Draft
Environmental Assessment
Rock Creek Meadow Restoration Project

Prepared by

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With Support from

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Executive Summary

The U.S. Fish and Wildlife Service (USFWS), in cooperation with the multi-agency Shasta Crayfish Technical Review Committee (TRC) and Shasta Crayfish Recovery Implementation Team (Recovery Team), is proposing to create refuge habitat for Shasta crayfish (*Pacifastacus fortis*) in an isolated, historically occupied segment of Rock Creek in the Hat Creek Drainage in Shasta County, California. The members of both the TRC and Recovery Team include scientists from USFWS, California Department of Fish and Wildlife (CDFW), Pacific Gas and Electric Company (PG&E), academia, Spring Rivers Foundation, and Spring Rivers Ecological Sciences LLC (Spring Rivers). Rock Creek is within the native range of Shasta crayfish, a species listed as endangered under both the federal and state Endangered Species Acts. Shasta crayfish inhabited Rock Creek prior to its diversion in 1950 to supply water to CDFW's Crystal Lake Hatchery. The objective of the proposed Rock Creek Meadow Restoration Project is to create a refuge habitat for Shasta crayfish were they will be isolated from invasive crayfish species that are causing their decline. To accomplish this objective the Rock Creek Meadow Restoration Project will restore a segment (~650 feet) of Rock Creek to pre-diversion conditions, which will provide high quality habitat for Shasta crayfish, and then reintroduce Shasta crayfish to the restored reach thereby establishing a refuge population safe from the effects of invasive crayfish. These activities are intended to help meet the goals of the Shasta Crayfish Recovery Plan.

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List of Acronyms and Abbreviations

BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BO	Biological Opinion
CAA	California Clean Air Act
CDFG	California Department of Fish and Game (prior to January 1, 2013)
CDFW	California Department of Fish and Wildlife (after January 1, 2013)
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CWA	Clean Water Act
DPS	Distinct Population Segment
EA	Environmental Assessment
ESA	Federal Endangered Species Act
FERC	Federal Energy Regulatory Commission
FONSI	Finding of No Significant Impact
FP	California Fully Protected
FPA	Federal Power Act of 1920
FSS	USDA Forest Service
HACCP	Hazard Analysis and Critical Control Points Plan
Hat Creek Project	Hat Creek Hydroelectric Project, FERC Project No. 2661

MBTA	Migratory Bird Treaty Act
MOU	Memorandum of Understanding
MND	Mitigated Negative Declaration
NAAQS	National Ambient Air Quality Standards
NANPCA	Nonindigenous Aquatic Nuisance Prevention and Control Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NISA	National Invasive Species Act
NPPA	California Native Plant Protection Act
OSH Act	Occupational Safety and Health Act of 1970
PG&E	Pacific Gas and Electric Company
Pit 1 Project	Pit 1 Hydroelectric Project, FERC Project No. 2687
Porter-Cologne Act	California Porter-Cologne Water Quality Control Act
PPA	Plant Protection Act
TRC	Shasta Crayfish Technical Review Committee
SHPO	State Historic Preservation Officer
Spring Rivers	Spring Rivers Ecological Sciences LLC
SSC	CDFW Species of Special Concern
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
WL	Watch List species protected under the Migratory Bird Treaty Act

1.0 INTRODUCTION

This Environmental Assessment (EA) has been prepared by the U.S. Fish and Wildlife Service (USFWS) pursuant to the National Environmental Policy Act (NEPA). This EA evaluates the effects of providing partial funding for, and implementation of the proposed Rock Creek Meadow Restoration Project (Project). The Project is located on privately owned lands within northeastern California (Shasta County).

The USFWS' purpose in preparing an EA is to allow the USFWS to determine whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI) on the proposed action.

2.0 PROJECT OVERVIEW

The USFWS, in cooperation with the California Department of Fish and Wildlife[1] (CDFW), the multi-agency Shasta Crayfish Technical Review Committee (TRC), and Shasta Crayfish Recovery Implementation Team (Recovery Team), is proposing to create refuge habitat for Shasta crayfish (*Pacifastacus fortis*) in an isolated, historically occupied segment of Rock Creek in the Hat Creek Drainage in Shasta County, California (Figure 1). The members of both the TRC and Recovery Team include scientists from USFWS, CDFW, Pacific Gas and Electric Company (PG&E), academia, Spring Rivers Ecological Sciences LLC (Spring Rivers), and Spring Rivers Foundation, a non-profit 501(c)(3) corporation dedicated in part to working toward the recovery of Shasta crayfish. Rock Creek is within the native range of Shasta crayfish, a species listed as endangered under the federal and state Endangered Species Acts. Shasta crayfish inhabited Rock Creek prior to its diversion in 1950 to supply water to CDFW's Crystal Lake Hatchery. The objective of the Rock Creek Meadow Restoration and Reintroduction Plan for Shasta Crayfish (Rock Creek Meadow Restoration Plan, PG&E 2014a), which is provided in Attachment A, is to establish a refuge population of Shasta crayfish isolated from the effects of invasive crayfish by restoring the stream channel in the Upper Rock Creek Meadow to pre-diversion conditions and reintroducing Shasta crayfish to the restored channel.

[1] California Department of Fish and Game [CDFG] prior to January 1, 2013. For simplicity, CDFW will also be used to refer to CDFG prior to 2013.

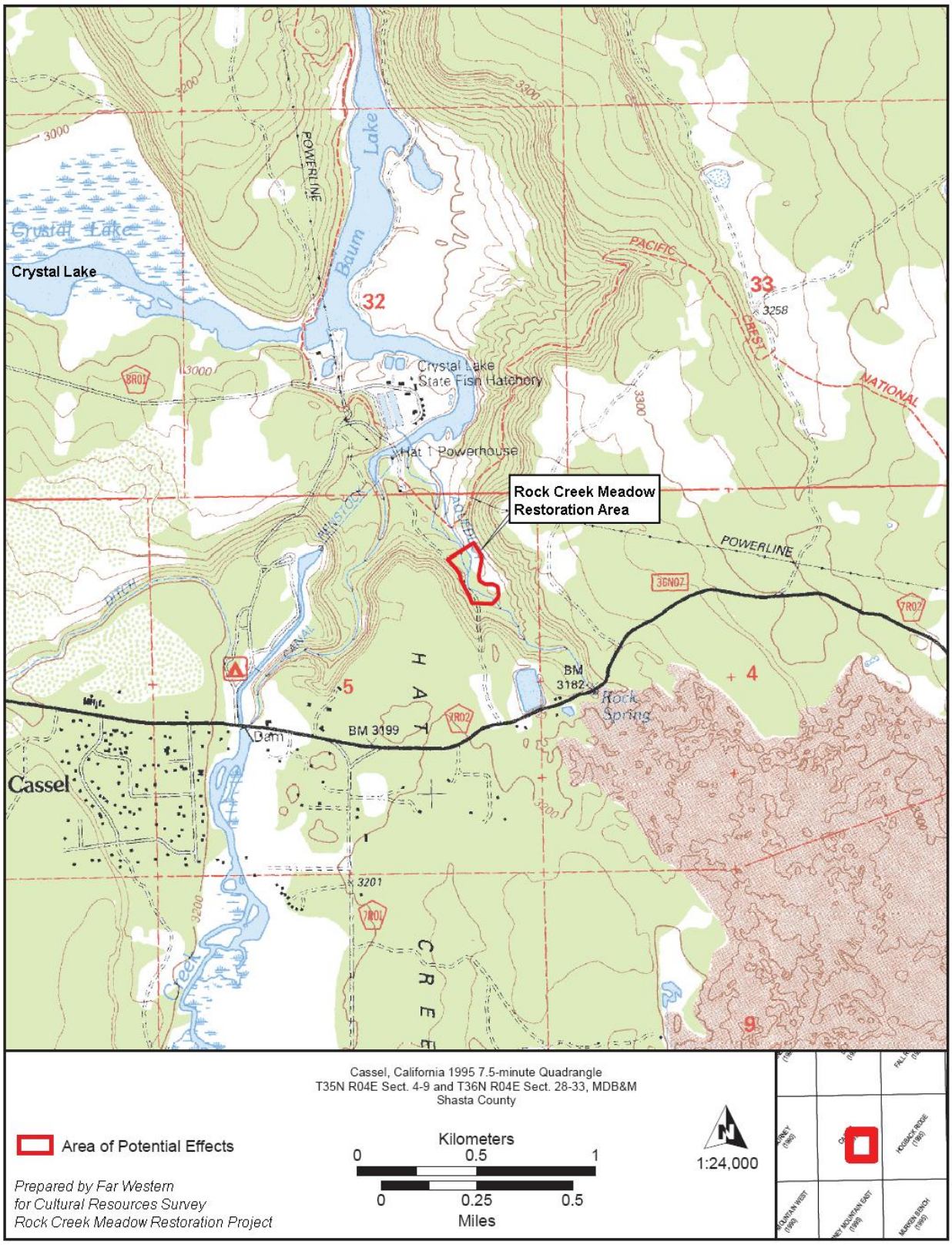


Figure 1. Location of proposed Project and affected waterways.

These activities help meet the goals of the Shasta Crayfish Recovery Plan (USFWS 1998). The goals of the Recovery Plan would be met by moving an at-risk population of Shasta crayfish, which has been threatened by the introduction and expansion of non-native signal crayfish (*Pacifastacus leniusculus*), to suitable habitat within the same watershed that is not occupied by invasive signal crayfish and is protected from signal crayfish invasion by the hatchery water diversion facilities. Signal crayfish are the primary cause of the catastrophic decline in Shasta crayfish populations during the last three decades (USFWS 1998).

The Rock Creek Meadow Restoration Project is on PG&E-owned lands outside of the Federal Energy Regulatory Commission (FERC) boundary for PG&E's Hat Creek Hydroelectric Project, FERC Project No. 2661 (Hat Creek Project). Construction activities include moving the hatchery intake structure 650 feet downstream from its current location, restoring the stream channel upstream of the new intake structure by removing encroached vegetation and sod along the banks, and rewatering the restored stream channel. The rewatered and restored stream channel will provide approximately 13,550 square feet (1,259 square meters) of habitat for Shasta crayfish, while maintaining the quality and quantity of the water supply for the Crystal Lake Hatchery.

Following completion of the restoration phase of the Project, including an adequate post-construction period to allow recolonization by native aquatic invertebrates and aquatic vegetation (i.e., at least one month), Shasta crayfish would be collected from nearby Crystal Lake, brought to the Crystal Lake Hatchery building for a 10-day quarantine in Rock Creek water, and then released into the restored segment of Rock Creek. The reintroduction phase would follow the applicable guidelines for the reintroduction of Shasta crayfish to refuge habitats as outlined in the Shasta Crayfish Genetic Management Plan (Petersen and May 2012a) developed for CDFW.

2.1 Purpose and Need

The primary objective of the Shasta Crayfish Recovery Plan (Service 1998) is to stabilize and protect existing populations so that Shasta crayfish may be reclassified as threatened and ultimately delisted. Actions needed to achieve that goal include eradicating or preventing invasions by signal crayfish (*Pacifastacus leniusculus*) and other non-native crayfish, restoring habitat, and eliminating impacts from land management activities. To date, non-native crayfish

have invaded all habitats known to be occupied by Shasta crayfish[2] (Spring Rivers 2013, 2014). Although eradication efforts have been employed against signal crayfish, successful preservation of Shasta crayfish as a species require additional measures such as establishing refugia sites and undertaking reintroductions of Shasta crayfish in historic habitats.

In order to carry out the primary objective of the Shasta crayfish Recovery Plan, the Service proposes to implement the Rock Creek Meadow Restoration Project. Rock Creek is an ideal refuge for Shasta crayfish, because it is within the species' native range, is currently free of non-native crayfish, and is protected from future invasion by the Crystal Lake Hatchery water diversion structures. Based on genetic studies by Peterson and May (2008, 2011, 2012a, 2012b), the Crystal Lake population will be used as the source population for reintroductions of Shasta crayfish into Rock Creek in order to preserve the Crystal Lake genome, which has the highest level of genetic variation in both nuclear and mitochondrial DNA. Through restoration and rewatering of the stream channel and Shasta crayfish translocation, the proposed Project will restore Shasta crayfish habitat and protect an important population of Shasta crayfish from invasive species.

The purpose of and need for the proposed federal action is to comply with the Service's mission to work with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The following goals and objectives further clarify the purpose of the proposed action:

- Provide a means and take steps to conserve, enhance, and restore the habitat and ecosystem upon which the Shasta crayfish depends and thereby ensure the species' long-term survival in the Rock Creek area.

- Establish refugia sites along Rock Creek within the native range of Shasta crayfish that are free of non-native crayfish.

[2] Signal crayfish have invaded lower Rising River and are assumed to have expanded throughout the Rising River subdrainage. Without landowner permission, however, the Rising River Shasta crayfish population has not been surveyed since the 1990s.

- Ensure the survival of the Shasta crayfish populations with the highest level of genetic diversity (i.e., Crystal Lake genetic cluster) by establishing a Shasta crayfish population in Rock Creek large enough to support future reintroduction projects.

2.2 Project Area and Land Use

The 6.15-acre Project Area is located along Rock Creek, which is a tributary of the impounded reach of Hat Creek known as Baum Lake (Pit River Drainage), one mile northeast of the town of Cassel in Shasta County, California (Figure 1). Rock Creek is a natural spring-fed drainage that is 0.9 miles (1.4 kilometers) long with an estimated discharge of 19–20 cubic feet per second (cfs). Most of the flow originates from Rock Spring and two spring-fed pools (Kerns Pond and Mancuso's Pond) near Cassel-Fall River Road, as well as other smaller springs in the upper, steeper portion of the drainage (Figure 2).

Project activities will take place within the Upper Meadow portion of the Rock Creek drainage, on lands owned by PG&E. The Project Area is adjacent to, but not within the FERC boundary for PG&E's Hat Creek Project (i.e., Hat Creek Project Area). CDFW leases the property for the Crystal Lake Hatchery from PG&E, as well as the right to divert not in excess of 30 cfs (current maximum discharge is estimated to be closer to 20 cfs) of water from Rock Creek, as stated in the original lease (May 1, 1945 through April 30, 1985). The lease also states that there should be a minimum instream flow release of 2 cfs into the Rock Creek channel at the diversion site and that PG&E reserves the right to 5 cfs of Rock Creek water for "beneficial purposes." The lease, which was renewed with a 40-year term in 1985, continues through April 30, 2025.

In 1950, CDFW constructed a diversion dam, 24-inch pipeline, and ditch to bring Rock Creek water to the Crystal Lake Hatchery through an inverted siphon under Baum Lake. In 1965, CDFW constructed a new diversion structure further upstream, 0.4 miles (0.7 kilometer) below Rock Spring, and diverted 90% of the flow from Rock Creek through a 0.6-mile (1-kilometer) long pipeline to the Crystal Lake Hatchery across Baum Lake on a pipeline bridge (Figure 2).

At the existing diversion structure, Rock Creek flows into a drop inlet that collects all of the flow into a large-diameter (4-foot) corrugated metal pipe intake (Figure 3). The intake constricts, connecting to a 24-inch-diameter, spiral-welded, steel pipe that conveys flow to the hatchery. The upper portion of the pipeline is coated with a nontoxic, non-asbestos asphaltic material.

