SOUTHERN CALIFORNIA EDISON

Bishop Creek Hydroelectric Project

(FERC Project No. 1394)

INITIAL STUDY REPORT

SOUTHERN CALIFORNIA EDISON

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October 2020

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Bishop Creek Hydroelectric Project
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INITIAL STUDY REPORT

Southern California Edison
1515 Walnut Grove Ave
Rosemead, CA 91770

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Support from:

Kleinschmidt

TABLE OF CONTENTS

List of Figures

List of Tables

List of Appendices in Volume II

Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
1-D	one-dimensional
µS/cm	microSiemens/cm
mg/L	milligrams per liter

A

ACHP	Advisory Council on Historic Preservation
AGR	Agricultural Supply
ANC	acid neutralizing capacity
AOU	American Ornithologists' Union
APE	area of potential effects
ASBS	areas of special biological significance

B

BCHS	Bishop Creek Hydroelectric System
BIOL	Preservation of Biological Habitats of Special Significance
BKF	bankfull
BLM	Bureau of Land Management
BWS	below water surface

C

Ca	calcium
Cal-IPC	California Invasive Plant Council
$CACO_3$	Calcium carbonate
Caltrans	California Department of Transportation
CDFW	California Department of Fish and Wildlife
CDPR	California Department of Parks and Recreation
CDWP	California Drinking Water Program
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations

cfs	cubic feet per second
cfu	colony forming units
CHRIS	California Historical Resources Information System
CHSC	California Health and Safety Code
cm	centimeter
CNDDB	California Natural Diversity Data Base
CNPS	California Native Plant Society
COLD	Cold Freshwater Habitat
COMM	Commercial and Sportfishing
COVID-19	Coronavirus Disease 2019
CPUE	catch per unit effort
CRPR	California Rare Plant Rank
CWA	Clean Water Act
CWHR	Californial Wildlife Habitat Relationships System
CY	cubic yard

D

DO	dissolved oxygen
DPS	Distinct Population Segment

E

EA	Environmental Assessment
ECIC	Eastern California Information Center
EIC	Eastern Information Center
ESA	Endangered Species Act

F

FERC	Federal Energy Regulatory Commission
FL	fork length
FLA	Final License Application
FLD	flood event
FLPMA	Federal Land Policy and Management Act
Form 80	FERC Form 80

FPA	Federal Power Act
FRSH	Freshwater Replenish

G

g	grams
GIS	geographic information system
GNSS	global navigation satellite system
GPS	global positioning system
GWR	Ground Water Recharge

H

HCM	Habitat Criteria Mapping
HCS	Habitat Suitability Criteria
HP	horsepower
HPMP	Historic Properties Management Plan
NHPA	National Historic Preservation Act
HSI	Habitat Suitability Index

I

IFIM	Instream Flow Incremental Method
ILP	Integrated Licensing Process
IND	Industrial Service Supply
INF	Inyo National Forest
IPaC	Information for Planning and Consultation
ISR	Initial Study Review
ITA	Indian Trust Assets

K

kHz	kiloHertz
kV	kilovolt
KVA	kilovolt amperes
KW	kilowatt

L

LADWP	Los Angeles Department of Water and Power
LAND 1	Project Boundary and Lands Study
LRWQCB	Lahontan Regional Water Quality Control Board
LWD	large woody material

M

MCL	Maximum Contaminant Levels
mg/L	milligram per liter
ml	milliliter
MIS	Management Indicator Species
mm	millimeter
MPN	most probable number
msl	mean sea level
MUN	Municipal and Domestic Supply
MYLF	mountain yellow-legged frog

N

NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission
ND	not detected
NEPA	National Environmental Policy Act
NGS OPUS	National Geodetic Survey Online Positioning User Service
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NPS	National Park Service
NRHP	National Register of Historic Places
NVUM	National Visitor Use Monitoring Program

O

O&M	Operation and Maintenance
OPH	Office of Historic Preservation

P

P	Phosphorus
PA	Programmatic Agreement
PAD	Pre-Application Document
PBCS	Point Blue Conservation Sciences
PHABSIM	Physical Habitat Simulation Model
PIT	Passive Integrated Transponder
PM	post mile
PME	Protection, Mitigation, and Enhancement
POW	Hydropower Generation
PRO	Industrial Process Supply
Project	Bishop Creek Hydroelectric Project No. 1394

Q

QA/QC	quality assurance/quality control

R

REC-2	Recreation Facilities Condition and Public Accessibility
REC-1	Recreation Use and Needs
RPM	revolutions per minute
RSP	Revised Study Plan
RTE	Rare, Threatened, and Endangered
RTK	real-time kinematic
RTS	robotic total station
RUN	Recreation Use and Needs
RWQCB	Regional Water Quality Control Board

S

SCE	Southern California Edison

SCORP	Statewide Comprehensive Outdoor Recreation Plan
SHPO	State Historic Preservation Office
SL	Standard Length
SMCL	Secondary Maximum Contaminant Level
SNARL	Sierra Nevada Aquatic Research Laboratory
SNYLF	Sierra Nevada yellow-legged frog
SO_4	Sulfate
SPD	Study Plan Determination
SPWN	Spawning, Reproduction, and/or Early Development
Study Plan	Technical Study Plan
SWAMP	Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board

T

TCP	traditional cultural property
TDS	total dissolved solids
TL	total length
TWG	Technical Working Group

U

U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator

V

W

WARM	Warm Freshwater Habitat
WET	wetted channel/baseflow

WILD	Wildlife Habitat
WUA	Weighted Usable Area

Y

YOY	Young of Year

1 INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Southern California Edison (SCE) is providing the Federal Energy Regulatory Commission (FERC) and interested parties in the relicensing of the Bishop Creek Hydroelectric Project (Project) with this Initial Study Report (ISR) to (1) describe its overall progress in implementing the approved Study Plan, (2) update the schedule for implementing the studies, and (3) describe the data collected. This ISR includes an explanation of any variance from the approved Study Plan and schedule and rationale for any proposed modifications to ongoing studies or new studies being proposed.

The ISR is not intended to analyze results for purposes of determining Project effects, nor does it discuss potential protection, mitigation, and enhancement (PME) measures. The results of studies will be provided in the Updated Study Report in the form of Technical Reports, which will be followed by a separate analysis of Project effects. This approach is intended to provide SCE and its Technical Working Group (TWG) with an iterative process for ensuring that the individual technical studies are completed.

This ISR will be distributed prior to the Study Plan Meeting described in 18 Code of Federal Regulations (CFR) 5.15(c)(2). During that meeting and in subsequent steps described by the Integrated Licensing process (ILP), SCE and the relicensing participants may propose Study Plan modifications or new studies. Modified or new studies must meet the criteria of 18 CFR 5.15(d) or 5.15(e), respectively. These criteria will be reviewed at the Study Plan Meeting currently scheduled for November 10, 2020.

1.2 STUDY PLAN IMPLEMENTATION

FERC issued their Study Plan Determination (SPD) for the Project on November 4, 2019. The SPD approved 15 studies as part of the Bishop Creek relicensing, as listed below. These 15 studies are what form the basis for this ISR.

- Assessment of Bishop Creek Riparian Community Study Plan (TERR 1)
- Invasive Plants Study Plan (TERR 2)
- Assessment of Special Status Plant Study Plan (TERR 3)
- Wildlife Study Plan (TERR 4)
- Bishop Creek Instream Flow Needs Assessment Study Plan (AQ 1)
- Bishop Creek Operations Model Study Plan (AQ 2)
- Bishop Creek Fish Distribution Baseline Study Plan (AQ 3)
- Bishop Creek Reservoirs Baseline Fish Distribution Study Plan (AQ 4)
- Bishop Creek Water Quality Technical Study Plan (AQ 5)
- Sediment and Geomorphology Study Plan (AQ 6)
- Recreation Use and Needs Study Plan (REC 1)

- Recreation Facilities Condition and Public Accessibility Study Plan (REC 2)
- Project Boundary and Lands Study Plan (LAND 1)
- Cultural Resources Study Plan (CUL 1)
- Tribal Resources Study Plan (CUL 2)

Of the 15 studies, 14 were approved as submitted by SCE in the Revised Study Plan submitted to FERC on August 29, 2019. The Wildlife Study Plan (TERR 4) was approved with modifications from FERC staff. The proposed modification was to expand the study area to include a small area of Project transmission facilities that are in the FERC boundary to provide information on the use of transmission lines by avian species within the Project area. SCE has subsequently reviewed its existing Aviation Protection Plan and believes it can adequately inform a future environmental review, when combined with data collected for this study.

After consultation with the TWGs, and in some instances due to field complications (including road construction, restrictions due to coronavirus pandemic responses, fires, and air quality hazards), slight changes were made to several of the approved studies. Those and all other study plan modifications can be found in their respective study plan sections throughout this report.

1.2.1 Process Plan and Schedule

The Project follows the ILP schedule as outlined by FERC guidance. Table 1.2-1 identifies the major milestones completed and those upcoming for the Project.

Table 1.2-1 Bishop Creek Relicensing Schedule

Responsible Entity	Milestone	Date	FERC Regulation
SCE	File Notice of Intent (NOI)/Pre-Application Document with FERC	May 1, 2019	5.5, 5.6
FERC	Notice of Commencement of Proceeding & Scoping Document 1 issued	June 27, 2019	5.8
FERC	Scoping and Site Visit	July 30, 2019	5.8(b)(viii)
All stakeholders	NOI/PAD/SD1 comments due	August 29, 2019	5.9
SCE	File Revised Study Plan	August 29, 2019	5.11(a)
SCE	File Waiver Request	September 4, 2019	
FERC	Approve Waiver Request	October 3, 2019	
All stakeholders	Study Plan Comments due	October 18, 2019	5.12
FERC	Director's Study Plan Determination	November 4, 2019	5.13(c)
SCE	First Study Season	Spr/Sum 2019	5.15(a)
SCE	Second Study Season	Spr/Sum 2020	5.15(a)
SCE	Initial Study Report	November 4, 2020	5.15(c)(1)
All stakeholders	Initial Study Report Meeting	November 10, 2020	5.15(c)(2)

SCE	Initial Study Report Meeting Summary	November 25, 2020	5.15(c)(3)
All stakeholders	Study Disputes/Request to Modify Study Plan due	December 4, 2020	5.15(c)(4)
All stakeholders	Responses to Disputes/Study Requests	January 5, 2021	5.15(c)(5)
FERC	Directors Study Plan Determination	February 6, 2021	5.15(c)(6)
SCE	Updated Study Report due	November 4, 2021	5.15(f)
All stakeholders	Updated Study Report Meeting	November 19, 2021	5.15(f)
Applicant	Updated Study Report Meeting Summary	December 4, 2021	5.15(f)
All stakeholders	Study Disputes/Request to Modify Study Plan due	January 2, 2022	5.15(f)
All stakeholders	Responses to Disputes/Study Requests	February 1, 2022	5.15(f)
FERC	Directors Study Plan Determination	March 2, 2022	5.15(f)
SCE	Preliminary Licensing Proposal due	January 31, 2022	5.16(a)
All stakeholders	Comments on Preliminary Licensing Proposal	May 1, 2022	5.16(e)
SCE	License Application filed	June 30, 2022	5.17
SCE	Public Notice of License Application filing	July 14, 2022	5.17(d)(2)

1.3 Consultation to Date

Below is a list of meetings held to support the relicensing effort.

- March 14, 2018 Public Informational Meeting
- March 15, 2018 Technical Working Group Kickoff Meeting
- April 3, 2018 Oversight/Policy Committee Meeting
- June 4, 2018 TWG Field Visit
- June 5 and 6, 2018 TWG Meetings
- July 13, 2018 Oversight/Policy Committee Meeting
- August 14 and 15, 2018 TWG Meetings
- October 9 and 10, 2018 TWG Meetings
- February 11, 2019 Oversight/Policy Committee Meeting
- February 26 and 27, 2019 TWG Meeting
- June 11, 2019 TWG Meeting
- June 19, 2019 TWG Meeting
- July 30, 2019 FERC Scoping Meeting
- July 31, 2019 FERC Scoping Meeting
- November 7, 2019 Recreation TWG Conference Call
- January 17, 2020 Aquatics TWG Conference Call
- May 7, 2020 TWG Meeting
- May 19, 2020 TWG Meeting

2 SUMMARY OF STUDIES

SCE completed or initiated several resource studies in 2019 as outlined in the revised Technical Study Plan and SPD. As such, several studies are in their second year of surveys while other resource areas just began in 2020; for reasons described below, some efforts have been delayed until 2021. Table 2.1 provides a summary of the field efforts conducted to date and a schedule for remaining studies. Those studies impacted by factors including road and site closures, the Coronavirus Disease 2019 (COVID-19) pandemic and wildfires are identified in the Table 2.1. Individual study reports are provided in this ISR.

Each section of this ISR resembles technical study reports but omits detailed discussions about potential Project impacts. The goal of the ISR is to solicit input on the implementation of studies and the reach agreement on what else (if anything) is needed to have an informed discussion of Project effects. The ISR is a snapshot of the status of each study with as much data as possible provided to help guide discussions.

As each study is completed, the ISR sections will be converted to stand-alone Final Technical Study Reports which will provide more detailed analysis and discussion. Once all Final Reports are completed in 2021, an effects analysis will be prepared. This will allow SCE and the TWGs to look at interactions between resources and derive a comprehensive list of effects, for which some level of PM&E measures would be appropriate.

Table 2.1 Bishop Creek Hydro Relicensing Project 2019 Field Study Summary

STUDY NAME	STATUS	MODIFICATIONS TO METHODOLOGY AND/OR NEEDED CONSULTATION
TERRESTRIAL AND BOTANICAL STUDIES		
TERR 1 – Assessment of Bishop Creek Riparian Community	SCE conducted riparian vegetation surveys throughout the 2019 field season focusing on the regulated stream reaches below Project diversions and reservoirs.	No changes or modifications to methods and no additional field work is anticipated for the duration of this relicensing process. Following the ISR meeting, authors will work to finalize technical reports provided no additional survey work is needed.
TERR 2 – Invasive Plants	SCE conducted surveys for invasive plants during the 2019 field season, focused on a 500-foot survey area around each Project facility and a larger survey area around Powerhouse No. 4 to document black locust populations. Final surveys at recreation facilities and Powerhouse No. 4 were conducted during the 2020 survey period.	No changes or modifications to methods. Following the ISR meeting, authors will work to finalize technical reports provided no additional survey work is needed.
TERR 3 – Assessment of Special Status Plants	SCE conducted surveys for special status plants on multiple visits to the study area during the 2019 field season. Final surveys at recreation facilities were conducted during the 2020 survey period.	No changes or modifications to methods and no additional field work is anticipated for the duration of this relicensing process. Following the ISR meeting, authors will work to finalize technical reports provided no additional survey work is needed.
TERR 4 – Wildlife	Surveys for general wildlife, special status amphibians, and a bat habitat assessment were performed in 2019. A winter roost survey was conducted in January 2020 and bat acoustic surveys were conducted in June 2020. In 2019, cameras were placed along the above ground flowline at mule deer crossings between Intake 2 and Powerhouse No 2.	General wildlife surveys were reduced to one field survey in 2019 and are now complete. In June 2020, two new cameras were placed at wildlife crossing areas to replace those stolen in 2019. Following the ISR meeting, authors will work to finalize technical reports provided no additional survey work is needed.
AQUATICS AND AQUATIC PROCESSES STUDY PLANS		
AQ 1 – Instream Flow Needs and Assessment	In March 2020, SCE calibrated the hydraulic component of the PHABSIM model and ran habitat suitability simulations for all PHABSIM study reaches, drafted a report, and reviewed the report with the Aquatic TWG. Beginning April 2020, SCE consulted further with California Department of Fish and Wildlife (CDFW) and U.S. Forest Service (USFS) to develop	No additional changes or modifications to methods are anticipated. SCE solicited comments from the TWG regarding the PHABSIM report in earlier this year. Following the ISR meeting, authors intend to work on Final Technical Reports provided no additional survey work is needed.

Study Name	**Status**	**Modifications to Methodology and/or Needed Consultation**
	Habitat Suitability Criteria (HSC) for Owens speckled dace, which was applied to study reaches 1 and 2. SCE used a Habitat Criteria Method (HCM) in 2020 as recommended by USFS for reaches 4 and 6, and the Birch-McGee study area.	
AQ 2 – Operations Model	The Operations Model has been configured and populated with historical data. The Relicensing Team continues to calibrate the model with SCE Operations.	No changes or modifications to methods.
AQ 3 – Fish Distribution Baseline Study (Creek)	Electrofishing and gill netting was conducted in the study area during the 2019 survey period and a report was submitted and reviewed it with the TWG earlier in 2020.	No changes or modifications to methods and no additional field work is anticipated for the duration of this relicensing process. Following the ISR meeting, authors will work to finalize technical reports provided no additional survey work is needed.
AQ 4 –Baseline Fish Distribution Study (Reservoirs)	Electrofishing and surveying for Owens sucker were conducted in June and September 2020 in Lake Sabrina and South Lake. Gill netting at Longley Reservoir was completed in September 2020.	No changes or modifications to methods. Gill netting at Longley Reservoir originally planned for June 2020 was postponed and completed in September 2020 due to USFS permitting office closures related to COVID-19. Following the ISR meeting, authors intend to work on Final Technical Reports provided no additional survey work is needed.
AQ 5 – Water Quality	Water quality sampling is being conducted at Lake Sabrina, South Lake, Intake No. 2 reservoir and locations along Bishop Creek throughout the summer of 2020 as outlined in the revised Water Quality Implementation Plan submitted to FERC in April 2020 with Progress Report 3.	No additional changes or modifications to methods.
AQ 6 – Sediment and Geomorphology	Channel and substrate surveys were conducted in September 2019. After consultation with stakeholders regarding challenges with bedload sampling, SCE decided to perform a tracer rock study during higher flows to understand when various size substrates are mobilized. To date, flows necessary to mobilize the tracer rocks have not been seen and results may need to wait until spring of 2021.	Fall 2019 work proceeded with no changes or modifications to methods. After a review of field conditions at bankfull flow, SCE does not believe the planned use of a bed-load sampler can be safely deployed or effectively implemented via wading, and notes that necessary infrastructure (bridges) for deployment of the sampler is not present for the desired sample reaches. To help resolve the question relating to sediment mobility that can't be answered by the bedload sampling that is not feasible, SCE proposed to perform a tracer rock study during higher flows to understand when various size substrates are mobilized. SCE discussed the change in methods with the TWG during review of the 2nd progress report in May 2020 and no concerns were raised.

STUDY NAME	**STATUS**	**MODIFICATIONS TO METHODOLOGY AND/OR NEEDED CONSULTATION**
HUMAN ENVIRONMENT AND COMMUNITY STUDY PLANS		
REC 1 – Recreation Use and Needs	Off-site recreation use surveys will be implemented in 2020 and 2021. All other activities, described in REC 1 will be implemented in 2021.	In January 2020, the USFS notified SCE of heavy road construction on South Lake Road which would significantly affect the recreational use patterns and scheduled activities for the 2020 recreation season (most notably user counts and surveys). Based on this development, SCE developed a revised implementation schedule for the REC 1 study plan in consultation with the USFS that moves the general recreation field surveys to the 2021 recreation season. The onset of the COVID-19 pandemic further supported the decision to postpone this study.
REC 2 – Recreation Facilities Condition and Public Accessibility	This study will be implemented in 2020. The Full Facilities Condition Assessment and ground-truthing of the Dispersed Use Assessment are scheduled for early August 2020.	No changes or modifications to methods. Following the ISR meeting, authors intend to work on Final Technical Reports provided no additional survey work is needed.
LAND 1 – Project Boundary and Lands	This study will be implemented in 2021.	No changes or modifications to methods.
CUL 1 – Cultural Resources	Field work began in the Fall of 2020; has been delayed multiple times because of the COVID-19 pandemic in addition to hazardous working conditions arising from western wildfires.	No changes or modifications to methods. There are currently slight delays to the schedule due to air quality related to the wildfires. Any portions of the surveys no conducted in 2020 will be completed in 2021.
CUL 2 – Tribal Resources	This study will be implemented in 2020 and 2021.	Due to COVID-19, the Relicensing Team has had difficulty scheduling interviews with tribes and conducting outreach to tribal councils. The California Stay-at-home order in the Spring of 2020 impacted interviews surrounding flowering season which will likely take place Spring 2021. Background research has been initiated and no changes to methods are expected.

3 ASSESSMENT OF BISHOP CREEK RIPARIAN COMMUNITY INITIAL STUDY REPORT (TERR 1)

3.1 Introduction

SCE and stakeholders identified the potential need for a Bishop Creek Riparian Community Study during the study scoping process. Stakeholders discussed data reported from the 2014 field season (Read, 2015) and anecdotal observations that black cottonwood (*P. balsamifera* ssp. *trichocarpa*) cover in riparian areas may be in decline; there was an interest in understanding potential causes and whether data collected in 2019 would show a continuation of this trend. In addition, stakeholders requested that a broader study using the "guild" approach of Lytle et al. (2017) be undertaken to address changes in the riparian community as a whole.

3.2 Review of Existing Information

Read (2015, 2020a) describes results from license-compliant riparian monitoring in 2014 and 2019 compared to previous years and the baseline, which was from 1991 to 1993, prior to implementation of the minimum instream flow program as required by the existing license. There is sufficient data from all these studies to re-analyze using the guild approach requested by stakeholders. In addition, data obtained at all three monitored stream reaches Bishop Creek in 2014 showed a decline in black cottonwood abundance compared to baseline, with the greatest decline exhibited on one monitoring site downstream of Powerhouse No. 4. This loss is contrary to expectations that riparian vegetation would respond positively to the addition of stream flow in a reach that was normally dry during the summer prior to the implementation of the required instream flow release program in 1994. Black cottonwoods were not present in monitored sites on Birch and McGee creeks in 2014 or previous years; however, possible reasons for their absence could be relevant to the decline on Bishop Creek, therefore these creeks were included in the black cottonwood study along with new data obtained from the 2019 field season.

3.3 Life History Information

Native plant species that occupy the riparian zone have a range of life histories that can be grouped into "guilds", using an approach described by Lytle et al. (2017). In many cases these life histories are well documented in the literature, making the guild approach a useful tool for analyzing data in an ecological context instead of species by species. For example, the life history of black cottonwood has been summarized by Steinberg (2001) and Sawyer et al. (2009). It is a deciduous tree that can live 200 years old or more. Reproduction is most often asexual (clonal), through root suckers and sprouts. Sexual reproduction through seed dispersal often occurs when stream or river flows begin to decline in spring. However, while seed production can be prolific, seed viability lasts only a few weeks and successful seedling establishment is episodic. Establishment depends on a coincidence of events; wherein mature seeds are produced when there will be sufficient soil moisture during the first month of growth. Seedling mortality can be high if root growth is slower than recession of the water table or stream.

No diseases causing widespread mortality are known for black cottonwood except for a disease transmitted by an invasive insect native to Southeast Asia (polyphagous shothole borer [*Euwallacea* nr. *fornicates*]). However, this insect has not been reported to occur in Inyo County and its distribution appears limited to southern California counties at this time (CalInvasives, n.d.).

3.4 STUDY OBJECTIVES

This Bishop Creek Riparian Community Study has the following objectives:

- Re-analyze the long-term monitoring dataset generated from monitoring conducted in compliance with the existing license using the guild approach of Lytle et al. (2017);
- Review and assess black cottonwood abundance and determine whether the decline observed in 2014 continued through 2019.

3.4.1 STUDY AREA

Figure 3.4-1 shows the existing monitoring sites at which data were collected from 1991 through 2019 as part of the monitoring program under the existing license and re-analyzed for the guild part of this Riparian Community Study Report. Since black cottonwoods have not been observed on Birch and McGee Creeks, only records of black cottonwoods from the sites on Bishop Creek were analyzed for that study. and the proposed study area for the proposed Assessment of Bishop Creek Riparian Community. The study area will include regulated stream reaches below Project diversions and reservoirs., consistent with the current Riparian Monitoring protocols.

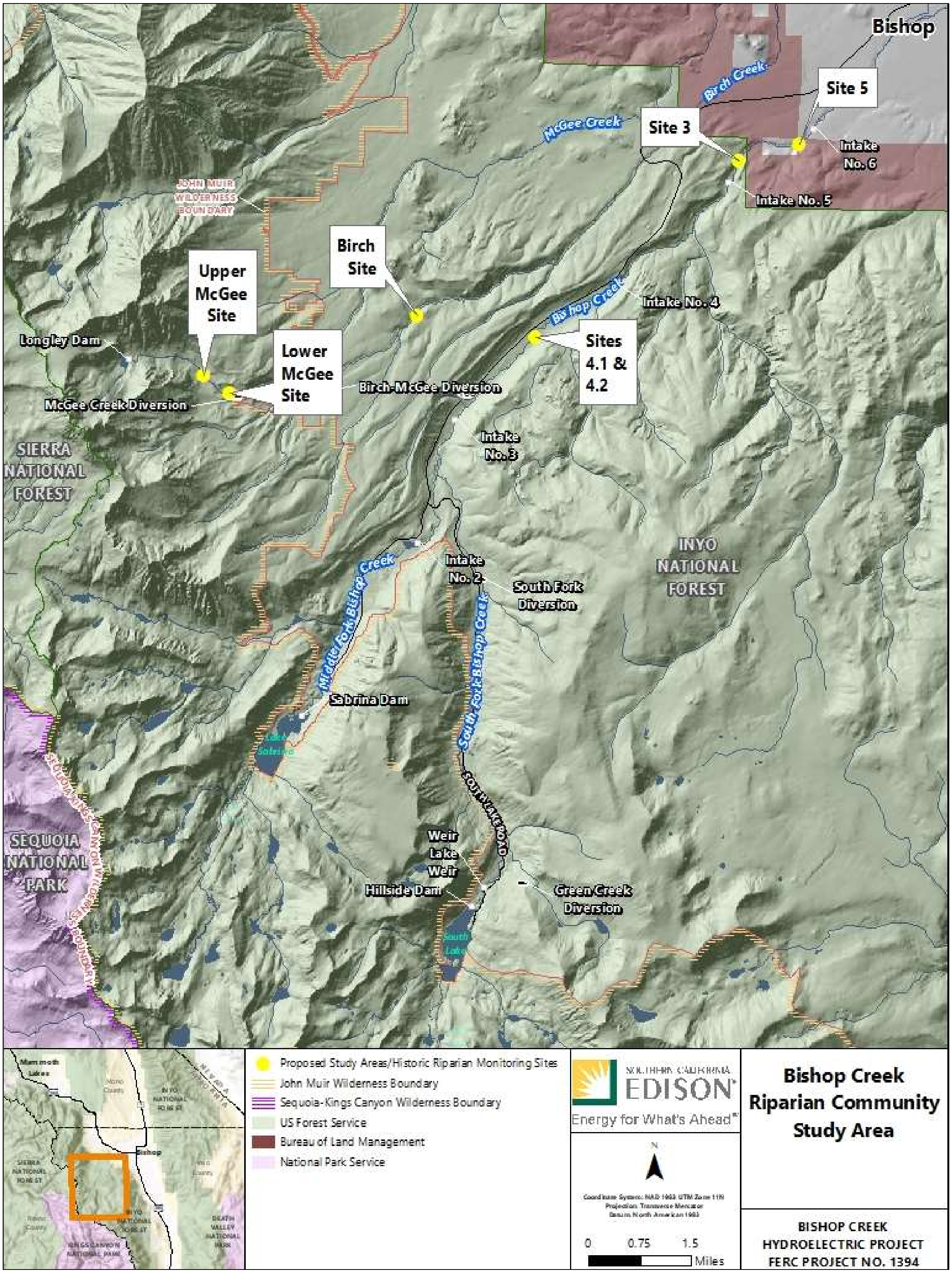

Figure 3.4-1 Riparian Community Study Area

3.5 Methods

Monitoring data collected from 1991 through 2019 in compliance with Federal Power Act (FPA) Section 4(e) conditions of the existing license, were re-analyzed using the guild approach of Lytle et al. (2017) to assess the condition of the riparian community as a whole. In this guild approach, species that share similar “vital rates” (fecundity, mortality, self-thinning) are analyzed as a group rather than as individual species. In addition to the guild study, cover by black cottonwoods in 2019 was compared to previous years to assess the extent to which the decline observed in 2014 at the Bishop Creek sites continued into 2019.

3.6 Modification to Methods

No changes to methods described in the study plan were made, other than to clarify as stated above that this study consisted of two parts: 1) analysis of existing data using the guild approach; and 2) analysis of existing black cottonwood cover data.

3.7 Results

The riparian community study, which analyzed data collected as part of monitoring requirements under the existing license, is complete at this time. Under the current license requirements, the next monitoring season would be in 2024, when trends in black cottonwood abundance can again be evaluated.

3.7.1 Guild Analysis

Results of the guild analysis were consistent with previous analyses using a species-by-species approach, insofar as perennialization of a stream reach below Powerhouse No. 4 and of Birch and McGee creeks below the diversions, increased abundance of riparian vegetation after minimum instream flows began in 1994. The analysis also confirmed that exceptionally high flows in 2019 flooded many areas occupied by mesoriparian meadow (herbaceous) vegetation, resulting in a decline in cover by this guild that had not been observed in previous years (Read, 2020).

At Site 5, where flow was ephemeral in dry to normal years, abundance of black cottonwoods increased after flow release began but declined in 2004 for unknown reasons. However, the same trend was observed at one of the perennial sites (4.1). At both of these sites, abundance trended upward in 2019.

In contrast, at the second site with perennial flow (4.2 immediately adjacent to Site 4.1 in the same stream) black cottonwood abundance has been declining and this trend continued into 2019 for unknown reasons.

3.7.2 Black Cottonwood Abundance

Abundance data for black cottonwoods were analyzed separately and the results in Table 3.7-1 were presented at a TWG meeting on May 7, 2020. The analysis included all data collected for this species from 1991 through 2019.

Table 3.7-1 Percent Cover of Black Cottonwood, 1991 through 2019

	1991[1]	1992[1]	1993[1]	1999[2]	2004[2]	2009[2]	2014[2]	2019[2]
Site 4.1	7.5	6.0	5.7	9.1	8.2	7.7	5.8	11.2
Site 4.2	12.6	11.9	13.2	15.2	12.3	10.7	7.3	2.2
Site 5	0.3			1.2	1.3	1.7	0.5	1.4

[1] Baseline before instream flows

[2] Post baseline

3.8 Discussion

The guild classifications provide more insight into changes in diversity over time, as compared to lumping taxa into simple riparian vs. upland categories. This interpretation will be elaborated on in the Technical Report and Effects Analysis which will follow completion of the study.

3.9 Consultation Summary

SCE distributed three periodic progress reports on the following schedule:

- Progress Report 1: December 19, 2019
- Progress Report 2: April 14, 2020
- Progress Report 3: July 24, 2020

Eight technical memoranda summarizing the 2019 study implementation were submitted with Progress Report 2. Following that filing, SCE hosted a TWG meeting on May 7, 2020 to discuss the 2019 study season, work completed to date, and the technical memoranda. TWG members submitted comments on the technical memoranda and SCE provided a general response to those comments as part of Progress Report 3 (Table 3.9-1).

Table 3.9-1 Updated Responses to Comments from the May 7, 2020 Technical Working Group Meeting

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response
4	Vegetation Guild Analysis Technical Memorandum (Riparian Communities)	May 21, 2020	CDFW	The Vegetation Guild Analysis Technical Memorandum identified the primary goal of the original monitoring program was to determine relationships, if any, between variations in stream flow and changes in riparian habitat attributable to the Project. CDFW is concerned that the Technical Memorandum does not identify all of the goals and objectives within the Technical Study Plan.	The guild analysis was conducted in response to a request from INF, and is largely a desktop exercise to re-evaluate existing data using the newer guild approach suggested by the INF. The analysis was not intended to replace the more detailed analysis presented in the riparian monitoring report for the 2019 field season, submitted to FERC's compliance docket separately for agency comment as required under the existing license. Section 3.4 (Study Objectives) identifies two objectives of the riparian study: 1) an analysis of existing data using the guild approach; and 2) analysis of existing data pertaining to black cottonwood.
5	Vegetation Guild Analysis Technical Memorandum (Riparian Communities)	May 21, 2020	CDFW	CDFW is concerned that the methods identified within the Technical Memorandum only assess the cover and guild assignment and do not adequately address all of the goals and objectives set by the Technical Study Plan. CDFW recommends the methodology and the analysis be modified to address all of the goals and objectives in the Technical Study Plan.	The methods in the guild analysis was provided to TWG members before and during the scoping process and was approved by FERC in its November 4, 2019 Study Plan Determination. The goals and objectives, relative to the relicensing study, are described and discussed in Section 3.4. Outcomes and findings will be further discussed in a separate technical report to be finalized in 2021. Following review of the ISR in November 2020, the TWG members will have the opportunity to discuss study plan methods and suggest adjustments as necessary. In preparation for that discussion, Section 3.5 describes the methods utilized for this Study Plan.

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response
6	Vegetation Guild Analysis Technical Memorandum (Riparian Communities)	May 21, 2020	CDFW	The Technical Memorandum should define what 'significant' means and how a decision of 'no significant difference' is made (i.e. black cottonwood cover declined but as of 2019 cover was not significantly different from 2014 and appears to have stabilized).	Black cottonwood cover data is described above in Section 3.7.2 in terms of trends rather than significance.
7	Vegetation Guild Analysis Technical Memorandum (Riparian Communities)	May 21, 2020	CDFW	The Technical Memorandum concludes: In general, monitoring results have indicated that the minimum flow releases have been associated with significant growth of riparian vegetation in stream reaches that were historically dry in summer. CDFW recognizes there has been a significant growth of riparian vegetation in stream reaches that were historically dry in the summer, however, this conclusion does not address the goals and objectives of the Technical Study Plan.	This comment refers to the conclusions drawn from the guild analysis, which was just one of two analyses conducted for riparian communities. Section 3.4 further clarifies the objectives utilized for this study.
8	Vegetation Guild Analysis Technical Memorandum (Riparian Communities)	May 21, 2020	CDFW	The Technical Memorandum categorizes the vegetation sampled during the field data collection into guilds as described in Lytle et al (2017). CDFW is concerned that the "lumping" of species into guilds blurs the results, analysis, and the intent of the Technical Study Plan's goals and objectives.	See Response to Comment #4 above
9	Vegetation Guild Analysis Technical	May 21, 2020	CDFW	The current methodology seems to ignore the second goal/objective entirely by continuing to use guilds. Additionally, it is difficult to determine	See Response to Comment #4 above. Section 3.7.2 (Black Cottonwood Abundance) of this ISR discusses results of the cottonwood analysis.

