  As described in previous mitigation and enhancement commitments (sections 5.3.2.3 and 6.1.2.1), the primary and priority management objective of the wildlife habitat conservation area west of Glade Reservoir will remain wildlife habitat mitigation as described in this FWMEP.
- **Implementation of Strategies and Actions:** All parties would implement management strategies determined by the parties on an annual basis.
- **Evaluation of Management Effectiveness (Monitoring):** To be determined.
- **Reporting of Findings and Recommendations of Evaluation:** To be determined.
- **Adjustment of Management Actions and Arrangements**: The following set of conditions will guide the program:
  - Resources include recreational land adjacent to the reservoir, and public land west of the reservoir owned or managed by the parties involved;
  - The parties involved will consider modifications to land access and trail patterns based on data collection;
  - Northern Water will assist other parties in seeking additional funding from parties and/or outside sources to implement actions beyond those described in this plan.
- **Review of Overall Program Management**: The Glade Reservoir Recreation and Wildlife Adaptive Management Program will run for a period of 20 years following the initiation of recreational access to the lands west of Glade Reservoir.
- **NISP Budget:** Northern Water does not anticipate expending funds, except as needed for administrative and personnel planning costs, for this adaptive management activity.

6.2. Enhancement Costs and Schedule

Estimated costs and schedule for the Enhancement Plan portion of this FWMEP are shown in Table 13. Capitalized costs represent the sum of the capital cost for implementation, plus any annual operations and maintenance costs capitalized over the life of the commitment, or 50 years for those commitments that are perpetual. As with the mitigation plan, cost types for the enhancement plan can be divided into the following categories:

- Cost type “a” – These costs represent a financially-based mitigation commitment. In general, Northern Water is either providing funding to or teaming with another group or organization to perform the mitigation commitment. The cost amount shown is Northern Water’s maximum financial commitment for this mitigation activity.
- Cost type “b” – These costs represent an outcome-based mitigation commitment. Northern Water is committing to performing the activity as described, and the cost represents the estimated cost for this performance. In general, these are construction activities. For cost type “b” activities, Northern Water reserves the right to seek additional funding partners or sources for the activity.
- Cost type “c” – These costs have not been quantified for a variety of reasons. Fox example, these commitments may be primarily operational in nature without a clearly defined cost, or may be part of standard construction activities that are not easily separable.

The Enhancement Plan schedule (Table 13) will be contingent on the issuance of permits and licenses, construction timetables, project completion, and the ability of the Northern Water to fill the reservoir. The schedule provided in the table provides an approximate timetable based on these activities.

Table 13. NISP Enhancement Plan Schedule and Cost Summary

Measure No.	Enhancement Measure	Capitalized Cost [1]	Cost Note [2]	Scheduled Start
Aquatic Life and Stream Morphology				
AG-03	Poudre River Adaptive Management Program	$5,930,000	a	Prior to startup through first 20 years after full buildout conditions
AG-05	Multi-Objective Diversion Structure Retrofits	$1,200,000	b	Prior to startup
AG-06	Glade Reservoir Fishery	$4,070,000	a	After startup
AG-08	Galeton Reservoir Native Fish Rearing	$100,000	a	Following startup
Streamflow Commitments				
FW-07	Ramp Hansen Supply Canal Releases	[3]	c	Perpetual operational commitment
Recreation				
RC-01	Glade Reservoir Recreation	$200,000	a	Perpetual operational commitment
RC-03	Glade Reservoir Recreation and Wildlife Adaptive Management Plan	[3]	c	First 20 years after startup
Terrestrial Wildlife				
TW-07	Wildlife Habitat – Glade Reservoir Conservation Enhancement	$810,000	a	Prior to startup
Water Quality				
WQ-05	Coalition for the Poudre River Watershed	$750,000	b	Perpetual operational commitment
Total		**$13,060,000**		

Notes:

[1] Capitalized cost is the sum of the capital cost plus any annual operations and maintenance costs capitalized over the life of the commitment, or 50 years for those commitments that are perpetual.

[2] Cost Notes: a = cost is a firm not-to-exceed monetary commitment in this amount, see text for details.
b = approximate implementation or construction cost of this commitment.
c = implementation cost has not been quantified.

[3] Implementation cost has not been quantified.

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APPENDIX A – FISH AND WILDLIFE MITIGATION AND ENHANCEMENT PLAN SUMMARY TABLES

Table A1. Mitigation and Enhancement Plan Summary Table - By Mitigation Action Item

Measure No.	Mitigation and/or Enhancement Measure [1]	Mitigation and/or Enhancement Commitment [2]	Resource Considerations (see Table A.2 for complete list of mitigated effects; see text for description of enhanced resources)	Capitalized Cost [3]	Cost Note [4]	Mitigation			Enhancement [1]	Resources Involved								
						Avoidance	Minimization	Compensation		Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other
Aquatic Life and Stream Morphology																		
AG-01	Stream Channel and Habitat Improvement Plan	Fund stream channel and habitat improvement plan	Compensation for accelerated degradation of channel geomorphology, increased flooding risk downstream of I-25, reduced Poudre River flows, reduced aquatic habitat, reduced water availability for riparian vegetation, reduced habitat for riverine special status species, increased water temperature and DO concentrations; Enhanced and accelerated channel restoration, aquatic habitat, riparian vegetation, riverine special status species, temperature and DO concentrations	$1,000,000	a			X	X	X	X	X	X	X		X		
AG-02	Stream Channel and Habitat Improvements	Construct stream channel improvements (2.4 miles)		$1,800,000	b			X	X	X		X	X	X		X		
AG-03	Poudre River Adaptive Management Program	Implement and fund Poudre River Adaptive Management Program in coordination with other Poudre River stakeholders	Enhanced and accelerated channel restoration, aquatic habitat, riparian vegetation, riverine special status species, temperature and DO concentrations	$5,930,000	a				X	X	X	X	X	X		X		
AG-04	Poudre Valley Canal Diversion Structure Reconstruction	Reconstruct Poudre Valley Canal with improvements in sediment diversion, fish passage, and boating safety	Minimization of reduced sediment transport capabilities; enhance Poudre River connectivity for aquatic migration, enhance boater safety	$300,000	b		X		X	X	X			X				

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Measure No.	Mitigation and/or Enhancement Measure [1]	Mitigation and/or Enhancement Commitment [2]	Resource Considerations (see Table A.2 for complete list of mitigated effects; see text for description of enhanced resources)	Capitalized Cost [3]	Cost Note [4]	Mitigation			Enhancement [1]	Resources Involved								
						Avoidance	Minimization	Compensation		Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other
AG-05	Multi-Objective Diversion Structure Retrofits	Construct multi-objective diversion structure retrofits that include fish passage, low flow conveyance and flow monitoring capabilities (4 sites)	Enhance Poudre River connectivity for aquatic migration, monitor and administer flow releases	$1,200,000	b				X	X			X					
AG-06	Glade Reservoir Fishery	Establish and maintain recreational cool water fishery at Glade Resevoir	Enhance regional recreational opportunities	$4,070,000	a				X	X	X							
AG-07	SPWCP Diversion Construction	Construct SPWCP diversion to avoid fish entrainment and allow fish passage	Avoidance and minimization of entrainment of fish in SPWCP diversion structure and decreased fish migration past diversion	$300,000	b	X	X			X								
AG-08	Galeton Reservoir Native Fish Rearing	Make Galeton Reservoir available to CPW for raising native warmwater fish for reintroduction	Compensation for reduced habitat availability and quality for native warmwater fish	$100,000	a				X	X								
AG-09	Galeton Reservoir Fish Screening	N/A [6]																
Streamflow Commitments																		
FW-01	Avoid Munroe Canal Diversions	Avoid NISP-related diversions through Munroe Canal	Avoidance of reduced Poudre River flows, reduced aquatic habitat, reduced river-based boating days, increased water quality concentrations	[5]	c	X				X	X	X	X			X		