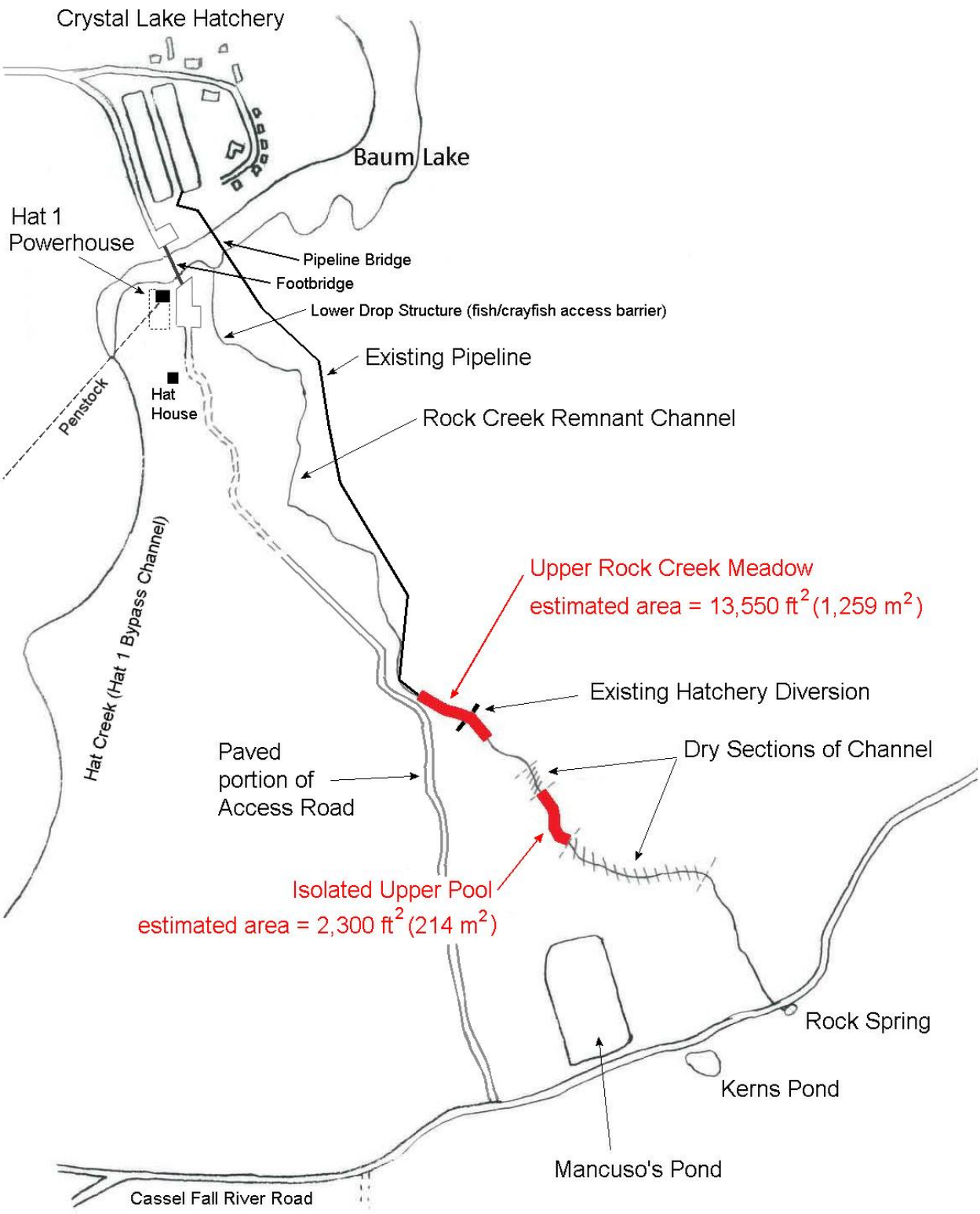


Figure 2. Diagram of Rock Creek showing springs and existing hatchery facilities.

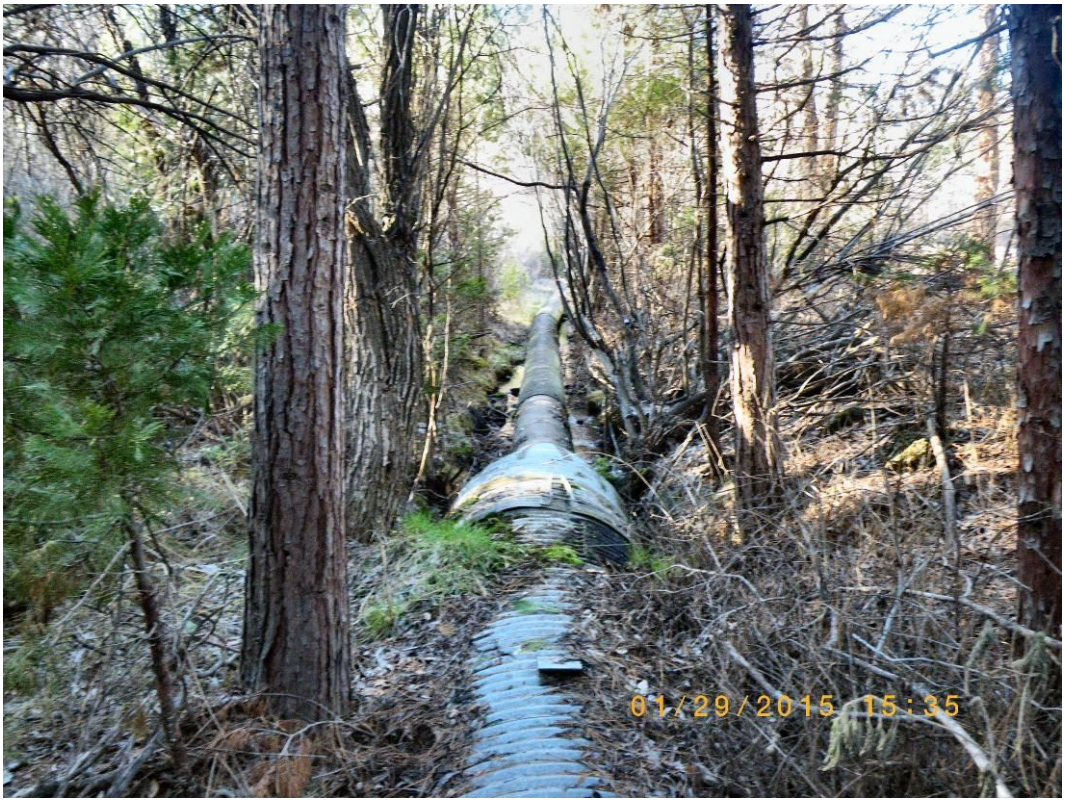


Figure 3. Upstream and downstream views of existing hatchery diversion.

Although all the flow from Rock Creek enters the intake, the Upper Meadow portion of Rock Creek (Upper Rock Creek Meadow) has a small remnant surface flow (less than 0.5 cfs) due to leakage, which is visible from the intake structure and diversion pipeline. There is a substantial leak just downstream of the intake structure where an opening was cut into the corrugated pipe section (perhaps to clear an obstruction that had gotten into the pipe), and then later welded closed. There are numerous other leaks along the pipeline, as well as four pressure relief points in the steep section of the pipeline between the upper and lower meadow sections of Rock Creek. These pressure relief points, which are approximately 1/8-inch-diameter holes in the top of the pipe, prevent water pressure from rupturing or collapsing the water supply line in the event of sudden, unforeseen changes in flow volume. Without valves, these pressure relief points allow additional water to discharge from the supply line before reaching the hatchery. A few tenths of a cfs of the Rock Creek discharge still flows through portions of its natural channel, through the lower drop structure at the bottom of lower Rock Creek meadow and into Baum Lake approximately 100 feet (30 meters) downstream of the Hat 1 Powerhouse (Figure 2).

The lower drop structure/culvert barrier at the bottom of lower Rock Creek meadow, which was constructed by CDFW to prevent fish from moving upstream from Baum Lake, is a crayfish barrier under any likely Rock Creek flow. The top of the CDFW concrete drop structure is almost 17 feet above the maximum elevation of Baum Lake. The drop structure has two consecutive 4-feet-wide by 2-feet-tall drops landing on flat concrete slabs. Water is then collected into a metal culvert that goes underground from the drop structure approximately 100 feet to the Rock Creek Channel. The end of the culvert protrudes 2 to 3 feet horizontally out over the channel and water spills 3.5 feet vertically onto a pile of boulders and cobbles.

The domestic water supplies for PG&E's Hat 1 Powerhouse and Hat House (see Figure 2) and CDFW's Crystal Lake Hatchery come off the main hatchery pipeline (pre-1914 riparian water right). The Hat 1 Powerhouse is remotely operated, and the Hat House is not currently occupied. The domestic water supply to the Crystal Lake Hatchery, however, also supplies the four hatchery buildings and six houses at the hatchery. The hatchery domestic water supply is currently chlorinated and CDFW has plans to install an ultraviolet water purification system.

Other land uses near the Project Area include residential communities, PG&E recreational facilities (e.g., Cassel Campground, Baum and Crystal Lake fishing accesses), and the Pacific Crest National Scenic Trail (PCT). The PCT crosses lower Rock Creek Meadow and the existing hatchery water supply pipeline downstream of the Project Area.

2.3 Project Background

2.3.1 History of Shasta Crayfish and their Management

The Shasta crayfish is the only surviving species of crayfish that is native solely to California. Originally designated as a rare species under California law in 1980, the Shasta crayfish was listed as endangered under the California Endangered Species Act (CESA) on February 26, 1988 and endangered under the federal Endangered Species Act (ESA) on September 30, 1988 (USFWS 1988). The Shasta Crayfish Recovery Plan was published by the USFWS on August 28, 1998 (USFWS 1998). No critical habitat has been designated for the species.

The limited distribution and abundance of Shasta crayfish, coupled with an apparent decline in the species, led to its listing as endangered (USFWS 1998). Its distribution is limited to the midreaches of the Pit River in Shasta County, California, particularly the spring-fed tributaries of Fall River, Hat Creek, Rising River, Crystal Lake, and Sucker Springs Creek (Ellis 1999, Figure 1). Because of the spring-fed nature of these waters, habitat for Shasta crayfish is generally of high quality (i.e., abundant lava cobbles and boulders on clean gravel with minimal fine sediment) with very stable water temperature and flow conditions (i.e., minimal seasonal or annual change in water temperature, flow, or clarity). Within the small native range of the Shasta crayfish, its distribution has become very fragmented over the past few decades and is currently limited to only a few areas, most within a short distance of headwater spring pools (USFWS 1998; Ellis 1999, Spring Rivers 2004–2015).

Overall, Shasta crayfish have a low abundance and fragmented distribution with migration and genetic exchange between populations limited by hydroelectric development, natural barriers, loss of habitat, and non-native species (USFWS 1998). In the first half of the twentieth century, Shasta crayfish were the only species of crayfish found in the midreaches of the Pit River drainage. Non-native crayfish were not introduced and were therefore nonexistent in the area until the late 1960s or early 1970s. The introduction and expansion of non-native crayfish

throughout the midreaches of the Pit River has resulted in rapid declines in Shasta crayfish populations during the last three decades (Ellis 1999). The non-native signal crayfish (*Pacifastacus leniusculus*), which is both a competitor and predator of the Shasta crayfish, is considered the greatest threat to the continued existence of the Shasta crayfish (Ellis 1999, USFWS 1998, 2009).

The native range of Shasta crayfish includes drainages that are currently regulated by PG&E's Hat Creek Project and Pit 1 Hydroelectric Project, FERC Project No. 2687 (Pit 1 Project). The FERC licenses for both the Hat Creek and Pit 1 projects contain articles designed to monitor and protect Shasta crayfish from non-native, invasive crayfish. Among other protection measures, Article 412 of both FERC licenses requires the development of Shasta Crayfish Management plans. The Hat Creek Shasta Crayfish Management Plan was approved by FERC on August 21, 2003 (PG&E 2003a) and the Pit 1 Shasta Crayfish Management Plan was approved by FERC on July 7, 2004 (PG&E 2003b). Shasta crayfish monitoring and signal crayfish eradication surveys are implemented according to these plans.

Article 410 of both FERC licenses requires PG&E to establish a technical review committee (TRC) to assist PG&E in the design and implementation of the terms and conditions required in the USFWS biological opinions for Shasta crayfish protection and recovery in the two hydroelectric project areas. The TRC was established in April 2003 in coordination with the USFWS, CDFW, and other resource agencies and interested stakeholders. The TRC assists PG&E with implementation of license conditions and conservation measures within the FERC project boundaries for the Hat Creek and Pit 1 projects, including monitoring of Shasta crayfish populations, non-native crayfish removal, and other license-required actions and conservation actions consistent with the USFWS biological opinions.

To establish a working group for other Shasta crayfish recovery projects, the USFWS formed the Shasta Crayfish Recovery Team (Recovery Team) in 2004. The Recovery Team, which is composed of scientists from federal and state agencies, species experts, and academia, implements conservation actions throughout the range of Shasta crayfish.

2.3.2 Shasta Crayfish in Rock Creek

Prior to 1950, Shasta crayfish were common in Rock Creek (L. Kerns, personal communication 1997, 1998). CDFW had previously determined that the protozoan *Ceratomyxa*, which is a parasite that infects the organs of most salmonid fish and is fatal to most non-native strains of rainbow trout (*Oncorhynchus mykiss*), was not present in Rock Creek (Schafer 1968). After 1950, CDFW constructed the hatchery diversion and drop structures on Rock Creek that made Rock Creek inaccessible to trout from Baum and Crystal lakes. After an outbreak of *Ceratomyxa* in the hatchery in 1962 and 1963, CDFW chemically treated Rock Creek with rotenone in 1962 and 1963 (Schafer 1968). During surveys in 1974, 1996, and 2003, no crayfish were found in Rock Creek (Daniels 1978, Ellis and Cook 1998, PG&E 2014a). The diversion of most of the water from the channel and the chemical treatments extirpated the Shasta crayfish population in Rock Creek.

Pursuant to the USFWS biological opinion and Articles 409 and 412 of the FERC license for the Hat Creek Project, PG&E developed the Shasta Crayfish Management Plan (PG&E 2003a) and the Rock Creek Meadow Restoration and Reintroduction Plan for Shasta Crayfish (PG&E 2014a). The existing and potential Shasta crayfish habitat in Rock Creek was mapped and quantified on October 22, 2003 (Spring Rivers 2004). One small area of existing habitat (i.e., isolated Upper Pool) was identified and two low-gradient reaches of Rock Creek (i.e., upper and lower Rock Creek meadows) were identified as potential Shasta crayfish habitat if rewatered and restored (Figure 2). The existing and potential habitat areas are described below.

Existing Upper Pool

The Upper Pool of Rock Creek has approximately 100 feet of channel with an average width of 23 (± 10.5) feet and an estimated 2,300 square feet (214 square meters, 0.053 acres) of Shasta crayfish habitat in its current condition. Subsurface water flow upstream and downstream of the Upper Pool isolates the pool from other portions of Rock Creek. Based on the calculated mean density of 0.83 Shasta crayfish per square meter observed in upper Spring Creek (Light et al. 1995), the Upper Pool habitat could potentially support more than 178 Shasta crayfish.

Existing habitat conditions within the Upper Pool are already suitable for Shasta crayfish. USFWS, PG&E, and CDFW are developing a Safe Harbor Agreement to allow reintroduction of

Shasta crayfish to the Upper Pool portion of Rock Creek and provide PG&E and CDFW assurances that they may use, alter, or modify the enrolled property in a manner consistent with the agreement, even if such use, alteration, or modification results in the incidental take of Shasta crayfish. USFWS plans to reintroduce Shasta crayfish to the Upper Pool as soon as the third-party landowner agreement and Safe Harbor Agreement are finalized. Shasta crayfish translocation activities associated with the Upper Pool project, as well as the Rock Creek Meadow Restoration Project, are covered under Spring Rivers' ESA Section 10(a)(1)(A) Recovery Permit #TE806679-7 and CDFW Memorandum of Understanding (MOU) provided in Attachment B.

Rock Creek Meadow

If restored and rewatered, both the upper and lower Rock Creek meadows would provide habitat for Shasta crayfish. The upper Rock Creek meadow is immediately downstream of the existing hatchery diversion, and the lower Rock Creek meadow is immediately upstream of the lower hatchery drop structure. Restored and rewatered, the Upper Rock Creek Meadow would provide a much larger refuge area (13,550 square feet) than the Upper Pool; this larger area could potentially support more than 1,000 Shasta crayfish. Consequently, the Rock Creek Meadow Restoration Project may provide sufficient habitat to support a Shasta crayfish population large enough to serve as a source population for future reintroduction projects.

Currently the Crystal Lake Hatchery diverts most of Rock Creek flow (~ 19 cfs) from the channel immediately upstream of Upper Rock Creek Meadow, but some flow (less than 1 cfs) is restored through leaks in the pipe. To fully restore streamflow, it is proposed to move the hatchery diversion and intake approximately 650 feet downstream of its current location. The stream channel above the new diversion would be restored and Shasta crayfish would be reintroduced to the restored and rewatered channel. A more detailed plan description of the hatchery diversion modifications, stream channel restoration and rewatering, and Shasta crayfish reintroduction are presented in the final Rock Creek Meadow Restoration Plan (Attachment A).

2.3.3 Other Shasta Crayfish Reintroduction Projects

Reintroduction of Shasta crayfish from remnant populations in Big Lake (Fall River Drainage) to Kerns Pond, which is a privately owned spring-fed pond in the headwaters of the Rock Creek

drainage (Figure 2), began in 2012. The Kerns Pond project, which is ongoing, is a cooperative effort between local landowners, USFWS Endangered Species Recovery Program, CDFW, Spring Rivers, and Spring Rivers Foundation. A Safe Harbor Agreement between the landowners and USFWS was signed on March 23, 2012 to provide a net conservation benefit for the federally endangered Shasta crayfish by promoting Kerns Pond to serve as a Shasta crayfish refuge. When the state signed a consistency determination on August 9, 2012, the Kerns Pond agreement became the first joint federal and state Safe Harbor Agreement in the State of California. Kerns Pond is isolated from the Upper Rock Creek Meadow and other portions of Rock Creek by sections of subsurface flow (Figure 2).

2.4 Objectives of the Proposed Project

The primary objective of the Shasta Crayfish Recovery Plan (USFWS 1998) is to stabilize and protect existing populations so that Shasta crayfish may be reclassified as threatened and ultimately delisted. The Rock Creek Meadow Restoration Project was developed to support Recovery Plan objectives. Specific Project objectives are as follows:

Objective 1: Facilitate Recovery of Shasta Crayfish

1a. Create Shasta crayfish refuge habitat by restoring and rewatering 650 feet of Upper Rock Creek Meadow. The restored and rewatered Upper Rock Creek Meadow channel will provide approximately 13,550 square feet (1,259 square meters) of Shasta crayfish habitat with an estimated carrying capacity of more than 1,000 Shasta crayfish (a number greater than the current number of Shasta crayfish found in all extant populations). The Upper Rock Creek Meadow is expected to support a Shasta crayfish population large enough to serve as a source population for future reintroduction projects.