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response
	Memorandum (Riparian Communities)			the species composition of the riparian community and to look for trends in species abundance with the current methodology.	Outcomes and findings will be further discussed in a separate technical report to be finalized in 2021.
10	Vegetation Guild Analysis Technical Memorandum (Riparian Communities)	May 21, 2020	CDFW	It is unclear and should be considered whether the upstream barriers may be negatively impacting the downstream black cottonwood populations by altering flow regimes or if sediment capture and removal behind these barriers may be impacting these black cottonwood populations.	Section 3.7.2 (Black Cottonwood Abundance) of the ISR discusses results of the analysis of the cottonwood data. Two of the three study sites are adjacent to one another in the same stream reach without a barrier between them, yet they showed opposite trends in abundance of black cottonwood. SCE previously indicated that “a discussion of the potential impacts of barriers to downstream black cottonwood communities” would be included in the ISR; however to keep the process on a consistent basis with other studies, it is proposed to analyze the data and provide conclusions and recommendations in the Final Technical Reports anticipated to be completed in 2021 and subsequent Effects Analysis.
11	Vegetation Guild Analysis Technical Memorandum (Riparian Communities)	May 21, 2020	CDFW	1. CDFW recommends the following: 2. Document the changes between historic and current flow regimes. 3. Compare species distribution, composition, age classes, and growth rates of the dominant woody species. 4. Document the age structure of black cottonwood along Bishop Creek and compare with historic flow regimes or with nearby control sites. 5. Utilize data to develop and implement management actions to support the continued existence of black cottonwood in	SCE previously indicated these recommendations would be adopted for the ISR however, to keep process and content with the FERC regulations and with other studies, these analyses will be topics of discussion following the completion of the ISR and after completion multiple studies, including the Operations Model, are available. SCE intends to issue technical reports following the conclusion of each study, in which the analysis and findings will be discussed. A separate effects analysis will be developed for all resource areas facilitate development of appropriate protection, mitigation, and enhancement measures.

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response
				Bishop Creek. Management actions could include, but are not limited to, downstream sediment deposition and/or altering flow regime based on natural conditions.	
12	Vegetation Guild Analysis Technical Memorandum (Riparian Communities)	May 21, 2020	CDFW	The technical study report should either list the specific desired conditions in the Technical Reports or list the Land Management Plan for the Inyo National Forest (INF) (USDA, 2018) in the reference section (hyperlink could be useful) with the appropriate Chapter, section, sub-section, and page numbers.	SCE agrees that this will be appropriate and useful information when we are conducting the impact analysis, relative to our goals and objectives. The impact analysis will occur after the studies have been completed and data has been reviewed and discussed with the TWG. This information will be documented in the Final Technical Reports in 2021.
40	Vegetation Guild Analysis Technical Memorandum (Riparian Communities)	May 12, 2020	INF	When the term “historically dry” is used to describe certain stream reaches, does this mean dry since Project construction? Or dry even since prior to Project construction?	The term refers to stream reaches that did not have perennial flow prior to minimum instream flow releases that began in 1994 per requirements of the existing license.
41	Vegetation Guild Analysis Technical Memorandum (Riparian Communities)	May 12, 2020	INF	Include a more detailed investigation/discussion of black cottonwood condition and trend.	Section 3.7.2 (Black Cottonwood Abundance) of the ISR provides results and discussion of these data, however more detailed analysis will be provided in the forthcoming Technical Reports following completion of the ISR.

3.10 REFERENCES

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4 INVASIVE PLANTS INITIAL STUDY REPORT (TERR 2)

4.1 INTRODUCTION

SCE and stakeholders identified the need for an Assessment of Invasive Plants to determine the type and distribution of invasive plants observed at the Project site, as well as assess the potential for other invasive species, and to determine control and management protocols. This Study Plan details the study objectives, study area, methods, results, and a discussion for this assessment.

Invasive plant species have been observed near Powerhouse No. 4, along stream reaches, and along access roads in the study area. An assessment of invasive plants in the Project area is important to plan for appropriate long-term operations and maintenance (O&M) best practices under a new license.

4.2 REVIEW OF EXISTING INFORMATION

The Land Management Plan for the Inyo National Forest (INF) (USDA, 2018) lists 58 invasive plant species with eradication, treatment, and control options identified for each species depending on life history and degree of threat to native ecosystems. These species range from annuals (growth and reproduction in one year) to perennials (growth and reproduction over many years) and include a wide range of growth forms, from grasses to forbs, shrubs, and trees.

Data collected as part of license-compliant monitoring (Read 2015, 2020) confirms that one invasive tree species, black locust (*Robinia pseudoacacia*), appeared for the first time at monitoring sites located between Powerhouse No. 4 and 5 after the minimum instream flow program under the existing license was implemented in 1994. The trees are also present downstream of Powerhouse No. 5 and the landscaped areas around Powerhouse No. 4; therefore, it is unclear where the new plants at the monitoring sites originated. Given the species' popularity in landscaping, the INF indicated that containment would be a more realistic goal compared to complete eradication. The INF proposes containment for cheatgrass (*Bromus tectorum*), an invasive grass, that expanded in the Birch and McGee creek watersheds after the Forks fire of 2009, and prickly Russian thistle (*Salsola tragus*).

4.3 STUDY OBJECTIVES

This assessment classifies and maps existing populations of invasive plants in the Project area. This information will be incorporated into a plan for control/containment to ensure that future Project facilities and operations are consistent with the Desired Conditions, Goals, and Standards described in the Land Management Plan for the INF (USDA, 2018) as they relate to ecological sustainability and biodiversity.

4.3.1 STUDY AREA

The study area consisted of the Project facilities including powerhouses, dams, diversions, valve houses and access roads that include 500-foot survey area around each facility; this buffer encompasses recreation facilities in the Project area (Recreation Use and Needs Study). A dense population of the invasive black locust was observed immediately downstream of Powerhouse No. 4; other invasive plant species may be present in that reach. Therefore, the survey area was expanded beyond 500 feet from Powerhouse No. 4 to document these populations (Figure 4.3-1).

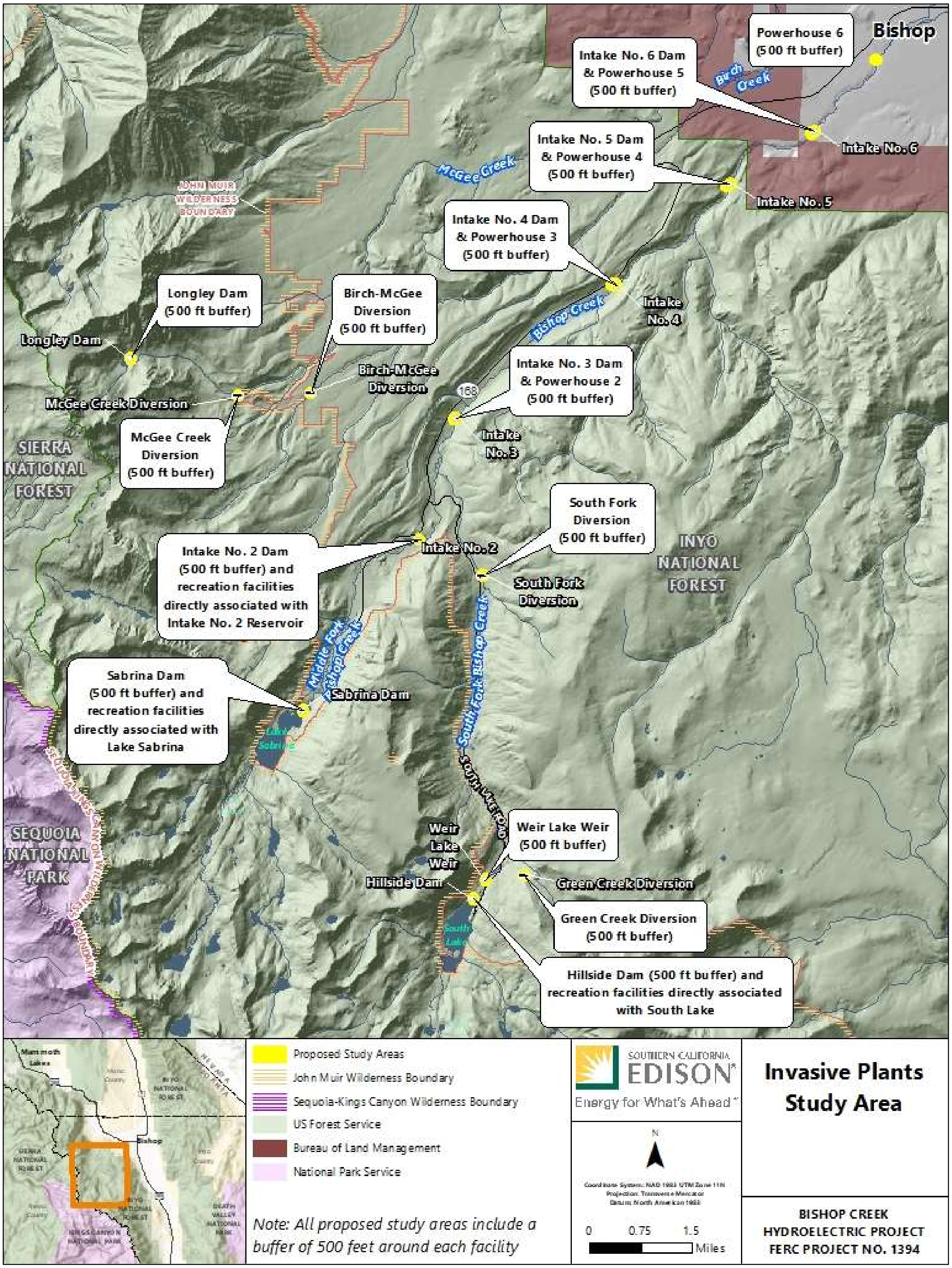

Figure 4.3-1 Study Areas for Invasive Plants Assessment

4.4 METHODS

The study focused on invasive species of concern to the INF and species ranked by the California Invasive Plant Council (Cal-IPC) that have a high or moderate threat to native ecosystems. Some of these species have not been reported to occur in the Project region but would be placed on a watch list for surveys during the term of the new license. The watch lists will be used to develop protocols for SCE control and management, including review of future landscape plans for power facilities if they are proposed within the terms of the new license. Field surveys were conducted in June and August 2019 and August 2020. Surveys were conducted by walking transects to ensure 100 percent visual coverage of the survey area. Inaccessible areas (i.e., private property or steep topography) were surveyed remotely via binoculars and were not directly accessed. Plant species were identified in the field or collected for later identification. Plants were identified using taxonomic keys, descriptions, and illustrations in Jepson Flora Project (2019), Baldwin et al. (2012), and Munz (1974). Nomenclature of plant taxa conform to the Jepson eFlora (Jepson Flora Project, 2019).

4.5 MODIFICATIONS TO METHODS

Two modifications were made to the Study Plan: 1) the area around Longley Lake was not surveyed due to its remote location in a wilderness area away from roads and public/SCE facilities, making occurrence of invasive plants highly unlikely; and 2) at the request of the INF, a survey for black locust was conducted upstream of Powerhouse No. 4. This survey was limited to the reach between Powerhouse No. 4 and 3. If black locust was detected, the plan was to continue the survey upstream of Powerhouse No. 3.

4.6 RESULTS

4.6.1 SURVEYS OF FACILITIES AND RECREATION AREAS

A total of 16 invasive plant species were observed in 2019 (Table 4.6-1). Appendix TERR--2 provides a copy of the technical memorandum (Psomas, 2020) that includes details of population sizes and locations of observation around the SCE facilities and stream reaches that were monitored in 2019 in compliance with conditions of the existing Project license. An update to this list based on surveys of the recreation areas in 2020 is in preparation and will be included in the Final Technical Report in 2021.

Table 4.6-1 Cal-IPC Invasive Plant Species Observed in Project Study Area

Scientific Name	Common Name	Cal-IPC Rating
Bromus diandrus	ripgut grass	Moderate
Bromus rubens	red brome	High
*Bromus tectorum**	cheat grass	High
Cirsium vulgar	bull thistle	Moderate
Cynodon dactylon	Bermuda grass	Moderate
Dactylis glomerata	orchard grass	Limited
Descurainia sophia	tansy mustard	Limited
Erodium cicutarium	redstem filaree	Limited
Festuca arundinacea	tall fescue	Moderate
Holcus lanatus	common velvet grass	Moderate
Plantago lanceolata	English plantain	Limited
Robinia pseudoacacia	black locust	Limited
Rubus armeniacus	Himalayan blackberry	High
Rumex crispus	curly dock	Limited
Salsola tragus	Russian thistle	Limited
Verbascum thapsus	woolly mullein	Limited

Source Psomas, 2020

4.6.2 Surveys for Black Locust

The survey of August 2020 targeted black locust between Powerhouse No. 4 and 3 did not detect any plants in the riparian zone along the stream. As part of this reach was not accessible on foot, drone video taken as part of the aquatic habitat component of the technical studies was reviewed. No black locust plants were detected in this reach.

4.7 Discussion

During surveys of the recreational facilities for black locust, several plants with characteristics of black locust were observed in the Four Jeffrey campground. How the plants arrived at this relatively isolated location, disjunct from the infested reach downstream of Powerhouse No. 4, is not known.

Sufficient information is now available from the 2019 and 2020 surveys to develop a plan for management of invasive species under the new license. This information is being analyzed and will be incorporated into the Final Technical Report and discussed with TWG members in 2021.

4.8 CONSULTATION SUMMARY

SCE distributed three periodic progress reports on the following schedule:

- Progress Report 1: December 19, 2019
- Progress Report 2: April 14, 2020
- Progress Report 3: July 24, 2020

Eight technical memoranda summarizing the 2019 study implementation were submitted with Progress Report 2. Following that filing, SCE hosted a TWG meeting on May 7, 2020 to discuss the 2019 study season, work completed to date, and the technical memoranda. After the meeting, TWG members submitted comments on the technical memoranda and SCE provided a general response to those comments as part of Progress Report 3 (Table 4.8-1).

Table 4.8-1 Updated Responses to Comments from the May 7, 2020 Technical Working Group Meeting

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response
13	Invasive Plants Study Plan Technical Memorandum (TERR 2)	May 21, 2020	CDFW	There was no assessment of this goal/objective: Assess the extent to which the Project may contribute to the spread of invasive plants which could adversely impact native ecosystems in the study area. CDFW recommends the technical memorandum provide an assessment of Project related contributions to the spread of invasive plants.	The technical memorandums were provided as a supplement to the progress reports and are interim work-products intended to summarize work to date and help the team prepare for additional field work. These status memorandums were not intended to be full "Study Reports". In general, it is too early to include an analysis of Project operations impacts, conclusions and analysis will be included in the Final Technical Reports expected in 2021.
14	Invasive Plants Study Plan Technical Memorandum (TERR 2)	May 21, 2020	CDFW	This goal/objective was not addressed: Ensure that future Project facilities and operations are consistent with the Desired Conditions, Goals, and Standards described in the Land Management Plan for the INF (USDA, 2018) as related to ecological sustainability and biodiversity. The technical memorandum should either list the specific desired conditions in the Technical Reports or list the Land Management Plan for the INF (USDA, 2018) in the reference section (hyperlink could be useful) with the appropriate chapter, section, subsection, and page numbers.	SCE agrees that this would be appropriate and useful information when we are conducting the impact analysis, relative to our goals and objectives. This analysis would typically occur after the ISR and associated meeting and will be included in the Final Technical Reports expected in 2021.
42	Invasive Plant and RTE Plant Plans	May 12, 2020	INF	Study area in both plans includes recreation sites-when will these be surveyed?	Surveys were completed in August 2020.
43	Invasive Plant and RTE Plant Plans	May 12, 2020	INF	Invasive Study Area: Surveys are needed upstream from Powerhouse No. 4 for black locust for effective plan management and control measures.	Surveys were completed at Powerhouse 4 in August 2020. No Robinia plants were detected.
44	Invasive Plant and RTE Plant Plans	May 12, 2020	INF	*Lepidium appelianum* (hairy whitetop) is listed by Cal-IPC as Limited.	Perhaps it was listed at one time. The current Cal-IPC inventory does not list the species.

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response
45	Invasive Plant and RTE Plant Plans	May 12, 2020	INF	Follow up with surveyors to verify that whitebark pine was targeted during Project surveys Endangered Species Act (ESA) candidate with proposed ruling expected Fall 2020).	This species was not specifically targeted, but all species observed during the surveys were recorded and listed in an appendix to the technical memorandum. Whitebark pine was not observed in the 2019 or 2020 surveys.
46	Invasive Plant and RTE Plant Plans	May 12, 2020	INF	Submit copies of geographic information system (GIS) data for invasive and special status species to INF Botanist, as well as photos of species, populations, sites.	SCE will provide these data as requested.

4.9 REFERENCES

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APPENDIX TERR-2

INVASIVE PLANT MEMORANDUM

5 ASSESSMENT OF SPECIAL STATUS PLANTS INITIAL STUDY REPORT (TERR 3)

5.1 INTRODUCTION

During TWG meetings, SCE and stakeholders identified the need for an Assessment of Sensitive or Special Status Plants. This assessment would identify sensitive plant species with potential for occurring within the Project boundary and reports results of field surveys conducted in 2019 and 2020.

5.2 REVIEW OF EXISTING INFORMATION

A review of the existing literature was conducted to determine the potential for special status plant species to occur in the Project region, defined as the following U.S. Geological Survey (USGS) 7.5-minute topographic quadrangles: Coyote Flat, North Palisade, Tungsten Hills, Mount Darwin, Mount Tom, Bishop, and Mount Goddard. To obtain information on known special status plant species reported to occur in the Project region, the California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB) (CDFW, 2018) and the California Native Plant Society (CNPS) Inventory of Rare, Threatened and Endangered Plants (RTE) (CNPS, 2018) were queried for occurrences of special status plant species in the above-mentioned quadrangles. In addition, this review included previous biological reports prepared for individual projects within the Special Status Plants Survey Area (Psomas 2004a, 2004b, 2005, 2006a, 2006b, 2007a, 2007b, 2008a, 2008b, 2010, and 2014) and the environmental analysis for the Project (FERC, 1991). The resulting list of plants with potential to occur is provided in Section 5.7 (Results).

5.3 STUDY OBJECTIVES

The objective of this assessment is to classify and map the existing distribution of special status plants (including aquatic plants) in the Project area and Project-affected reaches. This information will be used to develop a plan under the new license to ensure that future Project facilities and operations are consistent with the Desired Conditions, Goals and Standards described for plant species in the Land Management Plan for the INF (USDA, 2018).

5.3.1 STUDY AREA

The study area (Figure 5.4-1) consists of the Project facilities including powerhouses, dams, diversions, valve houses and access roads including a 500-foot survey area buffer around each facility and encompasses recreation facilities directly associated with the Project.

5.4 METHODS

Field surveys of facilities were conducted in June and August 2019 with recreational area surveys conducted in June 2020. A list was prepared of all plants observed during the surveys. Plants were identified in the field to species or the lowest taxonomic category possible with formal identification completed in the office.

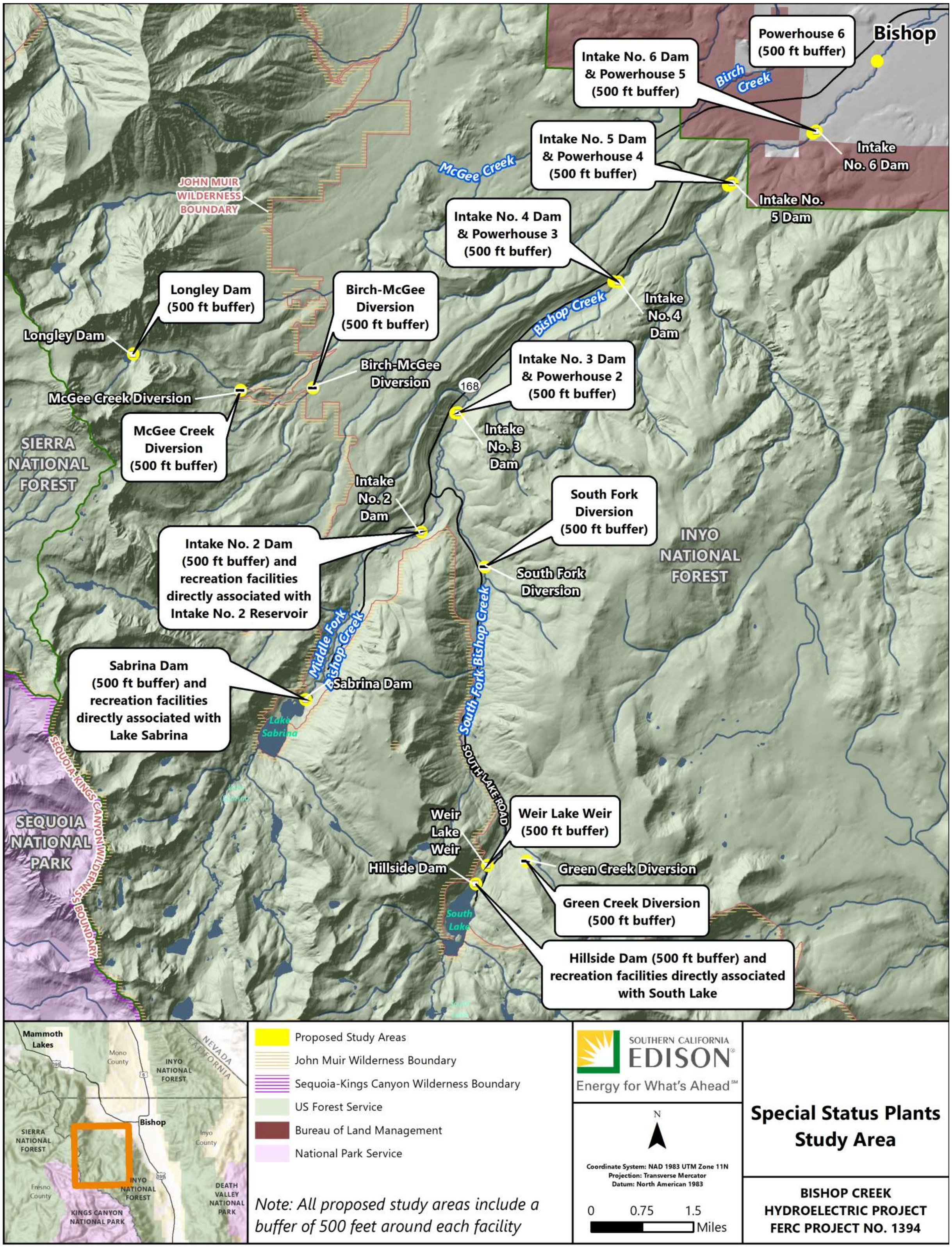

Figure 5.4-1 Assessment of Special Status Plants Study Areas

5.5 Modifications to Methods

There were no changes in methods from the Study Plan.

5.6 Results

Table 5.6-1 lists the species that were reviewed and determined to have potential for occurrence and summarizes the results from the 2019 and 2020 field surveys. Species observed during the surveys are provided in the Habitat Suitability/Survey Results column of Table 5.6-1 .

Table 5.6-1 Survey Results for Special Status Plants with Potential to Occur in the Project Vicinity

Scientific/ Common Name	Federal Status	State Status and CRPR[1] Rank	Estimated Detectability Period	Habitat	Habitat Suitability/Survey Results
Antennaria pulchella beautiful pussy-toes	–	CRPR 4.3	June–September	Alpine boulder and rock field (stream margins) and meadows and seeps from 9,186 ft. to 12,139 ft.	Recorded 1.6 miles south of South Lake (Hillside) Dam. Not observed in 2019 and 2020 surveys. While an Antennaria species was observed, it was identified as a common species.
Boechera dispar pinyon rock cress	–	CRPR 2B.3	March–June	Granitic, gravelly slopes and mesas in Joshua tree woodland, pinyon and juniper woodland, and Mojavean desert scrub from 3,297 ft. and 9,202 ft.	Recorded outside of the Project watershed, 1.5 miles southeast of Powerhouse No. 4, east of Coyote Creek. Not observed during 2019 and 2020 surveys. While Boechera species were observed, they were identified as common species.
Boechera tularensis Tulare rockcress	USFS_S	CRPR 1B.3	June–July	Rocky slopes in subalpine coniferous forest, upper montane coniferous forest from 5,987ft. to 11,007 ft.	Recorded 3.3 miles to the west of the Project watershed's western boundary, 6 miles west of Lake Sabrina. Not observed during 2019 and 2020 surveys. While Boechera species were observed, they were identified as common species.
Botrychium crenulatum scalloped moonwort	USFS_S	CRPR 2B.2	June–September	Moist meadows and seeps, upper montane coniferous forest, lower montane coniferous forest, marshes, and swamps from 3,887 ft. to 10,203 ft.	Recorded within the Project watershed boundary, 4.3 miles east of South Fork Bishop Creek and 4.8 miles southeast of Bishop Creek South Fork Diversion Dam, along the East Fork Coyote Creek. Not observed during 2019 and 2020 survey effort.
Bruchia bolanderi Bolander's bruchia	USFS_S	CRPR 4.2	N.A.	Moss which grows on damp clay soils in lower montane coniferous forest, meadows and seeps, and upper montane coniferous forest; ephemeral nature and disturbance adapted; from 5,282 ft. to 10,958 ft.	Recorded 2 miles south of the Project watershed's southern boundary, 5.5 miles south of South Lake. Not observed during 2019 and 2020 surveys.

Scientific/ Common Name	Federal Status	State Status and CRPR[1] Rank	Estimated Detectability Period	Habitat	Habitat Suitability/Survey Results
Calochortus excavatus Inyo County star-tulip	BLMS, USFS_S	CRPR 1B.1	April–July	Mostly on fine, sandy loam soils with alkaline salts; grassy meadows and seeps in shadscale scrub from 393 ft. to 7,201 ft.	Recorded outside the Project's northeastern watershed boundary, 2.9 miles northeast of Powerhouse No. 6 off Highway 168 in Bishop. Not observed in during 2019 and 2020 surveys.
Carex congdonii Congdon's sedge	–	CRPR 4.3	July–August	Alpine boulder and rock field and subalpine coniferous forest (rocky) from 8,530 ft. to 12,795 ft.	Reported 2.8 miles west of Longley Lake. Not observed during 2019 and 2020 surveys. While Carex species were observed, they were identified as common species.
Carex scirpoidea ssp. pseudoscirpoidea western single-spiked sedge	–	CRPR 2B.2	July–September	Often on limestone in alpine boulder and rock field, meadows and seeps, and subalpine coniferous forest from 6,988 ft. to 12,007 ft.	Recorded within the Project watershed boundary, 4 miles east of Bishop Creek South Fork Diversion Dam, along West Fork Coyote Creek. Not observed during 2019 and 2020 surveys. Carex species were observed; identified as common species.
Cryptantha glomeriflora clustered-flower cryptantha	–	CRPR 4.3	June–September	Great Basin scrub, meadows and seeps, subalpine coniferous forest, and upper montane coniferous forest from 5,906 ft. to 12,303 ft.	Reported along Highway 168 in 1941, 0.6 miles north of Lake Sabrina. Not observed during 2019 and 2020 surveys. Cryptantha species were observed; identified as common species.
Draba praealta tall draba	–	CRPR 2B.3	July–August	Meadows, seeps, and wetlands from 9,596 ft. to 11,302 ft.	Suitable mesic habitat for this species is present. Species reported from along Lake Sabrina, south of Lake Sabrina Dam. Not observed in 2019 or 2020 surveys.
Eriastrum sparsiflorum few-flowered eriastrum	–	CRPR 4.3	May-September	Chaparral, cismontane woodland, Great Basin scrub, Joshua tree woodland, Mojavean desert scrub, and pinyon and juniper woodland from 3,527 ft. to 5,610 ft.	Suitable habitat for this species at lower elevation recreation areas. Observed in 2019 at multiple locations downstream of the Bishop Creek South Fork Diversion Dam. Species also reported adjacent to Highway 168, 0.6 miles northwest of Powerhouse 3 and Intake 4. Not observed in 2020 surveys of the recreational areas.

Scientific/ Common Name	Federal Status	State Status and CRPR[1] Rank	Estimated Detectability Period	Habitat	Habitat Suitability/Survey Results
Helodium blandowii Blandow's bog moss	USFS_S	CRPR 2B.3	N.A.	Moss growing on damp soil, especially under willows among leaf litter in meadows, seeps, and subalpine coniferous forest from 6,108 ft. to 8,858 ft.	Recorded 1.3 miles south of the Project watershed southern boundary, 3.6 miles south of South Lake and 4.8 miles south of South Lake Dam, along Middle Fork Kings River. Not observed during 2019 and 2020 surveys.
Lomatium rigidum stiff lomatium	–	CRPR 4.3	April-May	Great Basin scrub and pinyon and juniper woodland from 3,937 ft. to 7,218 ft.	Suitable habitat for this species at lower elevation recreation areas but species was not observed in the 2020 surveys. Species was observed in 2019 at multiple locations within the Project vicinity.
Lupinus padre-crowleyi Father Crowley's lupine	–	SR; CRPR 1B.2	June–August	Great Basin scrub, riparian forest, riparian scrub, and upper montane coniferous forest from 7,218 ft. to 13,123 ft.	Reported 2.6 miles from the Project vicinity. Not observed during 2019 and 2020 surveys. While Lupinus species were observed, they were identified as common species.
Mentzelia inyoensis Inyo blazing star	BLMS, USFS_S	CRPR 1B.3	April–October	Great Basin scrub, pinyon- juniper woodland from 3,789 ft. to 6,496 ft.	Reported from along Bishop Creek, 0.4 miles north of Bishop Creek South Fork Diversion Dam. Suitable habitat is present at lower elevation recreation areas, but species was not observed during the 2020 surveys. While a Mentzelia species was observed, it was identified as a common species.
Muilla coronata crowned muilla	–	CRPR 4.2	Mar–April	Chenopod scrub, Joshua tree woodland, Mojavean desert scrub, and pinyon and juniper woodland from 2,198 ft. to 6,430 ft.	Suitable habitat is present. Reported at two locations within the Project vicinity, with one located 0.6 miles east of Powerhouse 6 and the other located 0.8 miles northeast of Powerhouse 5 and Intake 6. Not observed during 2019 and 2020 surveys.
Myurella julacea small mousetail moss		CRPR 2B.3	N.A.	Alpine boulder and rock field, subalpine coniferous forest, growing on damp limestone rock and soil; crevices, under hangs, shelves, in	Suitable habitat for this species is present. Reported from along Middle Fork Bishop Creek 0.6 miles northeast of Lake Sabrina Dam. Not observed in Survey Area during 2019 and 2020 surveys.

Scientific/ Common Name	Federal Status	State Status and CRPR[1] Rank	Estimated Detectability Period	Habitat	Habitat Suitability/Survey Results
				filtered light; sometimes on granite, from 8,858 ft. to 9,842 ft.	
Packera indecora rayless mountain ragwort	–	CRPR 2B.2	July–August	Mesic meadows and seeps from 5,593 ft. to 10,006 ft.	Recorded 3.7 miles west of the Project watershed's western boundary, 6.3 miles west of Lake Sabrina. Not observed during 2019 and 2020 surveys.
Parnassia parviflora small-flowered grass-of-Parnassus	–	CRPR 2B.2	August–September	Wet areas, meadows, and rocky seeps from 6,594 ft. to 9,104 ft.	Suitable habitat for this species is present in mesic areas. Observed in 2019 at the Birch Creek Diversion. Last recorded in 1937 in Buttermilk Country, outside the Project watershed's northern boundary, 1.9 miles north of Birch-McGee Diversion. Not observed in during the 2020 surveys of recreation areas.
Penstemon papillatus Inyo beardtongue	–	CRPR 4.3	June–July	Pinyon and juniper woodland and subalpine coniferous forest from 6,562 ft. to 9,843 ft.	Reported at multiple locations within the Project vicinity, with the closest one 570 feet south of the Survey Area at Lake Sabrina. Not observed during 2019 survey effort around the facilities but was observed in 2019 at the riparian monitoring site located downstream of the McGee Creek Diversion Dam. Not observed in the recreation areas in 2020. While Penstemon species were observed, they were identified as common species.
Phacelia inyoensis Inyo phacelia	USFS_S	CRPR 1B.2	April–August	Meadows and seeps (alkaline) from 3,002 ft. to 10,499 ft.	Reported 1.4 miles west of Powerhouse 4 and Intake 5. Not observed during 2019 and 2020 surveys. While Phacelia species were observed, they were identified as common species.
Pinus albicaulis Whitebark pine	Candidate; SCC		July–August	Tree found in Subalpine forest from 10,000 ft. to 12,100 ft.	Reported 1.2 miles northwest and 1.3 miles southeast of Lake Sabrina, and 1.8 miles southeast of South Lake (Hillside) Dam. Not

Scientific/ Common Name	Federal Status	State Status and CRPR[1] Rank	Estimated Detectability Period	Habitat	Habitat Suitability/Survey Results
					observed in Survey Area during 2019 and 2020 surveys.
Plagiobothrys parishii Parish's popcornflower	USFS_S	CRPR 1B.1	March–June	Alkaline soils; mesic sites in Great Basin scrub and Joshua tree woodland from 8,071 ft to 15,069 ft.	Recorded outside the Project watershed's northern boundary, located in a meadow along Highway 395 approximately 1.5 miles east of Bishop in 1913; more recent records are along the Owens River. Not observed during 2019 and 2020 surveys.
Potamogeton robbinsii Robbins' pondweed	–	CRPR 2B.3	July–August	Deep water, lakes, marshes, and swamps from 5,003 ft. to 11,466 ft.	Recorded 1.7 miles southeast of the Project watershed's eastern boundary, 4.6 miles southeast of South Lake Dam, along Fourth Lake. Not observed during 2019 and 2020 surveys.
Ranunculus hydrocharoides frog's-bit buttercup	–	CRPR 2B.1	June–September	In or bordering shallow springs or freshwater marshes and seeps from 4,133 ft. to 7,611 ft.	Suitable mesic habitat for this species is present. Observed in 2019 at one location within the Project vicinity. Species also recorded outside the Project watershed's northern boundary, 3.5 miles from Powerhouse No. 6, located in a channel within the town of Bishop. Not observed during 2020 surveys of the recreation areas.
Sabulina stricta bog sandwort	–	CRPR 2B.3	July–September	Moist, granitic gravelly sites in sedge meadows, seeps, alpine boulder and rock field, and alpine dwarf scrub from 8,000 ft. to 12,992 ft.	Last recorded in 1977 along Coyote Ridge within the Project watershed, 1.5 miles east of Green Creek Diversion Dam. Not observed during 2019 and 2020 surveys.
Sidalcea covillei Owens Valley checkerbloom	–	SE; CRPR 1B.1	April–June	Chenopod scrub and meadows and seeps from 3,593 ft. to 4,642 ft.	Reported 2 miles northwest of Powerhouse No. 6. Not observed during 2019 and 2020 surveys. While a Sidalcea species was observed, it was identified as a common species.