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Measure No.	Mitigation and/or Enhancement Measure [1]	Mitigation and/or Enhancement Commitment [2]	Resource Considerations (see Table A.2 for complete list of mitigated effects; see text for description of enhanced resources)	Capitalized Cost [3]	Cost Note [4]	Mitigation			Enhancement [1]	Resources Involved								
						Avoidance	Minimization	Compensation		Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other
FW-02	Curtail Diversions for Non-Consumptive Water Rights	Curtail NISP diversions for existing Poudre River non-consumptive water rights (5-50 cfs), including those for Bellvue Fish Hatchery at Watson Lake	Avoidance and minimization of reduced Poudre River flows below Poudre Valley Canal diversion, reduced aquatic habitat, reduced water availability for riparian vegetation, reduced habitat for riverine special status species, increased water quality concentrations and DO, reduced river recreational value, nonuse value impacts; enhancement of low flows in conveyance refinement reach	[5]	c	X	X			X	X	X	X			X		
FW-03	Summer and Winter Diversion Curtailments	Curtail diversions when flow is less than 50 cfs during the summer, and 25 cfs during the winter		[5]	c	X				X		X				X		
FW-04	Conveyance Refinement - Poudre River Intake	Convey 18 cfs (winter) to 25 cfs (summer) of deliveries to NISP participants by releasing from Glade Reservoir to the Poudre River, and rediverting at Timnath Inlet; prior to full buildout, convey a minimum of 35% of NISP deliveries through Poudre River Intake		$24,520,000	b	X	X		X	X		X	X			X		
FW-05	Poudre River Flow Augmentation Program	Assist with securing Flow Augmentation Protection for the Poudre River		[5]	c	X	X		X	X	X	X	X					

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Measure No.	Mitigation and/or Enhancement Measure [1]	Mitigation and/or Enhancement Commitment [2]	Resource Considerations (see Table A.2 for complete list of mitigated effects; see text for description of enhanced resources)	Capitalized Cost [3]	Cost Note [4]	Mitigation			Enhancement [1]	Resources Involved								
						Avoidance	Minimization	Compensation		Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other
FW-06	Glade Reservoir Enlargement for Water Quality Purposes	N/A [6]																
FW-07	Ramp Hansen Supply Canal Releases	Work with CPW and water commissioner to ramp Hansen Supply Canal releases	Enhancement of aquatic habitat	[5]	c				X	X			X			X		
FW-08	Peak Flow Operations Program	Curtail SPWCP exchanges for peak 3 days each year. Bypass Grey Mountain water rights based on Tier (see text for details): • Tier 1 (>76% full and likely to fill) - bypass during peak 3 days each year • Tier 2 (>76% full, not likely to fill; >50% full) - bypass during peak 2 days to meet 2,800 cfs for Tier 2a; bypass up to 1,200 ac-ft for Tier 2b • Tier 3 (<50% full) - no bypass, except bypass for peak 1 day if 2,800 cfs flow trigger has not been met in previous 3 years (see text for detailed tier classifications and actions)	Avoidance and minimization of reduced sediment transport capability, reduced aquatic habitat	[5]	c	X	X			X			X			X		
FW-09	Ramp NISP Diversions at PVC	Limit changes in NISP diversions at the PVC headgate to no more than 500 cfs in 24 hours.	Avoidance and miniminzation of impacts on aquatic species.	[5]	c	X	X			X								

Table A1. Mitigation and Enhancement Plan Summary Table - By Mitigation Action Item

Measure No.	Mitigation and/or Enhancement Measure [1]	Mitigation and/or Enhancement Commitment [2]	Resource Considerations (see Table A.2 for complete list of mitigated effects; see text for description of enhanced resources)	Capitalized Cost [3]	Cost Note [4]	Mitigation			Enhancement [1]	Resources Involved								
						Avoidance	Minimization	Compensation		Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other
Noxious Weeds																		
NW-01	Noxious and Invasive Weed Control Plan	Develop and implement noxious weed control plan during construction	Avoidance and minimization of potential spread of noxious weeds during construction activities.	[5]	c	X	X											X
Recreation																		
RC-01	Glade Reservoir Recreation	Allow public access to Glade Reservoir fishery; investigate opportunities for recreation management and develop management plan that may include motorized boating, fishing and camping	Enhanced regional recreational opportunities	$200,000	a				X		X							X
RC-02	Glade Reservoir and State Land Hunting Access	Provide replacement access to State Trust Lands near Glade Reservoir and allow hunting access adjacent to Glade Reservoir	Compensation for inundation of existing access to State Trust Lands west of Glade Reservoir, reduced hunter access and game harvest near Glade Reservoir	[5]	c			X			X				X			X
RC-03	Glade Reservoir Recreation and Wildlife Adaptive Management Plan	Provide habitat for affected wildlife species while allowing the public to have reasonable access for recreation throughout the area	Enhanced regional recreational opportunities	[5]	c				X		X				X			X
RC-04	Mitani-Tokuyasu State Wildlife Area	Replace facilities at Mitani-Tokuyasu State Wildlife Area	Compensation for loss of land and impact on facilities at Mitani-Tokuyasu State Wildlife Area due to construction of SPWCP infrastructure, wildlife impacts at Galeton Reservoir	$50,000	b			X			X							X
RC-05	Land Acquisition in Confluence Area	Provide partial funding for land acquisition in Poudre - South Platte confluence area		$500,000	a			X			X							X

Table A1. Mitigation and Enhancement Plan Summary Table - By Mitigation Action Item