1b. Stabilize the existing, remnant Shasta crayfish population in Crystal Lake by moving the population to refuge habitat protected from non-native crayfish in Rock Creek.

1c. Preserve the Crystal Lake genome, which has the highest level of genetic variation in both the nuclear and mitochondrial DNA.

1d. Protect the refuge habitat(s) and relocated Shasta crayfish in Rock Creek from invasion by non-native crayfish. Monitor the Upper Rock Creek Meadow Shasta crayfish

population to document reproduction, population growth, and potential dispersal throughout the restored meadow habitat.

Objective 2: Support Crystal Lake Hatchery Operations

2a. Ensure that both the quality and quantity of CDFW's water needs for the Crystal Lake Hatchery continue to be met.

2b. Ensure that no diseases may be hosted, incubated by, or transferred from Shasta crayfish to hatchery trout.

2c. Ensure that no pathogens or non-native species are introduced to Rock Creek or Rock Creek water during Project implementation and monitoring.

2.5 Legislation, Guidance, and Previous Planning

2.5.1 Relevant Legislation

The *National Environmental Policy Act* of 1969 (NEPA) was enacted to ensure that federal agencies consider and disclose the environmental impacts of any federal, or federally funded action, and to include public participation in the planning and implementation of those actions. In California, the *California Environmental Quality Act* (CEQA) was also enacted to inform the public, as well as governmental decision makers, about potential environmental effects of proposed activities; and also to identify the ways that environmental damage can be avoided or significantly reduced and prevent significant, avoidable damage to the environment by requiring changes in projects through the use of feasible alternatives or mitigation measures. It is anticipated that CDFW may choose to use this document, in whole or part, in compliance with their CEQA responsibilities.

Other federal and state legislation that is relevant to the proposed Rock Creek Meadow Restoration Project includes the Federal Water Pollution Control Act, commonly referred to as the *Clean Water Act* (CWA), and the California *Porter-Cologne Water Quality Control Act* (Porter-Cologne Act); the Clean Air Act (CAA) and California Assembly Bill 32; the *Endangered Species Act of 1973* (ESA) and the *California Endangered Species Act* (CESA); the *Migratory Bird Treaty Act* (MBTA); the *Bald and Golden Eagle Protection Act* (BGEPA); the *Plant Protection Act* (PPA) and the California *Native Plant Protection Act* (NPPA); the *National Historic Preservation Act* (NHPA); the *Occupational Safety and Health Act of 1970* (OSH Act);

the *Nonindigenous Aquatic Nuisance Prevention and Control Act* (NANPCA); the *National Invasive Species Act* (NISA); and Executive Order 13112 of 1999, which established the National Invasive Species Council. The purpose and relevance of these laws will be discussed in Section 5.0 (Environmental Consequences) of this EA.

2.5.2 FERC License Articles

Under the *Federal Power Act of 1920* (FPA, as amended 16 U.S.C. 791-828c), FERC has the authority and responsibility for regulating non-federally owned hydroelectric power projects that affect navigable waters. The ESA requires federal agencies such as FERC to ensure that their actions are not likely to jeopardize the continued existence of listed species or adversely modify or destroy designated critical habitat.

The FERC license for PG&E's Hat Creek Project contains articles designed to monitor and protect Shasta crayfish and other resources (PG&E 2003a). Although the Rock Creek Meadow Restoration Project Area is not within the FERC boundary for the Hat Creek Project, the Project plan was developed to comply with a FERC License Article 412 requirement. The other FERC license articles that require PG&E to monitor, protect, and/or enhance biological and cultural resources within the Hat Creek Project, and that are applicable to the Rock Creek Meadow Restoration Project, are summarized below.

Article 402. Erosion and Sediment Control

Article 402 requires the development of an Erosion and Sediment Control Plan, with specific erosion control measures. The plan was finalized in 2004 (PG&E 2004a) and the required erosion control measures have been implemented. Among the measures implemented were termination of grazing leases to protect the shoreline habitat at Baum and Crystal lakes, and the riparian habitat along Rock Creek and on the east side of Hat Creek downstream of the Hat 2 Dam. The plan also requires identification of measures that would be used to control erosion and sedimentation when new recreational facilities are constructed or when other activities that entail ground-disturbing activities are planned.

Articles 409, 412, and 413. Shasta Crayfish.

Article 409 requires the development of an implementation plan to monitor the habitat and populations of Shasta crayfish in the Hat Creek Project Area (i.e., within the FERC Project

boundaries). FERC License Article 412 requires the development of a Shasta crayfish management plan for the Hat Creek Project Area, including formulation of a plan to reintroduce Shasta crayfish to the Rock Creek springs area. FERC License Article 413 requires the development of a recreational management plan for educating the general public and protecting Shasta crayfish from recreational activities. The Shasta Crayfish Management Plan addressing license articles 409, 412, and 413 for the Hat Creek Project was finalized in 2003 (PG&E 2003a).

Article 415. Bald Eagle

Article 415 requires the development of a Hat Creek Bald Eagle Nesting Territory Management Plan (BENTMP). The BENTMP was finalized in 2003 (PG&E 2003c). Among other protection measures, the BENTMP requires seasonal restrictions to recreation activities within the eagle management zone and requires a limited operating period (LOP) for new construction activities. Except in the case of emergencies, no potentially disturbing activity will be allowed in the management zone between January 1 and August 1.

Article 422. Cultural Resources

Article 422 requires PG&E to implement the Cultural Resources Management Plan, which was finalized in 2001 (PG&E 2001).

2.5.3 Guidance Documents

The Shasta Crayfish Management Plan (PG&E 2003a), which was developed to fulfill the requirements of the FERC license articles pertaining to Shasta crayfish, provides guidance for Shasta crayfish management, as well as recreation, in the vicinity of the Hat Creek Project. The Rock Creek Meadow Restoration and Reintroduction Plan for Shasta Crayfish (Rock Creek Meadow Restoration Plan, Attachment A), which was developed in consultation with the TRC to fulfill a requirement of FERC License Article 412, details the specific objectives and methods for the proposed reintroduction of Shasta crayfish into Rock Creek. The Shasta Crayfish Genetic Management Plan (Petersen and May 2012a) provides guidance for Shasta crayfish translocation from Crystal Lake to Rock Creek. The proposal for translocation of Shasta crayfish from Crystal Lake into Rock Creek (Upper Rock Creek Pool and Upper Rock Creek Meadow), which Spring Rivers submitted for authorization by USFWS as required by Special Terms and Conditions 7m

in Spring Rivers' 10(a)1(A) recovery permit (TE806679-7), provides guidance for Shasta crayfish translocation from Crystal Lake to Rock Creek.

Other guidance documents that could affect the Rock Creek Meadow Restoration Project include PG&E's Bald Eagle Nesting Territory Management Plan (PG&E 2003c), Cultural Resources Management Plan and Programmatic Agreement (PG&E 2001), Erosion and Sediment Plan (PG&E 2004a), Yellow Starthistle Control Plan (PG&E 2004b), and Herbicide Use Plan (PG&E 2014b) for the Hat Creek Project. These documents guide PG&E's resource and recreation management practices for the Hat Creek Project and will be used as guidance documents for the Rock Creek Meadow Restoration Project.

2.5.4 Previous Planning

The portion of Rock Creek that will be restored for Shasta crayfish reintroduction (i.e., Upper Rock Creek Meadow) is located on PG&E-owned lands that are within the Hat Creek Planning Unit of the Pacific Forest and Watershed Lands Stewardship Council (Stewardship Council). The Stewardship Council is a private, nonprofit foundation that was established in 2004 as part of a PG&E settlement. The goals of the Stewardship Council are to ensure that over 140,000 acres of California's pristine watershed lands are conserved for the public good through their Land Conservation Program, and to invest in outdoor programs that serve California's young people through their Youth Investment Program. Although PG&E intends to retain ownership of the land parcels affected by the Rock Creek Meadow Restoration Project, the TRC and the Recovery Team are coordinating with the Stewardship Council to achieve mutual Project goals.

Studies that have been completed in support of the Rock Creek Meadow Restoration Project include Botanical Survey (PG&E 2011a), Wetlands Delineation (PG&E 2011b), Rock Creek-Diversion Hydrologic Assessment (PG&E 2012), and Cultural Resource Survey (Wohlgemuth 2014). A summary of results from those studies are provided in Appendix A of the Rock Creek Meadow Restoration Plan (Attachment A).

2.6 Issues and Impact Topics

2.6.1 Derivation of Issues and Impact Topics

Table 1 presents a brief rationale for the selection of each impact topic, as well as the rationale for dismissing specific topics from further consideration. The resources which could be affected and the impacts that could occur are described in detail in Section 4 (Affected Environment) and Section 5 (Environmental Consequences) of this document. "No measurable effect" is used in determining if an impact topic may be dismissed from further evaluation in an EA or EIS.

The following impact topics were selected for detailed analysis: water/wetland resources, air quality, wildlife resources, threatened and endangered species, botanical resources, health and safety, and pathogens/non-native animals. A description of each impact topic and the relevant laws, legislation, and FERC license articles pertaining to each impact topic are provided in Table 1.

2.6.2 Impact Topics Considered but Dismissed

The following issues were considered, but not carried forth for further analysis: erosion, reduction of water supply for hatchery, cultural resources, utilities, transportation, scenic resources and night sky, climate change, prime or unique farmlands, environmental justice, Indian Trust resources, socioeconomics, and land use. The rationale for the dismissal of these issues is discussed below.

Erosion

The proposed Project will have no measurable effects on erosion. For the stream channel restoration work, Rock Creek flow will be diverted around the construction area through a temporary pipeline to the new hatchery intake structure. The temporary pipeline will be routed to the new diversion structure along the meadow surface parallel to the historic channel and outside of the channel restoration area. The majority of construction activities will occur in the remnant channel prior to rewatering. All construction activities will be short term and will create minimal ground disturbance. As such, a Storm Water Pollution Prevention Plan will not be required.

Table 1. Impact topics retained for further evaluation.

Impact Topic	Issues	Relevant Laws, Regulations, and FERC License Articles[3]
Water/Wetland Resources	Stream restoration activities could impact water quality and will impact less than ½ acre of riparian wetlands adjacent to Rock Creek.	Clean Water Act (CWA); Porter-Cologne Water Quality Control Act; FERC Article 402.
Air Quality (Greenhouse Gas Emissions)	Changes in wetland habitat adjacent to Rock Creek could affect carbon sequestration and storage.	Clean Air Act (CAA); California Assembly Bill 32.
Wildlife Resources (including California Species of Special Concern)	Aquatic organisms in Rock Creek could be affected by the dewatering, channel restoration, and rewatering phases of the Project. Terrestrial wildlife could be affected by noise associated with stream channel restoration activities.	Migratory Bird Treaty Act (MBTA); Bald and Golden Eagle Protection Act; California Environmental Quality Act (CEQA); FERC Article 415.
Threatened and Endangered Species	Shasta crayfish translocation could adversely affect individuals within the population. There is potential for hikers using the PCT to wade in or otherwise disturb the restoration area/Shasta crayfish refuge. Hatchery operations could also impact Shasta crayfish Noise and disturbance during restoration work could impact threatened/ endangered birds if those birds are nesting near the Project Area	Endangered Species Act (ESA); California Endangered Species Act (CESA); FERC Articles 409, 412, and 413.
Botanical Resources (including California Rare Plants)	Less than ½ acre of riparian vegetation will be disturbed during stream channel restoration activities. The estimated impact area does not include special-status plant species. Introduction of noxious weeds could adversely impact special-status plants located near the Project Area.	Plant Protection Act; California Native Plant Protection Act; CEQA; Natural Community Conservation Planning Act; FERC Article 414.
Health and Safety	The uses of SCUBA diving during crayfish collection and heavy machinery during stream channel restoration have inherent risks to employees and partners, therefore this topic will be further evaluated.	Occupational Safety and Health Act of 1970 (OSH Act); Title 29 Code of Federal Regulations; California Health and Safety Code, Title 8.
Pathogens/ Non-native Animals	Shasta crayfish translocation could result in transfer of pathogens (e.g., *Ceratomyxa)* to Rock Creek. Any in-water work could result in accidental introduction of invasive organisms.	Nonindigenous Aquatic Nuisance Prevention and Control Act; National Invasive Species Act (NISA); Executive Order 13112 of 1999; FERC Article 414.

[3] Federal Energy Regulatory Commission (FERC) License requirements for PG&E's Hat Creek Hydroelectric Project (FERC Project No. 2661).

Shasta crayfish translocation will be completed by fewer than five biologists that will access the reintroduction site via an established trail from the paved access road to Rock Creek (see Figure 2). Crayfish will be carried to the banks of Rock Creek in buckets and hand released into the chosen refuge habitat. These activities will not result in disturbance of soil or vegetation.

Reduction of Water Supply for Hatchery

One of CDFW's primary concerns regarding the Rock Creek Meadow Restoration Project was a potential decrease in quantity of water needed for the Crystal Lake Hatchery. To address this concern, hydrologic assessments were implemented in the restoration area as summarized in Appendix A of the Rock Creek Meadow Restoration Plan (Attachment A). After initial hydrologic assessments in 2006 (Spring Rivers 2007), a more detailed hydrological assessment was implemented in October 2011 (PG&E 2012) to determine whether flow losses would occur along the Upper Rock Creek Meadow if the point of diversion to the hatchery was relocated 650 feet downstream from the existing point of diversion. Both assessments determined that the meadow area is not a hydrologic losing reach.

The loss of elevation head pressure that could result from moving the diversion structure downstream was also expressed as a concern. Sustainable Resource Engineering performed a hydraulic analysis on the existing pipeline. The relocation of the diversion structure 650 feet downstream results in a net loss of 7 vertical feet. The remaining 63 vertical feet provide more than adequate head pressure to provide the necessary flow to the hatchery.

Based on the hydrologic assessments and head-pressure analysis, implementation of the Rock Creek Meadow Restoration Project will have no measureable effects on the quantity of water available for Crystal Lake Hatchery.

Cultural Resources

An archaeological survey report was completed for the Rock Creek Meadow Restoration Project during 2011 (Wohlgemuth 2014). No pre-recorded or new archaeological sites were found within the Project Area. The hatchery pipeline was formally evaluated by PAR Environmental and recommended not eligible to the National Register of Historic Places (National Register). As a result, Wohlgemuth (2014) determined that the proposed Project would have no effect on cultural resources eligible to the National Register. In a May 12, 2015 letter to PG&E, the State

Historic Preservation Officer (SHPO) concurred with the *Finding of No Historic Properties Affected* based on the current project description and the Area of Potential Effects (APE). In addition, the footprint (APE) of the Rock Creek Meadow Restoration Project is the same as the footprint for the 2011 hydrologic assessment; the Notification of Compliance with Section 106 of the NHPA under the Programmatic Agreement between the USFWS, Advisory Council on Historic Preservation, and SHPO for the 2011 hydrologic assessment stated that the Project would not impact cultural resources and that "no further cultural resource identification effort is necessary for the project." The 2011 Notification of Compliance and Programmatic Agreement among the USFWS, the Advisory Council on Historic Preservation, and the SHPO, which was reviewed by the SHPO in February 2015 with no recommended changes, is provided in Attachment B.

Utilities

The proposed Project will have no measureable effects on existing hydroelectric facilities or other utility systems. Therefore, this impact topic was dismissed from further analysis.

Transportation

Access to the Project Area is via a private (PG&E), gated road. Public vehicle access is restricted; therefore, this impact topic was dismissed from further analysis.

Scenic Resources and Night Sky
Climate Change
Prime or Unique Farmlands, Environmental Justice
Indian Trust Resources
Socioeconomics
Land Use

No impacts on these resources/topics are anticipated due to their lack of designation within or absence from the project area, or due to the nature of this project as an endangered species recovery action.

3.0 ALTERNATIVES

This section discusses the proposed Project in relation to a "no action" alternative and summarizes alternatives to the proposed Project that were considered but were not carried forward for detailed analysis because they were not feasible or did not meet Project objectives.

3.1 Alternatives Considered but Dismissed

The following alternatives for restoring Rock Creek for Shasta crayfish reintroduction were considered but dismissed:

1. Restore the entire reach of Rock Creek for Shasta crayfish and trout spawning; this would entail developing Crystal Lake or Hat Creek as an alternative water source for Crystal Lake Hatchery.

2. Restore the lower meadow portion of Rock Creek above the lower drop structure (Figure 2); since the hatchery requires the full flow of Rock Creek for current operations, this alternative would also entail developing Crystal Lake or Hat Creek as an alternative water source for Crystal Lake Hatchery.