Scientific/ Common Name	Federal Status	State Status and CRPR[1] Rank	Estimated Detectability Period	Habitat	Habitat Suitability/Survey Results
Solorina spongiosa fringed chocolate chip lichen	–	CRPR 2B.2	N.A.	Meadows and seeps, including seeps within subalpine coniferous forest, on moss mats in areas with calcareous seepage. Generally, in high altitude sites with north or east exposure, from 9,498 ft.	Suitable mesic habitat for this species is present. Reported from 0.5 mile north of South Lake Dam, along South Lake Road within South Fork Bishop Creek Drainage but was not observed during the 2019 and 2020 surveys.
Tonestus peirsonii Peirson's tonestus	–	CRPR 4.3	July–August	Alpine boulder and rock field and subalpine coniferous forest (rocky) from 9,514 ft. to 12,139 ft.	Reported 2 miles west of Lake Sabrina. Not observed during 2019 and 2020 surveys.
Trichophorum pumilum little bulrush	–	CRPR 2B.2	August	Limestone soils within bogs and fens, marshes and swamps, and riparian scrub from 9,448 ft. to 10,662 ft.	Suitable mesic habitat for this species is present. Reported from 0.5 mile north of South Lake Dam, along South Lake Road within South Fork Bishop Creek Drainage. Not observed during 2019 and 2020 surveys.
Triglochin palustris marsh arrow-grass	–	CRPR 2B.3	July–August	Meadows and seeps, freshwater marsh, subalpine coniferous forest from 6,988 ft. to 11,597 ft.	Suitable mesic habitat for this species is present Observed in 2019 at one location within the Project vicinity. Recorded 0.8 miles southwest of Bishop Creek Intake No. 2, 0.15 miles east of Highway 168.
Viola pinetorum ssp. grisea grey-leaved violet	–	CRPR 1B.2	April–July	Dry mountain peaks and slopes in subalpine coniferous forest, upper montane coniferous forest, meadows, and seeps from 5,183 ft. to 12,139 ft.	Recorded 1.3 miles southeast of the Project watershed's eastern boundary, 4.3 miles southeast of South Lake Dam, along Fifth Lake. Not observed during 2019 and 2020 surveys.

LEGEND:
FT = Federal Threatened
SE = State Endangered USFS_ S U.S. Forest Service Sensitive
SR = State Rare
BLMS Bureau of Land Management Sensitive
CRPR California Rare Plant Rank
1B Plants Rare, Threatened, or Endangered in California and elsewhere
2B Plants Rare, Threatened, or Endangered in California but more common elsewhere

Plants about which we need more information – A Review List
Plants of limited distribution – A Watch List

CRPR Threat Code Extensions
Seriously threatened in California (over 80% of occurrences threatened; high degree and immediacy of threat)
Fairly threatened in California (20–80% of occurrences threatened; moderate degree and immediacy of threat)
Not very threatened in California (<20% of occurrences threatened; low degree and immediacy of threat or no current threats known)

5.7 DISCUSSION

As indicated in Table 5.6-1 a total of six special status plant species were observed during the surveys. None of the species are forest sensitive or federal/state listed as RTE but have a special status rank with the CNPS. However, status may change during the term of the new license, and habitat conditions may change in the future such that species not observed during the 2019 and 2020 surveys may occur.

5.8 CONSULTATION SUMMARY

SCE distributed three periodic progress reports on the following schedule:

- Progress Report 1: December 19, 2019
- Progress Report 2: April 14, 2020
- Progress Report 3: July 24, 2020

Eight technical memoranda summarizing the 2019 study implementation were submitted with Progress Report 2. Following that filing, SCE hosted a TWG meeting on May 7, 2020 to discuss the 2019 study season, work completed to date and the technical memoranda. After the meeting, TWG members submitted comments on the technical memoranda and SCE provided a general response to those comments as part of Progress Report 3 (Table 5.8-1).

Table 5.8-1 Updated Responses to Comments from the May 7, 2020 TWG Meeting

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response
15	Bishop Creek RTE Plant Survey	May 21, 2020	CDFW	There was no assessment of this goal/objective: Assess the extent to which the Project may affect rare, threatened, endangered or other special status species. CDFW recommends the technical memorandum address the extent of Project related impacts to rare, threatened, endangered or other special status plant species.	SCE agrees that this will be appropriate and useful information when conducting the impact analysis, relative to goals and objectives. This analysis will be included in the Final Technical Report on special status plants, currently scheduled to be filed in summer 2021.
16	Bishop Creek RTE Plant Survey	May 21, 2020	CDFW	This goal/objective was not addressed: Ensure that future Project facilities and operations are consistent with the Desired Conditions, Goals and Standards described for animal and plant species in the Land Management Plan for the INF (USDA, 2018). Should either list the specific desired conditions in the technical reports or list the Land Management Plan for the INF (USDA, 2018) in the reference section (hyperlink could be useful) with the appropriate Chapter, section, sub-section, and page numbers.	SCE agrees that this will be appropriate and useful information when we are conducting the impact analysis, relative to our goals and objectives. This analysis will be included in the Final Technical Report on special status plans, currently scheduled to be filed in summer 2021.

5.9 REFERENCES

California Native Plant Society (CNPS). 2018. "CNPS Inventory of Rare Plants." https://www.cnps.org/rare-plants/cnps-inventory-of-rare-plants. Accessed March 21, 2019.

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Psomas. 2008b. Project Description: Long Term Streambed Alteration Agreement for SCE eastern Sierra Hydro Projects.

Psomas. 2007a. Determination of No Effect on Listed Species for the Bishop Creek Intake 2 AVM and Pipe Installation Project Southern California Edison Company's Bishop Hydroelectric Power Project, Inyo County, CA.

Psomas. 2007b. Determination of No Effect on Listed Species for the Bishop Creek Intake 4 Project Southern California Edison Company's Bishop Hydro Project, Inyo County, CA (Chamber drain).

Psomas 2006a. Determination of No Effect on Listed Species for the Bishop Creek Intake 4 Project Southern California Edison Company's Bishop Hydro Project, Inyo County, CA (weir sediment removal).

Psomas. 2006b. Determination of No Effect on Listed Species for Maintenance Activities to Abelour Ditch, Southern California Edison Company Inyo County, CA.

Psomas. 2005. Determination of No Effect on Listed Species from Geomembrane Liner Project at Sabrina Lake Dam, Southern California Edison Company's Bishop Creek Hydro Project, Inyo County, CA.

Psomas. 2004a. Determination of No Effect on Listed Species for the Reconstruction of Sabrina Lake Dam Outlet Works Replacement and Concrete Face Maintenance, Southern California Edison Company's Bishop Creek Hydro Project, Inyo County, CA.

Psomas. 2004b. Determination of No Effect on Listed Species for the Reconstruction of Bishop Creek Intake No. 2, Southern California Edison Company's Bishop Creek Hydro Project, Inyo County, CA.

U.S. Department of Agriculture (USDA). 2018. Land Management Plan for the Inyo National Forest. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd589652.pdf. Accessed March 21, 2019.

6 WILDLIFE INITIAL STUDY REPORT (TERR 4)

6.1 INTRODUCTION

During the TWG meetings, SCE, and stakeholders identified the need to conduct a Wildlife Study to determine if wildlife species are utilizing Project facilities for nesting, roosting, foraging, or sheltering, and if so, how Project operations may affect these species. This Wildlife Study Plan details SCE's proposal for study objectives, study area, methods, and schedule for the effort.

Wildlife occurrences within the vicinity of the Project's powerhouses and facilities have been documented by past studies (Psomas, 2004a; 2004b; 2005; 2006a; 2006b; 2007a; 2007b; 2008a; 2008b; 2010; 2014) and the Project Environmental Assessment (EA) (FERC, 1991). Since those studies were undertaken, new species have been added to the federal and state endangered species lists, and others have been deemed sensitive by various government agencies. Relicensing is an appropriate time to examine wildlife presence in and around the Project and the Project vicinity to determine the effects of Project operations to wildlife in the context of the most recent U.S. Forest Service (USFS) Management Plan, the federal and state Endangered Species Act (ESA), the National Environmental Policy Act (NEPA), and the California Environmental Quality Act (CEQA).

6.2 REVIEW OF EXISTING INFORMATION

A review of the existing literature was conducted to determine the potential for special status wildlife species to occur in the Project vicinity. This review included previous biological reports prepared for individual projects within the Wildlife Study Plan Survey Area (Psomas 2004a, 2004b, 2005, 2006a, 2006b, 2007a, 2007b, 2008a, 2008b, 2010, 2014) and the EA for the Project (FERC, 1991). To obtain information on known special status wildlife species reported to occur in the Project vicinity, the CDFW's CNDDB (CDFW 2019; 2018) was queried for special status wildlife species for the following USGS 7.5 minute topographic quadrangles: Coyote Flat, North Palisade, Tungsten Hills, Mount Darwin, Mount Tom, Bishop and Mount Goddard. Additional literature reviewed includes the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation System (IPaC) website (USFWS, 2018); USFWS' Seven-Year Work Plan September 2016 Version (USFWS, 2016b); the Five Year Work Plan May 2019 Version (USFWS 2019); USFWS Unscheduled Listing Actions September 2016 version (USFWS 2016b); List of USFS Management Indictor Species (MIS) (USFS, 2018a); and a list of potentially occurring threatened and endangered and other sensitive species potentially occurring in the Wildlife Study Plan Survey Area (USFS, 2018b). The INF recently adopted a new Forest Plan that changes the list of species requiring assessments from USFS MIS and USFS Sensitive Species to a list of USFS Species of Conservation Concern (USFS, 2020). This report addresses the wildlife species identified in the Wildlife Study Plan approved for the Project.

Other sources reviewed included: eBird database for observations within the Project area including South Lake, Lake Sabrina, North Lake, Intake No. 2, Bishop Powerhouse No. 4 and Aspendell; Sierra Nevada yellow-legged frog (SNYLF) and mountain yellow-legged frog (MYLF) (northern distinct population segment [DPS]) Field Season 2017 (CDFW, 2018b); 2014 Owens Basin southwestern willow flycatcher (*Empidonax traillii)* survey results (CDFW, 2014; USFWS, 2015), yellow-billed cuckoo (*Coccyzus americanus*), and Bell's vireo surveys in Inyo and Mono counties (Greene, 2015); Sierra Nevada Yellow-legged Frog Critical Habitat Final Rule (USFWS, 2016c); Sierra Nevada Bighorn Sheep Critical Habitat Final Rule (USFWS, 2008); March-June 2018 Sierra Nevada Bighorn Sheep Location Maps (personal communication between USFS and Psomas October 10, 2018); the Butterfly Reference Document for the Inyo, Sequoia, and Sierra National Forests USFS Region 5 (USFS, 2015); Verner (1980) for coniferous bird communities; and Morrison (2018), Anderson et al. (2018), Pierson and Rainey (1998), Weller et al. (2018) for Townsend's big-eared bat (*Corynorhinus townsendii*), and Long and Weller (2018) for other bat species in the Project area.

As a result of the above literature review, it was determined that three wildlife species designated as threatened or endangered by the USFWS or CDFW were reported as occurring within the Wildlife Study Plan Survey Area, and another three wildlife species designated as threatened or endangered by the USFWS or CDFW were determined to may have the potential to occur within the Wildlife Study Plan Survey Area (Table 6.2-1). Five wildlife species designated as threatened or endangered by the USFWS or CDFW were determined unlikely to occur within the Wildlife Study Plan Area. As a result of the above literature review, it was determined that one sensitive species was reported as occurring within the Wildlife Study Plan Survey Area, and another five wildlife species designated as sensitive were determined to may occur within the Wildlife Study Plan Survey Area (Table 6.2-2).

Table 6.2-1 Endangered, Threatened, or Fully Protected Species Potential to Occur

SCIENTIFIC/ COMMON NAME	FEDERAL STATUS	STATE STATUS	HABITAT	LIKELIHOOD FOR OCCURRENCE/ OCCURRENCE NOTES
		KNOWN TO OCCUR IN THE PROJECT VICINITY		
Haliaeetus leucocephalus bald eagle	USFS_S	Endangered CDFW__FP	Requires large bodies of water, or free flowing rivers with abundant fish, and adjacent snags or other perches and nesting sites to support them. Perching sites need to be composed of large trees or snags with heavy limbs or broken tops. Roosts communally in winter in dense, sheltered, remote conifer stands. Breeding habitat in California is primarily in mountain and foothill forests and woodlands near reservoirs, lakes, and rivers.	Expected to occur for foraging and wintering; mainly expected to occur as a vagrant but not expected to occur for nesting. eBird* reports a recent sighting (2018) at Lake Sabrina. No occurrences of bald eagle were documented in the CNDDB search for the Project vicinity. 2019 Survey – Observed.

Scientific/ Common Name	Federal Status	State Status	Habitat	Likelihood for Occurrence/ Occurrence Notes
Aquila chrysaetos golden eagle	--	CDFW__FP, CDFW__WL	Occurs locally in open country such as open coniferous forest, sage-juniper flats, desert, and barren areas, especially in rolling foothills and mountainous regions. Within southern California, the species favors grasslands, brushlands, deserts, oak savannas, open coniferous forests, and montane valleys. Nesting is primarily restricted to rugged, mountainous country. Cliff-walled canyons provide nesting habitat in most parts of range; also, large trees in open areas.	Expected to occur for foraging and wintering; mainly expected to occur as a vagrant but not expected to occur for nesting. eBird reports recent sightings (2018) at Aspendell, Intake No 2 and South Lake, North Lake, and Lake Sabrina. No occurrences of golden eagle were documented in the CNDDB search for the Project vicinity. 2019 Survey – Observed.
Empidonax traillii willow flycatcher	USFS_S	Endangered	In general, prefers moist, shrubby areas, often with standing or running water; e.g., in California, restricted to thickets of willows, whether along streams in broad valleys, in canyon bottoms, around mountain-side seepages, or at the margins of ponds and lakes. In the west, generally occurs in beaver meadows, along borders of clearings, in brushy lowlands, in mountain parks, or along watercourses to 7,500 ft.	Expected to occur for foraging; mainly expected to occur as a migrant but not expected to occur for nesting. eBird reported observation at Aspendell, Lake Sabrina, South Lake, and North Lake; suitable habitat. Please note that eBird does not distinguish between northern subspecies of willow flycatcher and southwestern willow flycatcher. No occurrences of willow flycatcher were documented in the CNDDB search for the Project vicinity. 2019 Survey – Not Observed.

SCIENTIFIC/ COMMON NAME	**FEDERAL STATUS**	**STATE STATUS**	**HABITAT**	**LIKELIHOOD FOR OCCURRENCE/ OCCURRENCE NOTES**
Empidonax traillii extimus southwestern willow flycatcher	Endangered	Endangered	Occurs in riparian woodlands in southern California. Willow-dominated riparian habitats that are similar to least Bell's vireo nesting habitats; shows a stronger preference for sites with surface water in the vicinity, such as along streams, on the margins of a pond or lake, and at wet mountain meadows.	Expected to occur for foraging; mainly expected to occur as a migrant but not expected to occur for nesting. eBird reported observation at Aspendell, Lake Sabrina, South Lake, and North Lake; suitable habitat. Please note that eBird does not distinguish between northern subspecies of willow flycatcher and southwestern willow flycatcher. No occurrences of southwestern willow flycatcher were documented in the CNDDB search for the Project vicinity. 2019 Survey – Not Observed.
MAY POTENTIALLY OCCUR IN THE PROJECT VICINITY				
Siphateles bicolor snyderi Owens-tui chub	Endangered	Endangered	Needs clear, clean water, adequate cover, and aquatic vegetation within a variety of habitats, including Great Basin flowing water and Great Basin standing water within the Owens River basin; at elevations above 4,000 ft.	May potentially occur. Reported 4.4 miles northeast of Powerhouse No. 6, located along North Fork Bishop Creek near Hwy 6 north of Bishop, northeast of the Project watershed northeastern most boundary. 2019 Survey – Not Observed.

Scientific/ Common Name	**Federal Status**	**State Status**	**Habitat**	**Likelihood for Occurrence/ Occurrence Notes**
Vulpes vulpes necator Sierra Nevada red fox	Candidate, USFS_S	Threatened	Uses dense vegetation and rocky areas for cover and den sites. Found in a variety of habitats, including alpine, alpine dwarf scrub, broadleaved upland forest, meadow and seep, riparian scrub, subalpine coniferous forest, upper montane coniferous forest, and wetland; at elevations above 2,500 ft.	May potentially occur; reported 3.8 miles northeast of Powerhouse No. 6, located in Bishop, northeast of the Project watershed northeastern most boundary; last seen in 1922. 2019 Survey – Not Observed.
Ovis canadensis sierrae Sierra Nevada bighorn sheep	Endangered	Endangered, CDFW__FP	Available water and steep, open terrain free of competition from other grazing ungulates within alpine, alpine dwarf scrub, chaparral, chenopod scrub, Great Basin scrub, Mojavean desert scrub, montane dwarf scrub, pinon and juniper woodlands, riparian woodland, and Sonoran Desert scrub habitats, from 5,000 to 9,000 ft during the winter and 10,000 to 14,000 ft during summer.	May potentially occur. Reported 12.9 miles northwest of Powerhouse No. 6, located at Wheeler Crest (aka Wheeler Ridge), 10 miles northwest of Bishop, 12.9 miles northwest of the Project watershed northern boundary. 2019 Survey – Not Observed.
Unlikely to Occur in the Project Vicinity				
Oncorhynchus clarkii seleniris Paiute cutthroat trout	Threatened	–	Cannot tolerate presence of other salmonids. Requires clean gravel for spawning and cool, well-oxygenated waters in Great Basin flowing water habitat, at elevations up to 10,000 ft.	Unlikely to occur. Reported 6.2 miles northwest of Longley Lake Dam/McGee Lake, located in Birchim Lake in the headwaters of Pine Creek 5.4 miles northwest of the Project watershed northwestern boundary. Determined to be not true Paiute cutthroat trout by CDFW (CDFW, 2018a). 2019 Survey – Not Observed.

SCIENTIFIC/ COMMON NAME	**FEDERAL STATUS**	**STATE STATUS**	**HABITAT**	**LIKELIHOOD FOR OCCURRENCE/ OCCURRENCE NOTES**
Rana muscosa southern mountain yellow-legged frog	Endangered	Endangered	Highly aquatic and rarely found more than 3.3 ft. from water. Can be found sitting on rocks along the shoreline where there may be little or no vegetation. These species historically inhabited lakes, ponds, marshes, meadows, and streams at elevations typically ranging from approximately 4,500 to 12,000 ft.	Unlikely to occur. No recorded occurrences in Inyo County. 2019 Survey – Not Observed.
Rana sierrae Sierra Nevada yellow-legged frog	Endangered, USFS_S	Threatened,	Always encountered within a few feet of water. Tadpoles may require 2 to 4 years to complete their aquatic development. Found in streams, lakes, and ponds in montane riparian and a variety of other habitats from 4,495 to 11,975 ft.	Unlikely to occur. Reported from South Fork Bishop Creek, 2.1 miles south of Bishop Creek South Fork Diversion Dam; Wonder Lake, 2.3 mi northwest of Sabrina Lake; Treasure Lakes 3,4,5,6, and 7; 1.6 miles west of north end of South Lake. Populations along Bishop Creek are considered extirpated by CDFW. 2019 Survey – Not Observed.
Anaxyrus canorus Yosemite toad	Threatened USFS_S	CDFW _SSC	Primarily montane wet meadows; also, in seasonal ponds associated with lodgepole pine and subalpine conifer forest within meadow and seep, subalpine coniferous forest, and wetland habitat, from 6,400 to 11,300 ft.	Unlikely to occur. Reported 5.5 miles southwest of Sabrina Lake Dam, located 1.2 miles southwest of Project watershed western boundary. 2019 Survey – Not Observed.

SCIENTIFIC/ COMMON NAME	**FEDERAL STATUS**	**STATE STATUS**	**HABITAT**	**LIKELIHOOD FOR OCCURRENCE/ OCCURRENCE NOTES**
Gulo gulo California wolverine	Proposed Threatened, USFS_S	Threatened, CDFW__FP	Needs water source. Uses caves, logs, burrows for cover and den area. Hunts in more open areas. Can travel long distances. Found in the north coast mountains and the Sierra Nevada. Found in a wide variety of high elevation habitats, including alpine, meadow and seep, north coast coniferous forest, riparian forest, subalpine coniferous forest, upper montane coniferous forest, and wetland from 1,640 to 4,921 ft.	Unlikely to occur. Reported 0.38 mile south of South Lake Dam, located along the east side of South Lake; however, it is considered extirpated from Project area by CDFW (personal communication). 2019 Survey – Not Observed.

* eBird 2019
USFS: BLM: CDFW: CDF: California Department of Forestry and Fire Protection
LEGEND:
USFWS:
S: Sensitive
USFS
FFS Sensitive
BLM
S Sensitive
CDFW
FP Fully Protected
SSC Species of Special Concern
WL Watch List

Table 6.2-2 Sensitive Species with Potential to Occur

Scientific/ Common Name	Federal Status	State Status	Habitat	Likelihood for Occurrence/Occurrence Notes
Known to Occur in the Project Vicinity				
Accipiter gentilis northern goshawk	USFS_S, BLM_S	CDFW_SSC	Usually nests on north slopes, near water. Red fir, lodgepole pine, Jeffrey pine, and aspens are typical nest trees within north coast coniferous forest, subalpine coniferous forest, and upper montane coniferous forest habitats from 915 to 9,900 ft.	Known to occur. This species has been recorded 0.18 mile north of Birch Creek Diversion, near Birch Creek; and 0.75 mile south of South Lake Dam on the east side of South Lake. 2019 Survey – Observed.
May Potentially Occur in the Project Vicinity				
Corynorhinus townsendii Townsend's big-eared bat	USFS_S, BLM_S	CDFW_SSC	Roosts in the open, hanging from walls and ceilings throughout California in a wide variety of habitats, including chaparral, chenopod scrub, Great Basin grassland, Great Basin scrub, upper and lower montane coniferous forest, meadow and seep, riparian forest/woodland, and valley and foothill grassland. Most common in mesic sites. Roosting sites limiting. Extremely sensitive to human disturbance. Found from 4,000 to 10,800 ft.	May potentially occur. This species has been recorded at Yaney Mine, approximately 1.1. miles east of the Project watershed's eastern boundary, 1.6 miles northeast of Powerhouse No. 5 and Intake 6. 2019 and 2020 Survey – Not Observed.
Euderma maculatum spotted bat	BLM_S	CDFW_SSC	Feeds over water and along washes. Feeds almost entirely on moths. Needs rock crevices in cliffs or caves for roosting within wide variety of habitats from arid deserts and grasslands through mixed conifer forests from mostly 900 to 2,700 feet but up to 9,700 ft.	May potentially occur. This species has been recorded 1.5 miles northeast of Powerhouse No. 6, located in a residential area between Highway 395 and Highway 168, northeast of the Project watershed northeastern most boundary. 2019 and 2020 Survey – Not Observed.
Lepus townsendii western white-tailed jackrabbit	–	CDFW_SSC	Open areas with scattered shrubs and exposed flat-topped hills with open stands of trees, brush and herbaceous understory within sagebrush, subalpine conifer, juniper,	May potentially occur. This species has been recorded north of Bishop, northeast of the Project watershed's northeastern most boundary, 4.5 miles

Scientific/ Common Name	Federal Status	State Status	Habitat	Likelihood for Occurrence/Occurrence Notes
			alpine dwarf shrub, and perennial grassland habitats, from 120 to 12,000 ft.	northeast of Powerhouse No. 6 along North Fork Bishop Creek near Highway 6. 2019 Survey – Not Observed.
Lithobates pipiens northern leopard frog	–	CDFW_SSC	Highly aquatic species. Shoreline cover submerged, and emergent aquatic vegetation are important habitat characteristics within freshwater marsh, Great Basin flowing waters, Great Basin standing waters, marsh and swamp, wetland habitats, from sea level to 7,000 ft.	May potentially occur. This species has been recorded northwest of the Project watershed's northernmost boundary, 1.7 miles northwest of Powerhouse No. 6, 0.4 mile east of Birch Creek, 4 miles west of Bishop. Species analyzed in Aquatic Resources Section. 2019 Survey – Not Observed.
Martes caurina sierrae Sierra marten	USFS_S	–	Needs variety of different-aged stands, particularly old-growth conifers and snags which provide cavities for dens/nests, within mixed evergreen forests with more than 40% crown closure along Sierra Nevada and Cascade Mountains, from 8,000 to 10,300 ft.	May potentially occur. This species has been recorded 2.7 miles southwest of Sabrina Lake Dam, along Middle Fork Bishop Creek just south of Dingleberry Lake. 2019 Survey – Not Observed.

USFS: BLM: CDFW: CDF: California Department of Forestry and Fire Protection
LEGEND:
USFWS:
S: Sensitive
USFS
S Sensitive
BLM
S Sensitive
CDFW
SSC Species of Special Concern

In addition, the USFS provided a list of Sierra Forest MIS (Table 6.2-3).

Table 6.2-3 Sierra Nevada Forest Management Indicator Species

Sierra Nevada Forests Management Indicator Species Scientific Name	**Habitat or Ecosystem Component**	**CWHR Type(s) Defining the Habitat or Ecosystem Component[1]**	**Category for Project Analysis[2]**
aquatic macroinvertebrates	Riverine and Lacustrine	Lacustrine (LAC) and riverine (RIV)	2
fox sparrow (*Passerella iliaca*)	Shrubland (west-slope chaparral types)	Montane chaparral (MCP) Mixed chaparral (MCH) Chamise-redshank chaparral (CRC)	2
mule deer (*Odocoileus hemionus*)	Oak-associated Hardwood and Hardwood/Conifer	Montane hardwood (MHW) Montane hardwood-conifer (MHC)	2
yellow warbler (*Dendroica petechial*)	Riparian	Montane riparian (MRI) Valley foothill riparian (VRI)	2
Pacific tree frog (*Pseudacris regilla*)	Wet Meadow	Wet meadow (WTM) Freshwater emergent wetland (FEW)	2
mountain quail (*Oreortyx pictus*)	Early Seral Coniferous Forest	Ponderosa pine (PPN) Sierran mixed conifer (SMC) White fir (WFR) Red fir (RFR) Eastside pine (EPN) Tree sizes 1, 2, and 3 All canopy closures	2
mountain quail (*Oreortyx pictus*)	Mid Seral Coniferous Forest	Ponderosa pine (PPN) Sierran mixed conifer (SMC) White fir (WFR), red fir (RFR) Eastside pine (EPN) Tree size 4 All canopy closures	
sooty (blue) grouse (*Dendragapus obscurus*)	Late Seral Open Canopy Coniferous Forest	Ponderosa pine (PPN) Sierran mixed conifer (SMC)	1

Sierra Nevada Forests Management Indicator Species Scientific Name	Habitat or Ecosystem Component	CWHR Type(s) Defining the Habitat or Ecosystem Component[1]	Category for Project Analysis[2]
		White fir (WFR) Red fir (RFR) Eastside pine (EPN) Tree size 5 Canopy closures S and P	
California spotted owl (*Strix occidentalis occidentalis*) American marten (*Martes americana*) northern flying squirrel (*Glaucomys sabrinus*)	Late Seral Closed Canopy Coniferous Forest	Ponderosa pine (PPN) Sierran mixed conifer (SMC) White fir (WFR) Red fir (RFR) Tree size 5 (canopy closures M and D) Tree size 6	2
hairy woodpecker (*Picoides villosus*)	Snags in Green Forest	Medium and large snags in green forest	2
black-backed woodpecker (*Picoides arcticus*)	Snags in Burned Forest	Medium and large snags in burned forest (stand-replacing fire)	2

Source USFS 2018b

[1] All CWHR size classes and canopy closures are included unless otherwise specified; dbh = diameter at breast height; Canopy Closure classifications: S=Sparse Cover (10-24% canopy closure); P= Open cover (25-39% canopy closure); M= Moderate cover (40-59% canopy closure); D= Dense cover (60-100% canopy closure); Tree size classes: 1 (Seedling)(<1" dbh); 2 (Sapling)(1"-5.9" dbh); 3 (Pole)(6"-10.9" dbh); 4 (Small tree)(11"-23.9" dbh); 5 (Medium/Large tree)(≥24" dbh); 6 (Multi-layered Tree) [In PPN and SMC] (Mayer and Laudenslayer 1988).

[2] Category 1: MIS whose habitat is not in or adjacent to the Project area and would not be affected by the Project.

Category 2: MIS whose habitat is in or adjacent to Project area but would not be either directly or indirectly affected by the Project.

Category 3: MIS whose habitat would be either directly or indirectly affected by the Project.

The review of USFWS IPaC website (USFWS, 2018) also provided a list of Bird Species of Conservation Concern (Table 6.2-4).

Table 6.2-4 U.S. Fish and Wildlife Service Bird Species of Conservation Concern

SPECIES	BREEDING SEASON	HABITAT	POTENTIAL TO OCCUR
black rosy-finch *Leucosticte atrata*	Jun 15 to Aug 31	Above timberline throughout its range, wherever proper cliffs and rock slides provide nest sites with protection from falling rocks and hail and where adequate feeding grounds occur on tundra, fellfields, rock slides, snowfields, and glaciers within commuting distance. May occur in enclaves of alpine habitat on northeast faces of mountains whose summits are below timberline, but where cliffs, shade, and snow produce alpine climate.	eBird* reported observation at Aspendell; suitable habitat. 2019 Survey – Not Observed.
Brewer's sparrow *Spizella breweri*	May 15 to Aug 10	Breeds in shrublands; most closely associated with landscapes dominated by big sagebrush (*Artemisia tridentata*). Overwinters in sagebrush shrublands and brushy desert habitat, including desert scrub dominated by various saltbush species (*Atriplex* spp.) and creosote (*Larrea tridentata*).	eBird reported observation at Aspendell, Intake 2, Lake Sabrina, South Lake, and North Lake; suitable habitat. 2019 Survey –Observed.
Cassin's finch *Carpodacus cassinii*	May 15 to Jul 15	Generally open coniferous forests of interior western mountains over a broad elevational range. Often found in mature forests of lodgepole pine (*Pinus contorta*) and ponderosa pine (*P. ponderosa*)	eBird reported observation at Intake 4, Aspendell, Intake 2, Lake Sabrina, South Lake, and North Lake; suitable habitat. 2019 Survey –Observed.
green-tailed towhee *Pipilo chlorurus*	May 1 to Aug 10	Habitat varies with elevation. Dry shrubby hillsides (shrub-steppe) and post-disturbance shrubby second growth are most commonly used. Vegetation may be characterized as low brush cover, often interspersed with trees; avoids typical forest.	eBird reported observation at Aspendell, Intake 2, Lake Sabrina, South Lake, and North Lake; suitable habitat. 2019 Survey –Observed.
lesser yellowlegs *Tringa flavipes*	Breeds elsewhere	Common breeder in boreal forest (generally open forest) and forest/tundra transition habitats; less abundant in adjacent subarctic tundra. Nests in man-made habitats such as seismic and gas line right-of-way, road allowances, and mine clearings. Typical foraging areas are located along the shores of large, shallow, freshwater lakes and sloughs (interior breeders) or in brackish portions of salt marshes (coastal breeders).	Not expected to occur for breeding; no potentially suitable breeding habitat; may occur as a migrant. 2019 Survey – Not Observed.
Lewis's woodpecker	Apr 20 to Sep 30	Important aspects of breeding habitat include an open canopy, a brushy understory offering ground cover, dead or downed woody material, available perches, and abundant insects. Three	eBird reported observation at Aspendell; suitable habitat.

SPECIES	**BREEDING SEASON**	**HABITAT**	**POTENTIAL TO OCCUR**
Melanerpes lewis		principal habitats are open ponderosa pine forest, open riparian woodland dominated by cottonwood, and logged or burned pine (*Pinus* spp.) forest; found in oak (*Quercus* spp.) woodland, nut and fruit orchards, piñon pine–juniper (*Pinus cembroides – Juniperus* spp.) woodland, a variety of pine and fir (*Abies* spp.) forests, and agricultural areas including farm- and ranchland. Often classified as a specialist in burned pine forest habitat.	2019 Survey – Not Observed.
long-billed curlew *Numenius americanus*	Apr 1 to Jul 31	Nests primarily in short-grass or mixed-prairie habitat with flat to rolling topography. Wide range of habitats used during migration, including dry short-grass prairie, wetlands associated with alkali lakes, playa lakes, wet coastal pasture, tidal mudflats, salt marsh, alfalfa fields, barley fields, fallow agriculture fields, and harvested rice fields. Overwinters in tidal estuaries, wet pasture habitats, and sandy beaches.	Not expected to occur for breeding; no potentially suitable breeding habitat; may occur as a migrant. 2019 Survey – Not Observed.
marbled godwit *Limosa* fedoa	Breeds elsewhere	In northern prairies of Canada and United States, breeds in short, sparsely to moderately vegetated landscapes that include native grassland and wetland complexes with a variety of wetland classes (ephemeral to semi-permanent). Away from breeding areas, most migrants found in flocks at coastal estuaries, mudflats, salt marshes, lagoons, and sandy beaches. Habitats used by birds in winter like those of coastal migrants: coastal mudflats adjoining savannas or meadows, estuaries, sandy beaches, and sandflats; sometimes roosting at salt ponds.	Not expected to occur for breeding; no potentially suitable breeding habitat; may occur as a migrant. 2019 Survey – Not Observed.
olive-sided flycatcher *Contopus cooperi*	May 20 to Aug 31	Primarily montane and northern coniferous forests. May occur at any elevation from sea level to timberline, but usually at mid- to high-elevation forest (3,018–6,988 ft.). Within the coniferous forest biome, most often associated with forest openings, forest edges near natural openings (e.g., meadows, canyons, rivers) or human-made openings (e.g., harvest units), or open to semi-open forest stands. Frequently occurs along wooded shores of streams, lakes, rivers, beaver (*Castor canadensis*) ponds, bogs, and muskegs, where natural edge habitat occurs and standing dead trees often are present.	eBird reported observation at Aspendell, Intake 2, Lake Sabrina, South Lake, and North Lake; suitable habitat. 2019 Survey – Not Observed.
pinyon jay *Gymnorhinus cyanocephalus*	Feb 15 to Jul 15	Piñon-juniper woodland is used most extensively but flocks also breed in sagebrush (*Artemisia* spp.), scrub oak (*Quercus* spp.) and chaparral communities. In parts of its range	eBird reported observation at Intake 4, Aspendell, and Intake 2; suitable habitat.