Measure No.	Mitigation and/or Enhancement Measure [1]	Mitigation and/or Enhancement Commitment [2]	Resource Considerations (see Table A.2 for complete list of mitigated effects; see text for description of enhanced resources)	Capitalized Cost [3]	Cost Note [4]	Mitigation			Enhancement [1]	Resources Involved								
						Avoidance	Minimization	Compensation		Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other
RC-06	Glade Reservoir Poudre River Recreator Parking	Construct parking lot at Glade Reservoir complex for use by Poudre River recreators	Compensation for drive-by traffic at Ted's Place; enhanced regional recreational opportunities	$40,000	b			X	X		X							X
RC-07	Glade Reservoir Visitor's Center	Construct Visitor's Center at Glade Reservoir	Compensation for loss of prime farmland, geologic construction disturbance, other general minor environmental effects	$940,000	a			X		X	X	X	X	X	X	X	X	X
Riparian Vegetation																		
RV-01	Riparian Vegetation - Cottonwood Regeneration Areas	Develop cottonwood regeneration areas in 3 specific reaches (58 acres) and adjacent to channel and habitat improvement reaches (2.4 miles)	Compensation for accelerated decline of plains cottonwood, increased water temperatures	$130,000	b			X				X	X			X		
RV-02	Riparian Vegetation - Channel Improvements	Reconnect channel to floodplain in channel and habitat improvement reaches, re-establish connection with backwater sloughs in Windsor area	Compensation for adverse effects on plant communities sensitive to alluvial groundwater levels	$280,000	b			X		X		X	X	X		X		
Special Status Species																		
SS-01	Preble's	N/A [7]																
SS-02	Bald Eagle	Conduct surveys for bald eagles and nests; meet CPW buffer requirements; take actions according to Bald Eagle and Golden Eagle Protection Act and Migratory Bird Treaty Act (MTBA)	Avoidance and minimization of, and compensation for, potential effects to bald eagle	[5]	c	X	X	X					X					
SS-03	Colorado Butterfly Plant	Conduct surveys of Colorado butteryfly plant for 2 years prior to construction, implement conservation measures if needed	Avoidance of and compensation for potential effects to Colorado butterfly plant	[5]	c	X		X					X					

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Measure No.	Mitigation and/or Enhancement Measure [1]	Mitigation and/or Enhancement Commitment [2]	Resource Considerations (see Table A.2 for complete list of mitigated effects; see text for description of enhanced resources)	Capitalized Cost [3]	Cost Note [4]	Mitigation			Enhancement [1]	Resources Involved								
						Avoidance	Minimization	Compensation		Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other
SS-04	Ute Ladies'-Tresses Orchid	Conduct surveys for Ute ladies'-tresses orchid for 2 years prior to construction, implement conservation measures if needed	Avoidance of and compensation for potential effects to Ute ladies'-tresses orchid	[5]	c	X		X					X					
SS-05	Platte River Target Species	Offset depletions through membership in SPWRAP	Compensation for effects to Platte River target species	$1,550,000	b			X					X					
SS-06	Black-Footed Ferret	Reevaluate and resurvey prairie dog colonies potentially impacted during construction	Avoidance and minimization of, and compensation for, potential impacts to black-footed ferret	[5]	c	X	X	X					X					
SS-07	Black-Tailed Prairie Dog	Relocate black-tailed prairie dogs prior to construction, follow CDOT guidelines	Avoidance and minimization of potential impacts to black-tailed prairie dog	[5]	c	X	X						X					
SS-08	Swift Fox	Survey for swift fox den sites, coordinate conservation measures with CPW	Avoidance and minimization of, and compensation for, potential impacts to swift fox	[5]	c	X	X	X					X					
SS-09	Burrowing Owl	Resurvey prairie dog colonies for proposed disturbances, coordinate with CPW for any burrowing owls found	Avoidance and minimization of, and compensation for, potential impacts to burrowing owl	[5]	c	X	X	X					X					
SS-10	Other Riparian Species	Implement proposed mitigation for wetlands and riparian habitat to benefit these species.	Compensation for potential impacts to common gartersnake, northern leopard frog, smokey-eyed brown butterfly, two-spotted skipper, American currant	[5]	c			X				X	X				X	
SS-11	Bell's Twinpod	Conduct surveys in potential habitat prior to construction, reestablish populations where impacts are unavoidable	Avoidance and minimization of, and compensation for, potential impacts to Bell's twinpod	[5]	c	X	X	X					X					
SS-12	Townsend's Big-Eared Bat	Protect entrance to exisiting cave	Avoidance of potential impacts to Townsend's Big-Eared Bat	[5]	c	X							X					

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Measure No.	Mitigation and/or Enhancement Measure [1]	Mitigation and/or Enhancement Commitment [2]	Resource Considerations (see Table A.2 for complete list of mitigated effects; see text for description of enhanced resources)	Capitalized Cost [3]	Cost Note [4]	Mitigation			Enhancement [1]	Resources Involved								
						Avoidance	Minimization	Compensation		Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other
Terrestrial and Avian Wildlife																		
TW-01	U.S. 287 - Big Game Underpass and Fencing	Construct one big-game underpass, and identify other crossings that could potential be designed to accommodate wildlife movement	Compensation for potential impacts to big game migration in the area inundated by Glade Reservoir and affected by U.S. 287 realignment; enhanced opportunities for big-game migration across U.S. 287 corridor, enhanced habitat protection west of Glade Reservoir	$500,000	b			X	X						X			
TW-02	U.S. 287 - Big Game Movement Adaptive Management Plan	Monitor road kills for 10 years and implement adaptive management actions as needed		$280,000	a			X	X						X			
TW-03	Migrating Birds and Raptors - Surveys and No Work Zones	Survey and mark active nests to establish no-work zones during breading seasons in accordance with MBTA	Avoidance and minimization of, and compensation for, potential effects on migrating birds, raptors, amphibians, reptiles and other wildlife	[5]	c	X	X	X							X			
TW-04	Migrating Birds and Raptors - Vegetation Clearing	Conduct vegetation clearing during nonbreeding season, when possible in accordance with MBTA		[5]	c	X	X	X							X			
TW-05	Migrating Birds and Raptors - Buffer Zones	Follow CPW recommended buffer zones and seasonal restrictions within certain distances of nest sites for raptors in accordance with MBTA. Follow MBTA regulations and permits for incidental or unavoidable takes		[5]	c	X	X	X							X			

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Measure No.	Mitigation and/or Enhancement Measure [1]	Mitigation and/or Enhancement Commitment [2]	Resource Considerations (see Table A.2 for complete list of mitigated effects; see text for description of enhanced resources)	Capitalized Cost [3]	Cost Note [4]	Mitigation			Enhancement [1]	Resources Involved								
						Avoidance	Minimization	Compensation		Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other
TW-06	Wildlife Habitat - Glade Reservoir Conservation Mitigation	Conserve approximately 1,080 acres of land owned or required for purchase surrounding Glade Reservoir as wildlife habitat using a conservation easement or other legal instrument; see TW-07 for additional commitments	Compensation for loss of winter range big-game habitat at Glade Reservoir	$2,920,000	b			X			X				X			
TW-07	Wildlife Habitat - Glade Reservoir Conservation Enhancement	Acquire and conserve approximately 300 acres of additional land surrounding Glade Reservoir as wildlife habitat using a conservation easement or other legal instrument; engage in conserving additional land west of Glade for big-game habitat, allow use of Glade conserved land for GOCO match, and consent to GOCO requirements	Enhancement of regional big-game habitat at Glade Reservoir	$810,000	a				X		X				X			
Water Quality																		
WQ-01	Glade Reservoir - Multi-Level Outlet Tower	Construct multi-level outlet tower at Glade Reservoir to convey Poudre River releases	Avoidance and minimization of potential increases in temperature, DO, copper, manganese, nutrients and selenium, and other conservative constituents especially during times of reduced flows; enhancement of temperature and DO (through introduction of cooler water) in Poudre River	$1,000,000	b	X	X		X	X						X		
WQ-02	Glade Reservoir - Release Structure Aeration	Construct Glade Reservoir release structures with baffling to provide aeration		$200,000	b	X				X						X		