Ceratomyxa is present in both Crystal Lake and Hat Creek/Baum Lake so it would be necessary to install ultraviolet filters with a backup system in order to eliminate *Ceratomyxa* from these water sources. The Crystal Lake Hatchery staff and the TRC agreed that developing an alternative water source for the hatchery would not be economically feasible and would not allow for timely reintroduction of Shasta crayfish. Therefore, both alternatives were dismissed from further consideration.

3.2 Alternative 1: No Action

Under this alternative, Upper Rock Creek Meadow will not be restored to create refuge habitat for Shasta crayfish. Management of Shasta crayfish in Crystal Lake and elsewhere will continue according to the relevant management plans.

3.3 Alternative 2: Implement Proposed Project

Under this alternative, the upper meadow portion of Rock Creek (Upper Rock Creek Meadow) will be restored to pre-diversion conditions in order to create 13,550 square feet (1,259 square meters) of Shasta crayfish habitat. After the stream channel is restored, Shasta crayfish will be collected from Crystal Lake, quarantined and acclimated to Rock Creek water in the Crystal Lake Hatchery facilities for a minimum of 10 days, and then released into the restored and rewatered portion of Rock Creek. The restoration and reintroduction phases for this alternative are described below.

3.3.1 Rock Creek Restoration

The Rock Creek restoration phase of the Project will restore and rewater the approximately 650-foot-long Upper Rock Creek Meadow channel to create continuous Shasta crayfish habitat upstream of the new hatchery intake structure. In addition to ensuring that both the quality and quantity of CDFW's water needs for the Crystal Lake Hatchery continue to be met, implementation of the restoration will also provide the hatchery with an improved water diversion and supply system. The restoration of the Upper Rock Creek Meadow involves the following steps.

1) Reconstruct the Upper Rock Creek Meadow by removing encroached vegetation and sod along the banks, installing boulder cross-vanes to enhance pool habitat, and adding lava gravels to augment existing Shasta crayfish habitat.
    a. The sod that needs to be removed (estimated to be less than ½ acre) will be used on site for re-contouring the banks.
    b. Some woody riparian vegetation that is removed will be relocated or used in the revegetation portion (e.g., willow stakes).
    c. On-site boulders will be used for the boulder cross vanes and any augmented gravel will be locally sourced and thoroughly dried before use.
2) Construct a new hatchery diversion structure and water supply intake structure at the lower end of Upper Rock Creek Meadow approximately 650 feet downstream of the current diversion.
3) Remove the old hatchery diversion structure and water supply line from the restoration area and rewater the Upper Rock Creek Meadow.

Details of the restoration phase of the proposed Project are described in Section 3 of the Rock Creek Meadow Restoration Plan (Attachment A). These details include post construction revegetation by sod matting and willow staking along the new/restored channel bank.

3.3.2 Shasta Crayfish Reintroduction

The reintroduction of Shasta crayfish to Rock Creek will follow the applicable guidelines outlined in the Shasta Crayfish Genetic Management Plan (Petersen and May 2012a) developed

by CDFW, and will adhere to the terms and conditions of the federal Recovery Permit and state MOU authorizing the translocation. The Crystal Lake population will be used as the source population for reintroductions of Shasta crayfish into Rock Creek in order to preserve the Crystal Lake genome, which has the highest level of genetic variation in both the nuclear and mitochondrial DNA (Petersen and May 2008, 2011, 2012a, 2012b).

The translocation, quarantine, and reintroduction of Shasta crayfish from Crystal Lake to Rock Creek will follow the protocol outlined in the proposal for translocation of Shasta crayfish from Crystal Lake into Rock Creek (Upper Rock Creek Pool and Upper Rock Creek Meadow), which Spring Rivers submitted for authorization by USFWS as required by Special Terms and Conditions 7m in Spring Rivers' 10(a)1(A) recovery permit (TE806679-7). USFWS has addressed potential impacts to Shasta crayfish from the translocation, quarantine, and reintroduction of Shasta crayfish from Crystal Lake to Rock Creek in the BO that USFWS prepared for issuance of 10(a)1(A) permits for this species.

Details of the Shasta crayfish reintroduction phase of the proposed Project are described in Section 4 of the Rock Creek Meadow Restoration Plan (Attachment A) and in the proposal for translocation of Shasta crayfish from Crystal Lake into Rock Creek (Upper Rock Creek Pool and Upper Rock Creek Meadow). A brief synopsis is provided below.

Biologists permitted to work with Shasta crayfish will utilize snorkeling or scuba gear to systematically survey Crystal Lake and collect all Shasta crayfish found. The Shasta crayfish will be brought to the Crystal Lake Hatchery building in ice chests filled with Crystal Lake water, then slowly acclimated to Rock Creek water by mixing Rock Creek water with the ice chest water and draining periodically until the ice chests are filled with 100% Rock Creek water. If necessary, Crystal Lake water from the ice chests will be collected in isolated containers and drained off site to ensure that no Crystal Lake water enters the hatchery rearing ponds.

Once acclimated to Rock Creek water, Shasta crayfish will be housed in stainless steel troughs (15 feet long by two feet wide by two feet high) isolated from other hatchery troughs, and quarantined for a minimum of 10 days in a flow-through system with untreated Rock Creek water (constant 10 °C [50 °F]) to ensure the absence of *Ceratomyxa shasta*. A quantitative polymerase chain reaction, Q-PCR, assay will be done to verify that *Ceratomyxa shasta* DNA is

absent from water samples taken from the quarantined crayfish (Hallett and Bartholomew 2006). Following the quarantine period and negative assay results, the Shasta crayfish will be moved to the Upper Rock Creek Meadow refuge habitat.

Transfer of the Crystal Lake Shasta crayfish population will occur in two or more phases, so that only a portion of the population will be moved during the first phase. The success of the first phase will then inform any potential change in protocol for subsequent phases.

Monitoring will be implemented to document the number and trends of the reintroduced Shasta crayfish population, including genetic diversity, reproduction, population growth, and potential dispersal throughout the restored meadow habitat. Monitoring will also be implemented to ensure that non-native crayfish and other predators (e.g., brook trout) are not present in Rock Creek. Habitat monitoring will also be implemented to assess changes relative to baseline habitat conditions. Monitoring methods will be consistent with methods described in the Hat Creek and Pit 1 Shasta Crayfish Management Plans (PG&E 2003a,b).

3.4 Conservation / Mitigation Measures

Project impacts will be minimized by implementing the following Best Management Practices (BMPs), and species-specific protection measures.

3.4.1 Water/Wetland Resources

To minimize disturbance to stream/wetland habitat during site access/mobilization, two temporary construction mat crossings will be placed across Rock Creek to facilitate stream crossings. To prevent/minimize turbidity in Rock Creek downstream of the restoration area, the stream channel will be dewatered before restoration work begins as described below:

- Rock Creek flow will be diverted around the restoration area by installing a temporary bypass pipeline that will direct flow from the existing hatchery diversion to the outlet of the new hatchery diversion at the downstream end of the restoration area.
- At the new diversion structure, 2 cfs of Rock Creek flow will be released to the natural channel and the remaining flow will be delivered to the Crystal Lake Hatchery via the existing water supply pipeline.

- A silt fence and straw wattles will be placed downstream of the new diversion structure location and at the upper end of the lower Rock Creek meadow.
- Water used to flush the newly restored channel will be allowed to flow by the new diversion structure until it is clear.
- Turbidity will be monitored in lower Rock Creek. The duration and volume of water used to initially flush the restored Rock Creek channel will be adjusted to minimize turbidity in lower Rock Creek.

The following BMPs will be implemented to prevent spills or releases of hazardous substances into waterways and/or wetland habitats:

- Hazardous waste products such as grease cartridges and oil absorbents will be placed in proper containers and transported from the job site to an authorized Hazardous Waste Collection Site.
- Equipment will be refueled by hand, using 5-gallon fuel cans kept in containment boxes.
- No fuel storage tanks will be placed on the site.
- No fueling or equipment service will be performed in the channel or within the active floodplain.
- All fuel storage containers will be equipped with a fuel containment unit matching the size of the storage.
- Stationary equipment containing lubricating oils and fuel (e.g., portable generators) will be placed within a secondary containment.
- Heavy-duty pressure washing and/or steam cleaning of heavy machinery will be done off-site. All machinery will be maintained in a leak-free condition.

3.4.2 Wildlife Resources

Migratory Birds

If any construction activities are planned during the migratory bird breeding period (generally March 1 to September 1), pre-construction clearance surveys for nesting migratory birds will be completed before any vegetation removal or noise-generating activities begin. If nesting birds are documented in the Project Area, a buffer of 50 feet will be implemented, or work will be scheduled at a time after the young have fledged.

Aquatic Wildlife

A fish rescue will be performed in the segment of Rock Creek that will be briefly dewatered during construction; native fish will be released to adjacent habitat outside of the construction area.

3.4.3 Threatened and Endangered Species

Shasta Crayfish

The following measures will be implemented to protect Shasta crayfish:

- Shasta crayfish will only be handled by experienced biologists that are covered under a valid USFWS Recovery Permit and a CDFW MOU.
- Shasta crayfish will not be released into refuge habitat until the absence of predators, such as signal crayfish and brook trout, has been verified.
- The new hatchery diversion structure, which will include an "active" debris-screening structure and require necessary cleaning and maintenance activities, will be designed to minimize the potential for entrainment and take of Shasta crayfish to the extent feasible.
- Once Shasta crayfish have been introduced to Rock Creek, no wading or walking on in-water substrate will be permitted. If, however, wading or walking on Shasta crayfish habitat (i.e., in-water lava substrate) is expected to be necessary and unavoidable due to maintenance work or land management requirements, then the USFWS will be notified.
- No ground-disturbing activities shall be done along Rock Creek upstream of the hatchery diversion structure without an erosion and sedimentation control plan.
- To minimize potential impacts to Shasta crayfish from recreation use, native shrubs may be planted near the location where the PCT crosses the hatchery supply pipeline to screen the Rock Creek Restoration/Shasta Crayfish Refuge Area from view of recreationists using the Pacific Crest Trail (PCT). This measure should reduce the chances of recreationists wading in the Shasta Crayfish Refuge.
- An interpretation and education sign will be developed and installed at Crystal Lake Hatchery to educate the public about Shasta crayfish and the threats posed by non-native species. This sign can be viewed by hatchery visitors and recreationists using the PCT and fishing accesses around Baum Lake.

Bald Eagle

Prior to construction activities, the area will be surveyed for bald eagle. If a bald eagle nest is documented within 0.25 mile of the area, no construction will occur within the Limited Operating Period (LOP) of January 1 to August 15, or construction will be scheduled for a time after the young have fledged. Construction could be started prior to the end of the LOP following a determination that the nest had failed. Implementation of the LOP will ensure that the Project does not significantly affect nesting bald eagles.

3.4.4 Botanical Resources

A pre-construction botanical survey will be completed within the construction footprint before any ground-disturbing or vegetation thinning/removal activities begin. If special-status plant species are found within the construction area, those species will be flagged for avoidance and construction crews will be advised to work around the flagged areas.

Castlegar Hawthorne (California Rare Plant Rank 3)

The following species-specific protection measures will be followed to minimize any impacts on the putative Castlegar hawthorne at Rock Creek:

- Avoid cutting down the hawthorn shrubs, if possible. Associated shrub species (*Prunus virginiana*, *Prunus obcordata*, *Amelanchier* sp., *Salix* Sp., *Sambucus nigra*) can be removed.
- If necessary, hawthorn shrubs will be trimmed instead of removed. Similar to other hawthorns, Castlegar hawthorne probably has the ability to re-sprout from cut stumps/roots.
- If it is absolutely necessary to remove the shrubs, the putative Castlegar hawthorne at Rock Creek will be propagated from seed/cuttings and used as part of the restoration planting palate for the site.
- The population (existing and/or planted) will be monitored post-construction to assess and ensure viability.

Noxious Weeds

To prevent spread of noxious weeds, all tracked construction equipment and other heavy machinery will be washed (high-pressure washing) before transport to the site. During the post construction phase, all disturbed areas will be seeded and mulched with native species.

3.4.5 Health and Safety

Per OSHA and Cal/OSHA guidelines, activities that could result in personal injury will be addressed for all phases of the proposed Project, and this information will be made available to all workplace personnel. A file of Material Safety Data Sheets for all substances used on the job site will be maintained in the contractors' office location and at the job site as required by the Hazard Communication Law, General Industry Safety Orders, Sec. 5194. Spring Rivers' personnel and the selected contractors will adhere to PG&E's general Workplace Injury and Illness Prevention Program, and to the site-specific safety plan that will be developed when the Project Description is finalized. Safety tailgate meetings will be held to keep employees informed of work-related accidents, illnesses, and workplace hazards.

The following measures will be implemented for fire prevention:

- If site preparation and construction take place during declared fire season, a fire plan will be developed and implemented.
- Crew pickups will have one shovel, one axe, and one or more UL-rated 4BC extinguisher(s) or five-gallon water-filled backpack pump on each pick up, crew truck, and personal vehicle. One shovel with each tractor or back-hoe.
- One shovel and one fully charged chemical fire extinguisher at a point not greater than 25 feet from the work site for each gasoline-powered tool. Fire extinguishers shall be of the type and size set forth in the *California Public Resources Code*, Section 4431 and the *California Administrative Code*, Title 14, Section 1234.
- Shovels will be a type "O" with an overall length of not less than 46 inches. Axes or pulaskis (pulaskis being the tool of preference) will have a 2.5-pound or larger head and an overall length of not less than 28 inches.

3.4.6 Pathogens/Non-native Animals

A Hazard Analysis and Critical Control Points Plan (HACCP) addressing pathogen/invasive species concerns and identifying steps to reduce the potential for the spread of diseases and aquatic invasive species in Rock Creek is provided in Appendix B of the Rock Creek Meadow Restoration Plan (Attachment A). The HACCP and BMPs for invasive species will be implemented to prevent significant impacts to the environment and hatchery water supply that could result from introduction of pathogens and/or invasive animals. To prevent introduction of pathogens and/or non-native organisms to Rock Creek and/or the Crystal Lake Hatchery, the following measures will be implemented:

- All equipment, gear, and clothing (e.g., boots, waders, gloves, etc.) will be washed/ sanitized before entering Rock Creek or the Crystal Lake Hatchery facilities. After all mud and debris have been removed using a stiff brush, the equipment will be cleaned using one or more of the following methods:
    - Dry equipment thoroughly (at 84-86°F for at least 24 hours or at 104°F for at least two hours (Richards et al. 2004). Alternatively, a drying time of at least 48 hours under low humidity is recommended to remove all pockets of dampness. Clothing and gear must be completely dry for a minimum of 24 hours.
    - Freeze equipment overnight (at least 6 hours). Works well for hoses.
    - Pressure wash with hot (>140°F) water or soak equipment in water maintained at 120°F for a few minutes.
    - Soak equipment in Commercial Solution Formula 409® Cleaner Degreaser Disinfectant for at least five minutes.
- Crystal Lake water present in ice chests containing Shasta crayfish will not be drained or spilled within the Crystal Lake Hatchery building.
- Shasta crayfish will be quarantined for at least 10 days and tested to ensure absence of *Ceratomyxa* before they are transferred to Rock Creek.
- Additional gravel imported to the Project Area will be thoroughly dried for a minimum of 48 hours and visually inspected to ensure that it is completely dry prior to addition to channel (see above requirements for drying equipment). All boulders will be locally sourced from the Project vicinity.

- Standardized measures to prevent the spill of deleterious materials will be implemented to protect aquatic species.
- PG&E will install a hand pump water supply near the location where the PCT crosses the lower Rock Creek Meadow. By providing this water supply, PG&E will help prevent wading in the creek and potential contamination of Rock Creek and the hatchery water supply.

3.5 Consultations and Permitting Requirements

A history of Project Consultation is provided in Section 1.5 of the Rock Creek Meadow Restoration Plan (Attachment A). Other consultations and requirements are summarized below.

Spring Rivers submitted a proposal for translocation of Shasta crayfish from Crystal Lake into Rock Creek (Upper Rock Creek Pool and Upper Rock Creek Meadow) for authorization by USFWS as required by Special Terms and Conditions 7m in Spring Rivers' 10(a)1(A) recovery permit (TE806679-7). The USFWS Recovery Permit and CDFW MOU are provided in Attachment B. USFWS has addressed potential impacts to Shasta crayfish from the translocation, quarantine, and reintroduction of Shasta crayfish from Crystal Lake to Rock Creek in the BO that USFWS prepared for issuance of 10(a)1(A) permits for this species.

National Historic Preservation Act (NHPA) consultation was completed during Project planning (i.e., for the 2011 Rock Creek Hydrologic Assessment). The Notification of Compliance with Section 106 of the NHPA under the Programmatic Agreement between the USFWS, Advisory Council on Historic Preservation, and State Historic Preservation Officer (SHPO), which stated that the hydrologic assessment for the Project would not impact cultural resources and that "no further cultural resource identification effort is necessary for the project," was obtained in August 2011 (Attachment B). The footprint of the Rock Creek Meadow Restoration Project is the same as the footprint for the hydrologic assessment. The Archaeological Survey Report for the Rock Creek Meadow Restoration Project, Shasta County, California was submitted to the Army Corps of Engineers (ACOE) on February 5, 2015. ACOE has verified that the 2011 notification fulfills NHPA/SHPO Consultation for the Rock Creek Meadow Restoration Project (Matt Kelley, ACOE personal communication to Sheli Wingo, USFWS Partners for Fish and Wildlife Program on March 2, 2015). In addition in the May 12, 2015 letter to PG&E, SHPO

concurred with the *Finding of No Historic Properties Affected* based on the current project description and the Area of Potential Effects (APE).