SPECIES	**BREEDING SEASON**	**HABITAT**	**POTENTIAL TO OCCUR**
		(central Arizona, southern California), inhabits ponderosa and Jeffrey pine (*Pinus jeffreyi*) forests.	2019 Survey – Not Observed.
rufous hummingbird *Selasphorus rufus*	Breeds elsewhere	Breeds in dense mature and second growth coniferous forests, deciduous woods, riparian thickets, swamps and meadows, farmland, pasture edges, orchards and city yards, parks, and gardens; in the Pacific Northwest United States and Canada. Migrants utilize montane meadows; alpine meadows in the Sierras as high as 12,598 ft. Overwinters in Mexico.	eBird reported observation at Aspendell, Intake 2, Lake Sabrina, South Lake, and North Lake; suitable habitat. 2019 Survey –Observed.
sage thrasher *Oreoscoptes montanus*	Apr 15 to Aug 10	Shrub-steppe dominated by big sagebrush (*Artemisia tridentata*). Considered a sagebrush obligate but noted in black greasewood (*Sarcobatus vermiculatus*) habitat in Utah and Nevada and bitterbrush (*Purshia tridentata*) habitat in Washington. Migrants utilize sagebrush plains, arid shrub, grassland with scattered bushes, and open piñon-juniper woodland, primarily in arid or semiarid situations; rarely around towns. Overwinter in arid to semiarid, open, and semi-open country with scrub, scattered bushes, and sagebrush.	eBird reported observation 0.85-mile northeast of Powerhouse No. 3; suitable habitat. 2019 Survey – None Observed.
sagebrush sparrow *Artemisiospiza nevadensis*	Mar 15 to Jul 31	Prefers semi-open habitats with evenly spaced shrubs 3 to 6-feet-high. Vertical structure, habitat patchiness, and vegetation density may be more important in habitat selection than specific shrub species, but this sparrow is closely associated with big sagebrush throughout most of its range. observed in creosote bush, low desert scrub, and coastal sagebrush scrub during migration. In northern portions of its range, favors big sagebrush. Farther south, fairly common to uncommon during winter in desert washes, big sagebrush, creosote bush, sparse cactus scrub, arid grasslands, and arboreal yucca (*Yucca* spp.) mixed with greasewood	eBird reported observation at Intake 4, and Intake 2; suitable habitat. 2019 Survey – None Observed.
Virginia warbler *Vermivora virginiae*	May 1 to Jul 31	Over most of its range, typically found breeding in piñon-juniper and oak woodlands. May occur in high-altitude life zones dominated by large conifers but tends to select patches of shrubby vegetation for breeding; never occurs in coniferous forests where there is not a deciduous mix. Strong association for breeding in steep draws, drainages, or slopes with oak or other shrubby vegetation.	eBird reported observation at Aspendell and South Lake; suitable habitat. 2019 Survey – None Observed.

SPECIES	BREEDING SEASON	HABITAT	POTENTIAL TO OCCUR
white-headed woodpecker *Picoides albolarvatus*	May 1 to Aug 15	Requires montane coniferous forests dominated by pines (*Pinus* ssp.), with tree species composition varying geographically. Within the Sierra Nevada, occupies mixed coniferous forest of ponderosa and sugar pines, white fir, red fir (*Abies magnifica*), Douglas-fir, and black oak (*Quercus kelloggii*); occurs more locally on drier east-slope forests dominated by Jeffrey pine (*P. jeffreyi*) and in high-elevation lodgepole pine and western white pine (*P. monticola*) forests, and is generally absent from digger pine (*P. sabiniana*)-dominated habitats at lower elevations on western flank of the Sierra Nevada.	eBird reported observation at Aspendell, Intake 2, Lake Sabrina, and South Lake; suitable habitat. 2019 Survey – Not Observed.
willet *Tringa semipalmata*	Apr 20 to Aug 5	On the prairies, uses short, sparse cover in wetlands and grasslands. Breeds on semiarid plains near bodies of water (eastern Oregon), in grasslands associated with shallow wetlands (southern Alberta), in native grasslands and to a lesser extent cropland (N. Dakota), in uplands near brackish or saline wetlands, and less frequently on alkali flats (Utah) and lakes in forested mountain areas. During nonbreeding season, found in diverse California coastal types: mudflat, marsh, sandy beach, and rocky coast.	Not expected to occur for breeding; no potentially suitable breeding habitat; may occur as a migrant. 2019 Survey – Not Observed.
Williamson's sapsucker *Sphyrapicus thyroideus*	May 1 to Jul 31	Throughout range, breeds in middle to high elevation conifer and mixed conifer-deciduous forests. Common in montane western larch, Douglas fir (*Pseudotsuga menziesii*), ponderosa pine, and pine-fir forests.	eBird reported observation at Aspendell, Lake Sabrina, South Lake, and North Lake; suitable habitat. 2019 Survey –Observed.
willow flycatcher *Empidonax traillii*	May 20 to Aug 31	In general, prefers moist, shrubby areas, often with standing or running water; e.g., in California, restricted to thickets of willows, whether along streams in broad valleys, in canyon bottoms, around mountain-side seepages, or at the margins of ponds and lakes. in the West, generally occurs in beaver meadows, along borders of clearings, in brushy lowlands, in mountain parks, or along watercourses to 7,500 ft.	eBird reported observation at Aspendell, Lake Sabrina, South Lake, and North Lake; suitable habitat. 2019 Survey – Not Observed.

Source USFWS, 2018
* eBird 2019

A review of the USFWS 5-Year Work Plan (USFWS, 2019) provided a list of 27 wildlife species in California that are under consideration for the potential to receive federal protection by listing as threatened or endangered pursuant to the federal ESA. Of these 27 species, two species were determined to have the potential to be present in the

Project's Wildlife Study Area: Oregon vesper sparrow (*Pooecetes gramineus affinis*), and the little brown bat (*Myotis lucifugus*).

6.3 Study Objectives

This Wildlife Study Plan identified the following goals and objectives:

- Determine if the resident mule deer (*Odocoileus hemionus*) herd and/or other wildlife species are affected by or alter their migratory patterns in response to Project infrastructure or operation and evaluate the use at existing crossing structures to determine adequacy.
- Identify management and other special status species from existing information and site-specific surveys that possess a high potential for occurrence in or utilize the Project's powerhouses, ancillary facilities, and operations areas for nesting, roosting, foraging, and sheltering during any portion of their life cycle. For those species with a high potential to occur or that have been determined to utilize the powerhouses or other Project facilities, determine time/season of usage at those locations.
- Special status species are defined as wildlife species listed as endangered or threatened under the federal and state ESAs by USFWS and CDFW or species which have been determined to be sensitive or of special concern because of declining populations or rarity in the Project area by the USFS, Bureau of Land Management (BLM), or CDFW.
- For those special status species with high potential of utilization, or have been determined to be present, assess potential for Project impact. Identify the potential effects of continued Project operations on the habitats and associated wildlife within the Wildlife Study Plan Area.
- Provide Resource Management Plans and Guidelines so that future Project facilities and operations are consistent with the Desired Conditions described in the Land Management Plan for the Inyo National Forest (USDA, 2018) as they relate to ecological sustainability and diversity of plant and animal communities.

6.3.1 Study Area

The Wildlife Study Plan Study Area (Figure 6.3-1) consists of Project facilities including powerhouses, dams, diversions, lakes and other impoundments, the flowline starting at Intake No. 2, valve houses, other outbuildings, and access roads. The Wildlife Study Plan Survey Area includes a 500-foot survey area buffer surrounding each of the above listed Project components. Note: only those areas of lakes and other impoundments within 500 feet of a Project facility were surveyed.

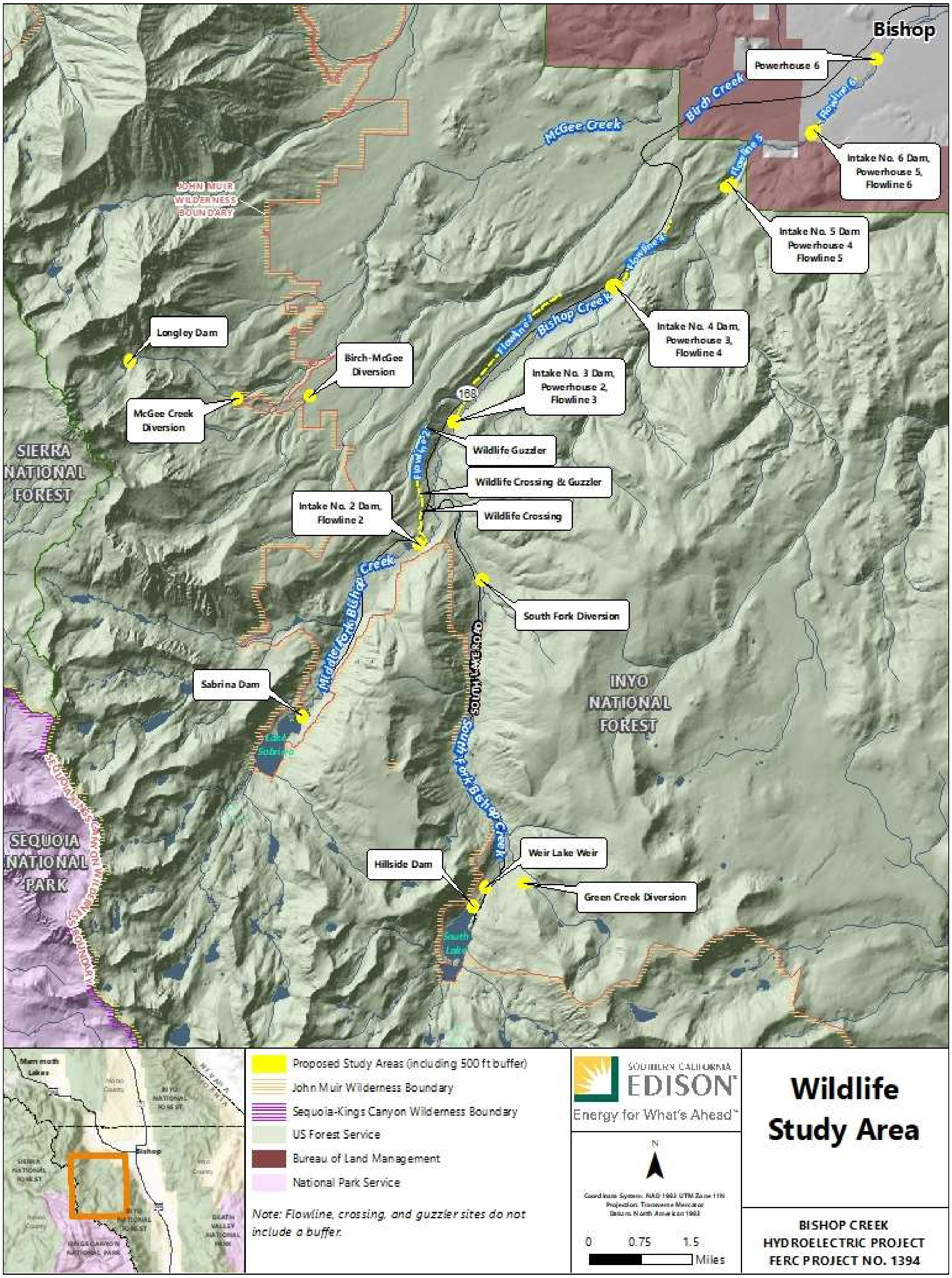

Figure 6.3-1 Wildlife Study Areas

6.4 METHODS

6.4.1 GENERAL WILDLIFE FIELD SURVEYS

General wildlife field surveys were conducted within the Wildlife Study Plan Survey Area from August 5 to 9, 2019. The general wildlife surveys included a habitat assessment for southwestern willow flycatcher nesting habitat, searches USFS MIS, and observation of mule deer use of deer crossings. The field surveys included a pedestrian surveys at each of the Project's facilities including a 500-foot buffer around each facility to identify and map existing conditions, document existing wildlife, and identify potentially suitable habitat (i.e., preferred plant associations and habitat structure) for special status species determined to have the potential to occur at each facility based on the literature review and agency consultation. Binoculars were used to directly observe wildlife. Active searches for reptiles and amphibians included lifting, overturning, and carefully replacing objects such as rocks, boards, and debris. Mammals were identified by visual recognition or evidence of diagnostic sign, including scat, footprints, scratch-outs, dust bowls, burrows, and trails. All wildlife species observed were recorded in field notes as to the species (if possible) and location. Nesting behavior of birds and raptors were noted by species and the locations of active or potential nests recorded with a hand-held global positioning system (GPS) unit. Breeding behavior of birds was observed and noted. Nests were located and mapped on an aerial photograph and nest location documented using a hand-held GPS unit. Observations of active or abandoned raptor nests were recorded using a hand-held GPS unit. All species observed were recorded in field notes.

Nomenclature for wildlife generally follows Crother (2017) for amphibians and reptiles, American Ornithologists' Union (AOU) (2020) for birds, and Wilson and Reeder (2005) for mammals.

6.4.1.1 Southwestern Willow Flycatcher Nesting Habitat Assessment

Biologists surveyed for suitable nesting habitat for southwestern willow-flycatcher, as defined by the USFS. Suitable habitat for southwestern willow flycatcher consists of relatively dense riparian tree and shrub communities alongside rivers, streams, or other wetlands, including lakes and reservoirs (riparian habitat). It establishes nesting territories, builds nests, and forages where mosaics of relatively dense and expansive growths of trees and shrubs are established, near or adjacent to surface water or underlain by saturated soil. In most instances, the dense vegetation occurs within the first 10 to 13-feet above ground. Habitat patches must be at least 0.25 acre in size and at least 30-feet-wide. Historically the southwestern willow flycatcher nested in native vegetation including willows (*Salix* spp.), seep willow (*Baccharis salicifolia*), boxelder (*Acer Negundo*), buttonbush (*Cephalanthus occidentalis*), and cottonwood (*Populus*). Following modern changes to riparian communities, this subspecies still nests in native vegetation, but also uses thickets dominated by non-native tamarisk(*Tamarix*) and Russian olive (*Elaeagnus angustifolia*), or mixed native/non-native stands. The willow flycatcher builds a small open cup nest, most often 6.5 to 23-feet above ground in a fork or on a horizontal branch of a medium-sized bush or small tree where the plant growth is most dense, where trees and shrubs have vegetation near ground level, and where there is a low-density canopy (Sogge et al., 2010).

6.4.2 MANAGEMENT INDICATOR SPECIES

Surveys for MIS were conducted concurrently with general wildlife surveys described above. Each MIS observed was counted and recorded at every location observed using a hand-held GPS.

6.4.2.1 Mule Deer

Pedestrian surveys were performed along the length of the flowline. Biologists recorded signs of mule deer use (i.e., scat and tracks, or direct observations) along the flowline road at each of the two deer crossings constructed over the flowline. Mule deer and their sign were also documented during the other surveys for wildlife. Biologists documented the locations of mule deer trails along the flowline with photographs, and locations were documented by hand-held GPS. Other wildlife identified by observation or tracks using the mule deer crossings were identified to the lowest taxonomic rank possible in the field, and tracks and signs documented with photographs. Additionally, trail cameras were installed along the flowline and at the existing deer crossings to document mule deer and wildlife use. Data from the trail cameras were downloaded by Psomas on the following dates; September 17 and 25, and November 9, 2019, and June 15 and 24, 2020. Photographs were reviewed, and species identified to lowest taxonomic level allowed by photography.

6.4.2.2 Bat Surveys

6.4.2.2.1 Literature Review

A review of the existing literature, reported in Section 6.2 above, was conducted to determine the potential for bat species to occur in the vicinity of the Project. The team coordinated with Kary Schlick, USFS biologist, and local bat expert, Dr. Michael Morrison, for the latest unpublished data on local special status bats species.

6.4.2.2.2 Summer Roost Habitat Assessment

On June 10, 2019, a bat habitat assessment was conducted at Project facilities along Bishop Creek. The facilities on Birch Creek and McGee Creek (Longley Dam, McGee Creek Diversion, and Birch Creek Diversion) were not accessible during the habitat assessment due to poor road conditions resulting from higher-than-normal snow levels and were excluded from the survey effort. The habitat assessment was conducted to determine potential for significant bat roosts at Project facilities, i.e. Project buildings and associated structures. Significant roosts consist of potential maternity roosts or winter hibernacula. Large mature trees present at many of the Project facilities have the potential to support roosting bats. Trees were not surveyed for past or present bat roosts because there are no current non-invasive survey techniques available to identify tree roosts. Project structures with the potential to support roosting bats for signs of past and present bat use (e.g., urine staining, guano deposits, vocalizations) were inspected. All evidence of roosting was recorded in field notes and marked on maps. Active roost sites were photographed.

6.4.2.2.3 <u>Winter Roost Assessment</u>

A survey for wintering bats was performed at potential winter roosting sites at Project facilities on January 27, 2020. The purpose of the winter bat survey was to determine if Project facilities, especially powerhouses and associated outbuildings are used by bats as winter hibernacula. Project structures were inspected for signs of past and present bat usage. All evidence of roosting was recorded in field notes. Photographs were taken of any evidence of bat use. A hard hat with an attached light, a hand-held spotlight, and binoculars were used to conduct the surveys.

6.4.2.3 Bat Acoustic Survey

Based on the results of the 2019 summer roost assessment, ultrasonic acoustic surveys were conducted at selected Project facilities. Evidence of day roosting bats were observed in Powerhouse Nos. 2, 3, 5, and 6 in 2019. The purpose of collecting acoustic samples is to determine which species are utilizing the facilities. Prior to installing the ultrasonic acoustic recording devices, bat biologists assessed each site to identify the best location for microphone placement. Preferences for microphone placement were at locations that sufficiently sample the appropriate bat foraging or commuting corridors.

The ultrasonic acoustic surveys were scheduled to avoid full moon events and postponed avoiding uncharacteristic weather events, including high winds, low air temperatures, and heavy precipitation. The survey occurred during months not associated with winter hibernation activity.

To the extent feasible, the microphones and associated equipment (e.g., poles) were placed in locations that best mask the equipment to minimize effects on flight patterns. Acoustic recording began 15 minutes before sunset and extend throughout the night, ending 15 minutes before sunrise. Each facility was monitored for a minimum of four consecutive nights to sufficiently sample the species diversity at the respective locations. Acoustic data was recorded in full spectrum format in short intervals when triggered by programmed acoustic thresholds. The thresholds were set to minimize the collection of environmental noise upon deployment of the acoustic recording devices.

The data collected was analyzed using Sonobat software, Version 4.2.2. Digital copies of the acoustic data were archived both before and after analysis. Metadata was affixed to the processed data using the GUANO[1] format.

[1] GUANO is a universal, extensible, open metadata format for bat acoustic recordings (Myotisoft, 2017).

6.4.2.4 Amphibian Surveys

6.4.2.4.1 Literature Review

A review of the existing literature, reported in Section 6.2 above, was conducted to determine the potential for special status amphibian species to occur in the Project vicinity.

Prior to the start of the surveys for Yosemite toad (*Anaxyrus canorus*), northern leopard frog (*Lithobates pipiens*), and SNYLF, aerial photographs of each survey area (1-inch to 200-foot scale) were prepared for field use to map existing features and note wildlife occurrences and areas of potentially suitable habitat.

6.4.2.4.2 Field Surveys

Surveys were conducted in potentially suitable aquatic and adjacent upland habitat for Yosemite toad, northern leopard frog, and SNYLF in the survey areas. They conducted both diurnal and nocturnal surveys on September 23 and 24, 2019. The survey areas for special status amphibians were selected based on Project electrofishing sites, including an appropriate buffer depending on the surrounding habitat. Those areas were selected so that the special status amphibian surveys could be performed in advance of the electrofishing to the extent possible. The survey areas included Site 1, Powerhouse No. 5 and Intake 6, Site 2, Powerhouse No. 4 and Intake 5, Site 3, Site 4, Powerhouse No. 3 and Intake 4, South Branch 1, Middle Branch, South Branch 2, and South Branch 3. The areas surveyed for the special status amphibian species included all suitable habitat within the previously mentioned areas.

Surveys primarily followed recommended protocols for special status amphibians as described in Rombough (2012) and Peek, et al. (2017), including decontamination procedures. The surveys included diurnal and nocturnal searches to determine the presence of eggs, tadpoles, and adults. Because surveys for these species were conducted concurrently, the timing of the surveys was scheduled to accommodate the activity patterns of all three species. Surveys focused on detecting toads/frogs by visual identification, listening for the advertising call of adult males, and checking potentially suitable breeding habitat for tadpoles and/or eggs. Biologists scanned pools for eggs, larvae, metamorphs, juveniles, and breeding and/or calling adults in potentially suitable breeding locations along Bishop Creek and for foraging individuals in the adjacent upland areas. Headlamps, flashlights, and binoculars were used to visually identify toads, frogs, and their larvae detected at night. Nocturnal surveys were conducted during appropriate environmental conditions conducive to the activity patterns of the northern leopard frog. Only one day and evening visit at each site was deemed appropriate because of the late season survey, and because the survey was intended to document presence of special status amphibian species so that potential impacts from electrofishing could be avoided, and to document the presence of potentially suitable habitat.

6.5 Modifications to Methods

General wildlife surveys were reduced to one field survey in 2019 and are now complete. In June 2020, two new cameras were placed at wildlife crossing areas to replace those stolen in 2019. No northern goshawk (*Accipiter gentilis*) surveys were conducted because the species presence was confirmed during the 2019 general wildlife surveys (refer to the Results section for more details on the observation). No other changes or modifications to the surveys are anticipated.

6.6 Results

6.6.1 General Wildlife Surveys

The following describes the natural environment surrounding the Project facilities and is based on the literature review and the results of the 2019 general wildlife surveys.

Numerous upland plant communities are present within the Project vicinity supporting a variety of wildlife species. These plant communities mix and blend one into another providing a complex of habitats with an overstory of one community supporting an understory of a second community. This complexity is reflected in the wildlife species that occur in multiple communities.

The intermixing of the vegetation communities in the Project vicinity provides for a complex habitat allowing wildlife to utilize many different plant communities throughout a great range of elevations. For this analysis the plant communities have been combined into lower, midrange, and higher elevation associations:

As a result of the field surveys, eight special status species were observed and are described below.

- Northern goshawks, a CDFW Species of Special Concern and USFS Sensitive Species, were observed with the Birch Creek Diversion survey area within quaking aspen (*Populus tremuloides*) and eastside pine habitat. After first hearing an alarm call from an adult, an adult male and one juvenile flew overhead among the pine trees. During the observation, begging calls were heard from at least one juvenile and response calls were heard from the adult. Additionally, three inactive nests were found with the aspen woodland.
- A bald eagle (*Haliaeetus leucocephalus*), a state listed endangered species and a CDFW fully protected species, was observed at the Bishop Creek Powerhouse No. 2 and Intake 3 survey area flying over bitterbush habitat. The bald eagle was a flyover occurrence; it was not observed nesting in any of the survey areas. Therefore, no CNDDB form was prepared for this species.
- Four golden eagles (*Aquila chrysaetos*), a CDFW fully protected species, were observed during the wildlife surveys: one adult and one juvenile were observed flying over eastside pine habitat at the McGee Creek Diversion; and two adults were observed flying over Singleleaf Pine, Great Basin Mixed Scrub, bitterbush habitats above the flowline west of Bishop Creek Intake 2 Dam. The golden eagles were flyover

occurrences at both survey areas; they were not observed nesting in any of the survey areas. Therefore, no CNDDB form was prepared for this species.

- A Brewer's sparrow (*Spizella breweri*), a USFWS Bird Species of Conservation Concern, was observed at the Bishop Creek South Fork Diversion Dam and Bishop Creek Intake 2 Dam survey areas flying through quaking aspen habitat in both areas.
- A rufous hummingbird (*Selasphorus rufus*), a USFWS Bird Species of Conservation Concern, was observed at the South Lake and Green Creek Diversion survey areas, flying through Lodgepole Pine and Subalpine Conifer habitat respectively.
- A green-tailed towhee (*Pipilo chlorurus*), a USFWS Bird Species of Conservation Concern, was observed at the Sabrina Lake Dam, McGee Creek Diversion, Birch Creek Diversion, Green Creek Diversion, Bishop Creek South Fork Diversion Dam, and Bishop Creek Intake 2 Dam survey areas. Green-tailed towhees were observed in the following habitats: quaking aspen, Curleaf Mountain Mahogany, and Subalpine Conifer.
- A Cassin's finch (*Haemorhous cassinii*), a USFWS Bird Species of Conservation Concern, was observed at the South Lake and Lake Sabrina survey areas, flying through Lodgepole Pine and quaking aspen habitat respectively.
- A Williamson's sapsucker (*Sphyrapicus thyroideus*), a USFWS Bird Species of Conservation Concern, was observed at the Lake Sabrina and Birch Creek Diversion survey areas, flying through quaking aspen and eastside pine habitat respectively.

6.6.1.1 Southwestern Willow Flycatcher Habitat Assessment

Willow (*Salix* spp.) habitat was present in the survey area in two very small, isolated fragments along Bishop Creek north of Powerhouses No. 6 and No. 5 and Intake 6. Willow habitat is dominated by tree-sized willows of any species in riparian floodplains, seeps, springs, swamps, or dry washes. Willow dominate these areas to the exclusion of other riparian species but other species such as cottonwoods, and alders (*Alnus* sp.) may occur in small amounts. The USFS specifies that suitable breeding habitat at low and mid-elevations can be composed of single species of willow, but the height must range from 9 to 55 feet. The willow habitat in the survey area did not meet this standard. Additionally, a distinct overstory of cottonwood, willow, or other broadleaf trees, with recognizable subcanopy layers and a dense understory of mixed species are often present. No such overstory was present in the survey area.

High elevation habitats range from nearly monotypic dense stands of willow to mixed stands of native broadleaf trees and shrubs, 6 to 21-feet in height with no distinct overstory layer; often associated with sedges, rushes, nettles, and other herbaceous wetland plants; usually very dense structure in lower 6 feet; live foliage density is high from the ground to the canopy. Vegetation surrounding the patch can range from open meadow, to agricultural lands, to pines or upland shrub. This habitat structure was not found during the surveys. At several sites, including areas near Powerhouse No. 4 and Intake 5 and Powerhouse No. 2 and Intake 3, riparian mixed hardwood habitat was identified. Riparian mixed hardwood describes the mixture of tree willows, cottonwoods, alders, and other tree species where none are dominant. In most cases, at least three genera are present in the mixture. These species occur in moist areas and adjacent to stream courses often found adjacent to upland lower montane conifers. The foliage in this habitat was not dense enough from the ground to canopy to be considered suitable habitat.

Other broadleaf habitat described in the survey area include quaking aspen, with an understory dominated by wild rose (*Rosa woodsii*). This habitat was described at multiple sites including, the Birch Creek Diversion, McGee Creek Diversion, Powerhouse No. 2 and Intake 3, the confluence of South Fork Bishop Creek and Mid Fork Bishop Creek, Intake No. 2 Dam and Reservoir, Lake Sabrina, South Fork Diversion Dam, Green Creek Diversion, and South Lake. As with the riparian mixed hardwood habitat, the aspen habitat was not dense enough in vegetation to be considered suitable habitat. The wild rose understory was dense, but the mid-story was sparse in foliage, and the overstory was not suitably dense enough either.

The habitat at Powerhouse No. 3 Intake 4 is dominated by eastside pine, Great Basin Mixed Scrub, and bitterbush. The general composition of the tree/shrub vegetation at the site is generally not considered to be suitable habitat for willow flycatcher.

6.6.1.2 Management Indicator Species

The MIS report prepared for the Project by the USFS-INF evaluated 11 habitats for evaluation on National Forest Lands. The MIS Report concluded that representative habitat for the following 10 MIS is present in the Project area: aquatic macroinvertebrates (riverine and lacustrine); fox sparrow (*Passerella iliaca*) (Shrubland (west-slope chaparral types); mule deer (Oak-associated Hardwood and Hardwood/Conifer); yellow warbler (*Dendroica petechial*) (Riparian); Pacific tree frog (Wet Meadow); mountain quail (*Oreortyx pictus*) (Early Seral Coniferous Forest and Mid Seral Coniferous Forest); California spotted owl (*Strix occidentalis occidentalis*), American marten (*Martes americana*), and northern flying squirrel (*Glaucomys sabrinus*) (Late Seral Closed Canopy Coniferous Forest); hairy woodpecker (*Picoides villosus*) (Snags in Green Forest); and black-backed woodpecker (*Picoides arcticus*) (Snags in Burned Forest). These MIS was included in the Forest's Category 2: MIS whose habitat is in or adjacent to Project area but would not be either directly or indirectly affected by the Project. Mule deer was the only MIS species observed during the general survey.

6.6.1.3 Mule Deer

An adult female mule deer and her fawn were observed at Bishop Creek Intake 2 Dam along the south end of the lake. Vertebrae were observed within the Green Creek Diversion survey area. Scat was observed at Bishop Creek South Fork Diversion Dam and Bishop Creek Powerhouse No. 2 and Intake 3. Three trail cameras were installed along the flowline and at the existing deer crossings to document wildlife use. One of the cameras was stolen, but two remain at the deer crossings over the flowline. The trail cameras successfully recorded the following species: mule deer, grey fox (*Urocyon cinereoargenteus*), and mountain lion (*Puma concolor*).

Because mule deer are mobile and are known to travel throughout the study area including crossing roads and Highway 6the California Department of Transportation

(Caltrans) was contacted concerning records of mule deer versus automobile collusions along Highway 6. During the 10-year period from January 1, 2007 to December 31, 2017 Caltran recorded 17 vehicle verse deer collision on Inyo Highway 168 from the beginning of the route (Postmile [PM] 0) near North Lake Road to North Fork Bishop Creek Bridge (PM 15.407) (Talbot, 2018).

The photographs taken from the camera stations document wildlife use from September 26 to November 9, 2019. This coincides with the timing of the fall migration of mule deer in the eastern Sierra Nevada. Mule deer spend the summer months at high elevation summer ranges, where there is a higher diversity and higher quality of foraging plants. Most mule deer migrate to lower elevations before the onset of severe winter weather to avoid getting trapped at the summer range (Monteith et al., 2011). The cameras may have documented a portion of the annual fall migration of mule deer using the wildlife crossings at the flowline to travel from high elevation summer ranges to lower elevation winter ranges.

CDFW GPS data points of mule deer locations within the regional vicinity demonstrate that there is a concentration of mule deer above the flowline. The data corroborate the camera findings by showing that the mule deer in the area are using the wildlife crossings.

6.6.1.4 Bat Surveys

6.6.1.4.1 Summer Roost Habitat Assessment

As a result of the summer roost habitat assessment, the powerhouses were determined to be the most suitable for bat day roosting. Appurtenant structures, such as sheds and warehouses, were also inspected; however, no evidence of day-roosting was observed, and the other structures did not provide environmental conditions equivalent to the powerhouses, such as accessibility, thermal insulation, and heat sources. Table 6.6-1 shows the Project buildings inspected and the presence of any roosting sign.

Table 6.6-1 Roosting Signs Observed

Project Building	Sign Present	Potential Maternity Roost
Powerhouse No. 6	None	No
Powerhouse No. 5	Current	Yes
Powerhouse No. 4	None	No
Powerhouse No. 3	Previous	No
Powerhouse No. 2*	Current	Yes

* Powerhouse No. 2 showed evidence of previous, non-maternity day-roosting. The active maternity roost is located in the transformer shed located at this facility (immediately adjacent to the powerhouse).

No sign of roosting was observed in Powerhouse No. 6 or No. 4 and no bat day roosting is anticipated at either facility. Powerhouse No. 3 contained limited bat guano likely resulting from bat night-roosting activity within the powerhouse; no significant bat roosts occurred in Powerhouse No. 3. Powerhouse No. 6 and No. 5 supported active bat day roosting during the survey. The species present could not be determined, but more than five bats were observed roosting in crevices at both powerhouses. Both roosts have potential to support maternity roosting.

Tailraces are channels that convey water away from Project turbines. The tailraces associated with the Project vary in size and diameter at the different powerhouses, but all are concrete and all experience high levels of water flow at intermittent times. The flushing events that occur intermittently in the tailraces are likely to deter any roosting. Regardless, the tailraces at Powerhouses No. 6, No. 5, and No. 2 are substantially taller and wider than the others and have some limited potential to support bat roosting. The underground extent of those tailraces is not accessible for a daytime visual survey.

6.6.1.4.2 Winter Roost Assessment

The powerhouses were determined to be the most suitable for bat roosting. Appurtenant structures, such as sheds and warehouses, were also inspected; however, no evidence of roosting was observed, and the other structures did not provide environmental conditions equivalent to the powerhouses, such as accessibility, thermal insulation, and heat sources. Table 6.6-2 provides the Project buildings inspected and the presence of any roosting sign.

Table 6.6-2 Winter Bat Roosting Signs

Project Building	Sign Present	Potential Winter Roost
Powerhouse No. 6	None	No
Powerhouse No. 5	Possible*	Unlikely*
Powerhouse No. 4	None	No
Powerhouse No. 3	None	Unlikely
Powerhouse No. 2	Possible	Unlikely
*See text for explanation		

No sign of current winter roosting was observed in any powerhouse or associated structure. Powerhouse No. 2 had very light, wide scattering of guano on the floor in the transformer building but no sign of bat use in the powerhouse. The guano in the transformer building was not fresh and could have fallen from summer or more likely late fall use. Another possibility is occasional use during periods when bats are active during winter (i.e., warm temperatures when bats might become active for short periods). Powerhouse No. 5 had a small amount of guano directly below the ceiling rafters where maternity use was identified during the June 10, 2019 survey. It is likely that the guano at this location fell from the remaining accumulation of guano on the rafters. Because no other guano was found in this powerhouse, current winter activity is unlikely.

Powerhouses No. 4 and No. 6 were not considered to have potential winter activity, at least as hibernacula, because of the lack of any secluded and cold roosting locations.

Powerhouse No. 3, while containing no current evidence of bat use, did have a few locations that might serve as at least temporary roosts for torpid bats (i.e., upper ceiling/rafter corners).

6.6.1.4.3 Acoustic Survey

A report of the acoustic survey results is in progress and will be included in the Final Technical Report in 2021. No special status bat species were recorded during the acoustic surveys.

6.6.2 AMPHIBIAN SURVEYS

Yosemite toad, northern leopard frog, or SNYLF were not observed during the surveys, nor were any other amphibian species detected. The lack of detection is most likely attributable to the timing of the surveys, although overnight temperatures during the surveys were mild with the lowest temperature recorded at 37° Fahrenheit (°F). The timing of amphibian surveys, occurring in conjunction with electrofishing, may have coincided with the overwintering of some amphibians rendering them undetectable.