Table A1. Mitigation and Enhancement Plan Summary Table - By Mitigation Action Item

Measure No.	Mitigation and/or Enhancement Measure [1]	Mitigation and/or Enhancement Commitment [2]	Resource Considerations (see Table A.2 for complete list of mitigated effects; see text for description of enhanced resources)	Capitalized Cost [3]	Cost Note [4]	Mitigation			Enhancement [1]	Resources Involved								
						Avoidance	Minimization	Compensation		Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other
WQ-03	Eaton Draw Water Quality Wetlands	Construct approximately 10 acres of wetlands in Eaton Draw to reduce ambient water quality concentrations in Lower Poudre River	Compensation for potential increased WQ concentrations in Poudre River near Greeley , increased sedimentation in lower Poudre, direct impacts to 0.3 acres of wetlands at Galeton Reservoir; enhancement of WQ concentrations in Poudre River near Greeley	$1,340,000	b			X	X							X	X	
WQ-04	Streamflow and Water Quality Monitoring	Establish/enhance streamflow and water quality monitoring network	Compensation for general water quality effects, monitoring required to implement provisions of this mitigation plan	$2,310,000	b			X		X	X			X		X		X
WQ-05	Coalition for the Poudre River Watershed	Provide funding and participate in Coalition for the Poudre River Watershed	Enhancement of general water quality, aquatics, vegetation, noxious weeds, recreation, riparian resources	$750,000	b				X	X	X	X				X		X
WQ-06	Stream Temperature Mitigation	Reduce or curtail NISP diversions if and as necessary to prevent new or exacerbated temperature standard exceedances	Avoidance and minimzation of potential increases in stream temperature, DO	[5]	c	X	X			X						X		
WQ-07	Mercury Bioaccumulation Mitigation	Support monitoring and management by CPW, provide Fish Consumption Advisory Signage as needed	Mitigation for potential bioaccumulation of mercury in fish tissue in Glade Reservoir and Glade Reservoir forebay	$220,000	a	X	X	X		X						X		
				Total	$53,240,000													

Notes:

[1] Green shaded rows indicate that the measure is entirely an enhancement mesaure. Green shading in Enhancement column only indicates the mitigation measure has an enhancment component.

Table A1. Mitigation and Enhancement Plan Summary Table - By Mitigation Action Item

Measure No.	Mitigation and/or Enhancement Measure [1]	Mitigation and/or Enhancement Commitment [2]	Resource Considerations (see Table A.2 for complete list of mitigated effects; see text for description of enhanced resources)	Capitalized Cost [3]	Cost Note [4]	Mitigation			Enhancement [1]	Resources Involved								
						Avoidance	Minimization	Compensation		Aquatic Life	Recreation	Riparian Veg/Wetlands	Special Status Species	Stream Morphology	Terrestrial Wildlife	Water Quality	Wetlands	Other

[2] The description of mitigation commitments is at a summary level - see text for details of the commitment. The text shall take precedent over any discrepancies between this table and the text.

[3] Capitalized cost is the sum of the capital cost plus any annual operations and maintenance costs capitalized over the life of the commitment, or 50 years for those commitments that are perpetual.

[4] Cost notes: a = cost is a firm not-to-exceed monetary commitment in this amount, see text for details.
b = approximate implementation or construction cost of this commitment
c = implementation cost has not been quantified.

[5] Implementation cost has not been quantified.

[6] AC-09 and FW-06 were not carried forward to final mitigation plans - see text for explanation.

[7] Because Preble's Meadow Jumping Mouse habitat mitigation is covered under federal statute with specific jurisdictional requirements, these mitigation activities are not further covered under this State FWMEP.

Table A2. Mitigation and Enhancement Plan Summary Table - By SDEIS Resource Effect [1]

Row	Resource	Summary of Effects Alternative 2 (Proposed Action Glade and SPWCP – Reclamation Action Option) [2]	Mitigation Measure No.
Surface Water			
1	*Surface Water*	**Poudre River** - Average diversion of **35,100** AFY at Poudre Valley Canal (Poudre Valley Canal) to Glade Reservoir. - Flows in 1.48 mile river reach between Poudre Valley Canal and Hansen Supply Canal would be greater (average 8,200 AFY) than No Reclamation Action Option. - Due to exchanges with CB-T, average reduction of 7,700 AFY in releases to Poudre River at Hansen Supply Canal. - Flows in Poudre River downstream of Hansen Supply Canal essentially same for Reclamation Action and No Reclamation Action Options due to releases from Glade Reservoir for Reclamation Action Option. - Diversions would primarily reduce peak flows during May and June in years with average to above average flows. - Reduced flows between Poudre Valley Canal and Larimer-Weld and New Cache headgates due to direct flow and storage exchanges during April-October (irrigation season). - Flow augmentation program would release water from Glade Reservoir to maintain flow of 10 cfs at downstream side of Larimer-Weld Canal headgate from November 1 through April 30 and September 1 through September 30. **South Platte River** - Average diversion of **28,400** AFY just downstream of confluence of Poudre and South Platte Rivers. - Diversions would be limited to a maximum of 200 cfs and could occur in all months when water rights are in priority. - Change in flow would be less than 10% of average monthly flows at Kersey Gage. **Horsetooth Reservoir** Variations in water levels would be similar to existing conditions. **Carter Lake** Variations in water levels would be similar to existing conditions.	FW-01; FW-02; FW-03; FW-04; FW-05; FW-08
Surface Water Quality			
Poudre and South Platte River Constituents			
2	*Nutrients*	Ammonia and total phosphorus increases may be measurable below WWTPs due to reduced river flows, may exceed standard at some locations in Segment 12 of Poudre River and 1b on South Platte River (standards are exceeded under Current Conditions for these nutrients).	WQ-03; WQ-04
3	*Metals*	Increases and decreases in metal concentrations due to flow changes may not be measurable. Medium chance of copper and dissolved manganese standard exceedance in Segment 10 of Poudre River. Medium chance of exceeding total phosphorus standard and a high potential for continued exceedance of selenium standard in Segment 11 of Poudre River. Iron, ammonia, total phosphorus, and selenium concentrations currently exceed standards in Segment 12 of Poudre River and likely to remain above standards. Iron, total phosphorus, and sulfate concentrations remain above standard in Segment 1b of South Platte River. Ammonia and dissolved manganese have a medium chance of exceeding standard in Segment 1b of South Platte River.	FW-03; WQ-01; WQ-04; WQ-07

Table A2. Mitigation and Enhancement Plan Summary Table - By SDEIS Resource Effect [1]