PG&E will notify the State Water Resources Control Board (State Water Board) of the change in location of the point of diversion for their Pre-1914 claim, Riparian Water Right to divert Rock Creek water for irrigation, domestic use, and to the Crystal Lake Hatchery for fish culture. Moving the diversion point 650 feet downstream will not adversely affect another water right user. PG&E will identify the new point of diversion location on the Supplemental Statement of Water Diversion and Use Form that is filed with the State Water Board every three years.

Consultation with the ACOE and State Water Board was initiated in January 2015. The restoration component of the Project will require an ACOE Nationwide 27 Permit and a 401 Water Quality Certification. Construction of the new diversion structure will require an ACOE Nationwide 25 Permit. The Project will be implemented under a License Agreement for a Right of Entry for Temporary Use between USFWS and the landowner PG&E. The Safe Harbor Agreement between USFWS and PG&E covers the reintroduction of Shasta crayfish to the Upper Pool portion of Rock Creek. This Safe Harbor Agreement also covers CDFW's activities associated with the Crystal Lake Hatchery as a lessee of PG&E. Because Partners for Fish and Wildlife is providing funding for some of the channel restoration work, a Partners for Fish and Wildlife Agreement was also developed. Because the Pacific Forest and Land Stewardship Council is providing funding to Spring Rivers Foundation for the Project, the Project will require a Lake and Streambed Alteration agreement to comply with CDFW Fish and Wildlife Code 1600.

4.0 AFFECTED ENVIRONMENT

This section provides a summary of the resources potentially affected by the proposed Project. It is organized by the impact and resource topics summarized in Table 1 (Section 2.6). The Area of Potential Effect (APE) is considered the Rock Creek Meadow Restoration Project Area (Figure 1).

For the purposes of this EA, actions that take place within the FERC boundary for the Hat Creek Project (i.e., collection of Shasta crayfish from Crystal Lake) are not included in the APE, because those actions have already been evaluated by the USFWS as components of Shasta

Crayfish Management Plan for the Hat Creek Project. The BO and incidental take statement for the Hat Creek Project, which was issued on August 8, 2013, is provided with other supplemental documents in Attachment B. The potential impacts to Shasta crayfish from the translocation, quarantine, and reintroduction of Shasta crayfish from Crystal Lake to Rock Creek were addressed in the BO that USFWS prepared for issuance of 10(a)1(A) permits for this species.

4.1 General Habitat Description

The Project Area is located entirely within the USGS 7.5' Cassel Quadrangle, and within the "Lower Pit River" USGS Hydrologic Unit (Map Unit Number 18020003). It is situated near the southern end of the Cascade Range geologic province at its juncture with the western part of the Modoc Plateau province. Elevations in the Project Area range from approximately 3,075 feet to 3,040 feet above sea level. Vegetation communities include Ponderosa Pine/Oak Forest/ Woodland and Non-Native Grassland/Herb.

The prevailing climate of the region is Mediterranean (cool wet winters, warm summers, and a predictable summer drought), but juxtaposition with the Great Basin makes all seasons drier and winters colder. Average annual rainfall is 27.98 inches, which falls between October and April (Western Regional Climate Center 2009). Annual average snowfall is 40.9 inches; most of this falls December through February. Average minimum temperatures range from 18.9 °F in January to 44.2 °F in July; average maximum temperatures range from 43.5 °F in January, to 88.0 °F in July. The growing season is thermic and assumed to extend from February 1 to October 31.

4.2 Water/Wetland Resources

Specific water resources that will be affected by the Project include Rock Creek and surrounding wetlands (Figure 2). Rock Creek is a natural, spring-fed stream that flows through seasonal and perennial wetlands before it is diverted through a pipeline to Crystal Lake Hatchery, which is located at the upstream end of Baum Lake.

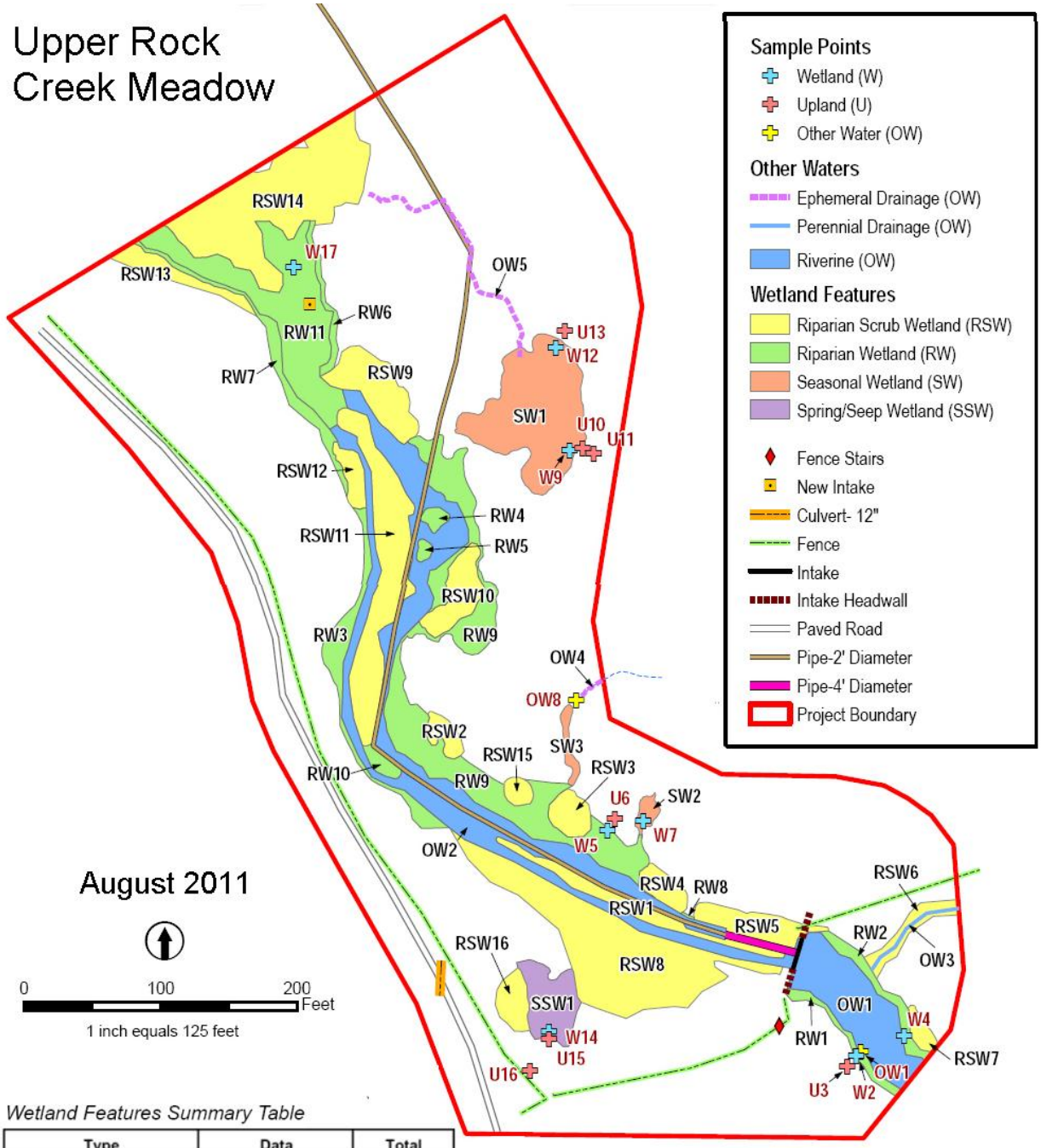
Wetlands and other waters present within the 6.15-acre Project Area were mapped by Dittes and Guardino Consulting during 2011 (PG&E 2011b). The area included approximately 1.868 acres of potentially jurisdictional Waters of the United States (Figure 4). Wetlands present included

riparian wetlands (approximately 0.471 acres), riparian-scrub wetlands (approximately 0.805 acres), a groundwater seep wetland (approximately 0.043 acres), and three seasonal wetlands (approximately 0.158 acres). Other waters were represented by the perennial drainage of Rock Creek (approximately 0.375-acres), a segment of a spring-fed perennial tributary-drainage (approximately 0.006 acres), and 2 segments of potentially jurisdictional ephemeral drainage (approximately 0.010 acres).

In a Preliminary Jurisdictional Determination, the ACOE concurred with the amount (1.868 acres) and location of wetlands and other water bodies as shown in Figure 4. The signed verification letter, dated September 14, 2011, is provided along with other supplemental documents in Attachment B. Based on the 20% design presented in the Rock Creek Meadow Restoration Plan (Attachment A), the calculated area of disturbance to water/wetland habitats is less than ½ acre.

4.3 Air Quality

Wetland habitats can function as carbon sinks, which are natural or man-made reservoirs of carbon dioxide. The process of carbon sequestration is considered important for reducing or slowing global warming. Conversely, water-logged wetland soils can emit methane gas, which contributes to global warming. The direction and rate of greenhouse gas fluxes in wetland habitats may be dependent on environmental conditions, such as soil moisture, plant biomass, and climate (EPA 2010). Large-scale changes in wetland habitat would be expected to alter existing wetland conditions and therefore direction and/or rate of greenhouse gas fluxes. Small-scale changes in wetland habitats would have less impact on greenhouse gas sequestration and/or production. The total area of disturbance to wetland habitats associated with the proposed Project is less than ½ acre. The use of heavy equipment during stream channel restoration activities could result in temporary airborne dust and fumes.



Wetland Features Summary Table

Type	Data	Total
Riparian Scrub Wetland	Sum of Acres	0.805
	Sum of Area (Sq.Ft.)	35,057.311
Riparian Wetland	Sum of Acres	0.471
	Sum of Area (Sq.Ft.)	20,534.260
Seasonal Wetland	Sum of Acres	0.158
	Sum of Area (Sq.Ft.)	6,899.972
Spring/Seep Wetland	Sum of Acres	0.043
	Sum of Area (Sq.Ft.)	1,867.926
Total Sum of Acres		**1.477**
Total Sum of Area (Sq.Ft.)		**64,359.470**

Other Water Features

Type	Label	Avg. Width (Ft.)	Length (Ft.)	Sq. Ft.	Acres
Riverine	OW1	N/A	N/A	4,347.04	0.100
Riverine	OW2	N/A	N/A	11,983.63	0.275
Perennial	OW3	3	82.75	248.25	0.006
Ephemeral	OW4	2	20.27	40.54	0.001
Ephemeral	OW5	2	206.44	412.87	0.009
				17,032.33	**0.391**

Figure 4. Upper Rock Creek Meadow water and wetland features mapped in 2011.

4.4 Wildlife Resources

Terrestrial and aquatic wildlife is abundant in the Project vicinity (i.e., within the USGS 7.5' Cassel Quadrangle) and includes many species designated as rare or sensitive. This section summarizes the species occurrence and habitat information available for the Project vicinity.

The rare/sensitive species information presented in this section was obtained from California Natural Diversity Database (CNDDB) records for the USGS Cassel 7.5' Quadrangle (downloaded in January 2015); PG&E data compiled during relicensing (PG&E 1998) and license-implementation studies (PG&E 2003a, 2003c, and 2013) for PG&E's Hat Creek Project; and USFWS knowledge of species presence within the Project vicinity.

The list of rare/sensitive species compiled for this EA includes 28 species, 10 of which are listed as threatened or endangered under ESA and/or CESA (Table 2). ESA- and CESA-listed species are discussed in Section 4.4 (Threatened and Endangered Species). Table 2 also includes 18 species that are designated by CDFW as Species of Special Concern (SSC), Fully Protected (FP), or Watch List (WL) species protected under the *Migratory Bird Treaty Act*.

Other potentially rare species for which no current state or federal status has been designated, such as those included on USDA Forest Service (FSS) or Bureau of Land Management (BLM) rare/sensitive species lists, were excluded from Table 2. For simplicity, those species will be evaluated collectively as Wildlife Resources. Species that historically occurred but no longer occur within the Project vicinity, such as foothill yellow-legged frog (*Rana boylii*), were also excluded from Table 2. Current studies have shown that foothill yellow-legged frogs no longer occur within the Project vicinity (PG&E 2009).

4.4.1 Migratory Birds

The California SSC and WL species listed in Table 2 have all been documented as occurring within the Project vicinity (PG&E 1998), and active osprey (*Pandion haliaetus*) nests are known around Crystal Lake. There is potentially suitable nesting habitat for osprey and other raptors near Rock Creek Meadow and potentially suitable nesting habitat for neo-tropical birds (i.e., willows and riparian vegetation) within the proposed restoration area.

Table 2. Rare/sensitive species list for USGS 7.5' Cassel Quadrangle (threatened and endangered species are highlighted).

Element Type	Scientific Name	Common Name	Federal Status	State Status	CDFW Status[1]
Terrestrial Wildlife					
Birds	*Gavia immer*	common loon	None	None	SSC
Birds	*Grus canadensis tabida*	greater sandhill crane	None	Threatened	FP
Birds	*Pelecanus erythrorhynchos*	American white pelican	None	None	SCC
Birds	*Phalacrocorax auritus*	double-crested cormorant	None	None	WL
Birds (raptors)	*Accipiter cooperii*	cooper's hawk	None	None	WL
Birds (raptors)	*Aquila chrysaetos*	golden eagle	None	None	FP, WL
Birds (raptors)	*Circus cyaneus*	northern harrier	None	None	SSC
Birds (raptors)	*Haliaeetus leucocephalus*	bald eagle	Delisted	Endangered	FP
Birds (raptors)	*Pandion haliaetus*	Osprey	None	None	WL
Birds (passerines)	*Empidonax traillii*	willow flycatcher	None	Endangered	-
Birds (passerines)	*Icteria virens*	yellow-breasted chat	None	None	SSC
Birds (passerines)	*Progne subis*	purple martin	None	None	SSC
Birds (passerines)	*Riparia riparia*	bank swallow	None	Threatened	-
Birds (passerines)	*Setophaga petechia*	yellow warbler	None	None	SSC
Mammals (carnivores)	*Bassariscus astutus*	ringtail cat	None	None	FP
Mammals (carnivores)	*Canis lupus*	gray wolf[2]	Endangered	Endangered	-
Mammals (carnivores)	*Pekania pennanti*	fisher - West Coast DPS[3]	Proposed Threatened	Candidate Threatened	SSC
Mammals (carnivores)	*Vulpes vulpes necator*	Sierra Nevada red fox[4]	None	Threatened	-
Mammals (bats)	*Corynorhinus townsendii*	Townsend's big-eared bat	None	Candidate Threatened	SSC

Element Type	Scientific Name	Common Name	Federal Status	State Status	CDFW Status[1]
Aquatic Wildlife					
Crustaceans	*Pacifastacus fortis*	Shasta crayfish	Endangered	Endangered	-
Reptiles	*Emys marmorata*	western pond turtle	None	None	SSC
Fish	*Cottus asperrimus*	rough sculpin	None	Threatened	FP
Fish	*Cottus klamathensis macrops*	bigeye marbled sculpin	None	None	SSC
Fish	*Lavinia symmetricus mitrulus*	Pit roach	None	None	SSC
Fish	*Mylopharodon conocephalus*	Hardhead	None	None	SSC

[1] CDFW Status codes: SSC = Species of Special Concern; FP = California Fully Protected Species; and WL = Watch List, consisting of taxa that were previously SSCs but no longer merit SSC status or which do not meet SSC criteria but for which there is concern and a need for additional information to clarify status.

[2] One radio-collared gray wolf (OR-7) passed through the region during 2011; however, current gray wolf occurrence in the region is considered transitory. The nearest known gray wolf territory is Jackson County, Oregon.

[3] The nearest documented occurrence of Fisher-West Coast DPS is more than 20 miles from the Hat Creek Project Area. Any potential occurrence is likely to be transitory.

[4] Sierra Nevada red fox prefer higher elevation habitats (i.e., montane and subalpine meadows) than are present in the Project vicinity and the species has never been documented within the Hat Creek Project Area. Any potential occurrence is likely to be transitory.

4.4.2 Carnivores

The ringtail cat (*Bassariscus astutus*) is an elusive, but relatively common, predator that is known to occur within the Project vicinity. The ringtail cat was originally listed as Fully Protected by California due to population declines associated with the fur trade. Its current status within California has not been recently evaluated. The ringtail cat occurs in various riparian habitats and in forest and shrub habitats (Ahlborn 2005). Den sites are usually among boulders or in hollows of trees with sufficient food in the form of rodents and other small animals, and diurnal rest sites include trees and sometimes rock outcroppings (Williams 1986). Potentially suitable habitat for ringtail cat is present within the Project Area; however, construction activities will be limited to the stream channel and surrounding banks. These areas would not provide suitable den or diurnal rest sites for ringtail cat.