Suitable terrestrial habitat for Yosemite toad, SNYLF, and northern leopard frog was present throughout all the survey areas. Suitable breeding habitat was present in all the survey areas for northern leopard frog. Breeding habitat for Yosemite toad and SNYLF, however, is present only at South Branch 1, Middle Branch, South Branch 2, and South Branch 3.

6.7 DISCUSSION

The studies completed along with the literature reviewed have produced data sufficient to address the objectives identified. No focused surveys for northern goshawk were determined to be necessary upon determining that the species is actively nesting within the survey area. Wildlife cameras continue to be deployed along the flowline and will be removed in fall 2020. The additional data collected for the remaining months of the wildlife camera studies are likely to support the findings made thus far.

A 2015 joint study by the USFWS, CDFW, Point Blue Conservation Sciences (PBCS), and Bishop Paiute Tribe found no southwestern willow flycatcher migrating or nesting along Bishop Creek. Of the 36 sites surveyed from Bishop Creek to Mono Lake, the Owens River was the closest site to the Project area that found willow flycatcher nesting territories. The findings from the current survey corroborate the results by the USFWS as neither suitable breeding habitat. In addition, no southwestern willow flycatchers were observed in the survey areas around Project facilities along Bishop, Birch, and McGee creeks.

No Yosemite toad, northern leopard frog, and SNYLF was observed during the surveys. These species are not expected to occur for the following reasons:

- Abundance of predatory fish species throughout Bishop Creek.
- Northern leopard frog was last recorded in Birch Creek area in 1960.

- Yosemite toad has never been recorded within the Bishop Creek Watershed.

Table 6.7-1 discusses the relevance of the studies completed with respect to study objectives identified for the Project.

Table 6.7-1 Relevance of Studies to Objectives

Study Objective	Relevance of Studies Completed
Determine if the resident mule deer herd and/or other wildlife species are affected by or alter their migratory patterns in response to Project infrastructure or operation and evaluate the use at existing crossing structures to determine adequacy.	The camera studies conducted have confirmed mule deer and other species are utilizing the wildlife crossings over the flowline throughout the year. Also, CDFW mule deer tracking data analysis shows that mule deer occur on both sides of the flow line. Although there is no temporal data associated with the points, the cluster of points near the deer crossing seems to confirm the camera observations. This objective has been satisfied.
Identify management and other special status species from existing information and site-specific surveys that possess a high potential for occurrence in or utilize the Project's powerhouses, ancillary facilities, and operations areas for nesting, roosting, foraging, and sheltering during any portion of their life cycle. For those species with a high potential to occur or that have been determined to utilize the powerhouses or other Project facilities, determine time/season of usage at those locations.	No special status wildlife species were observed hibernating, wintering, roosting, or nesting at any of the Project facilities during any of the surveys conducted. Use of Project facilities for nesting by special status birds was determined during the 2019 wildlife surveys. Use of Project facilities for roosting, hibernating, or wintering special status bat species was determined during the 2019/2020 summer and winter bat surveys. Wildlife camera data confirms year-round use of the wildlife crossings by mule deer and other wildlife species. This objective has been satisfied with the current studies.
Special status species are defined as wildlife species listed as endangered or threatened under the federal and state ESAs by USFWS and CDFW or species which have been determined to be sensitive or of special concern because of declining populations or rarity in the Project area by the USFS, BLM or CDFW.	The study results have no relevance for this objective.
For those special status species with high potential of utilization, or have been determined to be present, assess potential for Project impact. Identify the potential effects of continued Project operations on the habitats and associated wildlife within the Wildlife Study Plan Area.	No special status wildlife species were observed hibernating, wintering, roosting, or nesting at any of the Project facilities during any of the surveys conducted. The data collected by the current studies is adequate to address this objective.
Provide Resource Management Plans and Guidelines so that future Project facilities and operations are consistent with the Desired Conditions described in the Land Management Plan for the Inyo National Forest (USDA, 2018) as they relate to ecological sustainability and diversity of plant and animal communities.	The habitat and species occurrence data collected by the studies conducted will be adequate for preparing the resource management plans and guidelines to be completed as part of the licensing effort.

6.8 CONSULTATION SUMMARY

SCE distributed three periodic progress reports on the following schedule:

- Progress Report 1: December 19, 2019
- Progress Report 2: April 14, 2020
- Progress Report 3: July 24, 2020

Eight technical memoranda summarizing the 2019 study implementation were submitted with Progress Report 2. Following that filing, SCE hosted a TWG meeting on May 7, 2020 to discuss the 2019 study season, work completed to date and the technical memoranda. After the meeting, TWG members submitted comments on the technical memoranda and SCE provided a general response to those comments as part of Progress Report 3. Table 6.8-1 includes updated responses to those comments.

Table 6.8-1 Updated Comment Responses from May 7, 2020 Technical Working Group Meeting

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response
17	Bishop Creek General Wildlife Technical Memo	May 21, 2020	CDFW	The technical memorandum did not assess if the resident mule deer herd/and or other wildlife species are affected by or alter their migratory patterns in response to Project infrastructure or operation. The technical memorandum only provides evidence that some deer are using the existing crossing structures.	Technical memorandum were provided as a supplement to the progress reports and are interim work-products intended to summarize work to date and help the team prepare for additional field work. This analysis would typically occur after the ISR and associated meeting. The camera studies documented both mule deer and other wildlife species using the wildlife crossings over the flowline. The CDFW mule deer tracking data analysis further confirms mule deer are occurring on both sides of the flow line.
18	Bishop Creek General Wildlife Technical Memo	May 21, 2020	CDFW	The technical memorandum identifies management species and other special-status species and the parts of the Project area they utilize but the time/season of usage at the locations should be more thoroughly described for all species.	As a result of the current studies, no special status wildlife species were observed hibernating, wintering, roosting, or nesting at any of the Project facilities during any of the surveys conducted. Use of Project facilities for nesting by special status birds was determined during the 2019 wildlife surveys. Use of Project facilities for roosting, hibernating, or wintering special status bat species was determined during the 2019/2020 summer and winter bat surveys. Wildlife camera data confirms year-round use of the wildlife crossings by mule deer and other wildlife species.
18	Bishop Creek General Wildlife Technical Memo	May 21, 2020	CDFW	This goal/objective was not addressed in the technical memo: *For those special status species with high potential of utilization, or have been determined to be present, assess potential for Project impact. Identify the potential effects of continued Project operations on the habitats and associated wildlife within the Wildlife Study Plan Area.*	The technical memoranda were provided as a supplement to the progress reports and are interim work-products intended to summarize work to date and help the team prepare for additional field work. Special status species observed in the Project Area are identified in Table 6.2-1. Potential project impacts relative to the goal/objective referenced will be discussed in the Final Technical Reports in 2021.
20	Bishop Creek General Wildlife	May 21, 2020	CDFW	Resource Management Plans and Guidelines should be provided in the technical memo.	The technical memoranda were provided as a supplement to the progress reports and are interim work-products intended to summarize work to date and help the team prepare for additional field work.

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response
	Technical Memo				SCE agrees that this will be appropriate and useful information when we are conducting the impact analysis, relative to our goals and objectives. This analysis would typically occur after the ISR and associated meeting.

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7 BISHOP CREEK INSTREAM FLOW NEEDS ASSESSMENT INITIAL STUDY REPORT (AQ 1)

7.1 INTRODUCTION

During TWG meetings, SCE and stakeholders identified the need for an Instream Flow Needs Study Plan that focused on creeks located below Project plant diversions, and to a lesser extent on Birch and McGee creeks below Project diversions. This Study Plan details SCE's study objectives, study area, methods, results, and discussion of the study effort.

7.2 STUDY OBJECTIVES

The goal of this study is to evaluate the effect of Project operation, including the current minimum instream flow releases and channel maintenance flows on aquatic resources of Project streams including the South and Middle forks of Bishop Creek and the Bishop Creek plant bypass reaches and Birch and McGee creeks. A separate Sediment and Geomorphology Study will address the effect of Project operations and facilities on recruitment and movement of large woody debris and coarse sediment on aquatic habitat, specifically of macroinvertebrates.

Project operations may potentially affect habitat suitability in Bishop Creek below each plant diversion depending on the amount of spill allocated to the creek via spill. CDFW proposes to manage Bishop Creek below Powerhouse No. 4 primarily for species indigenous to the Owens Watershed and lower Bishop Creek (specifically Owens sucker [*Catostomus fumeiventris*] and speckled dace). CDFW manages Bishop Creek upstream from Powerhouse No. 4 primarily as a self-sustaining fishery for introduced brown trout (*Salmo trutta*).

There are presently year-round minimum flow requirements for each of the bypass reaches that were established during the prior relicensing, based on the result of a 1986 Physical Habitat Simulation (PHABSIM) model (EA, 1988). These flows vary by stream segment, ranging from 11 to 18 cubic feet per second (cfs). CDFW is concerned that these flows may potentially be outdated for purposes of habitat protection, due to changes in stream morphology, mesohabitat distribution, habitat management and applicable habitat suitability criteria that have ensued over recent decades.

7.2.1 STUDY AREA

The South and Middle forks of Bishop Creek above Powerhouse No. 2, and Bishop Creek between the Powerhouse No. 2 spillway and Powerhouse No. 6 (Figure 7.2-1) were identified by the CDFW as the overall study area for purposes of this study. Reaches below Powerhouse No. 4 are managed primarily for native non-game species including Owens sucker and speckled dace, whereas reaches upstream from Powerhouse No. 4 are managed as a self-sustaining brown trout fishery as the priority. On Birch and McGee creeks, the study area extends from each respective diversion downstream to a point that captures both upper and lower stream geomorphology.

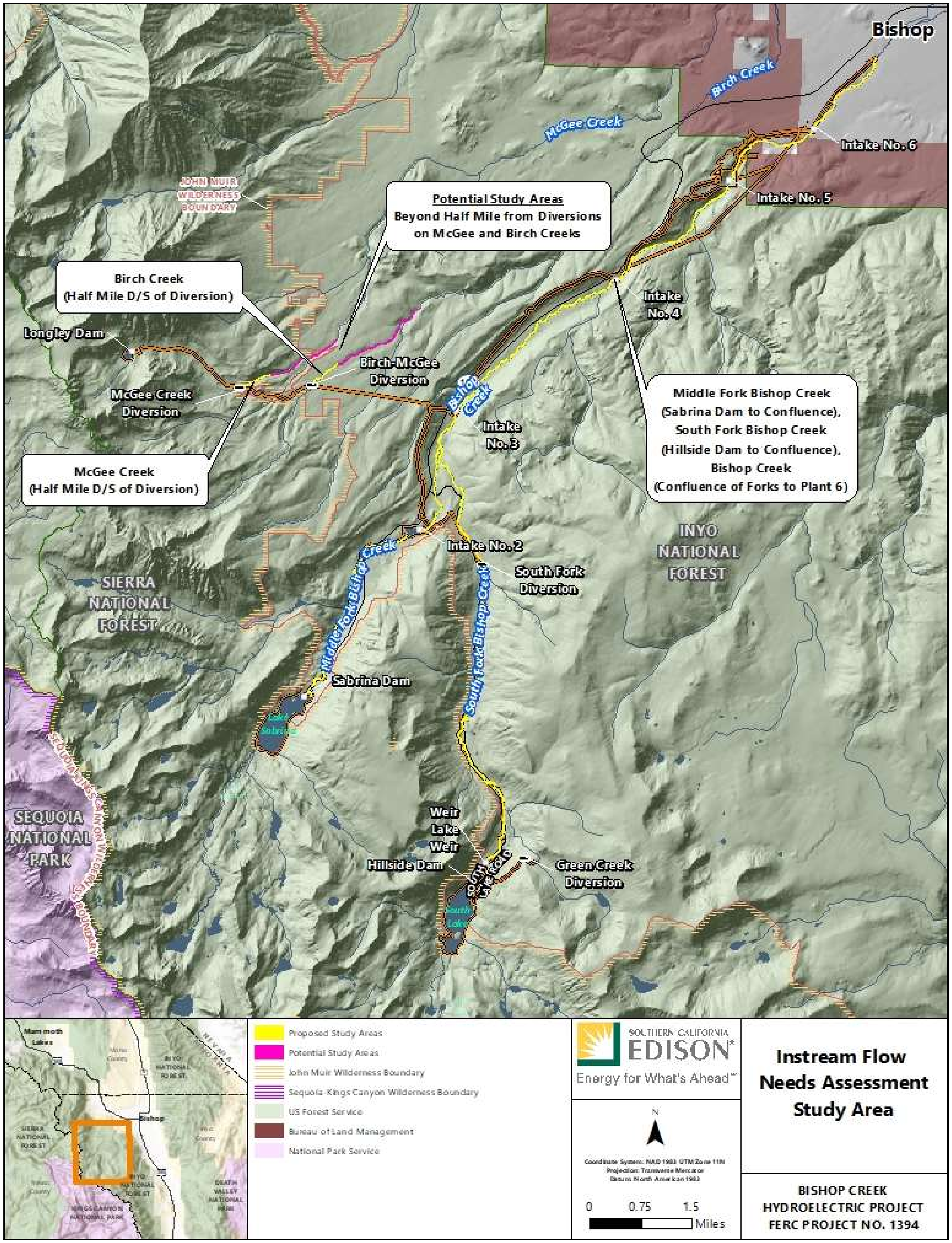

Figure 7.2-1 Instream Flow Needs Assessment Study Area

7.3 METHODS

The scope of this study is to quantify the effects of Project bypass reach flows on aquatic habitat suitability for both the Bishop Creek watershed, and Birch and McGee creeks aquatic community to support its managed fish resources. These data would be used in conjunction with hydrologic, operational, and other models to evaluate the costs and benefits of providing alternate flows to the targeted reaches of the Project.

CDFW recommended an Instream Flow Incremental Methodology (IFIM) study for Bishop Creek watershed to develop an understanding of key habitat-flow relationships in the study area and to serve as a basis for negotiating instream flow recommendations for the Project. This may be quantified by models such as PHABSIM or its equivalent. The model will be used to simulate reach-specific habitat suitability at various flow increments representing selected fish species. One-dimensional (1-D) (transect-based) hydraulic models will be used to simulate channel hydraulics in various areas of interest.

A simplified IFIM approach using empirical data rather than simulation was used to assess flows in two reaches of Bishop Creek unsuitable for PHABSIM modeling, and on Birch and McGee creeks.

Consistent with IFIM protocol, a study team comprised of agency and SCE biologists, along with aquatic TWG members, made technical decisions regarding input parameters and review of study results. Specifically, the team provided input on:

- specific spatial and temporal habitat management goals,
- boundaries of the study area and reaches,
- locations of specific representative or critical study sites, and study site transects,
- habitat suitability index (HSI) criteria for applicable species and life stages, and
- calibration of flows and the range of flows to be assessed.
- These decisions were made during the 2019-2020 winter and spring, on multiple conference calls with the TWG, agencies, and SCE.

7.4 MODIFICATIONS TO METHODS

7.4.1 STUDY SITE SELECTION AND MESOHABITAT MAPPING

The proposed study methods involved a phased approach beginning with mapping mesohabitat distribution in the study area as Phase 1.

Although not specified in the Study Plan, delineation was conducted using a drone to mark mesohabitat boundaries and identify dominant substrates and hydraulics and take detailed photographs of mesohabitat and candidate study sites. The upstream and downstream boundary of each mesohabitat unit within the study area was geo-referenced, and the information transferred to both a GIS format and annotated photos and video clips for TWG review.

7.4.2 DATA COLLECTION AND MODELING

A detailed description of data collection and modeling methods were presented in the draft technical report already reviewed and discussed by the TWG and are hereby incorporated by reference. In summary, habitat-discharge relationships were modeled for selected species and life stages in the study area using standard PHABSIM data collection and flow modeling procedures (Bovee, 1982; Bovee et al., 1998). An empirical flow demonstration study adapting the Habitat Criteria Mapping (HCM) (Stillwater Sciences 2009) method was substituted for PHABSIM in reaches 4, 6, and a portion of reach 8 because these study sites were not conducive to hydraulic simulation with PHABSIM[2]. This kind of approach can be used when a PHABSIM simulation would not be feasible or cost-effective.

7.4.3 MACROINVERTEBRATES

Aquatic macroinvertebrates are substrate oriented; therefore, this study characterized the dominant substrates inventoried during the mesohabitat survey and PHABSIM model. The Final Technical Report will further discuss macroinvertebrate by applying literature to these data relative to how the presence/absence of suitable substrates affect their habitat use in Bishop Creek.

7.4.4 ANALYSIS

The draft technical report documents the methods and results of the study; in the final phase, the basic flow and weighted usable area (WUA) relationships will be applied in consultation with the aquatics TWG to evaluate station operations, habitat suitability, water quality, sediment transport, and hydrology data.

7.4.5 MODIFIED APPROACH FOR BIRCH AND MCGEE CREEKS

An empirical flow study adapting the HCM method was conducted at one site on each creek in September 2020 in accordance with TWG recommendations. Results will be provided in the Final Study Report.

7.5 RESULTS

The TWG reviewed the draft technical instream flow needs technical report on May 7, 2020, which included a detailed discussion of results, including discussion of study reach-specific trends in the data. The tables and figures from that report are enclosed in Appendix AQ-1 for reference and not discussed further in this ISR.

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[2] turbulent, high gradient channel conditions in reaches 4 and 6, and complex braided channel conditions in part of reach 8.

7.6 Discussion

The goal of this study is to evaluate the effect of existing and alternative Project operations on aquatic resources of Project streams (including the current minimum instream flow bypass releases and channel maintenance flows). Each bypass reach is presently subject to minimum flows established during the prior relicensing. These data quantify the relationship between incremental changes in discharge and habitat suitability represented by the various evaluation species and lifestages selected by the TWG across a broad spectrum of flows. These data do not point toward a single binary “right” answer but are intended to be used in conjunction with operations, water quality and sediment transport data to balance aquatic habitat management objectives with existing and proposed operating conditions.

7.7 Consultation Summary

SCE distributed three periodic progress reports on the following schedule:

- Progress Report 1: December 19, 2019
- Progress Report 2: April 14, 2020
- Progress Report 3: July 24, 2020

Eight technical memoranda summarizing the 2019 study implementation were submitted with Progress Report 2. Following that filing, SCE hosted a TWG meeting on May 7, 2020 to discuss the 2019 study season, work completed to date and the technical memoranda. After the meeting, TWG members submitted comments on the technical memoranda and SCE provided a general response to those comments as part of Progress Report 3 (Table 7.7-1).

Table 7.7-1 Updated Responses to Comments from May 7, 2020 Technical Working Group Meeting

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response
21	Instream Flow Incremental Methodology Technical Memorandum	May 21, 2020	CDFW	This goal was accomplished as written in the technical memorandum, but it differs from the *Goals and Objectives* stated in the *Volume III Technical Study Plans*. The technical memorandum did not address Section 3.1.2.8 Macroinvertebrates in Technical Study Plans: SCE intends to address the potential impacts within the Phase 1 IFIM study, by characterizing the dominant substrates inventoried during the mesohabitat survey and applying literature to discuss how the presence/absence of suitable substrates affect their distribution.	The October 4, 2019 Mesohabitat Survey memorandum briefly described reach-specific dominant substrates and discussed with the TWG during the related conference call. These were subsequently quantified in greater detail on each PHABSIM transect, each of which was selected in consultation with the CDFW and other TWG participants as representative of habitat conditions within each reach. In general, substrates were dominated by boulder but with patches of gravel, and cobble, all of which are substrates suitable for macroinvertebrates. SCE will describe these substrates in the context of macroinvertebrate habitat as part of the Final Technical Report in 2021.
22	Instream Flow Incremental Methodology Technical Memorandum	May 21, 2020	CDFW	The intended meaning of "optimal habitat suitability" should be defined in the methods section, or possibly replaced by a more appropriate term….Most of the brown trout weighted usable area (WUA) curves do not reach their peak in the narrow range of flows that were simulated. Therefore, the 'optimum' cannot be stated. The study design does not require the determination of optimal, so replacement of the term with a more appropriate term should not be controversial. CDFW recommends replacing the term 'optimum' with 'modelled boundary' in most cases.	SCE notes CDFW's distinction and will address this in the Final Technical Report. SCE notes that the CDFW's general comment that "*Most of the brown trout weighted usable area curves (WUA) do not reach their peak in the narrow range of flows that were simulated*" is only partially correct, and primarily applies to only the adult life stage within certain reaches. The report confirms that juvenile brown trout WUA peak at flows within the model range in all except two study reaches, and most commonly at flows at the lower end of the modeled range. In all cases habitat suitability for juvenile trout increased only slightly throughout the higher range of flows. Adult WUA peak in three of the study reaches within the flow range, and the data generally show that of the remaining reaches, incremental gains in adult WUA at flows greater than 25- 50 are very slight up to 100 cfs.

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response
					<table><tr><td>Reach</td><td>Juv. Trout (peak WUA flow)</td><td>Adult trout (peak WUA flow)</td></tr><tr><td>1</td><td>25 cfs</td><td>Minimal WUA at all flows</td></tr><tr><td>2</td><td>50 cfs</td><td>Minimal WUA gains at higher flows</td></tr><tr><td>3</td><td>6 cfs</td><td>20 cfs</td></tr><tr><td>5</td><td>100 cfs</td><td>100 cfs</td></tr><tr><td>8</td><td>50 cfs</td><td>Minimal WUA gains at higher flows</td></tr><tr><td>9</td><td>6 cfs</td><td>Minimal WUA gains at higher flows</td></tr><tr><td>10</td><td>6 cfs</td><td>37 cfs</td></tr></table> SCE appreciates having the discussion regarding WUA but does not agree that maximum trout WUA is necessarily the goal or metric that should drive our analysis.
23	Instream Flow Incremental Methodology Technical Memorandum	May 21, 2020	CDFW	Page 2-9. The reference to 'adult suitability' should be clarified to indicate which species is being characterized.	SCE notes CDFW's recommendation and will address this in the Final Technical Report in 2021.
24	Instream Flow Incremental Methodology Technical Memorandum	May 21, 2020	CDFW	Page 2-10. Use of the word 'embankments' to describe habitat in the reach 5 study site should be reconsidered. To the best of our knowledge no embankments have been constructed within the referenced site.	SCE notes CDFW's distinction and will address this in the Final Technical Report in 2021.

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response
25	Instream Flow Incremental Methodology Technical Memorandum	May 21, 2020	CDFW	Page 3-2. References to the Stillwater report should be 'in prep,' not 'in press.'	SCE notes CDFW's distinction and will address this in the Final Technical Report in 2021.
26	Instream Flow Incremental Methodology Technical Memorandum	May 21, 2020	CDFW	Page 3-3. The statement 'Maintaining wild populations [of fish] means that recruitment from younger life stages should be optimized' is not correct. No evidence suggests the population is recruitment limited. Maintaining wild populations depends on provision of adequate habitat for populations of adults, not maximizing recruitment.	SCE notes CDFW's distinction; SCE's observation was merely to note that the adult fish lifestage must be recruited from younger lifestages such as juveniles and therefore the importance of managing nursery habitat should not be overlooked.
27	Instream Flow Incremental Methodology Technical Memorandum	May 21, 2020	CDFW	Page 3-3. The phrase 'ichthyomechanics in terms of navigating velocities' should be restated using broadly accepted vocabulary. We suspect the intention is to refer to bioenergetics.	SCE notes CDFW's distinction. However, ichthyomechanics refers to the ability of a fish's swimming strength and agility, whereas bioenergetics refers to metabolic processes that support the animal's ability to swim. Based on this definition, SCE feels the term is correctly applied.

7.8 REFERENCES

Bovee, K.D. 1982. A guide to stream habitat analysis using the instream flow incremental methodology. (Office of Biol. Service FWS/OBS-82-26). Washington, DC.: USFWS, U.S. Dept. of Interior.

Bovee, K.D., Lamb, B.L., Bartholow, J.M., Stalnaker, C.B., Taylor, J. & Henriksen, J. (1998). Stream habitat analysis using the instream flow incremental methodology. (Biological Resources Division Information and Technology Report USGS/BRD-1998-0004/ viii). U.S. Geological Survey.

EA Engineering, Science, & Technology, Inc. (EA). 1988. Instream flow and fisheries report for the Bishop Creek Hydroelectric Project. EA Engineering, Science, & Technology, Inc. Lafayette, California prepared for Southern California Edison, Rosemead, CA.

Stillwater Sciences, 2009. Lower McCloud River Instream Flow Study (FA-S8) Technical memorandum 56 (TM-56). Habitat Criteria Mapping on the Lower McCloud River. 60 pp.

APPENDIX AQ-1

HABITAT SUITABILITY TABLE

See Volume II

8 BISHOP CREEK OPERATIONS MODEL INITIAL STUDY REPORT (AQ 2)

8.1 INTRODUCTION

During the TWG meetings, SCE and stakeholders identified the need to develop a user-friendly Operations Model to assist stakeholders and SCE to identify key hydrologic connections among the components of the Project. The Operations Model facilitates an understanding of how potential changes to the system or its operation may influence the hydrology of the Project area.

Continued Project O&M, and other activities including PME measures implemented during a new license will require an understanding of the existing relationship between hydrology and Project operations. Proposed studies will evaluate the potential impacts of the Project's continued operations on the existing aquatic and riparian environment. A tool is needed to inform these study efforts and to evaluate the feasibility of any proposed operational changes that may be considered a result of those efforts.

8.2 REVIEW OF EXISTING INFORMATION

The Operations Model would combine physical attributes of the power generation facilities, basin hydrology, legal, and regulatory considerations to obtain a mathematical representation of how water could be routed under alternative hydrologic regimes and regulatory scenarios. Therefore, this section reviews available data to develop the most appropriate inputs.

8.2.1 PROJECT FLOW ROUTING

The Project diverts water at three points: Green Creek at the Green Creek Diversion, McGee Creek at the McGee Creek Diversion, and Middle Fork Bishop Creek at Lake Sabrina.

Starting at the Green Creek Diversion (10,264.0 feet mean sea level [msl]) water flows through a pipeline to South Lake and is then released through Hillside Dam (9757.6 feet msl) into South Fork where it meets with the remaining flows from Green Creek that were not diverted. Together this water flows down the South Fork to the South Fork Diversion (8211.0 feet msl). At the South Fork Diversion structure, a portion of the flow is diverted through a pipeline to Intake No. 2 (8105.0 feet msl), and the remainder continues to flow down South Fork. Upper watershed areas contributing to the Middle Fork drain into Lake Sabrina. Reservoir water exits through Sabrina Dam (9137.9 feet msl) into the Middle Fork which flows approximately 1 mile before converging with North Fork. The combined waters from the Middle and North forks of Bishop Creek flow to Intake No. 2 Dam (8104.8 feet msl) which also receives water from the South Fork Diversion flowline. From Intake No. 2 Dam, the water enters a 2.1-mile-long flowline and a 0.5-mile-long penstock which connects to Powerhouse No. 2 sited on Bishop Creek.

Powerhouse No. 2 receives water which originates from Longley Lake Dam (McGee Lake) and upper portions of the Birch Creek watershed. Longley Lake Dam (10,708.0 feet msl) discharges water to McGee Creek where it flows over 1 mile before it is intercepted by the McGee Creek Diversion (9192.0 feet msl). The diversion spillway connects to an open ditch and steel pipe which exits to Birch Creek. After entering Birch Creek, the water flows approximately 0.5 mile before being diverted again by the Birch Creek Diversion (8304.0 feet msl). At this point, the water enters a pipe where it descends over 1100 feet in elevation to Bishop Creek Powerhouse No. 2.

From this point on, a portion of the water flows down Bishop Creek and a portion is conveyed through a series of pipes and penstocks connecting Powerhouses Nos. 2, 3, 4, 5, and 6. Each powerhouse and intake controls the portion of water entering the creek and the portion directed into the pipe and penstock conveyances. After Powerhouse No. 6, Bishop Creek flows to the Bishop community and the Owens Valley. A 1.79-mile ditch (Abelour ditch) carries water discharged from Powerhouse No.6 penstock to the Rocking K subdivision.

The flowlines described above are considered the functional nodes that must be considered in the Operations Model Figure 8.2-1

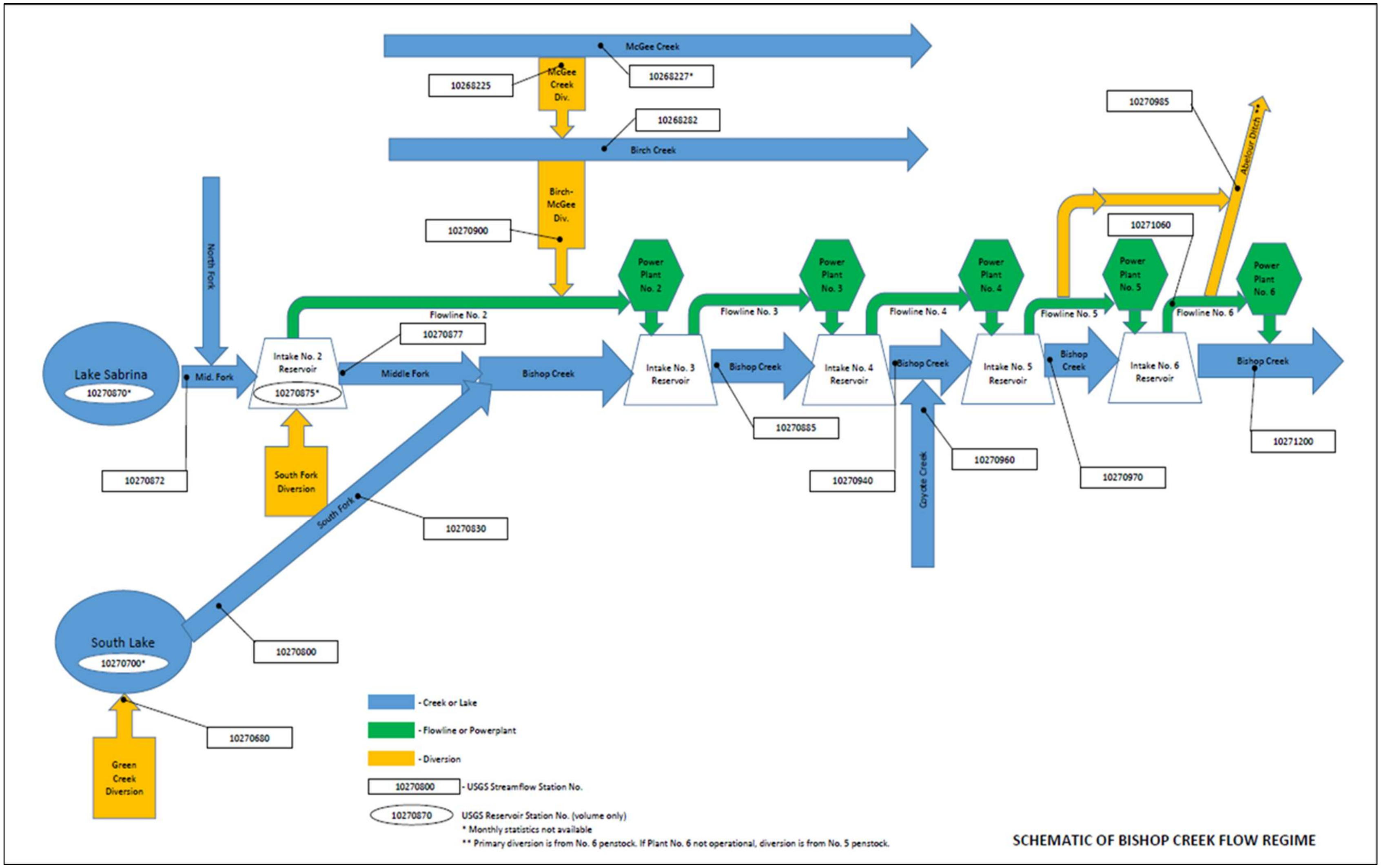


Figure 8.2-1 Bishop Creek Flow Routing

8.2.2 PROJECT HYDROLOGY

Flows vary monthly, depending on the amount of runoff and SCE's release schedule, which is dictated by snowpack, snow melt, spring rain events, drought, power demand, and irrigation. At the lower end of the system, the peak runoff occurs from May to August. Annual runoff averages 100 cfs, with calculated monthly mean flows ranging from 41 cfs to 285 cfs. SCE reviewed and compiled the natural hydrograph for the period of record which includes 29 years of flow data (Figure 8.2-2**Error! Reference source not found.**) based on the stream gauges identified in Figure 8.2-1. From these data, curves representing normal, dry, and wet years were used in the Operations Model (Figure 8.2-2).

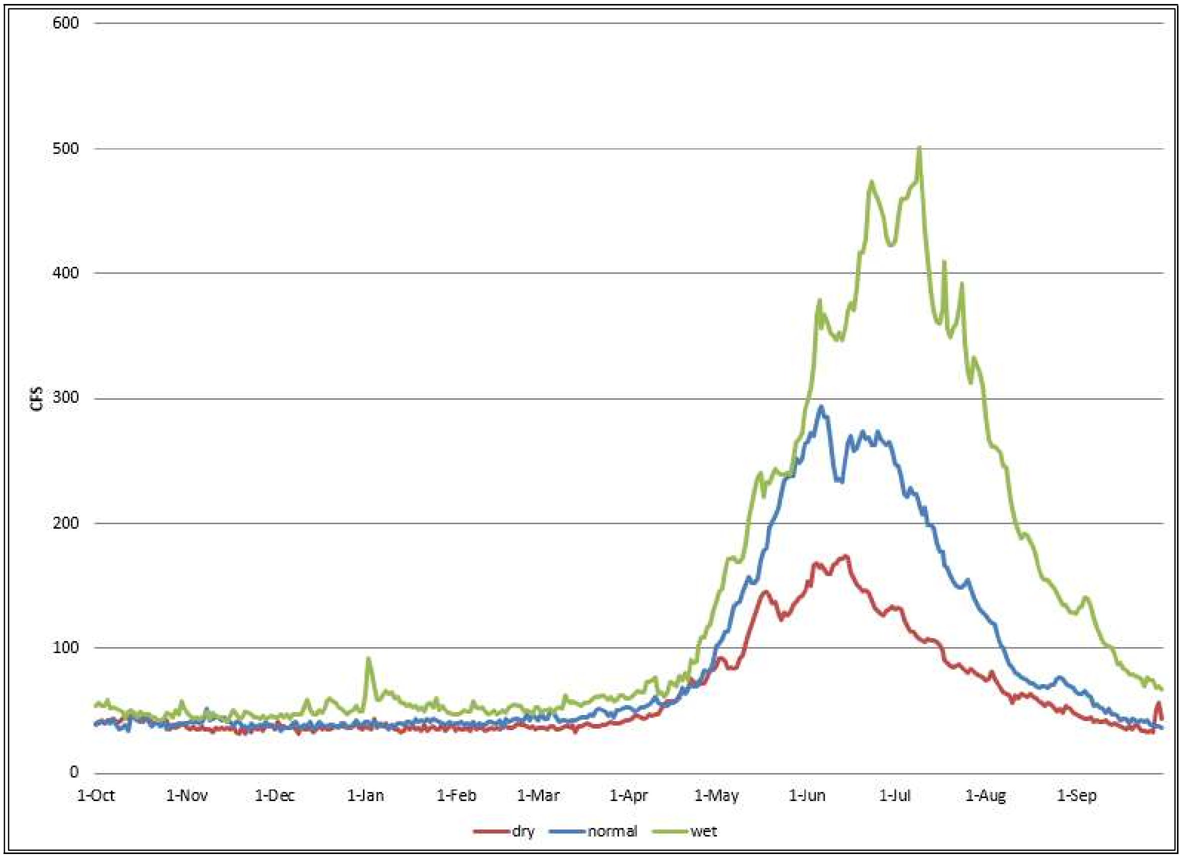


Figure 8.2-2 Representative Dry, Normal, and Wet Years from the Natural Hydrograph on Bishop Creek (1989-2017)

The regulated reaches between Lake Sabrina and Intake No. 2 and between South Lake and South Fork Diversion experience similar flow fluctuations. Because these reaches aggregate and convey all Project flows, they are never as low as the flows in the diverted sections. During wet years, the regulated reaches have much higher flows. The current license requires minimum flow releases into diverted reaches.