Row	Resource	Summary of Effects Alternative 2 (Proposed Action Glade and SPWCP – Reclamation Action Option) [2]	Mitigation Measure No.
4	*Temperature*	Adverse effects on stream temperature possible in sensitive reaches of Segment 10 and Segment 11 including key months of July and August. Flow augmentation program would provide net benefit in parts of Segments 10 and 11 (from 0.37 miles upstream of Larimer County Canal to Timnath Inlet headgate) in key months of March and September.	AG-01; AG-02; FW-04; WQ-01; WQ-02; WQ-04; WQ-06
5	*Dissolved Oxygen*	Diversions at Poudre Valley Canal could exacerbate occasionally observed DO issues in July and August in Segment 11. Flow augmentation would likely provide DO benefit November through April and in September. Aeration of releases from Glade Reservoir should also help maintain DO concentrations within standards.	WQ-02; WQ-04
Larimer-Weld and New Cache Canal			
6	*Crop Yield*	Elevated salinity and selenium concentrations in Galeton Reservoir releases to canals would result in decrease in crop yields where water used for irrigation.	SE-01; SE-02
Channel Morphology and Sediment Transport			
7	*Change in flow regime*	Mean flow reduced **20-30%** mid-April to mid-July. Duration of flows at or above 1,000 cfs reduced **30-35%**. 2% flow reduced 10-30%. 10-year flood peak reduced up to **21%**. *Laporte Reach:* 1, 2, and 5% exceedance flows reduced **11-26%**. Lower flows (10 and 25% flows) reduced **16-28%**. *Fort Collins Reach:* Winter low flows increased up to 35% from flow augmentation. 1, 2, and 5% flows reduced **13-47%**. Lower flows (10 and 25% flows) reduced **12-41%**. 2-year flood reduced **19-36%** in Fort Collins and upper Timnath reaches. 25-year flood reduced up to **10%** in Fort Collins. *Timnath, Windsor, Greeley Upstream, Greeley Channelized, and Greeley Reaches:* Impact greatest on 5% exceedance flows, reduced **25-42%**. Impact on floods up to 25-year flood reasonably uniform, with 2, 10, and 25-year flood peaks all reduced **16-21%**.	AG-01; AG-02; FW-08

Table A2. Mitigation and Enhancement Plan Summary Table - By SDEIS Resource Effect [1]

Row	Resource	Summary of Effects Alternative 2 (Proposed Action Glade and SPWCP – Reclamation Action Option) [2]	Mitigation Measure No.
8	*Fining of surficial material*	At 55% of cross sections duration of flows that flush river bed fines reduced **5-50%**. For remaining 45% of cross sections no flushing or no change in duration of flushing flows. *Laporte Reach:* 15 flushing events under Current Conditions lasting 132 days total reduced to **10** flushing events lasting **94** days total (26-year period of record) *Fort Collins Reach:* 23 flushing events under Current Conditions lasting 325 days total reduced to **16** flushing events lasting **222** days total (26-year period of record) *Timnath, Windsor, Greeley Upstream, Greeley Channelized, and Greeley Reaches:* 18 flushing events under Current Conditions lasting 292 days total for Windsor reach reduced to **19** flushing events lasting **218** days total (26-year period of record)	AG-01; AG-02; AG-04; FW-08
9	*Loss of morphologic complexity*	Duration of bed material movement reduced on average **21%** and up to **40%** in some locations. Temporal variability of habitats reduced throughout. Spatial variability reduced downstream of I-25. *Laporte Reach:* Channel has barely responded to historical changes in flow regime over last two centuries. Any change predicted to be similarly constrained by lack of sediment supply. *Fort Collins Reach:* Effective discharge of 2,000 cfs remains unchanged from Current Conditions hydrology. Channel capacity similar unless quantity or size distribution of available sediment changes. Current channel still undergoing slow adjustment in response to historical changes in flow regime. Any change would be incremental to that existing response. *Timnath, Windsor, Greeley Upstream, Greeley Channelized, and Greeley Reaches:* Complexity of in-channel morphologic features already low in reaches downstream of I-25 from sand deposition smothering bed and reducing magnitude and frequency of pool and riffle sequences. Further channel contraction would exacerbate this condition.	AG-01; AG-02; FW-08

Table A2. Mitigation and Enhancement Plan Summary Table - By SDEIS Resource Effect [1]

Row	Resource	Summary of Effects Alternative 2 (Proposed Action Glade and SPWCP – Reclamation Action Option) [2]	Mitigation Measure No.
10	*Channel contraction*	Sediment transport potential reduced throughout river. Capability of river to move bed material reduced **12-31%** (upstream of I-25) and **8-18%** (downstream of I-25). Propensity toward channel contraction throughout system but mainly downstream of I-25 where material of relevant size fraction available for deposition and bio-geomorphic feedback loops would prevail. Likely acceleration of channel contraction would lead to increased frequency of flooding downstream of 1-25. *Laporte Reach:* Channel capacity similar to Current Conditions unless quantity or size distribution of available sediment changes. *Fort Collins Reach:* Channel capacity similar under Current Conditions unless quantity or size distribution of available sediment changes. *Timnath Reach:* Channel contraction would occur as extension of processes already underway by deposition on bars, islands, riffles, and channel margins.	AG-01; RV-02; FW-08
11	*South Platte River*	Minor effects to river morphology and sediment transport. Channel-forming flows (1.5-year peak flows of 3,858 cfs) would be reduced from ~ 3% to less than 1% of the time. Scouring flows equivalent to 25-year peak flows would continue to occur.	N/A
Ground Water			
12	*Ground Water*	Minimal effects to ground water from reduced river flows and associated changes in river stage. Greatest changes would be within 50 feet of Poudre River. Minimal seepage from reservoir to alluvium could increase water availability to vegetation. No impacts on ground water quality.	
Geology			
13	*Geology*	Disturbance from construction activities and excavation of sand, gravel, and bedrock for Glade Dam and Galeton Dam embankments, foundation, and rip rap. Excavation and removal of Paleozoic and Mesozoic sedimentary rocks associated with the U.S. 287 realignment. excavation of sand, gravel, and bedrock for Glade Dam and Galeton Dam embankments, foundation, and rip rap. Excavation and removal of Paleozoic and Mesozoic sedimentary rocks associated with the U.S. 287 realignment.	GC-04; RC-07
Prime Farmland if Irrigated (acres lost)			
14	*Prime Farmland if Irrigated (acres lost)*	686	RC-07
Vegetation			
15	*Permanent impacts on all vegetation (acres)*	3,895	N/A

Table A2. Mitigation and Enhancement Plan Summary Table - By SDEIS Resource Effect [1]