4.4.3 Western Pond Turtle

Western pond turtles (*Emys marmorata*) are common around Baum Lake, however, none have been observed in Rock Creek Meadow, and no potentially suitable habitat has been identified within the Project Area.

4.4.4 Fish and Other Aquatic Wildlife

No special-status aquatic species have been documented in Rock Creek. The only fish species that have been documented in Rock Creek are Pit sculpin (*Cottus pitensis*) and brook trout (*Salvelinus fontinalis*). During surveys in 1974, Pit sculpin was the only fish species found in Rock Creek (Daniels 1978, Moyle and Daniels 1982). In 2011, non-native brook trout were found in Rock Creek between Rock Spring and the current hatchery intake structure (Figure 2).

4.5 Threatened and Endangered Species

The list of rare/sensitive species compiled for this EA includes 10 species that are listed as threatened or endangered under ESA and/or CESA (Table 2). Of those, only greater sandhill crane (*Grus canadensis tabida*), bald eagle (*Haliaeetus leucocephalus*), bank swallow (*Riparia riparia*), Townsend's big-eared bat (*Corynorhinus townsendii*), Shasta crayfish (*Pacifastacus fortis*), and rough sculpin (*Cottus asperrimus*) are known to occur within 5 miles of the Project

Area. The following subsections summarize the known species occurrence information and evaluate the potential for each species to occur within the Project Area.

4.5.1 Greater Sandhill Crane

Greater sandhill crane (*Grus canadensis tabida*) is a migratory bird currently listed as threatened under CESA. Small flocks or single pairs of greater sandhill crane are infrequently observed around Baum and Crystal Lakes (Spring Rivers unpublished data). The species typically arrives at breeding grounds in northeastern California as early as mid-February; most cranes lay eggs in late April (Littlefield 1995).

The Project Area contains potentially suitable foraging habitat (grassland/herbland) for greater sandhill crane, and the species has been observed within 5 miles from the Project Area. Therefore, mitigation measures for migratory birds, including sandhill crane, will be implemented. These measures will include pre-construction clearance surveys, and if nesting birds are found, no vegetation removal or other noise-generating activities will be scheduled during the migratory bird breeding period (generally March 1 to September 1).

4.5.2 Bald Eagle

Bald eagle (*Haliaeetus leucocephalus*) is listed as endangered under CESA, and is protected under the *Bald and Golden Eagle Protection Act* and *Migratory Bird Treaty Act*. Bald eagles are known to forage and nest in the Project vicinity. No active eagle nests are currently known within one mile from the Project Area.

4.5.3 Willow Flycatcher

Five subspecies of willow flycatcher (*Empidonax traillii*) are listed as endangered under CESA. Of the five willow flycatcher subspecies currently recognized, *E.t. brewsteri* ("Little Willow Flycatcher") is the subspecies that is known to breed in northern California. Willow flycatcher was documented as occurring in the Project vicinity (near mouth of Hat Creek) during relicensing studies for PG&E's Pit 3, 4, and 5 Hydroelectric Project in 1999 (PG&E 2013); however, no willow flycatchers have been observed in the Project vicinity since 1999.

Although willow flycatcher presence within the Project vicinity has not been recently documented, the willows and riparian habitat along Rock Creek could provide potentially suitable nesting habitat for willow flycatcher and other neo-tropical birds.

4.5.4 Bank Swallow

Bank swallow (*Riparia riparia*) is listed as threatened under CESA. A bank swallow nesting colony is located along the Hat 2 Flume Road, which is more than 2 miles from the Project. No potential nesting habitat has been documented within the Project Area.

4.5.5 Gray Wolf, Sierra Nevada Red Fox, and Fisher

Gray wolf (*Canis lupus*) is federally and state listed as endangered; Sierra Nevada red fox (*Vulpes vulpes necator*) is state listed as threatened; and fisher (*Pekania pennanti*) West Coast DPS (distinct population segment) is proposed for federal and state listing as threatened. Although these carnivores have been documented in the Project vicinity (i.e., Cassel Quadrangle); there have been no recent, documented occurrences within 5 miles of the Project Area. One radio-collared gray wolf (OR-7) passed through the region during 2011; however, current gray wolf occurrence in the region is considered transitory. The nearest known gray wolf territory is Jackson County, Oregon.

A small Sierra Nevada red fox population occurs in alpine and subalpine regions within Lassen National Park and surrounding Lassen National Forest. Although individual foxes may move into lower elevation habitats during winter, they are rarely sighted below 1,500 m (4,929 ft) and are seen most often above 2,100 m (6,889 ft) (Grinnell et al. 1937; Schempf and White 1977). The Project Area is at an elevation of approximately 930 m (3060 ft), which is well below the documented elevation range for the Sierra Nevada red fox.

Fisher West Coast DPS has been documented within PG&E's Pit 3, 4, and 5 Hydroelectric Project Area (GANDA 2009), which is within 30 miles from the Project Area. Fishers are associated with forests having moderate to dense forest canopy and complex structure (e.g., large amounts of coarse down wood, moderate shrub cover, dead trees and trees with decay elements, and a component of hardwood trees). They typically avoid non-forested habitats such as open forest, grassland, and wetland habitats (Powell and Zielinski 1994; Weir and Corbould 2010).

The Project Area is located in a small, open meadow surrounded by small patches of forest and large valleys. Habitat within and near the Project Area does not appear suitable for fisher.

4.5.6 Shasta Crayfish

Shasta crayfish (*Pacifastacus fortis*) is listed as endangered under ESA and CESA. A remnant population exists in Crystal Lake, and individuals have been introduced to Kerns Pond, which is an isolated spring-fed pool in the headwaters of Rock Creek (Figure 2). Although Shasta crayfish may be reintroduced to the Upper Pool of Rock Creek during 2015, the Upper Rock Creek Meadow section of Rock Creek, which is isolated from the Upper Pool, does not currently support Shasta crayfish. Since Shasta crayfish are not present within Upper Rock Creek Meadow, stream restoration activities associated with implementation of the proposed Project will not impact Shasta crayfish. During the reintroduction phase of the Project, however, Shasta crayfish will be collected, quarantined, and reintroduced to the Rock Creek restoration area as described in the proposal for translocation of Shasta crayfish from Crystal Lake into Rock Creek (Upper Rock Creek Pool and Upper Rock Creek Meadow) that Spring Rivers submitted for authorization by USFWS as required by Special Terms and Conditions 7m in Spring Rivers' 10(a)1(A) recovery permit (TE806679-7). USFWS has addressed potential impacts to Shasta crayfish from the translocation, quarantine, and reintroduction of Shasta crayfish from Crystal Lake to Rock Creek in the BO that USFWS prepared for issuance of 10(a)1(A) permits for this species. It is anticipated that Shasta crayfish could be injured or killed during or after translocation, quarantine, and reintroduction. In addition, recreation use and hatchery operations within and near Rock Creek meadow could potentially affect the reintroduced Shasta crayfish population or the refuge habitat. Recreation areas near the Project Area are shown in Figure 5. These areas include PG&E-managed facilities and the Pacific Crest National Scenic Trail (PCT), which extends from Mexico to Canada.

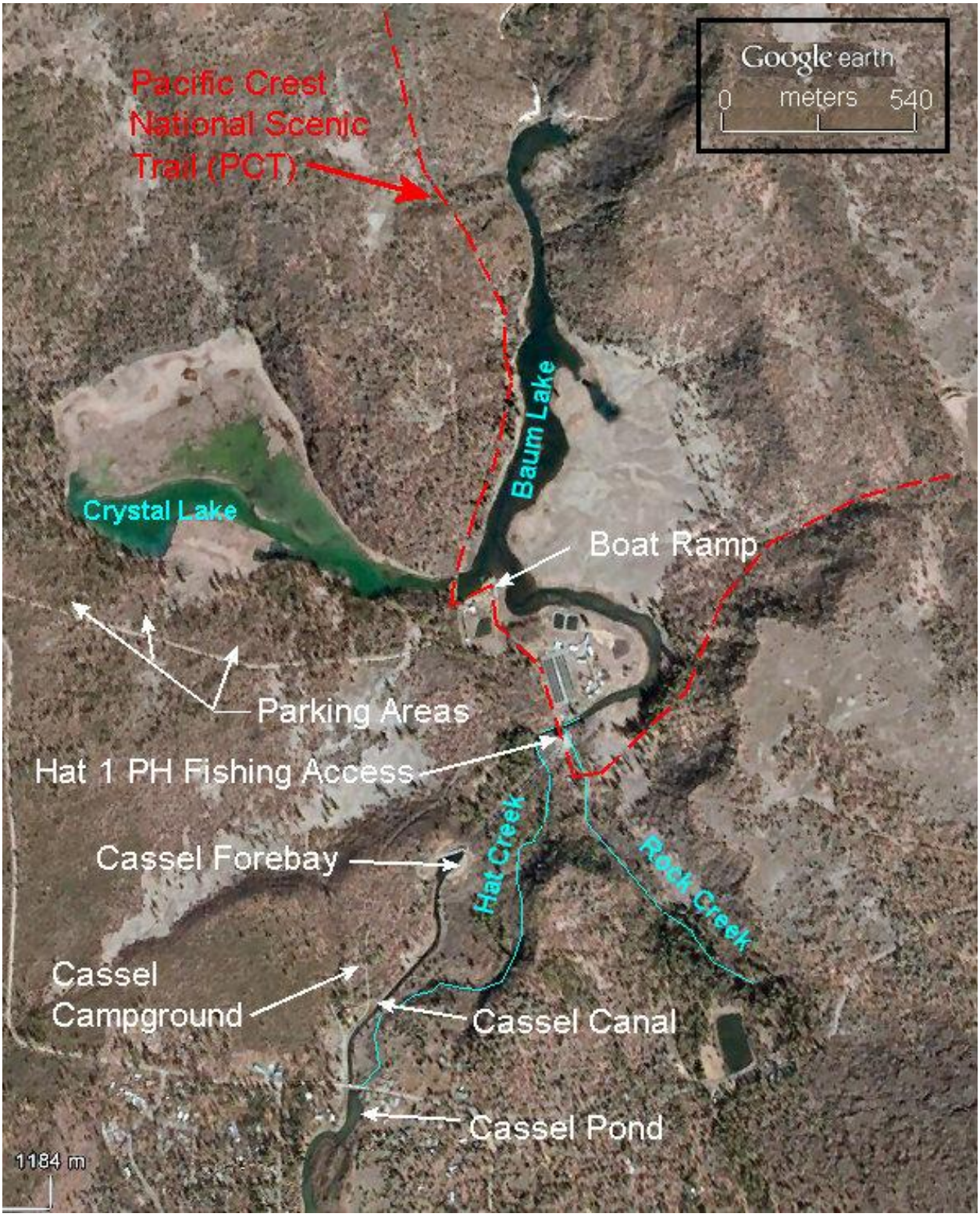


Figure 5. PG&E-managed public access areas and approximate Pacific Crest Trail route.

4.5.7 Townsend's Big-Eared Bat

Townsend's big-eared bat (*Corynorhinus townsendi*) is a candidate for listing as threatened under CESA. The species has been documented as occurring within PG&E's Pit 3, 4, and 5 Hydroelectric Project (PG&E 2013); however, there have been no documented occurrences within PG&E's Hat Creek Project (bat surveys were not conducted during project relicensing). Roosting habitat for the species includes natural caves or rock crevices; manmade structures such as mines, bridges, and buildings; as well as dense woodland (including riparian areas) and scrub habitats (Zeiner et al. 1990). Some dense woodland and rock outcroppings are present near the proposed Project Area; however, construction activities will be limited to the stream channel and surrounding banks. These areas do not provide suitable roosting habitat for bats.

4.5.8 Rough Sculpin

Rough sculpin (*Cottus asperrimus*) is listed as threatened under CESA and is a California Fully Protected species. Rough sculpin occurs in Hat Creek and Crystal Lake; however, the species has never been found in Rock Creek.

4.6 Botanical Resources

Stream restoration activities associated with the proposed Project could potentially affect special-status botanical resources within the construction footprint. A list of rare/sensitive plant species that could potentially occur within the Project Area was compiled for the 2011 Botany Survey (Table 3). The list includes 13 plant species with California Native Plant Society (CNPS) ranks ranging from Rank 3 (plants about which we need more information) to Rank 1B (rare, threatened, or endangered in California and elsewhere), and Threat Ranks ranging from 0.1 (high threat) to 0.3 (low threat). Plants with a Rare Plant Rank of 4 (plants with limited distribution) were not included in the list.

During the 2011 surveys, Castlegar hawthorne (*Crataegus castlegarensis)* was tentatively identified within the botany survey area, which included the footprint of proposed Rock Creek restoration activities, with a minimum of 100 feet buffer around the Project footprint (Figure 4). This putative Castlegar hawthorne (California Rare Plant Rank 3), which was the only potential rare plant found, was observed in association with riparian scrub vegetation in the northern-most portion of the survey area.

Table 3. Special-Status plant species with potential to occur in Project Vicinity.

Common Name Scientific Name	**Status[1] (CNPS)**	**Habitat (Elevation)**	**Plant Community Association[2]**	**Flowering Period**
Long-haired Star Tulip *Calochortus longebarbatus var. longebarbatus*	1B.2	Drying edges of wet meadows; heavy clay soil (1200-1900 m; 3937-6234 ft.)	YPF	Jun-Aug
Bristly Sedge *Carex comosa*	2.1	Marshes, swamps and lake margins (0-625 m; 0-2051 ft.)	MshSw	May-Sep
Castlegar Hawthorne *Crataegus castlegarensis*	3	Riparian Shrub; Moist rocky loam (0-975 m; 0-3,195 ft.)	RpScr	May- Jun
English Sundew *Drosera anglica*	2.3	Swamps, bogs (1200-1800 m; 3937-5906 ft.)	YPF; MshSw	Jun-Aug
Baker's Globe Mallow *Iliamna bakeri*	1B.2	Sagebrush scrub; lava beds (1000-2500 m; 3281-8202 ft.)	Chrpl; NJW	July
Bellinger's Meadow Foam *Limnanthes floccosa ssp. Bellingeriana*	1B.2	Vernally wet flats and roadsides (290-1100 m; 950-3,610 ft.)	Cmwld; Mdws (mesic)	Apr-Jun
Eel-grass Pondweed *Potamogeton zosteriformis*	2.2	Marshes, swamps, lake shallows (freshwater) (0-1862 m; 0-6100 ft.)	MshSw	Jun-Aug
Great Basin Nemophila *Nemophila breviflora*	2.3	Streambanks, meadows and thickets 1220- 410 m; 4000-790 ft.)	GBSrb, Mdws, UCFrs	May-July
Long-stiped Campion *Silene occidentalis ssp. Longistipitata*	1B.2	Dry forest openings; disturbed areas (1000-2000 m; 3285-6560 ft.)	Chrpl, LMCfrs, UCFrs	Jun-Aug
Marsh skullcap *Scutellaria galericulata*	2.2	Meadows; marshes (1200-2000 m; 3937-6562 ft.)	YPF; Msh/Mdws	Jun-Sep
English Peak Greenbrier *Smilax jamesii*	1B.3	Edges of lakes/ streams, rivers; alder thickets (1500-2500 m; 4921-8202 ft.)	YPF; MCF; NCCF; FW	Jun-Sep
Hairy Marsh Hedge-nettle *Stachys palustris ssp. Pilosa*	2.3	Meadows and seeps (1200-1770 m; 3937-5807 ft.)	GBScr (mesic)	Jun-Aug
Long-leaved Starwort *Stellaria longifolia*	2.2	Meadows; damp sand/ gravel along streams (900-1500 m; 2953-4921 ft.)	YPF; NCS	Jun-Jul

[1] California Native Plant Society (CNPS) Status Codes:

California Rare Plant Rank **1B** (formerly List **1B)** = Rare, threatened, or endangered in CA and elsewhere; California Rare Plant Rank **2** (formerly List **2)** = Rare, threatened, or endangered in CA but more common elsewhere; California Rare Plant Rank **3** (formerly List **3)** = Plants about which we need more information; Threat ranks: **0.1** = high; **0.2** = moderate; **0.3** = low

[2] Plant Community Association Codes:
Chrpl = Chaparral; **GBScr** = Great Basin Scrub; **LMCfrs**= Lower Montane Coniferous Forest; **NJW** = Northern Juniper Woodland; **MCF** = Mixed Conifer Forest; **Mdws** = Meadows; **MshSw** = Marshes and Swamps; **NCCF** = Northern Coastal Conifer Forest; **NCS** = Northern Coastal Scrub; **UCfrs**= Upper Montane Coniferous Forest; **YPF** = Yellow Pine Forest

On June 12, 2015, a follow-up botanical survey was done to map and flag the putative Castlegar hawthorne shrubs, and to collect voucher specimens for taxonomic determination. The Jepson Manual separates Castlegar hawthorne from the closely-related Douglas' hawthorn based on the hairier inflorescences and longer thorns (18-23 mm). The Rock Creek Meadow population appears to be intermediate with thorns that are well-over 18 mm in length (some exceed 25mm), but inflorescences that are mostly completely without hairs. Voucher specimens were sent to Dr. Jim Phipps at University of Western Ontario, who described the species, for taxonomic determination. A final determination from Dr. Phipps is pending. Therefore for the purposes of this EA, the putative Castlegar hawthorne will be treated the same as Castlegar hawthorne until a final determination is made.