Table 8.2-1 Acre-Feet of Unregulated Flow in Bishop Creek Drainage

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1988-89	2344	2276	2561	2428	2107	2877	5093	6734	8896	5453	3240	2774	46783
1989-90	2735	2212	2025	2252	2052	2258	4032	6231	8956	7339	3595	2559	46246
1990-91	2264	1887	1761	1780	1551	2675	2381	6090	14240	10072	4214	2975	51890
1991-92	1949	2128	2010	1995	2062	2102	3921	9524	7672	5213	3607	2278	44461
1992-93	2028	2080	2206	2819	2341	2583	3605	11888	17907	18746	8809	3563	78575
1993-94	2162	1818	2032	1804	1829	2176	3640	8509	12265	7245	3889	2920	50289
1994-95	3855	2415	2331	3437	2357	4129	3826	8047	21531	33241	19359	8813	113341
1995-96	4047	2967	3325	3171	3535	3677	5735	13617	21594	17572	10010	4721	93971
1996-97	3192	3678	3799	6110	3220	4116	6572	17619	19068	12843	7886	4680	92783
1997-98	3033	3025	3283	3087	3585	3385	4026	7002	19400	29141	13644	7994	100605
1998-99	3612	3672	2923	2834	2773	3065	3432	11193	15874	10355	5355	3541	68629
1999-00	2568	2058	1973	2306	2619	3024	3811	12227	16161	8353	5302	2929	63331
2000-01	2299	2468	2205	2303	2269	3232	4273	16884	11517	8166	4596	3141	63353
2001-02	2370	1973	2292	2500	2277	2064	3915	7555	12947	7674	3405	2326	51298
2002-03	2203	2736	2585	2428	2057	2426	3030	10681	17567	9512	4837	3023	63085
2003-04	1946	2114	2577	2503	2438	3568	4458	8992	13430	7693	4012	2373	56104
2004-05	2071	2381	2222	2860	2224	2700	3364	13853	18690	23606	9240	3181	86392
2005-06	2529	2363	3187	3079	2077	3225	3967	18152	27528	23814	8202	4238	102361
2006-07	3422	2846	2882	2704	2488	3085	4006	8621	7528	5551	3738	2749	49620
2007-08	2188	1784	2101	2658	2289	2412	3447	8628	12305	8596	3809	2446	52663
2008-09	2221	2454	2252	2294	2339	2633	3858	12375	11533	11686	4177	2613	60435
2009-10	2880	2118	2315	2484	1933	2299	3551	6333	21450	19011	5613	2572	72559
2010-11	3198	2802	4085	2902	2412	3435	5040	9617	20743	23622	12045	5288	95189
2011-12	4136	3079	2498	2571	2236	2574	4248	7446	6409	5325	4775	2697	47994
2012-13	2444	2147	2512	2259	1847	2282	3484	6513	6907	5132	3423	2113	41063
2013-14	1850	1704	1839	1723	1641	2066	3313	6219	7793	4571	3985	2123	38827

2014-15	1609	1526	1779	1745	1730	1976	2020	4569	6430	4840	2738	1785	32747
2015-16	2390	2057	1989	2128	2075	2554	3861	7848	16580	8205	3557	2005	55249
2016-17	2203	1979	2215	4043	3141	3150	5628	17429	36592	29709	13213	7006	126308
Average	2612	2370	2474	2662	2327	2818	3984	10013	15156	12837	6354	3497	67108

Figure 8.2-3 through Figure 8.2-5 represent the operating rule curve for mean, high and low water years. The area-capacity curves that are used by Project operators to manage reservoir elevation and discharge were included in the Operations Model.

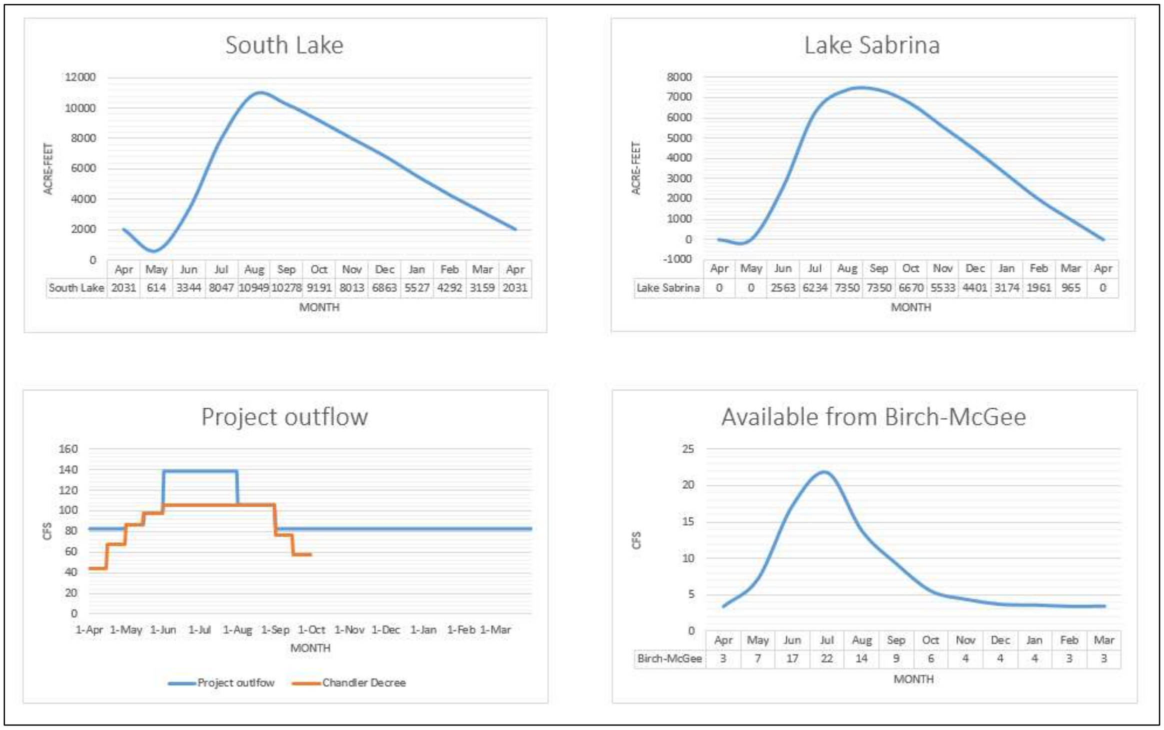


Figure 8.2-3 Operating Rule Curve – Mean Water Year

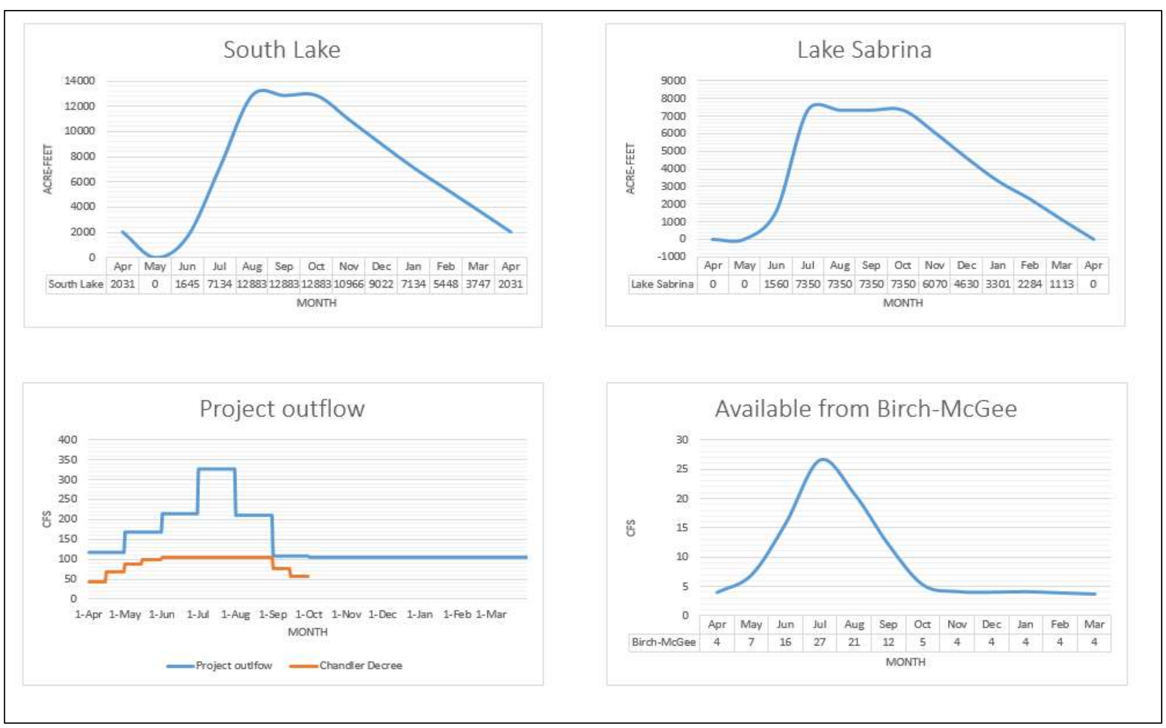


Figure 8.2-4 Operating Rule Curve – High Water Year

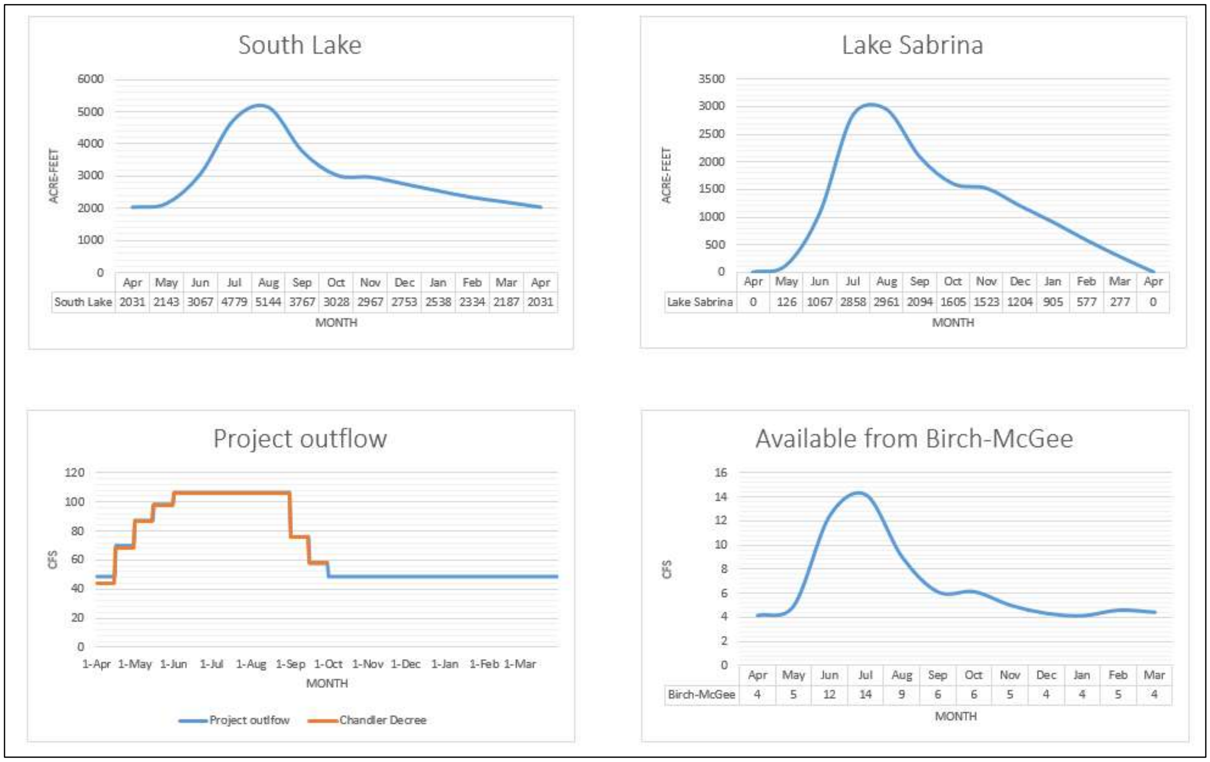


Figure 8.2-5 Operating Rule Curve – Low Water Year

8.2.3 REGULATORY AND LEGAL CONSTRAINTS

Project operations are subject to adjudicated water rights and other agreements that provide for non-power uses. The Chandler Decree is one of the primary controlling documents. The Sales Agreement between Southern Sierra Power Company (predecessor to SCE) and Los Angeles Department of Water and Power (LADWP) addresses SCE's obligations with respect to the waters of Bishop Creek. Within these constraints, SCE manages the releases from the storage reservoirs, for purposes of hydro-generation and meeting water allocation requirements.

The Sales Agreement provides for seasonal maximum carry-over limits of 2147 acre-feet, as measured on or about April 1, annually. Variances from this requirement have been obtained on a case-by-case basis in the past, by mutual-agreement between SCE and LADWP. Additionally, SCE meets with USFWS annually to determine: 1) seasonal minimum storage requirements for recreation purposes; and 2) annual flushing flows.

The Chandler Decree and SWRCB water rights licenses determine how flows are allocated and used, as follows:

- Seasonal diversion and accumulation limit not to exceed historically measured use (i.e., not to exceed current Project capacity), including an annual limit of 1400-acre feet from Green Creek.

- Instantaneous diversion limit at all locations not to exceed historically measured use (i.e., not to exceed current Project capacity), including a daily average limit of 1 cfs for domestic use.
- Minimum Project flow-through (downstream delivery) requirements, for senior downstream water rights holders, are measured below Powerhouse No. 6, as required by the Chandler Decree (Table 8.2-2).
- Minimum instream flow requirement of 0.25 cfs at the Birch Creek diversion, for senior downstream water rights holders, as stipulated by the Chandler Decree.
- Minimum instream flow requirement of 1.6 cfs during the irrigation season, and 0.4 cfs at other times, through the Abelour Ditch, for senior downstream water rights holders in the Rocking K Subdivision.

Table 8.2-2 Daily Average Flow Requirements for Flow below Plant 6

TIME PERIOD	DAILY AVERAGE FLOW (CFS)	INSTANTANEOUS MINIMUM FLOW (CFS)
April 1-15	44	33
April 16-30	68	51
May 1-15	87	65
May 16-31	98	74
June 1 - Jul 31	106	90
August 1-31	106	80
September 1-15	6	57
September 16-30	58	44

Source: Chandler Decree, 1929

In addition, there are required minimum instream flow requirements that are mandated by the Article 105 of the FERC license, as follows:

- Lake Sabrina to Intake 2: no less than 13 cfs or natural flows, whichever is less, year-round
- South Lake to South Fork Diversion: no less than 13 cfs or natural flows, whichever is less, year round
- Southfork Diversion: no less than 10 cfs from Friday of the last weekend in April thru October 31; no less than 7 cfs for the remainder of the year
- Intake 2: no less than 10 cfs from Friday of the last weekend in April thru October 31; no less than 7 cfs for the remainder of the year; or no less than 5 cfs in all months in dry years
- Plant 2 to Plant 3: no less than 13 cfs year-round
- Plant 3 to Plant 4: no less than 5 cfs year-round

- Plant 4: no less than 12 cfs year round (Article 105)[3]
- McGee Creek Diversion: no less than 1 cfs or the natural flow, whichever is less, year round
- Birch Creek Diversion: no less than 0.25 cfs or the natural flow, whichever is less, year round

8.2.4 GENERATION NODES

The generation equipment at the Project includes 5 powerhouses and 14 units as depicted in Table 8.2-3. Each of these units can be operated independently. There exists some uncertainty regarding the effective generating potential for each unit, which can be limited by head, flow, mechanical or electrical constraints. Confirming these limits is one of the objectives of the study.

[3] Article 114 required 18 cfs (or the natural streamflow, whichever is less), however this license condition was removed by order dated February 1, 1995 because of a conflict with the Energy Policy Act of 1992, which hanged how the Federal Land Policy and Management Act (FLPMA) treated lands which had been previously subject to a reservation under Section 24 of the Federal Power Act. The remaining language in Article 105 ambiguous as to whether the minimum flow requirement is 12 cfs or some greater amount negotiated with the CDFW. Historically SCE has been releasing 18 cfs.

Table 8.2-3 Project Generation Equipment Based on Current Exhibit A (2002) and SCE Data Book

PLANT NAME	UNIT NUMBER	UNIT RATED KW	EFFECTIVE KW[1]	CFS UNIT
	Bishop Creek			
Plant 2	1	2500	2600	45
	2	2500	2600	45
	3	2900	2600	45
Total		**7900**	**7800**	**135**
Plant 3	1	2750	2750	50
	2	2750	2750	50
	3	2750	2750	65
Total		**8250**	**8250**	**165**
Plant 4	1	1000	1000	19
	2	1000	1000	19
	3	2180	2100	29
	4	2180	2100	29
	5	2180	2100	29
Total		**8540**	**8300**	**125**
Plant 5	1	2500	2100	71
	2	2813	1700	59
Total		**4532**	**3800**	**130**
Plant 6	1	**2000**	**2000**	**150**
Bishop Creek Total	**14**	**32,003**	**30,015**	

Source: SCE Exhibit A, 2002

[1] Values provided for "effective kilowatt (KW)" are based on operator experience and will be confirmed as part of this study.

8.3 STUDY OBJECTIVES

This Operations Model Study had the following goals and objectives:

Develop a robust Operations Model to assist SCE and stakeholders in understanding how Project operations interact with Bishop Creek hydrology. This Operations Model would be used to make informed decisions regarding the implementation of other relicensing studies. To meet this goal, this Study Plan has the following objectives:

- Accurately model the systems inflows, outflows, and generation nodes.
- Align model with needs of other relicensing studies and information needs.
- Develop procedures to configure model for alternative operational scenarios and document results.

- Determine effective operating limits for all units to accurately represent installed and dependable capacity for licensing documents.
- Ensure that future Project facilities and operations are not inconsistent with the Desired Conditions described in the Land Management Plan for the INF (USDA, 2018) as they relate to ecological sustainability and diversity of plant and animal communities.

8.3.1 STUDY AREA

Figure 8.3-1 shows the study area for the Operations Model. The study includes all Project influenced waters including diverted reaches, bypass reaches, and reservoirs. All hydrologic contributions are incorporated into the Operations Model by either direct measurement or representative synthesis of ungauged drainage area.

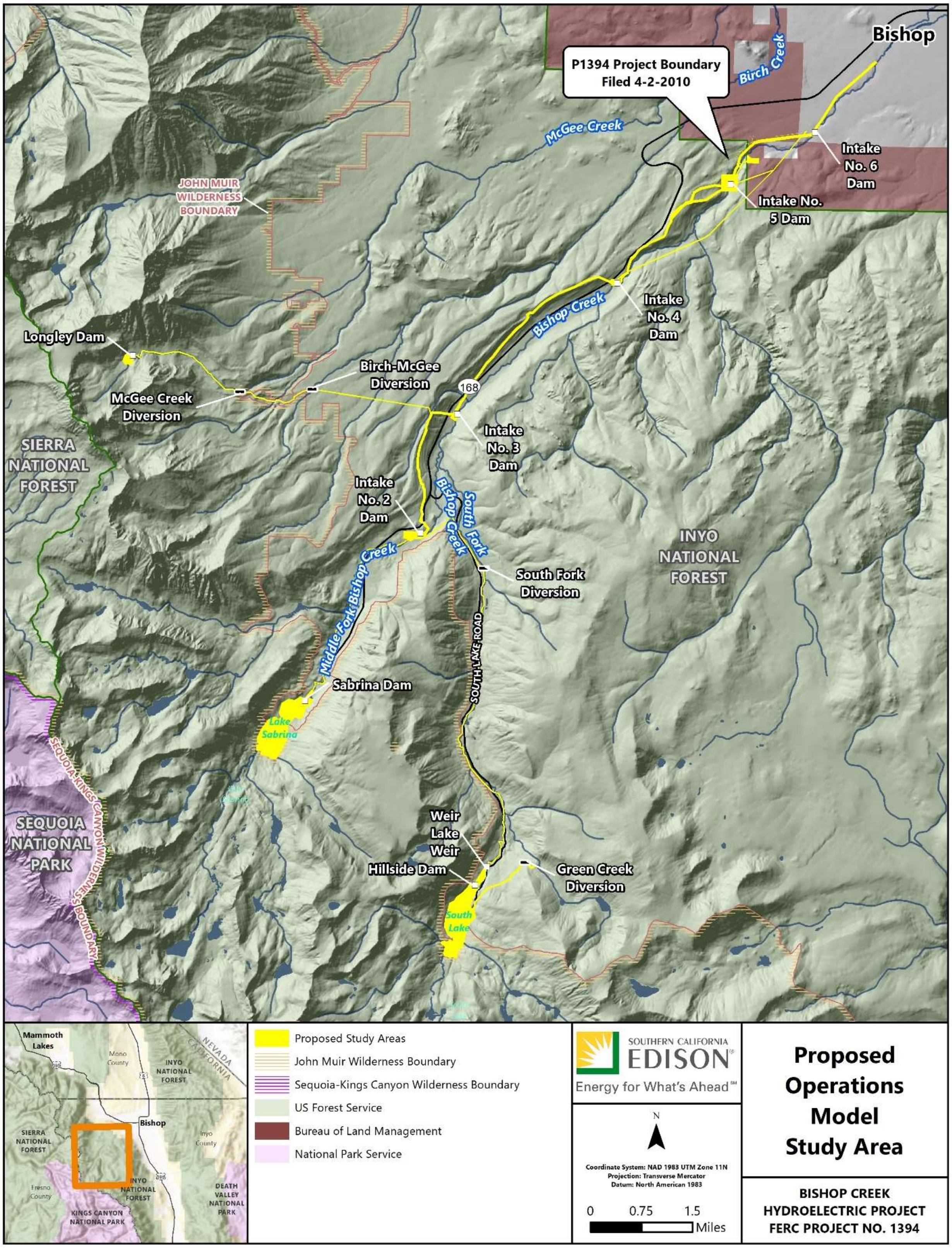


Figure 8.3-1 Operations Model Study Area

8.4 METHODS

The Operations Model combines physical attributes of each component within the system with basin hydrology to calculate effects of alternative operational scenarios. Results of the Operations Model simulations on proposed changes to resource allocation may be used in balancing potential environmental measures effecting stakeholder interests. Beyond physical constraints such as reservoir storage curves and capacities, legal obligations are prioritized in the logic for resource allocation within the Operations Model, which include legal and contractual requirements described by the Chandler Decree and the Sales Agreement between Southern Sierra Power Company and LADWP. For model simulations, these obligations are treated as resource demands that must be accommodated in all scenarios to the extent possible given daily resource availability.

The platform for the Operations Model is Microsoft Excel, which provides a transparent format for stakeholders. While much of the logic imbedded is complex, formulae are visible and can be traced to determine both inputs (precedents) and effects (dependents) in other cells. Components of the Bishop Creek hydro system that are represented within the Operations Model include reservoirs, diversions, tributaries and additional ungauged drainage areas, outlets, penstocks, and hydro stations.

Regulatory scenarios include bypass flow requirements below dams and diversions. Existing flow requirements, which originate from the IFIM studies conducted in the 1990s, have been the subject of additional analysis generated by the Instream Flow Condition Assessment Study Plan.

The general sequence of steps used to create and manage the Operations Model are:

1. Create schematic showing nodes interaction and the primary interactions between each node;
2. Quantify and incorporate physical, regulatory, and legal constraints for each node;
3. Populate model with historic flow datasets;
4. Calculate daily mean flows within and between each node based on requirements and historic storage averages;
5. Calibrate against historic flow records and adjust hydrologic inflows as needed; and
6. Develop documentation for the Operations Model’s use, specifically variable inputs for alternative scenarios, which also describes the Operations Model configuration.

Because the hydrologic input dataset statistically impacts the outcome of model scenarios, the period of record was selected based on available period of record for critical sources, namely the storage reservoirs. The USGS data sources provide daily temporal resolution, and a 30-year period provides adequate representation of current resource utilization.

8.5 MODIFICATIONS TO METHODS

No substantive changes to the Study Plan were made during the development of the Operation Model. Operations Model refinements were made as part of calibration to historical hydrology throughout the development process.

8.6 RESULTS

Mean daily flow data from 1989 through 2019 was used from readily available USGS gauge records, and model logic for allocation of flow was performed on a daily basis. This provides a reasonable period of record reflective of current resource allocation. The limitation of the Operations Model period was based on the availability of daily storage records for both Lake Sabrina and South Lake. The daily storage levels provide a means for flow allocation in model logic and provide a means to calculate Project net inflow, which is critical in the calibration process.

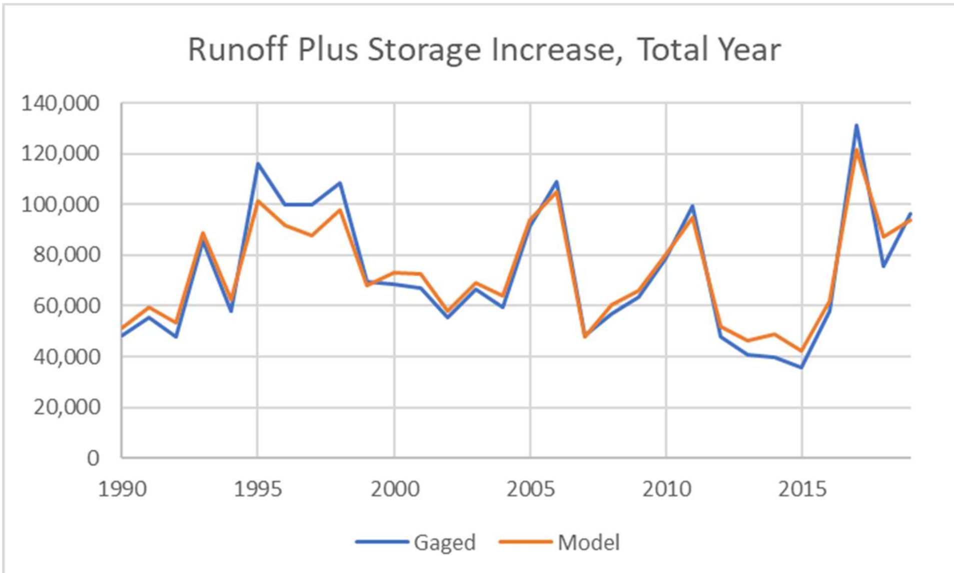
Model operating logic was established using physical constraints for each Project feature as the controlling structure. For example, reservoir spillway elevations are thresholds for storage capacities, beyond which flows are released into the downstream reach. Hydraulic capacities of conveyances and/or powerhouses are upper limits for flows, beyond which water is spilled into downstream or bypassed reaches.

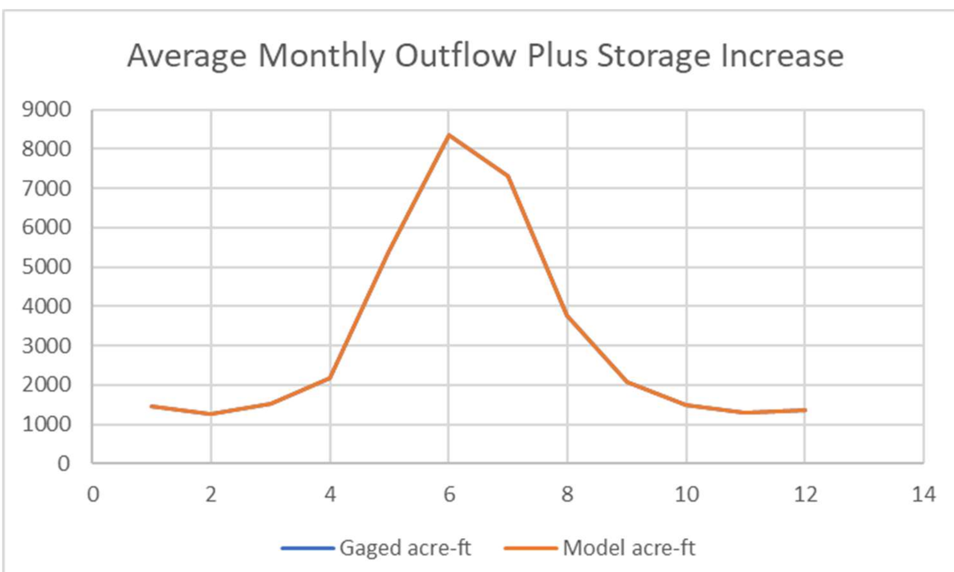
Tertiary to the physical constraints, legal obligations, and regulatory requirements, flows in the model are allocated according to a set of reservoir operating curves that are reflective of the currently license period. While SCE may operate in the interest of generation on any given day, the general allocation of storage is targeted to provide use across annual periods. These reservoir operating curves have been divided into high, low, and mean water years, and are each reflective of average reservoir storage at the beginning of each month for respective year types. Determination of water year type in the model is based upon water content measurements of six snow coursed at the beginning of April, with the annual total compared to the long-term average total. Sums that exceed 25 percent of the long-term average result in using wet-year reservoir operating curves, while those that are below 75 percent of the long-term average use dry-year curves. Interpolation of storage determines the daily target storage, and allocations split from the two reservoirs to follow the curves for each.

This forms the basic architecture for flow routing decisions within the Operations Model and reflects a base scenario that simulates existing operations and historical conditions. The percent of time minimum flow allocations are met has been calculated and can be compared with future changes to allocation. Changes to flow releases may impact the ability of the resource to meet other allocation targets. For example, increasing flow requirements may impact the ability to meet the target on a continuous basis later in the season during dry years.

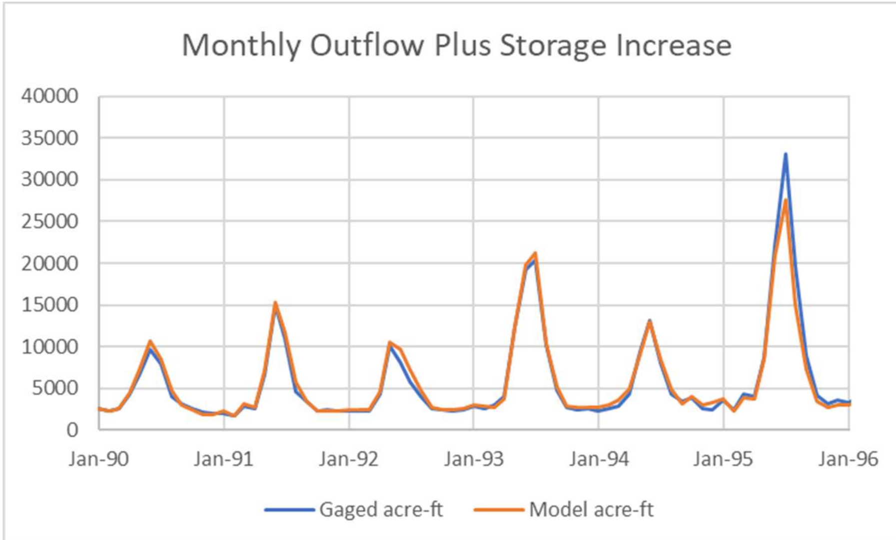
Calibration of the Operations Model was performed to best match historic average monthly gauged inflow to model-predicted inflow. This was performed by calculating the total outflow, combined with the total increase in reservoir storage, for model-predicted and gauge-recorded values. While the monthly average values were matched within

1 percent, the historic annual inflow deviated to some degree, and overpredicted by an average of 3.4 percent for the 3-decade model period. The maximum over-predicted inflow was 22 percent, while the lowest inflow was underpredicted by 13 percent. Deviation from historical is due to ungauged drainage areas and gauge accuracy. Ungauged drainage areas, such as the North Fork tributary and Coyote Creek, were simulated based on historic data. Average monthly flows were synthesized based on these records, correlated with snow course measurements during spring and summer runoff, and based on historic monthly averages where correlation was below 50 percent.