Row	Resource	Summary of Effects Alternative 2 (Proposed Action Glade and SPWCP – Reclamation Action Option) [2]	Mitigation Measure No.
16	*Permanent impacts on native plant communities (acres)*	2,857	N/A
17	*Irrigated agricultural lands dry up (acres)*	0	N/A
Noxious Weeds			
18	*Noxious Weeds*	Increased distribution and cover by noxious weeds due to construction disturbance. Periods of prolonged low water levels at Glade and Galeton Reservoirs would allow for noxious weeds to colonize the drawdown area to construction disturbance. Periods of prolonged low water levels at Glade and Galeton Reservoirs would allow for noxious weeds to colonize the drawdown area.	NW-01
Wetlands and Other Waters			
19	*Wetlands (permanent direct effects) (acres)*	44	WL-01; WL-02; WQ-03
20	*Wetlands (temporary direct effects) (acres)*	8	GC-01
21	*Wetlands from Irrigation Dry-up (permanent indirect effects) (acres)*	0	N/A
22	*Wetlands from Poudre Valley Canal lining (permanent indirect effects) (acres)*	0	N/A
23	*Wetlands from Poudre River flow changes (indirect effects) (acres)*	9	RV-01; RV-02
24	*Waters (permanent direct effects) (acres)*	12	GC-01
25	*Waters (temporary direct effects) (acres)*	3	GC-01
Riparian Resources			
26	*Riparian shrubland and woodland (permanent direct effects) (acres)*	112 (inundation and construction)	AG-01; RV-01
27	*Riparian shrubland and woodland(temporary direct effects) (acres)*	8	AG-01; RV-01; GC-01

Table A2. Mitigation and Enhancement Plan Summary Table - By SDEIS Resource Effect [1]

Row	Resource	Summary of Effects Alternative 2 (Proposed Action Glade and SPWCP – Reclamation Action Option) [2]	Mitigation Measure No.
Wildlife			
Mule Deer			
28	Overall Range (acres)	Permanent – 3,995	TW-01; TW-02; TW-06
29		Temporary – 782	
30	Winter Range (acres)	Permanent – 3,789	
31		Temporary – 647	
32	Winter Range Permanent Local Effect (%)	**16**	
33	Severe Winter Range (acres)	Permanent – 228	
34		Temporary – 173	
35	Winter Concentration Area (acres)	Permanent – 70	
36		Temporary – 152	
White-Tailed Deer			
37	Overall Range (acres)	Permanent – 2,057	RC-05
38		Temporary – 582	
39	Winter Range (acres)	Permanent – 416	
40		Temporary – 192	
41	Winter Range Permanent Local Effect (%)	**8**	
42	Concentration Area (acres)	Permanent – 421	
43		Temporary – 203	
Pronghorn			
44	Overall Range (acres)	Permanent – 2,256	RC-05
45		Temporary – 335	
46	Winter Range (acres)	Permanent – 2,256	
47		Temporary – 295	
48	Winter Range Permanent Local Effect (%)	**25**	
49	Severe Winter Range (acres)	Permanent – 2,254	
50		Temporary – 256	
51	Winter Concentration Area (acres)	Permanent – 1,928	
52		Temporary – 204	
53	Winter Concentration Area Permanent Local Effect (%)	**31**	

Table A2. Mitigation and Enhancement Plan Summary Table - By SDEIS Resource Effect [1]

Row	Resource	Summary of Effects Alternative 2 (Proposed Action Glade and SPWCP – Reclamation Action Option) [2]	Mitigation Measure No.
Elk			
54	Overall Range (acres)	Permanent – 2,043	TW-01; TW-02; TW-06
55		Temporary – 386	
56	Overall Range Permanent Local Effect (%)	18	
57			
58	Winter Range (acres)	Permanent – 186	
59		Temporary – 101	
60	Severe Winter Range (acres)	Permanent – 2	
61		Temporary – 8	
62	Winter Concentration Area (acres)	Permanent – 124	
63		Temporary – 75	
64	Winter Concentration Area Permanent Local Effect (%)	**13**	
Migratory birds and raptors, amphibians and reptiles, and other wildlife			
65	*Migratory birds and raptors, amphibians and reptiles, and other wildlife (acres)*	Loss of **44** acres of wetlands, **12** acres of aquatic habitat, **537** acres of shrublands, **29** acres of riparian woodlands, and **2,929** acres of grassland habitat. Mortality and nest destruction could occur during construction. Temporary impacts include disturbance of vegetation and increased noise and human presence. Reductions in streamflows on Poudre and South Platte Rivers not anticipated to cause loss of riparian and/or wetland habitat. **9** acres of wetland habitat along banks could experience change in species composition.	TW-03; TW-04; TW-05
Aquatic Biological Resources			
Poudre River Fish, Macroinvertebrates, Periphyton, and Plants			
66	Segment A	Fish: Minor adverse impact to adult trout due to reduced runoff flows, negligible impacts to other species/life stages Macroinvertebrates: Minor adverse impact with changes in species composition due to reduced peak flows Periphyton and Plants: Minor adverse impact with increases in filamentous green algae due to reduced peak flows	AG-01; AG-02; AG-04; FW-02; FW-03; FW-04; FW-08; FW-09

Table A2. Mitigation and Enhancement Plan Summary Table - By SDEIS Resource Effect [1]

Row	Resource	Summary of Effects Alternative 2 (Proposed Action Glade and SPWCP – Reclamation Action Option) [2]	Mitigation Measure No.
67	Segment B	Fish: Minor to moderate beneficial impact to most species of fish with augmented low flows Macroinvertebrates: Beneficial impact to abundance, minor adverse impact with changes in species composition due to reduced peak flows Periphyton and Plants: Minor adverse impact with increases in filamentous green algae due to reduced peak flows	AG-01; FW-03; FW-04; FW-05; RV-01; RV-02; FW-08; FW-09
68	Segment C	Fish: Negligible impact to most species, moderate adverse impact to trout with reduced runoff flows and higher temperatures Macroinvertebrates: Minor adverse impact with changes in species composition due to reduced peak flows Periphyton and Plants: Minor adverse impact with increases in filamentous green algae due to reduced peak flows	AG-01; FW-02; FW-03; FW-08; FW-09
69	Segment D	Fish: Minor adverse impact for some species with reductions in runoff flows, negligible impact for others Macroinvertebrates: Minor adverse impact with changes in species composition due to reduced peak flows Periphyton and Plants: Minor adverse impact with increases in filamentous green algae due to reduced peak flows	AG-01; FW-03; RV-01; RV-02; FW-08; FW-09
70	Segment E	Fish: Minor adverse impact for most species with reduced runoff flows Macroinvertebrates: Minor adverse impact with changes in species composition due to reduced peak flows Periphyton and Plants: Minor adverse impact with increases in filamentous green algae due to reduced peak flows	AG-01; FW-03; FW-08; FW-09
71	Segment F	Fish: Minor adverse impact for most species with reduced runoff flows Macroinvertebrates: Minor adverse impact with changes in species composition due to reduced peak flows Periphyton and Plants: Minor adverse impact with increases in filamentous green algae due to reduced peak flows	AG-01; FW-03; FW-08; FW-09
South Platte River Fish, Macroinvertebrates, Periphyton, and Plants			
72		Negligible	AG-07

Table A2. Mitigation and Enhancement Plan Summary Table - By SDEIS Resource Effect [1]