The Rock Creek hawthorn plants are all restricted to a single colony located just north (down slope) of the alignment of the new pipe from the new diversion and intake structure to the existing hatchery pipeline. The approximately 45 shrubs within the colony were flagged with Blue and Black-striped plastic flagging and each plant was marked with white plastic flagging labeled with permanent marker (cc1-cc45). As many individual shrubs were GPS mapped as were possible to access. The alignment of the new pipe from the new diversion and intake structure to the existing hatchery pipeline will be along the upslope side of the hawthorn colony as shown by the red-bordered green polygon drawn around the perimeter of GPS-mapped shrubs (Figure 6).

The California Native Plant Society lists Castlegar hawthorne as a California Rare Plant Rank 3 species, or one about which more information is needed (a review list). For now, its State Rank is S1S3, meaning that its distribution/abundance is not really known. It has been assigned a Global Rank of G5, meaning it is demonstrably secure to ineradicable outside of California.

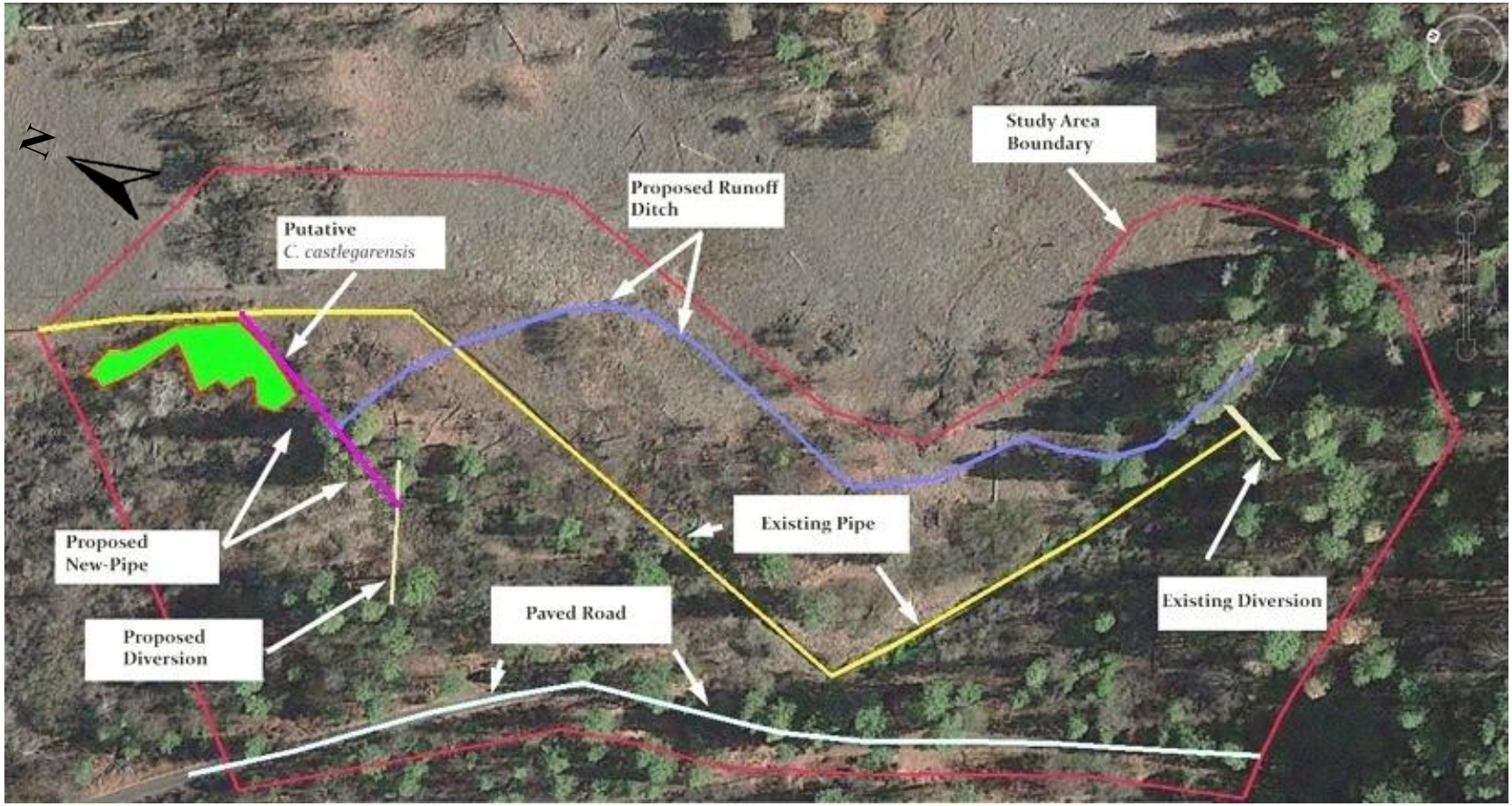


Figure 6. Rock Creek Meadow Restoration Project showing existing and proposed infrastructure and location of putative Castlegar hawthorne (*Crataegus castlegarensis*); Cassel USGS 7.5' Quadrangle; Shasta County, CA; field mapping conducted by J. Dittes on June 12, 2015.

4.7 Health and Safety

The restoration phase of the proposed Project requires the use of heavy machinery, such as backhoe or excavator, as well as other construction equipment. Some of the most common hazards related to backhoe and excavator operation are slipping and falling of the machine operator, tipping or overturning of the machine, and contacting energized power lines with the machine. Other general safety hazards include fire, exposure to hazardous substances, falling objects, and extreme weather conditions (heat-related illness or hypothermia).

The Shasta crayfish reintroduction phase of the proposed Project requires collection of Shasta crayfish from Crystal Lake. Crayfish will be collected by certified scuba divers in cold waters (6–11 °C or 43–52 °F) at depths between 3 and 20 feet. Hazards associated with this activity include hypothermia, compression sickness, and drowning. Other hazards associated with crayfish collection and relocation include tripping hazards, back injuries, and insect/snake bites (rattlesnakes are common in the work area).

4.8 Pathogens/Invasive Animals

The proposed Project requires translocation of Shasta crayfish from Crystal Lake to Rock Creek. In order to avoid any potential introduction of fish pathogens into Rock Creek (hatchery water source), Shasta crayfish will be quarantined for a period of ten days prior to reintroduction. The pathogen of greatest concern is *Ceratomyxa shasta*, which is a microscopic myxosporean protozoan parasite that infects the organs of salmonid fish of the Pacific Northwest. *Ceratomyxa shasta* is present throughout most of the midreaches of the Pit River drainage, including Hat Creek and Crystal Lake (Hendrickson et al. 1989). Although the native Pit River rainbow trout are resistant to the protozoan, *Ceratomyxa shasta*, would be fatal to other trout strains reared at the Crystal Lake Hatchery.

Ceratomyxa shasta has a complex life cycle that requires the freshwater polychaete *Manayunkia speciosa* as an intermediate host for infection of salmonids and the completion of its life cycle (Bartholomew et al. 1997). Without this intermediate host, the parasite cannot be passed directly from fish to fish. Infection occurs when the polychaete host releases actinospores through its epidermis; these actinospores infect the salmonid host (Meaders and Hendrickson 2009). Given the proximity of Rock Creek to the *C. shasta*-infected waters of Baum and Crystal Lakes, it

would seem highly unlikely that Rock Creek is capable of supporting *M. speciosa*, given the fact that Rock Creek is, and historically has been, free of *C. shasta* (Schafer 1968). Ratliff (1983) showed that water containing the infective actinospore of *Ceratomyxa shasta* collected from the Deschutes River remained infective for no more than 10 days when aerated and held at river temperatures (6.9-8.6 °C). Consequently, the duration of quarantine for Shasta crayfish is recommended to be no less than 10 days.

The introduction of non-native crayfish or any other non-native animals to Rock Creek would defeat the purpose of the Project. Cross-contamination (i.e., transfer of water, gear, or equipment from one water body to another) could potentially result in introduction of non-native species to Rock Creek. Mollusc species such as Asian clam (*Corbicula fluminea*) and New Zealand Mud Snail (*Potamopyrgus antipodarum*) are highly invasive non-native species that are present in nearby waters. Asian clam, is of particular concern, because the species has been observed in the Pit River (i.e., upper Lake Britton) at its junction with Hat Creek (Spring Rivers unpublished data). Introduction of these or other unforeseen non-native species to Rock Creek could prevent successful establishment of Shasta crayfish.

5.0 ENVIRONMENTAL CONSEQUENCES

This section describes the potential environmental impacts associated with implementation of the proposed Project. Impacts are evaluated based on intensity and duration, and on whether they are direct, indirect, or cumulative impacts. To enhance understanding of potential impacts, the environment, water/wetland and biological resources sections are broken into subsections; the first subsection describes impacts that could potentially occur without implementation of mitigation/protection measures, and the second subsection evaluates if/how those impacts are prevented or minimized with implementation of mitigation/protection measures.

Overall, these impact evaluations are based on a review of existing literature and PG&E studies; information provided by regional biologists, species experts, regional archeologists, and other agencies; and professional judgment.

The following terms were used to define the nature of impacts associated with project alternatives:

- *Type*: Impacts can be beneficial or adverse.

- *Impact intensity*: The degree or intensity of impacts can be negligible, minor, moderate, or major.
- *Duration*: Depending on the resource, impacts may last for the duration of the project, for a single year or season, or longer. For purposes of this analysis, impact duration is described as temporary or long term.
- *Direct and indirect impacts*: Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects are caused by the action and occur later or farther away, but are still reasonably foreseeable. Direct and indirect impacts are considered in this analysis, but are not specified in the narratives.

5.1 Cumulative Effects

Cumulative effects are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. The CEQ regulations that implement NEPA require assessment of cumulative effects in the decision-making process for federal projects. Cumulative effects are considered for all alternatives and are presented at the end of each impact topic discussion.

5.1.1 Methods for Assessing Cumulative Effects

To determine potential cumulative effects, actions and land uses were identified that have occurred, are occurring, or are reasonably expected to occur near the Project Area. Potential future actions were determined by reviewing the relevant PG&E management plans and TRC Annual Reports (Spring Rivers 2004–2014). These actions were then assessed in conjunction with the Project impacts to determine if they would have any added adverse or beneficial effects on a particular impact topic.

5.1.2 Past, Present, and Future Projects

Shasta Crayfish Management

Shasta crayfish monitoring, signal crayfish eradication, and public outreach under the Hat Creek Shasta Crayfish Management Plan (PG&E 2003a) is ongoing and will continue to occur following the schedule outlined in the plan. If/when Shasta crayfish are reintroduced to Rock Creek, the refuge areas will be routinely monitored (possibly at 5-year intervals), and public outreach (e.g., installation of information signs) will be implemented. The monitoring activities could have cumulative impacts on Shasta crayfish and other aquatic resources in Rock Creek; other potential impacts associated with monitoring include increased turbidity and potential introduction of pathogens/invasive animals.

Crystal Lake Hatchery Operations

Crystal Lake Hatchery has and will continue to use water from Rock Creek for the six raceways in the main hatchery area and Crystal Lake water for the raceway nearest Crystal Lake. Future hatchery maintenance activities that occur in Rock Creek, such as cleaning of the new hatchery diversion structure, could adversely affect aquatic resources, including Shasta crayfish, within the Project Area.

5.2 Water/Wetland Resources

The objective of the *Clean Water Act* is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing point and nonpoint pollution sources, providing assistance to publicly owned treatment works for the improvement of wastewater treatment, and maintaining the integrity of wetlands. Under the Porter-Cologne Act, the State Water Board has the ultimate authority over State water rights and water quality policy. The Porter-Cologne Act, however, also establishes nine Regional Water Quality Control Boards (Regional Boards) to oversee water quality on a day-to-day basis at the local/regional level. Regional Boards regulate all pollutant or nuisance discharges that may affect either surface water or groundwater.

Activities associated with implementation of the proposed Project could result in impacts to water/wetland resources regulated under the Clean Water Act and Porter-Cologne Act. A description of potential impacts and a determination of expected impacts are provided below.

5.2.1 Description of Potential Water/Wetland Impacts Without Mitigation

The types of water quality impacts that could be associated with the Project without implementation of mitigation measures include increased turbidity and pollutant discharges. Increased turbidity could occur when soil is washed into the flowing stream channel from the banks (e.g., during stream restoration work) or when sediment within the channel is disturbed (e.g., initial flushing when channel is rewatered, during Shasta crayfish relocation). Turbidity could also occur as a result of Shasta crayfish monitoring activities and hatchery diversion intake cleaning (cumulative impacts). These direct and cumulative impacts would most likely be minor and temporary, and would only occur within Rock Creek. The restoration reach is immediately upstream of a subterranean boulder section of Rock Creek, so impacts to downstream waterways (i.e., Baum Lake) are not anticipated.

Without implementation of mitigation measures, pollutant discharges could occur from accidental or intentional spills of hazardous substances during stream channel restoration activities. Adverse impacts to Rock Creek water quality and/or wetlands would be temporary, and the intensity of impact could be minor, moderate, or major, depending on the type/quantity of substance spilled.

Wetland impacts associated with the Project include loss or alteration of less than ½ acre of riparian wetlands during stream channel restoration. Even without reseeding or replanting, the small area of riparian wetland habitat that will be affected would eventually regenerate; therefore, adverse impacts to wetland habitat would likely be minor and temporary.

5.2.2 Determination of Water/Wetland Impacts With Mitigation

Mitigation measures to protect water/wetland resources include implementation of BMPs. These BMPs are described in Section 3.4.1.

Table 4 summarizes the potential impacts to water/wetland resources for each alternative if the mitigation measures designed to protect these resources are implemented. Alternative 1 (No Action) would not impact water quality or wetland habitat; therefore, this alternative would have no impacts on water/wetland resources. Under Alternative 2 (proposed Project), less than ½ acre of riparian habitat, including some riparian wetlands, will be temporarily and adversely impacted

during stream channel restoration. Once stream channel restoration is completed, however, the stream banks will be revegetated and riparian wetland habitat will be restored. Therefore, Alternative 2 would initially result in minor, temporary, adverse impacts to water/wetland resources, but would ultimately result in minor, long-term, beneficial impacts to water/wetland resources.

To ensure long-term protection of water/wetland resources, and maintain the quality of the water supply for CDFW, all monitoring activities planned for the restoration area and future hatchery maintenance activities will adhere to the BMPs and mitigation measures implemented during the restoration. Therefore, any cumulative impacts on water/wetland resources associated with monitoring and hatchery maintenance will be less than significant (Table 4).

Table 4. Determination of impacts to Water/Wetland Resources.

Alternative	Impact Description	Cumulative Impacts
1. No Action	No impacts	None
2. Restoration and Translocation	Minor, temporary, adverse impacts followed by minor, long-term, beneficial impacts	Less than significant

5.3 Air Quality

The Clean Air Act (CAA) is the comprehensive federal law that regulates air emissions from stationary and mobile sources. Among other things, this law authorizes EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and to regulate emissions of hazardous air pollutants. Greenhouse gas emissions are included as hazardous air pollutants. California Assembly Bill 32, also known as California Global Warming Solutions Act of 2006, requires California to reduce its Greenhouse gas emissions to 1990 levels by 2020 — a reduction of approximately 15 percent below emissions expected under a "business as usual" scenario.

The potential effects of wetland habitat improvement and meadow restoration projects on greenhouse gas emissions is a topic that is currently being investigated by the EPA and other state, federal, and private organizations. Since the total area of wetland habitat that will be

altered during the Rock Creek Meadow Restoration Project is less than ½ acre, the Project is not expected to significantly affect greenhouse gas emissions. The use of heavy equipment during stream channel restoration activities could result in temporary airborne dust and fumes; however, the local, short-term impact on air quality is expected to be less than significant (Table 5).

Given that the total area of wetland habitat that will be altered during the Rock Creek Meadow Restoration Project is less than ½ acre and the duration of construction period is short (less than a month), the direct and indirect impacts to air quality will be less than significant. The Service is not aware of any other project that when combined with the proposed project would result in a cumulatively significant effect (Table 5).

Table 5. Determination of impacts to Air Quality.

Alternative	Impact Description	Cumulative Impacts
1. No Action	No impacts	None
2. Restoration and Translocation	Less than significant	Less than significant

5.4 Wildlife Resources

The CESA states that all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation, will be protected or preserved. CEQA guidelines clearly indicate that Species of Special Concern (SSC) should be included in an analysis of project impacts if they can be shown to meet the criteria of sensitivity outlined therein. SSC is an administrative designation that carries no formal legal status. The intent of designating SSCs is to focus attention on animals at conservation risk by the CDFW, other state, local and federal governmental entities, regulators, land managers, planners, consulting biologists, and others; stimulate research on poorly known species; and achieve conservation and recovery of these animals before they meet CESA criteria for listing as threatened or endangered.