Average Monthly Model Inflow versus Actual Inflow


Monthly Outflow Plus Storage Increase
40000
35000
30000
25000
20000
15000
10000
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Jan-90
Jan-91
Jan-92
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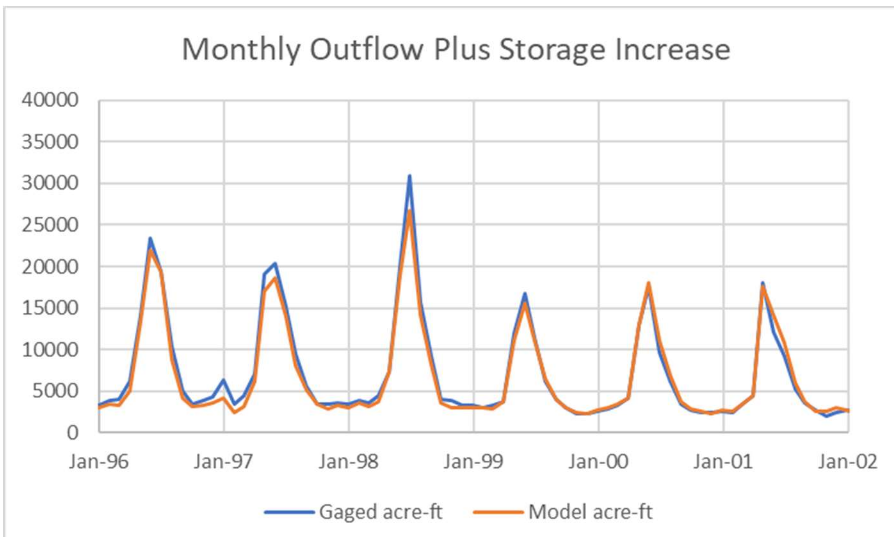
Jan-95
Jan-96
Gaged acre-ft
Model acre-ft


Monthly Outflow Plus Storage Increase
40000
35000
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25000
20000
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Jan-96
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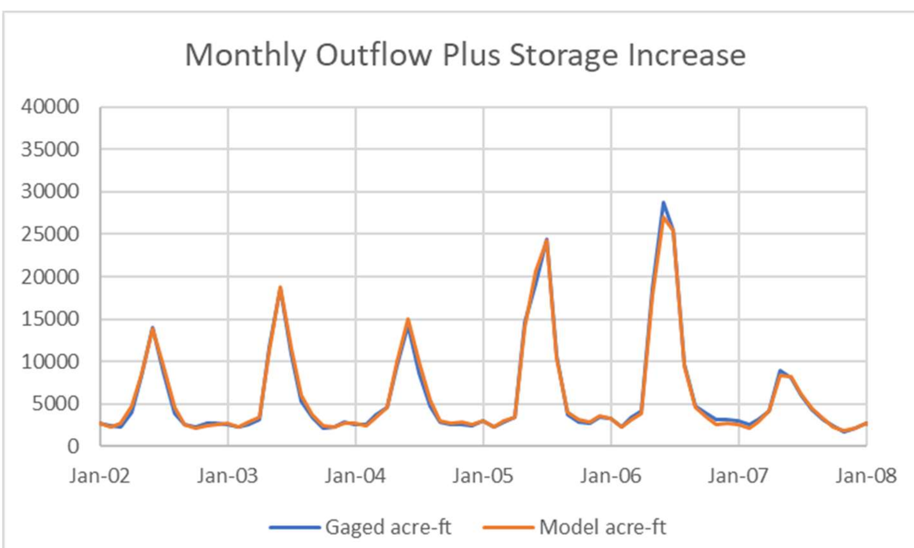
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Gaged acre-ft
Model acre-ft


Monthly Outflow Plus Storage Increase
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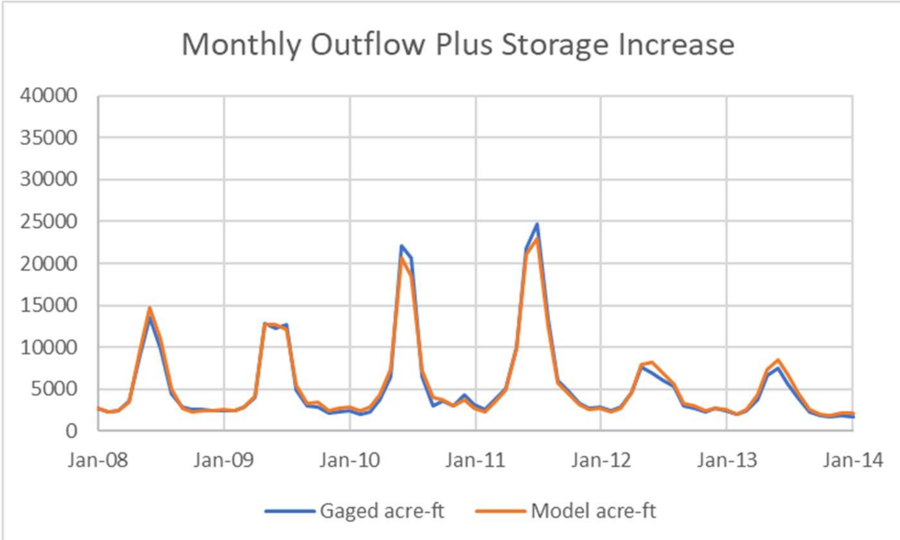
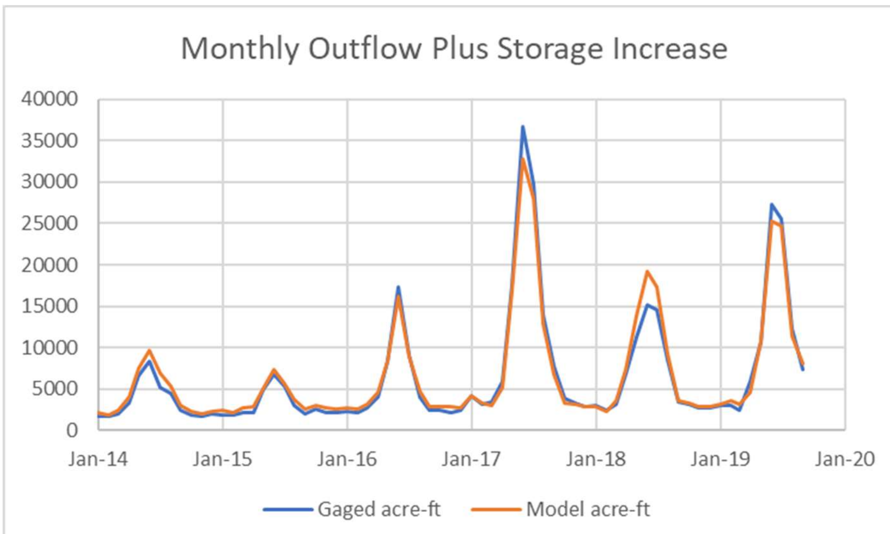
Gaged acre-ft
Model acre-ft





Monthly Inflow, Model-predicted versus Gauged

Confirmation of individual turbine and generator ratings was conducted via correspondence with Project operations personnel, and the sum of these values' limiting ratings compiled for the application process. Critical to the Operations Model was the hydraulic capacities of each individual powerhouse, which in some cases is less than the sum of individual units due to capacity limits of conveyances.

Table 8.6-1 Equipment and Powerhouse Ratings

POWERHOUSE	UNIT	TURBINE TYPE	TURBINE HP[1]	RATED FT[2]	STATIC FT	RPM[3]	TURBINE KW[4]	GENERATOR KVA[5]	P.F.[6]	GENERATOR KW	LIMIT	RATED KW
PH2	1	Pelton Single-jet	3,950	875	951	300	2,947	2,500	1	2,500	Generator	2,500
	2	Pelton Single-jet	3,670	875	951	300	2,738	2,500	1	2,500	Generator	2,500
	3	Pelton Single-jet	3,530	875	951	300	2,633	2,900	0.8	2,320	Turbine	2,320
Total:			11,150				8,318	7,900		7,320		7,320
PH3	1	Pelton Single-jet	4,000	730	809	300	2,984	2,750	0.91	2,503	Generator	2,503
	2	Pelton Single-jet	4,000	730	809	300	2,984	2,750	1	2,750	Generator	2,750
	3	Pelton Single-jet	4,000	730	809	300	2,984	2,750	1	2,750	Generator	2,750
Total:			12,000				8,952	8,250		8,003		8,003
PH4	1	Pelton Single-jet	3,000	1,053	1,112	450	2,238	1,000	1	1,000	Generator	1,000
	2	Pelton Single-jet	3,000	1,053	1,112	450	2,238	1,000	1	1,000	Generator	1,000
	3	Pelton Single-jet	3,000	1,053	1,112	400	2,238	2,180	0.91	1,984	Generator	1,984
	4	Pelton Single-jet	2,850	1,053	1,112	400	2,126	2,180	0.91	1,984	Turbine	1,984
	5	Pelton Single-jet	2,850	1,053	1,112	400	2,126	2,180	0.91	1,984	Turbine	1,984
Total:			14,700				10,966	8,540		7,951		7,951
PH5	1	Francis	2,900	382	418	600	2,163	2,500	0.8	2,000	Turbine	2,000
	2	Francis	2,800	350	418	720	2,089	2,813	0.9	2,532	Turbine	2,089
Total:			5,700				4,252	5,313		4,532		4,089
PH6	1	Pelton Single-jet	2,850	220	263	164	2,126	2,000	0.8	1,600	Generator	1,600
Total Project	14		46,400				34,614	32,003		29,406		28,963

[1]HP horsepower

[2] FT feet

[3] RPM revolutions per minute

[4] kW kilowatt

[5] KVA kilovolt amperes

[6] P.F. power flow

Table 8.6-2 Powerhouse Flow Capacities

Powerhouse	Maximum Flow Capacity (cfs)
PH2	120
PH3	164
PH4	125
PH5	131
PH6	133

The total Project dependable capacity is related to hydrologic availability and any other system limitations. Because reservoir operations can be used for flow allocation to all Projects, only the depletion of the storage would cause limitation on capacity. The highest hydraulic capacity is 164 cfs (Powerhouse No. 3), storage is historically availably 98 percent of the time to provide an 8-hour generation cycle at that flow rate. The dependable capacity for Bishop Creek is therefore considered the rated capacity of 28,963 kilowatts (KW).

Project facilities and operations are evaluated based upon pertinent TWG studies for adherence to desired conditions for the Land Management Plan, using the Operations Model to balance the allocation of hydrologic resources. This Study Plan provides the vehicle for the evaluation, to be used by various stakeholders to balance interests and resources for ecological sustainability and diversity of plant and animal communities.

8.7 Discussion

The primary objective of the Operations Model is to balance future allocations of resources among stakeholder interests. Other aspects of the Study Plan are information collection and capacity determination, which are considered complete, and will be used in the final application. Significant value was expressed on the accuracy of hydrologic availability, and the Operations Model calibration was focused on the Project.

Using the calculated sum of flows exiting the system, combined with gauged total daily storage increase, the model-predicted equivalent was compared. Initially, this correlation was performed on a monthly basis. However, the application of equations derived with this method caused increases in model error due to the application of monthly flow correlations to daily inflow calculations. Daily flows have a much greater range of inflow, particularly on the high end, compared to monthly average, and the temporal resolution was insufficient. Daily calibration was attempted, but correlation was poor because of the duration of daily storage changes relative to flows exiting the system. While high flow months exhibited strong correlation, low flow periods had correlation as low as 18 percent. A 5-day running average of the calculated inflows was used for calibration, and resulted in much stronger correlation, while maintaining the inflow range reflective of the system. Polynomial equations derived from this correlation were applied to all flow contribution calculations in the model. While much closer to average monthly inflows, some discrepancy remained, with model-predicted values closer during high flow months. A simple multiplier was applied to each inflow point, then adjusted until the average monthly inflow matched historical gauge totals.

System outflows were modeled using average reservoir operations for the period reflective of the existing license. Changes to these operations can be made by adjusting target storage levels in each reservoir at the start of each month, for each year designation (wet, dry, or normal). Changes to the flow requirements can be made to the summary tab of the model. Flow quantities are easily adjustable, and the resulting percent of time they can be met calculated automatically, as well as additional days the model spills water from the reservoirs. Change to dates may be made, but additional dates for flow release requirements requires structural changes to model calculations in the appropriate location. Quantification of the magnitude of flow deviations from targets may be performed at stakeholder request but require definition of the quantification (such as how often a flow missed the target by 25 percent, or 5 cfs).

8.8 References

Chandler Decree 1922 (Chandler Decree). Hillside Water Company v. William A. Trickey et.al, U.S. District Court, Southern Division of California (Northern Division), No. B-61 EQ, Final Decree in Equity (Chandler Decree), January 27, 1922 (Unreported).

Southern California Edison (SCE). 2002. FERC License Exhibit A document. General Description and Specifications of Mechanical, Electrical, and Transmission Equipment. May, 2002

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9 BISHOP CREEK FISH DISTRIBUTION BASELINE INITIAL STUDY REPORT (AQ 3)

9.1 INTRODUCTION

Bishop Creek is the largest tributary to the Owens River and enters the river near the community of Bishop in Inyo County, California. When the current license was issued in 1994, FERC established the minimum flow requirements in Bishop Creek of 18 cfs below Powerhouse No. 4 (Intake 5) and 5 cfs below Powerhouse No. 3 (Intake 4). Baseline fish population monitoring efforts in Bishop Creek began in 1991, and population monitoring efforts continued through 2010, following changes to minimum instream flow releases (Sada and Rosamond, 2010; Sada, 2006; Sada and Knapp, 1993). The Fish Distribution Baseline Study Report (Creeks) focuses on identifying the presence and distribution of fish species within the Project area that may be affected by Project operations, as described in the Study Plan approved by FERC on November 4, 2019. This report includes the results of fish population sampling in the Bishop Creek watershed during September 2019.

9.2 REVIEW OF EXISTING INFORMATION

Project facilities (13 dams and diversions, 5 powerhouses, and associated intakes) are sited along Bishop Creek and its tributaries, Birch and McGee creeks. Bishop Creek has a total drainage area of approximately 70-square-miles from its headwaters to its confluence with the Owens River. South Lake and Lake Sabrina are the major storage reservoirs in the watershed. SCE manages the releases from the storage reservoirs, for purposes of hydro-generation and meeting water allocation requirements in accordance with the Chandler Decree. Water from McGee and Birch creeks (combined drainage area of approximately 25-square-miles) is also diverted to Bishop Creek through the hydroelectric facilities.

This network of creeks and reservoirs supports both stocked and self-sustaining trout fisheries, including brown trout, brook trout (*Salvelinus fontinalis)* and rainbow trout (*Oncorhynchus mykiss*) managed by the CDFW. The CDFW introduced these trout, which are managed to support an angling harvest. All three species are non-indigenous, and stocking is required to support heavy angling exploitation for the put-and-take fishery in the reservoirs. Segments of the lower reaches of Bishop Creek support self-sustaining brown trout populations, and McGee and Birch creeks maintain scattered populations of brook trout. Owens sucker are believed to have been informally introduced into Bishop Creek (N. Buckmaster, CDFW, *personal communication*). During an early June 2018 field visit to Lake Sabrina, adult Owens sucker were observed spawning in a shallow arm near the eastern end of the Lake Sabrina dam. EA (1987) netted an unidentified sucker from Lake Sabrina, which the authors speculated was an Owens sucker. SCE monitored the Bishop Creek brown trout population at intervals from 1988 through 2010 (Sada and Rosamond, 2010). Sada and Rosamond (2010) determined that population parameters such as growth, age, and abundance remained similar to that of other regional Sierra creeks throughout most of the study period, however abundance declined during 2010, the last year of monitoring. CDFW noted that growth of adults was limited in recent years but that recruitment from natural reproduction does not appear to be a limiting factor (N. Buckmaster, CDFW, *personal communication*).

9.3 LIFE HISTORY INFORMATION

CDFW currently manages waters in the Project area as a popular stocked rainbow trout fishery. Bishop Creek presently supports a self-sustaining brown trout fishery, while McGee and Birch creeks maintain small brook and possibly brown trout populations. Introduced species such as Owens sucker and speckled dace also occupy Project waters.

9.3.1 BROWN TROUT

Brown trout are an introduced species to the Bishop Creek watershed that has established a self-sustaining fishery, supported entirely by natural reproduction. Spawning recruitment to the fishery does not appear to be a limiting factor (N. Buckmaster, CDFW, *personal communication*). The following summary of brown trout life history is excerpted from Raleigh et al. (1986).

> *Brown trout mature as early as the end of their first year and as late as their eighth year but most mature in their third to fifth year. Brown trout up to 30.0 cm in length feed generally on terrestrial and aquatic insects but, as they exceed 25.0 cm, fish and crustaceans become more important in the diet. Brown trout are fall spawners with apparent latitudinal differences in time of onset. Spawning migrations appear to be triggered by decreasing day length, increased late fall flows, or drops in water temperature to <9 o C though these events are usually concurrent. In California, however, spawning often occurs when stream flows are low. Eggs are buried in unguarded nests (redds) built in well aerated gravels where they incubate throughout the winter. Egg sac larvae live in the gravels prior to emerging as fry in the spring.*
>
> *Optimal brown trout riverine habitat is characterized by clear, cool to cold water; a relatively silt-free rocky substrate in riffle-run areas; a 50% to 70% pool to 30% to 50% riffle-run habitat combination with areas of slow, deep water; well vegetated, stable stream banks; abundant instream cover; and relatively stable annual water flow and temperature regimes. Brown trout tend to occupy the lower reaches of low to moderate gradient areas (~1%) in suitable, high gradient river systems.*

9.3.2 OWENS SUCKER

Owens sucker were introduced into the Bishop Creek watershed and are known to occupy Lake Sabrina. It is not known if Owens sucker have colonized other portions of the watershed. This species occupies waters specifically in the Owens River Valley but have migrated via the Owens Aqueduct to the Santa Clara River drainage.

This species prefers soft-bottomed runs in cool-water streams and the bottoms of lakes and reservoirs. Owens suckers feed at night on aquatic insects, algae, detritus, and organic matter. They spawn from early May through early July. Larval suckers become juveniles at a total length (TL) of 19 millimeters (mm) to 22 mm and hide under cover along stream margins and in backwaters. According to CDFW (n.d.):

> *Owens suckers, in the Owens River … are most common in stream reaches with long runs and few riffles. Habitat in these reaches is characterized by fine substrate…with lesser amounts of gravel and cobble, water temperatures of 7-13°C, and pH of 7.9-8.0. In lakes and reservoirs, … adults are abundant near the bottom, regardless of depth. Adult suckers (> 15 cm) were also commonly found at the bottom of pools in a 10-mile reach of the Owens River Gorge. Recent surveys in the lower Owens River found suckers predominantly in off-channel habitats, such as backwaters.*

9.4 STUDY OBJECTIVES

The primary goal of the creek fishery study is to acquire information on the current distribution of game and non-game fish species of interest and the growth and density of wild brown trout populations in the Project area. To address this goal, this study was designed with the following objectives:

- Characterize fish populations and distribution in Project-influenced stream reaches:
  - Assess if recruitment of Owens sucker has occurred downstream of Lake Sabrina and South Lake in Bishop Creek;
  - Assess the distribution of other fish species in Project waters (streams and Project intakes);
  - Determine if naturally reproducing brown trout populations are consistent with levels documented from 1991 through 2010 at historical monitoring locations; and
  - Evaluate population health and condition of recreationally important trout species (e.g., brown trout, rainbow trout, and brook trout) in lotic habitat affected by Project operations.
- Evaluate select, localized water quality parameters that may affect the growth and distribution of fish species; and
- Determine whether future Project facilities and operations are consistent with the Desired Conditions described in the Land Management Plan for the Inyo National Forest (USDA, 2018) as they relate to ecological sustainability and diversity of plant and animal communities.

9.4.1 STUDY AREA

The study area included the Bishop Creek watershed downstream of Project reservoirs (i.e., South Lake and Lake Sabrina) to Powerhouse No. 5. This section of the watershed ranges in elevation from approximately 4,900 feet to 8,500 feet. Bishop Creek is separated into multiple segments by a series of powerhouses and intakes. Sample sites were selected in six locations within Project-affected reaches of Bishop Creek, Middle Fork Bishop Creek, and South Fork Bishop Creek (Figure 9.4-1). Of the six sample sites, two historical sample locations (Sada 3 and Sada 5) were selected for comparison with historical fish monitoring data from Bishop Creek[4] The remaining four sample sites (South Fork, Middle Fork [Cardinal Village], Intake 4 and Intake 5) were selected to assess fish species distribution. The locations of these sample sites specifically targeted suitable habitat for Owens sucker and Owens dace (*Rhinichthys osculus robustus*) primarily considering low channel gradients, smaller substrates (i.e., South Fork and Cardinal sites), or availability of large pool habitat (i.e., Intake 4 and Intake 5 sites) (Figure 9.4-1). Sample sites were selected based on habitat characteristics in consultation with CDFW and U.S. Department of Agriculture (USDA) Forest Service.

[4] The historic Sada 5 site showed clear evidence of having become a frequently visited angling location. To minimize any potential bias resulting from angling exploitation a site with similar habitat was selected in a more remote area downstream from the original site.

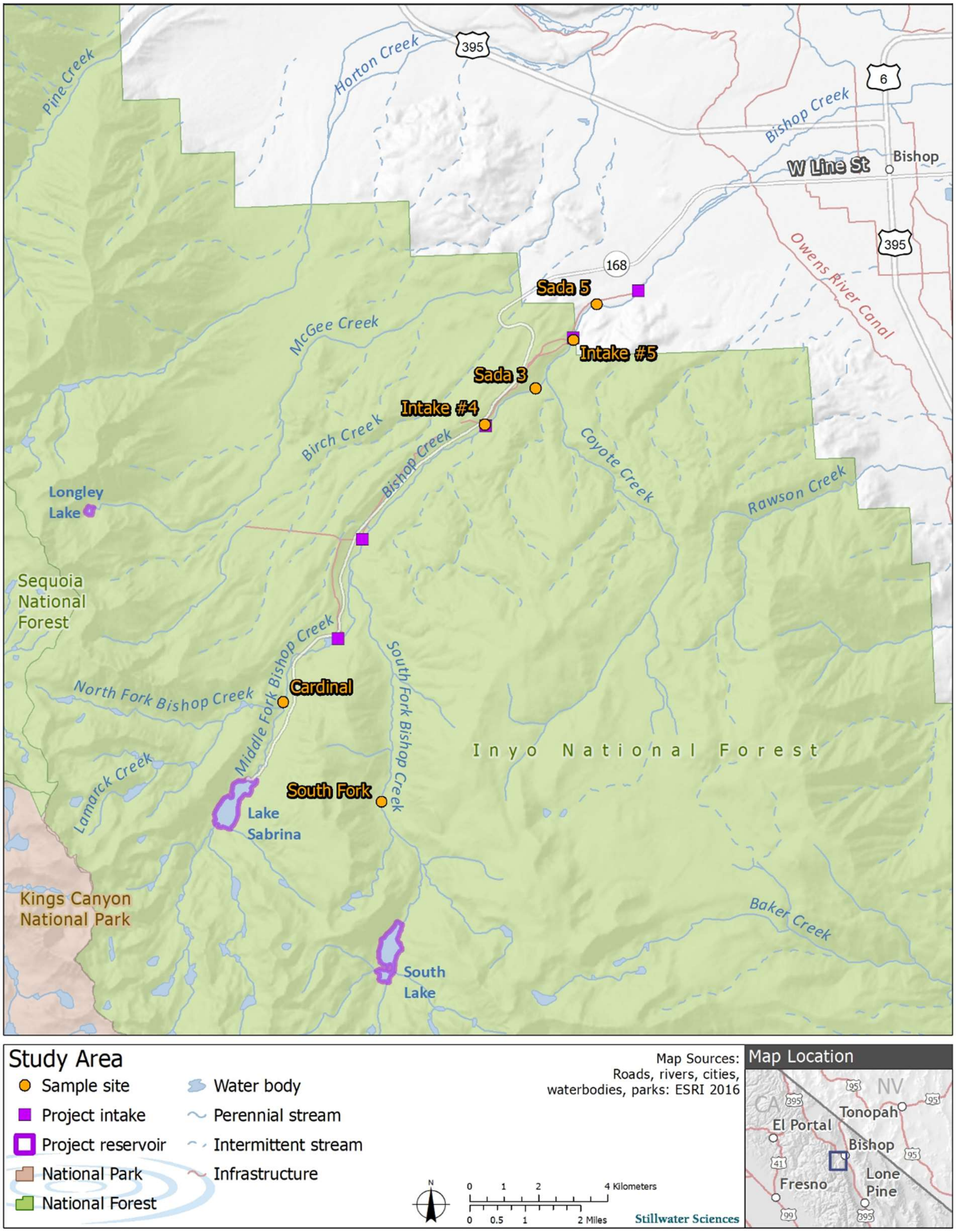


Figure 9.4-1 Stream Fish Distribution Sample Sites

9.5 METHODS

9.5.1 FISH SAMPLING

Fish surveys were conducted from September 22–26, 2019. Stream sampling methods included multiple-pass depletion backpack electrofishing at the Sada 5 and Sada 3 sample sites, gill netting in Project intakes, and single-pass backpack electrofishing at the South Fork and Cardinal sample sites (Table 9.5-1). All sites were sampled to assess fish species composition, distribution, and fish condition. The Sada 5 and Sada 3 sample sites were sampled to estimate abundance for comparison with historical monitoring data. Relative abundance was summarized as percent composition using the total count of fish observed at each sample site. Fish age class structure was assessed at stream sample sites using backpack electrofishing. Length-frequency histograms were developed for all fish species captured at each sample site. Breaks or modalities within the histogram were evaluated for each trout species to determine approximate age classes. Fish scales were taken on-site from approximately 50 fish (rainbow trout and/or brown trout) of different age classes and were aged by CDFW staff. Historical fish age data collected from Bishop Creek (Walsh and Williams, 1991)[5] were plotted along with length-frequency and scale ages from this study.

Sample methods are summarized by location in Table 9.5-1 . Photographs of habitat conditions and block net locations are provided in Appendix AQ-3A.

9.5.1.1 Single-Pass Electrofishing

Single-pass electrofishing was conducted at Middle Fork (Cardinal) and South Fork Bishop Creek (South Fork) sample sites. One representative segment approximately 196-feet-long was sampled at South Fork due to uniform channel conditions, whereas four segments totaling approximately 387 feet were sampled at Cardinal due to variable channel conditions, including pool, riffle, run, and side-channel habitats.

Block nets were used to section sites and/or stream segments to prevent migration in and out of the sample site and to increase capture probabilities. Two biologists with Smith Root LR-24 backpack electrofishers and three netters began electrofishing at the downstream block net and proceeded upstream. A single pass through each segment was made by the electrofishing crew. As fish were captured (netted), they were placed in buckets with aerated stream water and periodically transferred to a live-car until the completion of the pass. The captured fish were processed upon completion of each pass. Fish data recorded included species identification, total length, fork length (FL; mm), and weight (grams [g]). At each sample site, scale samples were collected from up to 20 brown trout distributed across each 50 mm size increment greater than 100 mm. Scales were

[5] The age class system used in Walsh and Williams 1991 did not include YOY but considered brown trout ranging from 36 mm to 103 mm as age 1+ fish. To convert the age class system used in Walsh and Williams 1991 to match the age class system in this report the following updates were made: age 1+ fish are referred to as YOY, age 2+ fish are referred to as age 1+, and age 3+ fish are referred to as age 2+.

taken from the fish's left side below the dorsal fin and above the lateral line, and then placed in individually labeled envelopes. Using the same methods, scale samples were collected opportunistically from other trout species captured including rainbow trout and brook trout. Scales were later analyzed by CDFW in their Bishop laboratory to characterize age/size class.

Table 9.5-1 Sample Site Locations and Sampling Dates during the September 2019 Survey

Sample Site Name	Site Description	Location (UTM NAD 83)[1]		Sample Method	Survey Dates	Sampling Rationale
		Easting	Northing			
Sada 5	Bishop Creek downstream of Intake 5	367749	4132748	Multiple-pass depletion backpack electrofishing	9/22–23/2019	Document species distribution, abundance, fish condition, and age class structure and compare with historical monitoring data
Sada 3[6]	Bishop Creek upstream of Coyote Creek	365839	4130446	Multiple-pass depletion backpack electrofishing	9/26/2019	Document species distribution, abundance, fish condition, and age class structure and compare with historical monitoring data
Intake 4	Margin and open water lentic habitat	364306	4129497	Gill netting	9/24/2019	Document species distribution and fish condition
Intake 5	Margin and open water lentic habitat	367006	4131759	Gill netting	9/25/2019	Document species distribution and fish condition
Cardinal	Middle Fork Bishop Creek downstream of Lake Sabrina	357978	4121838	Single-pass backpack electrofishing	9/24/2019	Document species distribution, fish condition, and age class structure
South Fork	South Fork Bishop Creek downstream of South Lake	360580	4118679	Single-pass backpack electrofishing	9/25/2019	Document species distribution, fish condition, and age class structure

[1] UTM is a coordinate system (universal transverse Mercator) NAD83 is the North American Datum 1983 geodetic reference system.

[6] Sample site was relocated from the historical location

9.5.1.2 Gill Netting

Gill netting was conducted at sample sites in Intake 4 and Intake 5. A single gill net approximately 80-feet-long with variable mesh sizes ranging from 0.75 inch to 2.50 inch was deployed in each intake. The net was deployed perpendicular to the shoreline with one end attached to the shore and the other end anchored in deeper water. The gill net was deployed in Intake 4 for a single 13-hour period spanning from evening until morning. At Intake 5, the gill net was deployed for a 9-hour period from morning until evening; however, since no fish were captured during the initial set, the gill net was redeployed for a 14-hour period from evening through morning. All fish captured were processed as previously described.

9.5.1.3 Multiple-Pass Electrofishing

Multiple-pass depletion backpack electrofishing, following procedures described by Reynolds (1996), was conducted at two sample sites (Sada 5 and Sada 3) for comparison to historical fish monitoring data from Bishop Creek. Each site was approximately 393-feet-long; to repeat methods used during historical monitoring efforts, each sample site was divided into five segments. Block nets were installed at the upstream and downstream ends of each segment to prevent migration in and out of the sample site and to facilitate an accurate assessment of sample populations.

Two biologists with Smith Root LR-24 backpack electrofishers and three netters began at the downstream block net and proceeded upstream. As fish were captured (netted), they were placed in buckets with aerated stream water and periodically transferred to a live-car until the completion of the pass. Upon completion of each pass, all captured fish were processed as previously described. After processing, fish were held in a live-car outside the boundary of the segment until the completion of the final pass. Once the fish from the final pass were processed, all fish were returned to the segment. A minimum of three passes were conducted within each segment. If there was poor depletion after three passes, a fourth pass was performed, and the fish captured were assumed to be the total count of fish in the segment.

Trout abundance, density, and biomass were calculated for sites sampled using multiple-pass electrofishing. Abundance was calculated as the total number of fish captured at each site. Density and biomass estimates were calculated for each segment and then averaged over the entire sample site for brown trout and for all trout species combined. Multiple-pass depletion values were analyzed using the MicroFish V. 3.0 software package (Van Deventer and Platts, 2006) to generate maximum-likelihood population estimates. Biomass was calculated by multiplying the average fish weight per segment by the calculated segment density and then adding all the segment values to get the total site biomass.

9.5.1.4 Trout Condition

Trout condition was evaluated for all trout captured. The weight-to-length relationship of individual trout was assessed as a method of identifying the nutritional state or health of the fish related to size and growth. Fulton’s condition factor (Ricker, 1975), a measure of this nutritional state, was calculated for each trout. Individual condition factors (k) were calculated by the following formula:

$$\mathrm{k} = \frac{\text{wet weight (g)} \times 10^5}{[\text{fork length (mm)}]^3}$$

The mean condition of trout was calculated by averaging individual condition factors for each trout species at each sample site.

9.5.1.5 Current and Historical Brown Trout Population Data Comparison

Brown trout population data collected from the Sada 5 and Sada 3 sample sites in 2019 were compared to population data from historical monitoring sites collected between 1991 and 2010 (Sada and Rosamond, 2010; Sada, 2006; Sada and Knapp, 1993). Brown trout density estimates from 2019 were compared to previous monitoring results using a two-tailed t-test with unequal variance to determine if 2019 density is significantly different. Biomass values from previous studies are reported as the site mean biomass and upper and lower range of values which do not allow for comparison using t-tests.

9.5.2 Habitat Conditions

Habitat descriptors and physical habitat measurements were recorded at each sample site. Each segment was characterized by habitat type (e.g., pool, run, or riffle). The length of each segment was measured along the thalweg to the nearest tenth of a meter, and the mean width of each sampling segment was calculated by measuring the width of the wetted channel to the nearest tenth of a meter at six or more evenly spaced transects. The area of each sampling segment was calculated by multiplying the site length by mean width. The approximate maximum depth and the estimated discharge of the sample site were recorded. Substrates and fish cover were visually estimated at each sample site. Water temperature, dissolved oxygen (DO), pH, electrical conductivity, and specific conductance were measured using a YSI Pro Plus multi-parameter meter at the time of sampling.

9.6 Modifications to Methods

As noted above, the historic Sada 5 site showed clear evidence of having become a frequently visited angling location. To minimize any potential bias resulting from angling exploitation, a site with similar habitat was selected in a more remote area downstream from the original site. No other modifications where made to this study.

9.7 Results

9.7.1 Habitat Conditions

General habitat conditions at fish sample sites in the Bishop Creek watershed are summarized by sample site in Table 9.7-1 . Habitat condition data and water chemistry are provided in Appendix AQ-3B. Riffle was the dominant habitat type at most stream sample sites except for South Fork, which primarily contained run habitat. The Sada 5 and Sada 3 sample sites had larger substrates (boulder and cobble) than the South Fork and Cardinal sample sites (cobble, gravel, and sand).[7] Estimated stream discharge was higher at the Sada 5 and Sada 3 sample sites than at the farther upstream South Fork and Cardinal sample sites. Water quality conditions measured during the study were comparable with reported values required to maintain and enhance cold freshwater habitat for DO levels and pH (CRWQCB, 1995) while water temperatures were generally colder than the optimal ranges reported for brown trout (NDEP, 2017) (Table 9.7-2).

Table 9.7-1 Summary of Habitat Conditions during the September 2019 Survey

SAMPLE SITE	HABITAT TYPE (%)			SUBSTRATE		WATER TEMPERATURE (°C)	DISCHARGE (CFS)[A]
	Pool	Riffle	Run	Dominant	Subdominant		
Sada 5	5	90	5	Boulder	Cobble	10.0	22
Sada 3	28	58	14	Boulder	Cobble	13.8	20
South Fork	20	0	80	Sand	Gravel	8.5	14
Cardinal	16	61	23	Cobble	Gravel	11.0	10

[A]Discharge values provided by Southern California Edison

Table 9.7-2 Water Quality Measurements at Sample Sites and Optimal Ranges Reported for Brown Trout

SAMPLE SITE	DISSOLVED OXYGEN (MG/L)	WATER TEMPERATURE (°C)	PH
Sada 5	9.70	9.2	7.73
Sada 3	8.62	13.8	6.98
South Fork	7.99	8.5	7.28
Cardinal	8.07	11.0	6.77
Forebay 4	10.18	8.6	6.84
Forebay5	8.52	9.8	7.60
Water Quality Criteria			
	> 7.00[a]	12–19°C[b]	6.5–8.5 [a]

[a] CRWQCB, 1995, criteria for cold freshwater habitat

[b] NDEP, 2017, optimal temperature for brown trout.