Row	Resource	Summary of Effects Alternative 2 (Proposed Action Glade and SPWCP – Reclamation Action Option) [2]	Mitigation Measure No.
Special Status Species			
73	*Preble's meadow jumping mouse*	Permanent loss of **53** acres of known Preble's habitat. Temporary disturbance to **24** acres of Preble's habitat. Potential disturbance of Preble's behavior due to increased noise and human presence and physical harm to individual Preble's from construction machinery and future recreational activities at Glade. Changes in flows in Poudre River unlikely to affect Preble's habitat.	SS-01
74	*Bald eagle*	Permanent impacts of **21** acres and temporary impacts of **13** acres of winter concentration area. **Less than 1** acre of nest buffer permanently affected and **8** acres temporarily affected. Pipeline construction impacts could result in nest abandonment or decreased nesting success if conducted during sensitive breeding and nesting periods. Glade Reservoir could provide additional summer foraging habitat, especially if stocked with fish. Galeton Reservoir could provide additional summer foraging habitat.	SS-02
75	*Colorado butterfly plant (CBP)*	**No effect.** No known populations occur in study area and is unlikely to occur in study area. Changes in flows in Poudre River unlikely to affect CBP.	SS-03
76	*Ute ladies'-tresses orchid (ULTO)*	**No effect.** None found during surveys of study area. No known populations occur in study areas and is unlikely to occur in SPWCP pipeline study area. Glade to Horsetooth pipeline route less than 1 mile from currently known populations of ULTO. Prior to construction, ULTO habitat assessments and/or final surveys would be conducted for potentially impacted suitable habitat not previously evaluated. Changes in flows in Poudre River unlikely to affect ULTO.	SS-04
77	*Black-tailed prairie dog and burrowing owl*	Permanent impacts on **367** acres of prairie dog habitat, mostly from construction of Galeton Reservoir.	SS-07; SS-09
78	*Swift fox*	Permanent impacts on **1,928** acres of overall swift fox range (**0.3 to 1.0** home ranges/pair).	SS-08
79	*Common gartersnake and northern leopard frog*	Permanent loss of **44** acres of wetland habitat, **11** acres of aquatic habitat, and **28** acres of riparian woodland habitat (gartersnake only). Temporary impacts on **8** acres of wetland habitat, **3** acres of aquatic habitat, and **8** acres of riparian woodland (gartersnake only).	SS-10
80	*Smokey-eyed brown butterfly, two-spotted skipper, and American currant*	No effect.	SS-10
81	*Bell's twinpod*	Permanent loss of **29** acres and temporary impacts on **45** acres from western realignment of U.S. 287.	SS-11
82	*Brassy minnow and common shiner*	No effect	N/A
83	*Iowa darter*	Negligible except Segment B, which would be moderate beneficial	FW-03; FW-04

Table A2. Mitigation and Enhancement Plan Summary Table - By SDEIS Resource Effect [1]

Row	Resource	Summary of Effects Alternative 2 (Proposed Action Glade and SPWCP – Reclamation Action Option) [2]	Mitigation Measure No.
Recreation Resources			
84	*Boating (kayaking and canoeing)*	If Glade is managed for recreation, new flat water boating opportunities would exist, a major beneficial effect. No public access planned at Galeton Reservoir. Poudre River Segment A: Negligible effects. Poudre River Segment B: Moderate to major effects with 3 to 7 fewer boating days per month (total of 19 fewer days over May-August period) based on target flows of 150 cfs or greater. Poudre River Segments C, D, E, and F: No effects.	FW-02; FW-03; FW-04; RC-06; FW-08
85	*Fishing*	If Glade is managed for recreation, would provide a new fishery, a major beneficial effect. No public access planned at Galeton Reservoir. Poudre River Segment A: Reductions in habitat for brown and rainbow trout would be a minor adverse effect on fishing. Poudre River Segment B: Augmented winter flows would result in minor beneficial effects on recreational fishing. Poudre River Segments C, D, E, and F: Negligible effects.	AG-02; FW-02; FW-03; FW-04; RC-06; FW-08
86	*Hunting*	Loss of **340** acres of Poudre River State Trust Land, which is managed for hunting and fishing by CPW. Construction of Glade Reservoir may improve habitat, therefore improving hunting opportunities. Loss of **21** acres of Mitani-Tokuyasu SWA. Mule deer and white-tailed deer winter range may be affected at SPWCP forebay, thus affecting nearby big game hunting. Pronghorn winter and severe winter range and mule deer winter range affected at Galeton Reservoir and may have an effect on nearby big game hunting. Construction of Galeton Reservoir may improve waterfowl habitat in area, which may improve nearby hunting opportunities.	RC-02; RC-04; RC-05
87	*Other Recreational Activities*	Construction of Glade to Horsetooth pipeline would temporarily disrupt dispersed recreational uses along its alignment. Reductions in flows on Poudre River not expected to affect aesthetic qualities of riparian habitat of Poudre River, Poudre River Trail, or natural areas. Construction of Galeton Reservoir may improve habitat in area, which may improve nearby wildlife viewing or photography opportunities. Construction of SPWCP pipelines is not expected to affect recreation resources.	N/A

Table A2. Mitigation and Enhancement Plan Summary Table - By SDEIS Resource Effect [1]

Row	Resource	Summary of Effects Alternative 2 (Proposed Action Glade and SPWCP – Reclamation Action Option) [2]	Mitigation Measure No.
Cultural Resources			
88	*Cultural Resources*	**2** known cultural resources and an estimated **35** NRHP eligible sites affected by construction of Glade Dam and Reservoir and associated facilities or would be inundated by reservoir. **7** known cultural resources and **7** unrecorded cultural resources would be affected by western realignment of U.S. 287. Of the known cultural sites, 3 of these are eligible sites, 1 is not eligible, and 3 have not been assessed. **15** known cultural resources occur within areas that would be disturbed by construction of Galeton Dam and Reservoir and associated facilities or would be inundated by reservoir. Of these 15 sites, 13 have not had an official determination and may be eligible for listing in NRHP and two are not eligible.	CR-01; CR-02; CR-03
Paleontological Resources			
89	*Paleontological Resources - U.S. 287*	Adverse impacts on subsurface fossils in areas underlain by Class 5 geologic units (Morrison Formation). Adverse impacts on potentially substantial vertebrate, invertebrate, plant, and trace fossils possible in Class 3 geologic units (Niobrara Formation, Benton Group, Dakota Group, Undivided Jelm, and Sundance Formations). Adverse impacts on potentially substantial vertebrate, invertebrate, plant, and trace fossils unlikely but possible in Class 2 geologic units (Lykins Formation). Adverse impacts consist of destruction of fossils by breakage and crushing during construction-related ground disturbance.	CR-04; CR-05
Aesthetics and Visual Resources			
90	*Aesthetics and Visual Resources*	Change in landscape from terrestrial to open water for Glade and Galeton Reservoirs. Reservoir dams would change current visual character of sites. One-third of Mitani-Tokuyasu SWA would be replaced by Galeton forebay resulting in substantial reduction in scenic quality. Realignment of U.S. 287 would create contrast in scenic quality elements where it cuts through hogback formation.	VS-01
Traffic and Transportation			
91	*Traffic Volumes*	Existing traffic patterns not expected to change so reduced traffic volumes along SH 14 between Overland Trail and Ted's Place. If recreation provided at Glade Reservoir minor seasonal fluctuations in vehicle volumes can be anticipated. reduced traffic volumes along SH 14 between Overland Trail and Ted's Place. If recreation provided at Glade Reservoir minor seasonal fluctuations in vehicle volumes can be anticipated.	GC-03
92	*Existing Roadways*	7-mile portion of U.S. 287 relocated. New alignment 2.3 miles shorter. Location of Galeton Reservoir would not infringe on or disturb any existing roadways. 2.3 miles shorter. Location of Galeton Reservoir would not infringe on or disturb any existing roadways.	GC-05