This EA evaluates potential impacts to wildlife species that have not been listed as threatened or endangered, but have been designated as California Species of Special Concern (SSC). This EA

will also evaluate potential impacts to migratory birds, such as those designated as CDFW Watch List (WL) species, protected under the *Migratory Bird Treaty Act* and/or *Bald and Golden Eagle Protection Act*. A description of potential impacts and a determination of expected impacts are provided below.

5.4.1 Description of Potential Wildlife Impacts Without Mitigation

Without implementation of mitigation measures, Alternative 2 has potential to affect migratory birds. Removal of riparian vegetation along the banks of Rock Creek could result in destruction of small bird nests that could be present in the riparian vegetation. The noise generated by operation of heavy machinery could also result in disturbance of actively nesting birds if nests are located near the construction site. This disturbance could cause temporary or permanent nest abandonment. Therefore, potential significant impacts to migratory birds could be direct or indirect, and short-term or long-term.

Since the area of ground disturbance and vegetation removal associated with implementation of Alternative 2 would be small and restricted to the banks of the stream channel, construction activities will have less than significant impacts on other terrestrial wildlife, including ringtail cat and other carnivores, and western pond turtles.

Under Alternative 2, the portion of the stream channel that will be restored will be temporarily dewatered. Aquatic wildlife present within the natural channel may be killed during the dry period. Although no special-status fish species have been documented within Rock Creek, native Pit sculpin, if present, would be adversely impacted. Since aquatic invertebrates, including native molluscs, are expected to quickly recolonize the restored portion of the channel once it is rewatered, impacts to aquatic invertebrates would be less than significant.

5.4.2 Determination of Wildlife Impacts With Mitigation

Mitigation measures to protect wildlife resources are as follows. If any construction activities are planned during the migratory bird breeding period (generally March 1 to September 1), pre-construction clearance surveys for nesting migratory birds will be completed before any vegetation removal or noise-generating activities begin. If nesting birds are documented in the

Project Area, a buffer of 50 feet will be implemented, or work will be scheduled at a time after the young have fledged.

To protect fish that may be present in Rock Creek, a fish rescue will be performed before the channel is dewatered. All captured fish will be released to suitable habitat outside of the construction footprint.

Table 6 summarizes the potential impacts to wildlife resources (i.e., special-status species not listed as threatened or endangered) for each alternative if the mitigation and protection measures described in Section 3.4 are implemented. Alternative 1 (No Action) and Alternative 2 (proposed Project) would have less than significant impacts on wildlife resources, and no cumulative impacts from Shasta crayfish monitoring and/or hatchery maintenance operations are anticipated.

Table 6. Determination of impacts to Wildlife Resources.

Alternative	Impact Description	Cumulative Impacts
1. No Action	No impacts	None
2. Restoration and Translocation	Less than significant impacts	None

5.5 Threatened and Endangered Species

In California, threatened and endangered species are protected under the ESA and CESA. The ESA directs all federal agencies to cooperate in the conservation and management of federally-listed threatened and endangered species and their habitats. The CESA states that all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation, will be protected or preserved.

Activities associated with implementation of the proposed Project could result in impacts to wildlife species protected under the ESA and/or CESA. A description of potential impacts and a determination of expected impacts are provided below.

5.5.1 Description of Potential Threatened/Endangered Species Impacts Without Mitigation

Stream restoration activities have the potential to affect greater sandhill crane, bald eagle, and willow flycatcher. Project activities are not expected to impact bank swallow, gray wolf, Sierra Nevada red fox, fisher, Townsend's big-eared bat or other special-status bat species, or rough sculpin. The nearest bank swallow colony is located more than 2 miles from the Project Area. The Project Area does not contain potentially suitable habitat for gray wolf, Sierra Nevada red fox, or fisher; and any potential occurrence of these species within the Project Area would likely be transitory. Some potentially suitable habitat for Townsend's big-eared bat may occur near the Project Area, but no suitable bat roosting habitat has been identified within the proposed construction footprint. Rough sculpin do not occur within the Project Area.

Potential impacts to sandhill crane, bald eagle, and willow flycatcher are the same as those described for other migratory birds in Section 5.3.1. Removal of less than ½ acre of riparian vegetation along the banks of Rock Creek could destroy nests of willow flycatcher, and noise-generating activities could disturb nesting sandhill cranes and/or bald eagles. Without the proposed mitigation/conservations measures, these are potentially significant impacts.

Stream restoration activities will not impact Shasta crayfish, because the species does not currently occur within the restoration area. It is anticipated that Shasta crayfish could be harmed or killed during or following translocation, quarantine, and reintroduction. In addition, recreation use and hatchery operations within and near Rock Creek meadow or the Upper Pool could potentially affect the reintroduced Shasta crayfish population or the refuge habitat. Although these are potentially significant short-term impacts, this Project will reintroduce Shasta crayfish to approximately 2,300 square feet (214 square meters, 0.053 acres) of unoccupied suitable habitat in the Upper Pool potentially supporting more than 178 Shasta crayfish in the future. Restored and rewatered, the Upper Rock Creek Meadow would provide a much larger refuge area (13,550 square feet) than the Upper Pool; this larger area could potentially support more than 1,000 Shasta crayfish. The Project could very likely be the turning point that prevents the extinction of the Shasta crayfish by providing habitat for up to 1,700 or more individuals.

The potential impacts to Shasta crayfish from the translocation, quarantine, and reintroduction of Shasta crayfish from Crystal Lake to Rock Creek were addressed in the BO that USFWS prepared for issuance of 10(a)1(A) permits for this species.

5.5.2 Determination of Threatened/Endangered Species Impacts With Mitigation

Mitigation measures to protect threatened and endangered species are described in detail in Section 3.4.3. These include specific protection measures for sandhill crane, bald eagle, willow flycatcher, and Shasta crayfish. To avoid potential impacts to greater sandhill crane or willow flycatcher, pre-construction clearance surveys will be implemented, and if nesting birds are found, no vegetation removal or other noise-generating activities will be scheduled during the migratory bird breeding period (generally March 1 to September 1). In addition, if nesting birds are documented in the project area, a buffer of 50 feet will be implemented or work will be scheduled at a time after the young have fledged. If a bald eagle nest is documented within 0.25 mile of the area, no construction will occur within the LOP of January 1 through August 15, or construction will be scheduled for a time after the young have fledged.

Shasta crayfish protection measures will include implementation of proper handling, transportation, and reintroduction procedures/techniques; removal of potential predators within the refuge area before Shasta crayfish are translocated; implementation of protection measures during site maintenance and monitoring activities; and installation of education signs and other measures to reduce potential recreation-related impacts.

Table 7 summarizes the potential impacts to threatened and endangered species for each alternative if the mitigation and protection measures described in Section 3.4 are implemented. Alternative 1 (No Action) would have major, long-term, adverse impacts on Shasta crayfish, because the goals of the Recovery Plan for Shasta crayfish would not be met. With proper implementation of mitigation measures during and after Shasta crayfish translocation, Alternative 2 (proposed Project) would have major, long-term, beneficial impacts on Shasta crayfish. Monitoring of Shasta crayfish in Rock Creek, which will be conducted following approved methods, will enhance benefits to Shasta crayfish by ensuring that the population is healthy and that the refuge area remains free of predators (e.g., brook trout and non-native crayfish). Alternative 1 (No Action) and Alternative 2 (proposed Project) would have less than

significant impacts on greater sandhill crane, willow flycatcher, or any other species listed as threatened or endangered. No cumulative impacts to these species are anticipated.

Table 7. Determination of impacts to Threatened and Endangered Species.

Alternative	Impact Description	Cumulative Impacts
1. No Action	Major, long-term, adverse impacts on Shasta crayfish. No impacts on other species.	None
2. Restoration and Translocation	Major, long-term, beneficial impacts on Shasta crayfish. Less than significant impacts on other species.	Shasta crayfish monitoring will add to long-term, beneficial impacts.

5.6 Botanical Resources

The *Plant Protection Act* (PPA) is a federal statute regulating plant pests and noxious weeds. In California, four pieces of legislation form the framework for native plant conservation: CESA, CEQA, the *Native Plant Protection Act* (NPPA), and the *Natural Community Conservation Planning Act* (NCCPA). CESA and CEQA require protection and evaluation of impacts to special-status plants. The NPPA directs the CDFW to carry out the Legislature's intent to "preserve, protect and enhance rare and endangered plants in this State" by designating native plants as endangered or rare, and requiring permits for collecting, transporting, or selling such plants. The NCCPA was enacted in 1991 to promote long-term protection of species and habitats via cooperative, landscape-level planning.

California Native Plant Society (CNPS) states: "All of the plants constituting California Rare Plant Rank 3 meet the definitions of the California Endangered Species Act of the California Department of Fish and Game Code, and are eligible for state listing. Impacts to these species or their habitat must be analyzed during preparation of environmental documents relating to CEQA, or those considered to be functionally equivalent to CEQA, as they meet the definition of Rare or Endangered under CEQA Guidelines §15125 (c) and/or §15380.

Activities associated with implementation of the proposed Project could result in impacts to special-status botanical resources, or introduction and/or spread of noxious weeds. A description of potential impacts and a determination of expected impacts are provided below.

5.6.1 Description of Potential Impacts Without Mitigation

Only one potential special-status plant species, *Castelgar hawthorne*, was detected within the Project Area during 2011 and 2015. The putative Castlegar hawthorne at Rock Creek are all restricted to a single colony located just north (down slope) of the alignment of the new pipe from the new diversion and intake structure to the existing hatchery pipeline (Figure 6). The new pipe may be able to be installed without any impact to the hawthorn shrubs, however, some trimming of the shrubs on the upslope edge of the colony may be required. Similar to the closely-related Douglas' hawthorn, as well as some non-native invasive hawthorn species, Castlegar hawthorne likely has the ability to re-sprout from cut stumps/roots.

The potential impacts to botanical resources associated with the Project include potential trimming of a few shrubs on the upslope edge of the hawthorn colony, which consists of approximately 45 shrubs. Even without reseeding or replanting of the putative Castlegar hawthorne at Rock Creek, the few shrubs that will be affected will likely regenerate; therefore, adverse impacts to potentially special-status plants would likely be minor and temporary.

If the mitigation measures for noxious weeds are not implemented, there is potential for introduction and/or spread of invasive plant species. Introduction/spread of noxious weeds is a long-term, adverse impact that would be moderate or major, depending on the weed species.

5.6.2 Determination of Impacts With Mitigation

Mitigation measures to protect special-status botanical resources and prevent introduction/spread of noxious weeds include implementation of BMPs, species-specific protection measures, weed management protocols, and general avoidance and minimization measures. These measures are described in Section 3.4. To ensure long-term protection of botanical resources, including special status plants, all Project activities will adhere to these BMPs and mitigation and protection measures. Therefore, any cumulative impacts on botanical resources associated with the Project will be less than significant.

Table 8 summarizes the potential impacts to botanical resources for each alternative if the mitigation and protection measures are implemented. Alternative 1 (No Action) and Alternative 2 (proposed Project) would have less than significant impacts on botanical resources, and no cumulative impacts on botanical resources are anticipated.

Table 8. Determination of impacts to Botanical Resources.

Alternative	Impact Description	Cumulative Impacts
1. No Action	No impacts	None
2. Restoration and Translocation	Less than significant impacts	None

5.7 Health and Safety

The Occupational Safety and Health Act (OSH Act) established the Occupational Safety and Health Administration (OSHA). The purpose of OSHA is to "assure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education, and assistance." The Division of Occupational Safety and Health (DOSH), better known as Cal/OSHA, protects workers from health and safety hazards on the job in almost every workplace in California through its research and standards, enforcement, and consultation programs.

Per OSHA and Cal/OSHA guidelines, activities that could result in personal injury will be addressed for all phases of the proposed Project, and this information will be made available to all workplace personnel. A file of Material Safety Data Sheets for all substances used on the job site will be maintained in the contractors' office location and at the job site as required by the Hazard Communication Law, *General Industry Safety Orders*, Sec. 5194. Spring Rivers personnel and the selected contractors will adhere to PG&E's general Workplace Injury and Illness Prevention Program, and to the site-specific safety plan that will be developed when the Project Description is finalized. Safety tailgate meetings will be held to keep employees informed of work-related accidents, illnesses, and workplace hazards.

By following approved safety plans, implementing BMPs to minimize significant health and safety impacts, and adhering to the mitigation measures for Fire Hazard Prevention and Hazardous Materials Spill Prevention described in Section 3.4 (Mitigation Measures), the proposed Project will have less than significant impacts on health and safety and no cumulative impacts (Table 9).

Table 9. Determination of impacts to Human Health and Safety.

Alternative	Impact Description	Cumulative Impacts
1. No Action	No impacts	None
2. Restoration and Translocation	Less than significant impacts.	None

5.8 Pathogens/Invasive Animals

The purpose of the National Invasive Species Act (NISA) is to "provide for ballast water management to prevent the introduction and spread of non-indigenous species into the waters of the United States, and for other purposes." It was created to reauthorize and amend a previous measure, the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990, and one of its prime focuses is to prevent invasive species from entering the Great Lakes through ballast water. Executive Order 13112 of 1999 established the National Invasive Species Council and extended the area of investigation and management to inland waters and other areas of the United States.

For the proposed Project, preventing the introduction of non-native species such as signal crayfish and pathogens such as *Ceratamyxa shasta* to Rock Creek is of utmost importance. Successful establishment of Shasta crayfish within Upper Rock Creek Meadow depends on the absence of non-native crayfish, and successful rearing of several trout strains by Crystal Lake Hatchery depends on the absence of *Ceratamyxa shasta* from the Rock Creek water source.

The Shasta crayfish reintroduction protocol includes measures, such as a quarantine period, to prevent introduction of *Ceratamyxa shasta* to Rock Creek. These measures will be implemented along with mitigation measures to prevent the introduction/spread of invasive species. The

HACCP developed for the Project, which is provided in Appendix B of the Rock Creek Meadow Restoration Plan (Attachment A), outlines the specific measures for pathogen/invasive species control. With implementation of these measures, the proposed Project will not result in the introduction or spread of pathogens or invasive species. Therefore, the Alternative 2 (proposed Project) would have less than significant impacts associated with pathogens/invasive animals, and no cumulative impacts (Table 10).

Table 10. Determination of impacts associated with Pathogens/Invasive Animals.

Alternative	Impact Description	Cumulative Impacts
1. No Action	No impacts	None
2. Restoration and Translocation	Less than significant impacts.	None

6.0 CONSULTATION AND COORDINATION

Consultation regarding Shasta crayfish management within the Hat Creek Project Area has been conducted under the current Hat Creek Project license through the Shasta Crayfish TRC. PG&E has filed Shasta Crayfish TRC annual reports with FERC, USFWS, and CDFW in May of each year (Spring Rivers 2004–2014); these reports summarize TRC and Recovery Team activities and contain detailed TRC meeting minutes.

A timeline of consultation and actions related to the Rock Creek Meadow Restoration Project is provided in Section 1.5 of the Rock Creek Meadow Restoration Plan (Attachment A). The following list of agencies and organizations were consulted during Project planning:

- U.S. Fish and Wildlife Service (USFWS)
- U.S. Army Corps of Engineers (USACOE)
- California Department of Fish and Wildlife (CDFW)
- State Historic Preservation Officer (SHPO)
- State Water Resources Control Board (SWRCB)
- Regional Water Quality Control Board (RWCCB)
- Pacific Gas and Electric Company (PG&E)

- Spring Rivers Ecological Sciences LLC (Spring Rivers)
- Spring Rivers Foundation.

7.0 LIST OF PREPARERS, TECHNICAL EXPERTS, AND REVIEWERS

This EA was prepared by the USFWS, Region 8, Sacramento Fish and Wildlife Office, with support from Spring Rivers Ecological Sciences LLC. The following individuals were involved in the preparation of this document:

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Contribution: Preparation of HACCP Plan and 2006 Rock Creek Meadow Hydrologic Assessment, Review of Water/Wetland Resources and Mitigation/Protection Measures (Technical Specialist Review), and Document Editing.

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Contribution: Preparation of Rock Creek Meadow Restoration and Reintroduction Plan for Shasta Crayfish; Review of Shasta Crayfish Background, Wildlife Resources, and Threatened and Endangered Species (Technical Specialist Review); and Document Editing.

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Contribution: Preparation of Draft EA and Document Editing.

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8.2 Personal Communications

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ATTACHMENT A

Rock Creek Meadow Restoration and Reintroduction Plan for Shasta Crayfish

(Rock Creek Meadow Restoration Plan)

[Insert PDF of Restoration Plan here]

ATTACHMENT B

Supplemental Documents

1) Biological Opinion for Hat Creek Hydroelectric Project

2) USFWS Recovery Permit for Shasta Crayfish

3) CDFW MOU for Shasta Crayfish

4) NHPA Consultation Letter

4) USACE Preliminary Jurisdictional Determination