Table A2. Mitigation and Enhancement Plan Summary Table - By SDEIS Resource Effect [1]

Row	Resource	Summary of Effects Alternative 2 (Proposed Action Glade and SPWCP – Reclamation Action Option) [2]	Mitigation Measure No.
93	*Current Travel Patterns*	New U.S. 287 alignment would be about 2.3 miles shorter. Access to Bonner Spring Ranch Road may be affected by realignment and new access would be provided. Pipeline construction would potentially temporarily disrupt some transportation, depending upon alignment.	GC-01; GC-03
94	*Site Access*	Construction of Galeton Reservoir would require extension an existing roadway or construction of a private drive for purposes of accessing and maintaining facility.	GC-01
Land Use			
95	*Agriculture*	Portion of Munroe Canal inundated by Glade Reservoir. Canal would be realigned with Poudre Valley Canal or routed under Glade Reservoir.	GC-01
96	*Grazing*	Grazing permittee would lose use of District lands at Glade Reservoir. 26 acres of BLM land used for grazing inundated by Glade Reservoir. About 36 acres of grazing lease affected on State Land Board lands at Galeton Reservoir site.	GC-01
97	*Access*	CSU and Poudre School District access road into State Trust Land inundated. Existing access to Bonner Springs Ranch residential area from south altered by U.S. 287 realignment. Construction of SPWCP forebay would inundate a portion of access road and parking area of Mitani- Tokuyasu SWA.	RC-02; GC-03; RC-04
98	*Utilities*	Two towers on Platte River Power Authority 230-kV transmission line relocated. Realignment of four H- frame structures and 0.6 miles of a 69-kV electric transmission line owned by Poudre Valley REA. Proposed Cheyenne-Totem gas pipeline is shown to partially parallel SPWCP pipelines and cross proposed Galeton Reservoir forebay. Thirty-one producing oil and gas wells are within Galeton Reservoir footprint. District would relocate any well that would interfere with reservoir operations. District anticipates all wells would be abandoned by operator before Galeton Reservoir was built.	GC-01; HZ-02
99	*Natural Areas*	Reservoir Ridge Natural Area temporarily affected during construction of Glade to Horsetooth pipeline.	GC-01
100	*Urban/Residential*	2 residences inundated during construction of Glade Reservoir and 1 residence located within 500 feet of the reservoir. Construction of Glade to Horsetooth pipeline and other pipelines could potentially temporarily affect some urban and residential uses, depending upon final alignments.	LU-01; GC-01

Table A2. Mitigation and Enhancement Plan Summary Table - By SDEIS Resource Effect [1]

Row	Resource	Summary of Effects Alternative 2 (Proposed Action Glade and SPWCP – Reclamation Action Option) [2]	Mitigation Measure No.
101	*Industry*	No impact to industry.	N/A
Socioeconomic Resources			
Study area			
102	Water Rates/Affordability	Minor impact on rates and affordability for some Participants.	RC-07
103	Population growth	No effect.	N/A
Poudre River Communities			
104	Recreation Resources	Major impact on boating recreational value in Fort Collins. Moderate impact on recreational value of Poudre River Trail in Fort Collins. No effect on fishing recreation values.	FW-02; FW-03; FW-04
105	Property Values	No effect in Fort Collins. Potential minor effects downstream of I-25 due to changes in flood risks.	AG-01
106	Water/Wastewater Treatment Costs	No effect.	N/A
107	Other Socioeconomic Effects	Likely no additional effect on Fort Collins economy/economic development. Potential major impact on nonuse values associated with Poudre River for Fort Collins residents.	FW-03; FW-04
Broader Study Area			
108	Regional Recreation Resources	Major benefit from recreation at Glade Reservoir.	N/A
109	Irrigated Agriculture-Related Economy	No effect under average conditions. Minor effect under potential worst-case conditions due to increased salinity associated with the SPWCP ditch exchange.	SE-02
110	Road Relocation Effects	Moderate to major impact on gasoline station and campground at Ted's Place. No net effect on value of residential properties.	RC-06
111	Construction Effects	Construction stimulus paid for by regional residents over future years. No net effect.	N/A
112	Agricultural-related economy	Estimated annual impact on agricultural-related economic output in the study area of approximately $34 million and an estimated reduction in agriculture- related employment of about 291 jobs associated with growth onto agricultural lands and their conversion to municipal uses.	N/A
Hazardous Sites			
113	*Hazardous Sites*	Proposed Glade Reservoir forebay located near Atlas "E" Missile Site 13 and known TCE plume associated with missile site. Currently no detectable TCE within footprint of proposed forebay. Soil containing TCE not expected within proposed footprint of forebay. As contaminant mass continues to naturally attenuate TCE plume will continue to decrease in size.	HZ-01

Table A2. Mitigation and Enhancement Plan Summary Table - By SDEIS Resource Effect [1]

Row	Resource	Summary of Effects Alternative 2 (Proposed Action Glade and SPWCP – Reclamation Action Option) [2]	Mitigation Measure No.
Noise			
114	*Noise*	Increased noise associated with reservoir and pipeline construction and realignment of U.S. 287 would occur in localized areas temporarily.	GC-01
Air Quality			
115	*Air Quality*	Same as Alternative 1.	AQ-01; GC-01
Energy Use/Greenhouse Gases			
116	*Energy Use/Greenhouse Gases*	Electrical energy used to pump water up to reservoirs and for conveyance of water and for SPWCP exchange; includes additional pumping of water to Carter Lake. Projected annual electricity requirements at full utilization = 48,135,987 KwH Projected annual carbon dioxide emissions at full utilization (English tons) = 37,259	EG-01
Construction Duration			
117	*Construction Duration*	6 years.	GC-01; GC-02; GC-03; GC-04
Other CPW Effects [3]			
118	*Townsend's big-eared bat*	The inundation by Glade Reservoir of approximately seven miles of U.S. Highway 287, includes the 'loss' by flooding of the State Land Board parcel (T9N, R70W, S36) which contains a known roost site for the Townsend's big-eared bat (Corynorhinus townsendii), a State Species of Special Concern. CPW suggests that further ground surveys for additional roost sites should be conducted across the area to be inundated, and compensatory mitigation for loss of these sites should be considered if the project is approved.	SS-12

Notes:

1 Source of table is SDEIS Table 4-109 for Alternative 2 (Northern Water's Preferred Alternative)

2 Dark gray shading indicates those effects from SDEIS 4-109 that are not covered under this Fish and Wildlife Mitigation and Enhancement Plan. See Conceptual Mitigation Plan (SDEIS Appendix F) for mitigation information on these items.

3 Effects were not included in the SDEIS, but were comments and/or proposed mitigation measures by CDNR.