9.7.2 COMPOSITION AND DISTRIBUTION

Three fish species were observed in the Bishop Creek watershed: brown trout, rainbow trout, and brook trout. No Owens sucker were observed, indicating no recruitment of this species in Bishop Creek downstream of Lake Sabrina and South Lake (Table 9.7-3). Composition and distribution patterns appeared similar throughout the Bishop Creek watershed with brown trout being the dominant species at all locations and rainbow trout

[7] The Sada 5,Sada 3, Cardinal, and South Fork sites are also IFIM study sites used in the Instream Flow Needs PHABSIM model

observed at all sample sites, although in low abundance (Figure 9.7-1). However, a single brook trout was captured in Intake 5. Rainbow trout represented a larger portion of the fish species captured in Project intakes compared to the proportion of rainbow trout at stream sample sites, but overall, fish capture numbers were relatively low in the intakes; this likely reflects the different sampling methods (i.e., gill net versus single-pass and multiple-pass electrofishing). During 2019, rainbow trout in the "catchable" size range (roughly 12 inches) were stocked throughout the study area including in Bishop Creek, Middle Fork Bishop Creek, and South Fork Bishop Creek (CDFW, 2019).

Table 9.7-3 Fish Species Captured by Sample Site during the September 2019 Survey

FISH SPECIES (COMMON NAME)	SADA 5	SADA 3	SOUTH FORK	CARDINA L	INTAKE 4	INTAKE 5
Brown trout	186	103	45	145	2	7
Rainbow trout	8	10	3	1	1	4
Brook trout	0	0	0	0	0	1
Total	**194**	**113**	**48**	**146**	**3**	**12**

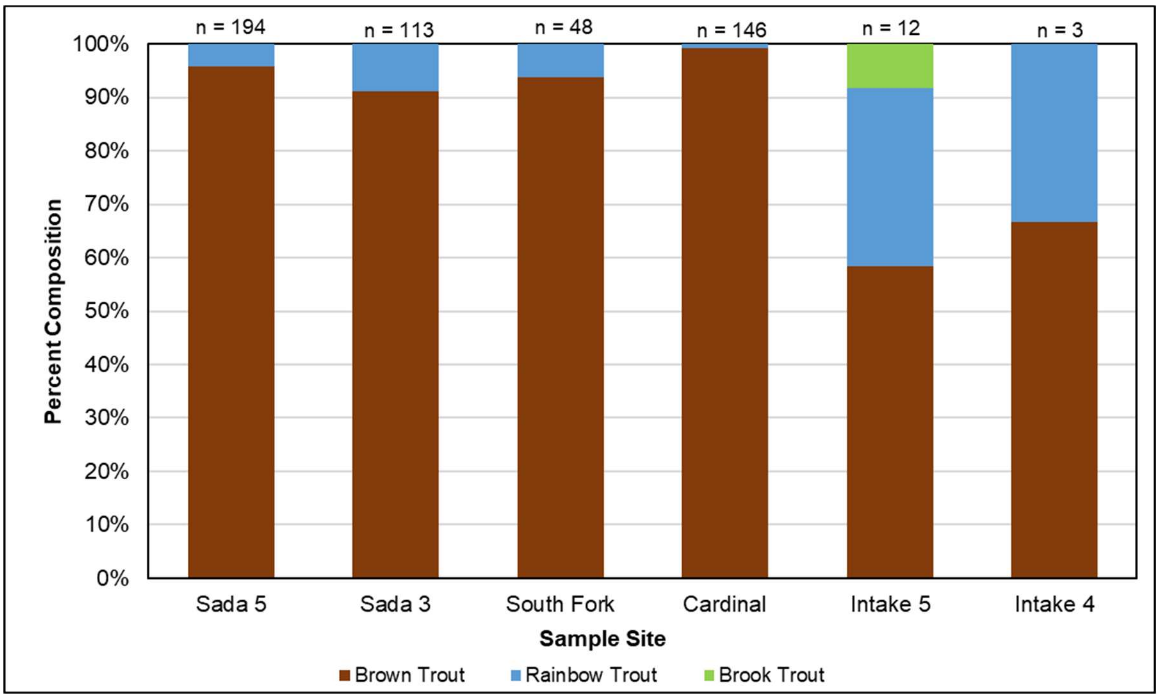


Figure 9.7-1 Fish Species Composition Observed in the Bishop Creek Watershed during September 2019 Survey

9.7.3 ABUNDANCE, DENSITY, AND BIOMASS

Of the two sites sampled using multiple-pass electrofishing, trout abundance was higher at the Sada 5 sample site; however, biomass was greater at the Sada 3 sample site. Brown trout, the dominant species at both sites, were the primary driver of the population estimates. Trout abundance, density, and biomass in Bishop Creek at the Sada 5 and Sada 3 sample sites are summarized by site in Table 9.7-4 and Figure 9.7-2. Trout abundance and biomass are presented by segment in Appendix AQ-3C, and individual fish data are provided in Appendix AQ-3D.

Table 9.7-4 Trout Population Abundance, Estimated Density, and Estimated Biomass at the Sada 5 and Sada 3 Sample Sites, September 2019

Sample Site	Site Length (m)	Average Width (m)	Trout Species	Number Captured	Biomass (g/m²)			Density (Trout per Mile)		
					Est.	Lower 95% C.I.	Upper 95% C.I.	Est.	Lower 95% C.I.	Upper 95% C.I.
Sada 5	122	6.3	Rainbow	8	0.13	--a	--a	--a	--a	--a
			Brown	186	5.72	3.89	7.55	2,889	2,032	3,745
			All Trout	194	5.85	5.06	6.65	2,983	2,220	3,747
Sada 3	123	5.1	Rainbow	10	1.58	--a	--a	--a	--a	--a
			Brown	103	9.08	2.46	15.70	1,354	1,222	1,485
			All Trout	113	10.58	4.00	17.16	1,486	1,334	1,637

[a] Depletion pattern and low capture numbers for rainbow trout did not allow for density estimates.

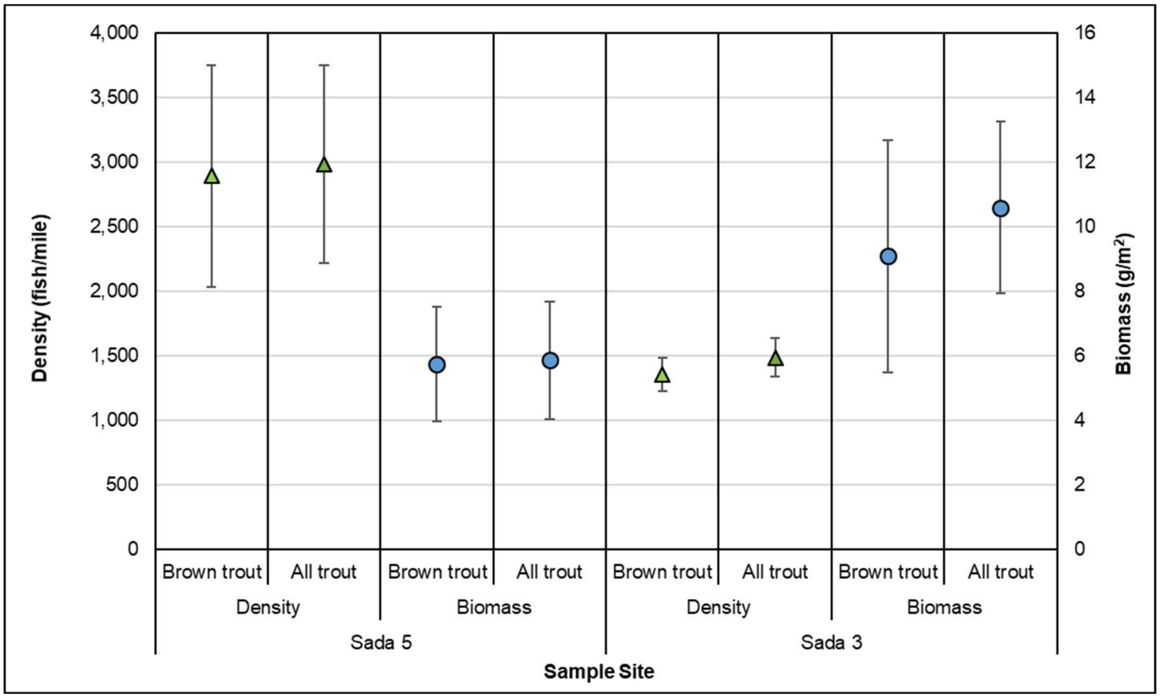


Figure 9.7-2 Estimated Density and Biomass (with 95% confidence intervals) for Brown Trout and all Trout at the Sada 5 and Sada 3 Sample Sites, September 2019

9.7.4 AGE CLASS DISTRIBUTION

During the 2019 sampling effort, brown trout were observed at each sampling location with most fish ranging from young of year (YOY) up to age 3+ with a few older fish observed; both sites had fish as old as 4+; the Sada 3 sample site had brown trout as old as 7+. Length-at-age size ranges based on scale analysis, length frequency distribution, and previously reported values are presented in Table 9.7-5. Fish lengths during this study were narrower in range for each age class than the values provided in Walsh and Williams (1991) (Table 9.7-5 and Figure 9.7-3 through Figure 9.7-7).

Table 9.7-5 Trout Age Based on Length Frequency Histograms and Scale Analysis

Fish Species	Age	Fork Length Range Based on 2019 Scale Analysis (mm)[A] Sada 5	Sada 3	Cardinal	Fork Length Range (mm) Based on Length-Frequency Nodes[B]	Fork Length (mm) Range Reported in Walsh and Williams 1991[C]
Brown Trout	YOY	--[d]	100	--[d]	< 120	36–103
	1+	100–112	97–100	107–149	90–170	87–219
	2+	178–248	140–172	137–236	130–220	136–327
	3+	250	150–204	167–182	180–250	--
	4+	240	199	--[d]	210–290	--
	5+	--[d]	198–270	--[d]	>290	--
	6+	--[d]	--[d]	--[d]	--	--
	7+	--[d]	289	--[d]	--	--
Rainbow Trout	YOY	--[d]	--[d]	--[d]	--	--
	1+	--[d]	--[d]	--[d]	--	--
	2+	--[d]	170–176	--[d]	--	--
	3+	--[d]	147–174	--[d]	--	--
	4+	--[d]	--[d]	--[d]	--	--
	5+	--[d]	233	--[d]	--	--
	6+	--[d]	--[d]	--[d]	--	--
	7+	--[d]	--[d]	--[d]	--	--
	8+	--[d]	--[d]	285	--	--

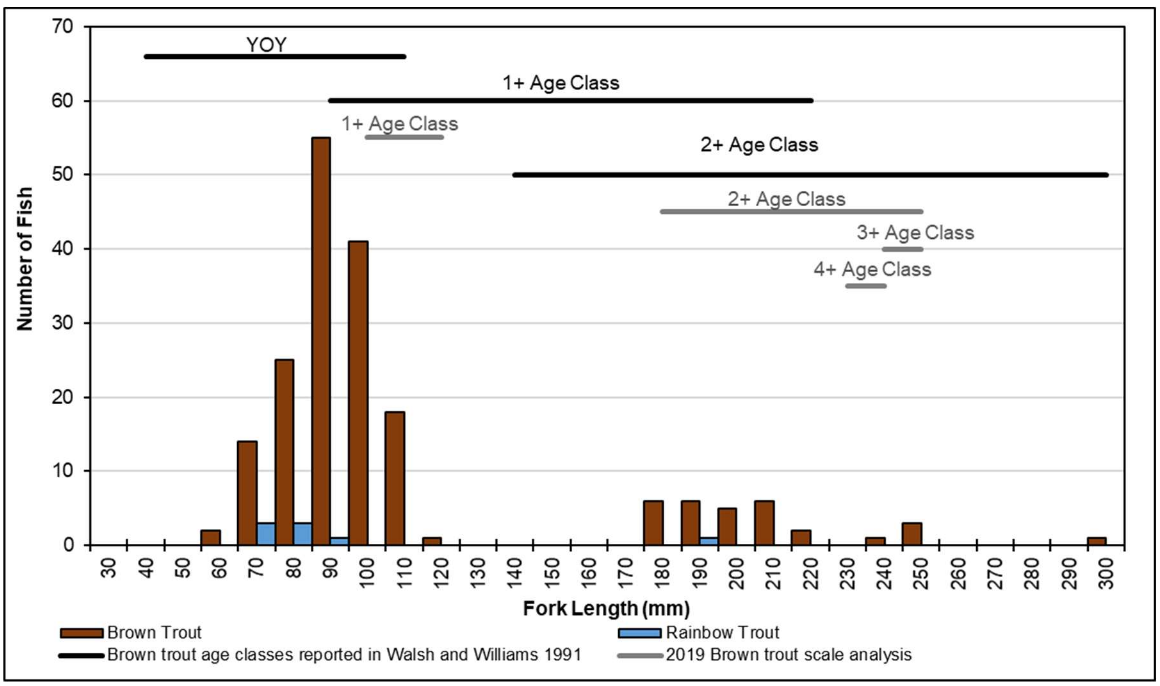
[a] Fish were not aged from scales collected at the South Fork, Intake 5 or Intake 4 sample sites.

[b] Distinct nodes were not apparent on the length frequency distribution for brown trout longer than 290 mm FL or for rainbow trout of any size due to low numbers captured.

[c] Brown trout age class data in Walsh and Williams (1991) included YOY, age 1+ and age 2+; no rainbow trout ages were reported.

[d] Scales were not aged from fish in this size class (*N. Buckmaster, CDFW, personal communication*).

Brown trout captured at the Sada 5 sample site were predominately smaller fish, less than 110 mm FL. Although no scales were aged from brown trout less than 100 mm FL at the Sada 5 sample site, brown trout less than 100 mm FL are expected to fall within the YOY age-class based on the length frequency distribution and scale age data reported in Walsh and Williams (1991). Brown trout within the age 1+ and age 2+ age-classes were common but in lower numbers. A few brown trout longer than 220 mm FL were captured and likely fall within the age 2+ through age 4+ range. The overlap in fish lengths at specific age-classes is typically due to variability in individual fish growth rates and the overlap in age-class lengths is fairly common especially for older age-classes. The larger fish length assigned to age 3+ brown trout compared to age 4+ brown trout is likely due to age-class size overlap and the small sample size of scales analyzed from fish in both age classes (n = 1). The largest brown trout captured at the Sada 5 sample site was 299 mm FL and was likely age 5+ or older. The gap in sizes of brown trout observed between 120 mm and 180 mm at the Sada 5 sample site (Figure 9.7-3) may indicate unfavorable 2018 environmental conditions that limited fish survival or growth or delayed the spawning season. Multiple age classes of brown trout and a high abundance of young fish suggest that brown trout are successfully reproducing within this segment of Bishop Creek. The low number of rainbow trout captured at the Sada 5 sample site did not allow for identification of specific age-classes; however, the large range in sizes observed suggest at least two age groups were observed (Figure 9.7-3). Rainbow trout less than 100 mm FL observed at the Sada 5 sample site suggest that a small population of rainbow trout is reproducing in this section of Bishop Creek.

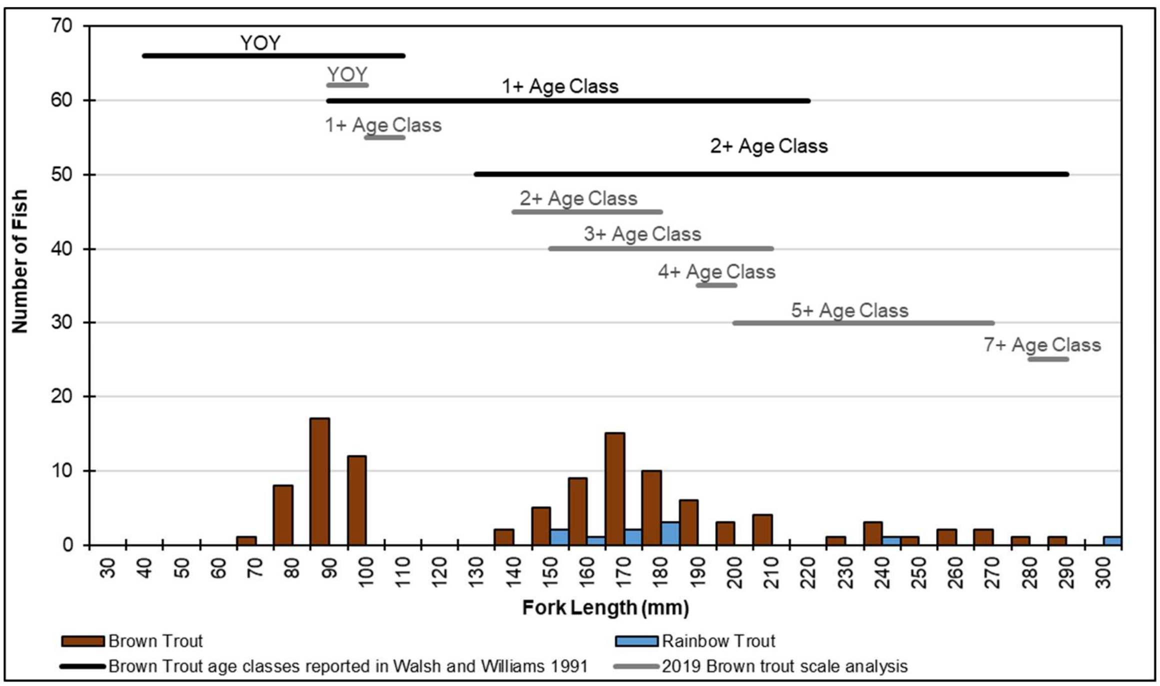


Source: Walsh and Williams, 1991

Figure 9.7-3 Length-frequency and Age Class Structure of Trout Species Captured by Electrofishing in 2019 Compared to Brown Trout Age Classes Identified in 1991

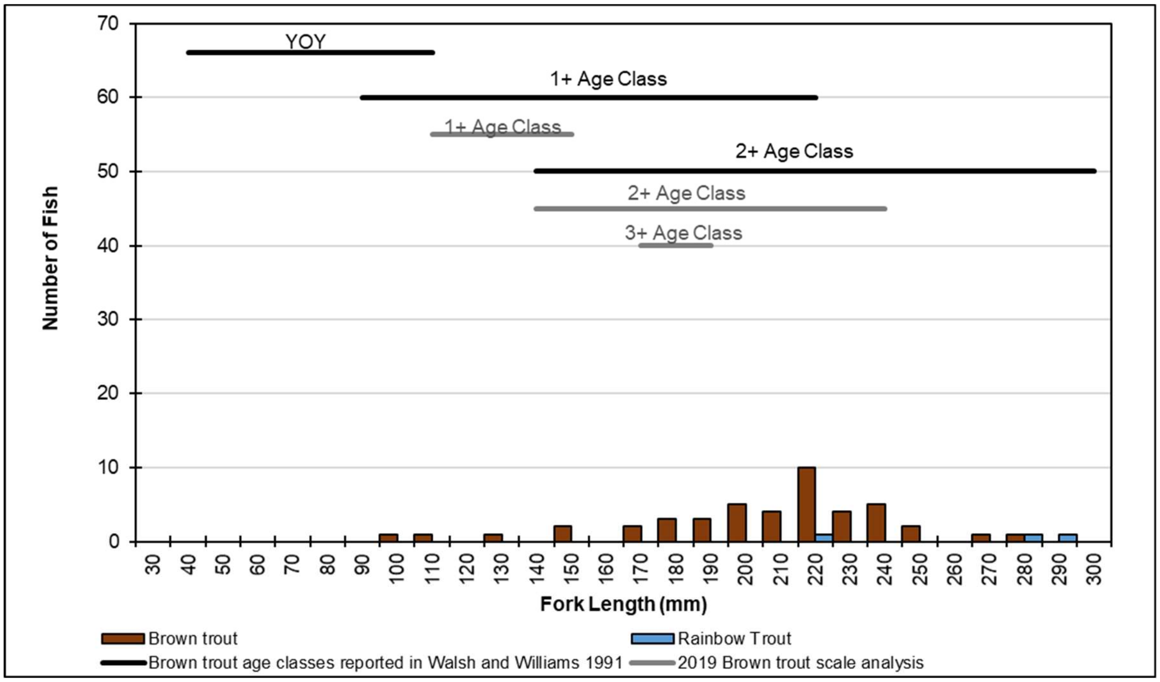
At the Sada 3 sample site, brown trout were fairly evenly distributed within the YOY through age 3+ age classes with lower abundance of larger fish from age 4+ and 5+ (Figure 9.7-4). A single fish was estimated to be age 7+ based on scale analysis suggesting that brown trout older than age 5+ are rare within this section of Bishop Creek (Figure 9.7-4). As previously discussed, the overlap in fish lengths at specific age-classes is typically due to variability in individual fish growth rates and becomes more apparent for older age-classes. Rainbow trout captured at the Sada 3 sample site were between the 2+ and 6+ (or older) age classes (Figure 9.7-4).

Scales collected from fish at the South Fork sample site revealed signs of scale regeneration and/or damage and were therefore considered unreliable for aging. That said, the length frequency distribution for the South Fork sample site shows very few brown trout in the presumptive YOY and 1+ age classes relative to older age classes, which is atypical for trout populations (Figure 9.7-5). The skewed age-class distribution is likely an artifact of the unique habitat conditions (e.g., slow, deep water with sand and gravel substrate) that are less favored by YOY brown trout, which prefer shallow water and rocky substrate, which is consistent with habitat suitable for adult brown trout (Raleigh et al., 1986). Based on scale analyses from the Cardinal sample site, most brown trout at the South Fork sample site were likely within the age 2+ to age 3+ range. The narrow range of lengths assigned to age 3+ brown trout that falls within the length range for age 2+ brown trout is likely due to the small sample size of scales analyzed from age 3+ brown trout (n = 2) and the potential for variable growth between age-classes.



Source: Walsh and Williams, 1991

Figure 9.7-4 Length-frequency and Age Class Structure of Trout Species Captured by Electrofishing in 2019 Compared to Brown Trout Age Classes Identified in 1991

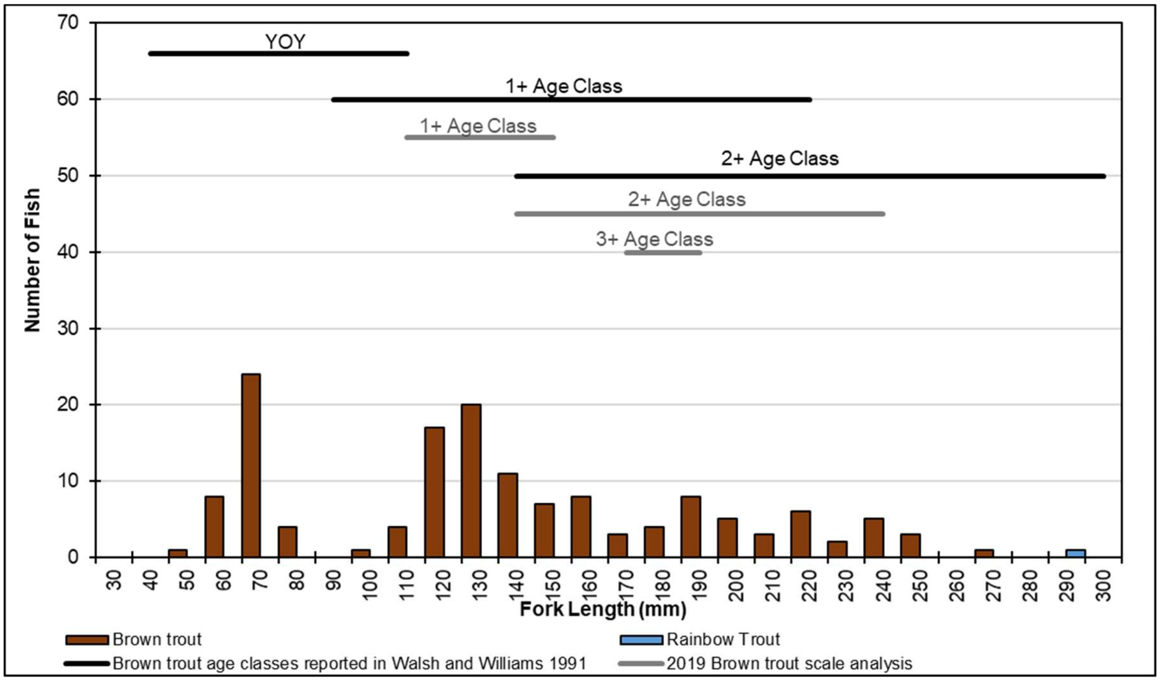


Source: Walsh and Williams, 1991

Notes: Scales were not aged from fish at the South Fork sample site; scale analyses shown are based on ages from fish captured at the Cardinal sample site.

Figure 9.7-5 Length-frequency and Age-class Structure of Trout Species Captured by Electrofishing in 2019 Compared to Brown Trout Age Classes Identified in 1991

At the Cardinal sample site, brown trout estimated to fall within the YOY were observed in relatively high numbers, with lower numbers of brown trout through age 4+ (Figure 9.7-6). A single rainbow trout was captured at the Cardinal sample site and estimated to be age 8+. Overall, length distribution for brown trout at the Cardinal sample site suggests multiple age classes indicative of a self-supporting population of brown trout.



Source: Walsh and Williams, 1991

Figure 9.7-6 Length-frequency and Age-class Structure of Trout Species Captured by Electrofishing in 2019 Compared to Brown Trout Age Classes Identified in 1991

Lengths of brown trout captured in Project intakes ranged from approximately 160 mm FL to 400 mm FL. Scales collected from fish in Intake 4 and Intake 5 revealed signs of scale regeneration and/or damage and were therefore considered unreliable for aging. Based on ages observed from other locations in the Bishop Creek watershed, fish captured in Project intakes likely ranged from age 1+ up to age 5+ or older (Figure 9.7-7). Gill netting was selective for fish longer than approximately 100 mm, therefore the fish lengths observed may not be representative of the true fish size and age distribution in these locations and cannot be compared to creek sites where samples were obtained by electrofishing.

Source: Walsh and Williams, 1991

Figure 9.7-7 Length-frequency and Age-class Structure of Fish Species Captured by Gill Netting in September 2019, Compared to Brown Trout Age Classes Identified in 1991

9.7.5 Fish Condition

Site-specific mean condition factors (k-values) of trout sampled at all sites in 2019 ranged from 0.92 to 1.21[8], indicating that trout were generally in good condition (Table 9.7-6).

[8] Condition factors in western Sierra Nevada streams typically range from 0.8 to 2.0, with a mean condition factor generally 1.2 or below (Beak 1991, EA 1986, Ebasco Environmental 1993, Wilcox 1994, Hanson Environmental 2005). Rabe (1967) reported the condition factor to be between 0.9 and 1.1 for rainbow trout in Alpine lakes. Arismendi et al. (2011) cites broader ranges (0.5 to 2.0); however, condition is dependent on the sampling season, the species, the strain of trout, state of sexual maturity, and the way fish length is defined (e.g., fork length, total length, or standard length [SL]), which is not often documented with the results.

Table 9.7-6 Trout Condition (k-value) Calculated for Fish Captured September 2019

STREAM	SAMPLE SITE	TROUT SPECIES	(N)	MEAN K-VALUE	K-VALUE RANGE
Bishop Creek	Sada 5	Rainbow	8	1.10	0.83–1.30
		Brown	186	1.08	0.78–1.31
	Sada 3	Rainbow	10	1.03	0.93–1.10
		Brown	103	0.97	0.79–1.13
	Intake 5	Brook	1	0.95	0.95
		Rainbow	4	0.98	0.92–1.05
		Brown	7	1.00	0.92–1.08
	Intake 4	Rainbow	1	1.21	1.21
		Brown	2	1.12	1.09–1.16
Middle Fork Bishop Creek	Cardinal	Rainbow	1	0.94	0.94
		Brown	145	0.92	0.65–1.14
South Fork Bishop Creek	South Fork	Rainbow	3	1.09	1.01–1.21
		Brown	45	0.96	0.75–1.70

9.7.6 CURRENT AND HISTORICAL BROWN TROUT POPULATION DATA COMPARISON

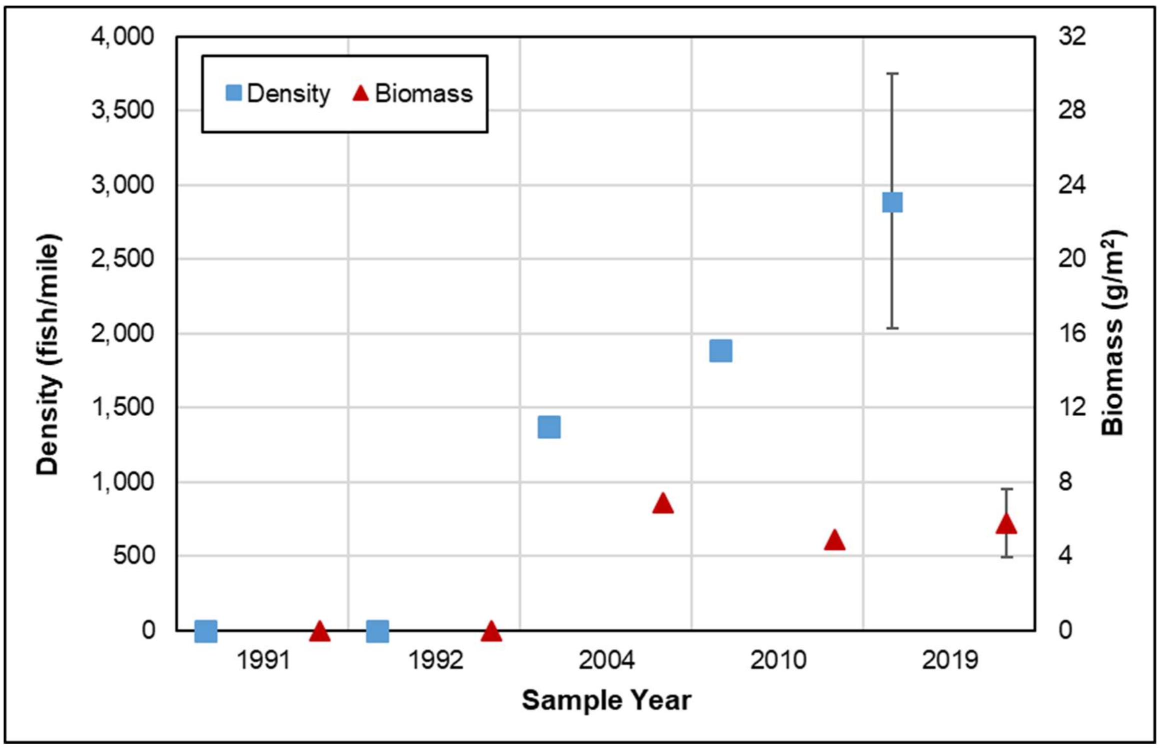
9.7.6.1 Abundance and Biomass

The estimated density for brown trout in Bishop Creek at the Sada 5 sample site during 2019 was significantly higher (P=0.045) than in all previous years, while biomass was within the range of prior years (Table 9.7-7 , Figure 9.7-8). The Sada 5 site was dry during 1991 and 1992 monitoring efforts, and subsequently, no fish were captured (Sada, 2006). At the Sada 3 sample site, the estimated density and biomass for brown trout during 2019 were higher than in 2010 but lower than in previous years (Figure 9.7-9); however, no significant difference was detected between any of the estimated densities at this site during these sample years (Table 9.7-7).

Table 9.7-7 Results from Two-tailed T-tests with Unequal Variances Comparing Density Estimates at Sada 3 and Sada 5 for 2019 and Previous Monitoring Efforts

Sample years	P-values	
	Sada 5	Sada 3
2019 and 2010	0.015	0.221
2019 and 2004	0.045	0.504
2019 and 1992	na [a]	0.265
2019 and 1991	na [a]	0.275

[a] This location was dry during 1991 and 1992, so no fish were captured during those years.
Note: Light grey highlight indicates significant differences at α = 0.05.



Note: This location was dry during 1991 and 1992, so no fish were captured during those years

Figure 9.7-8 Brown Trout Estimated Density and Biomass at the Sada 5 Sample Site during 2019 (with 95% confidence intervals) and Previous Studies

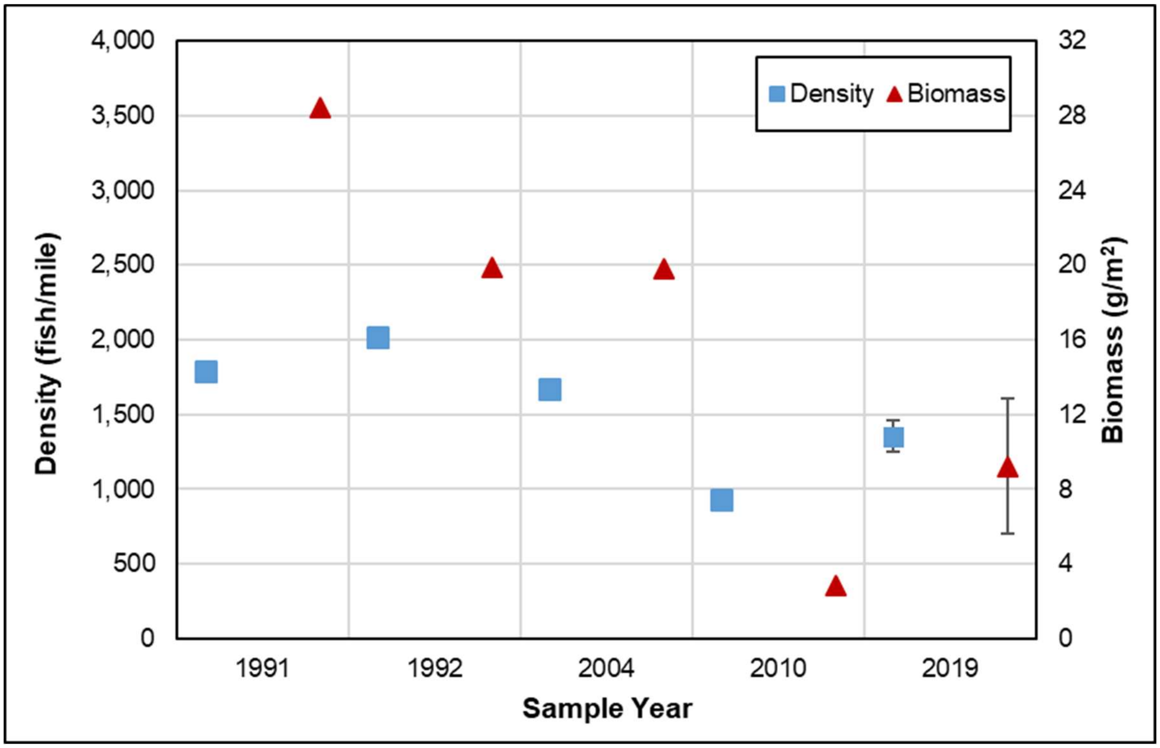


Figure 9.7-9 Brown Trout Estimated Density and Biomass in Bishop Creek at the Sada 3 Sample Site during 2019 (with 95% Confidence Intervals) and Previous Studies

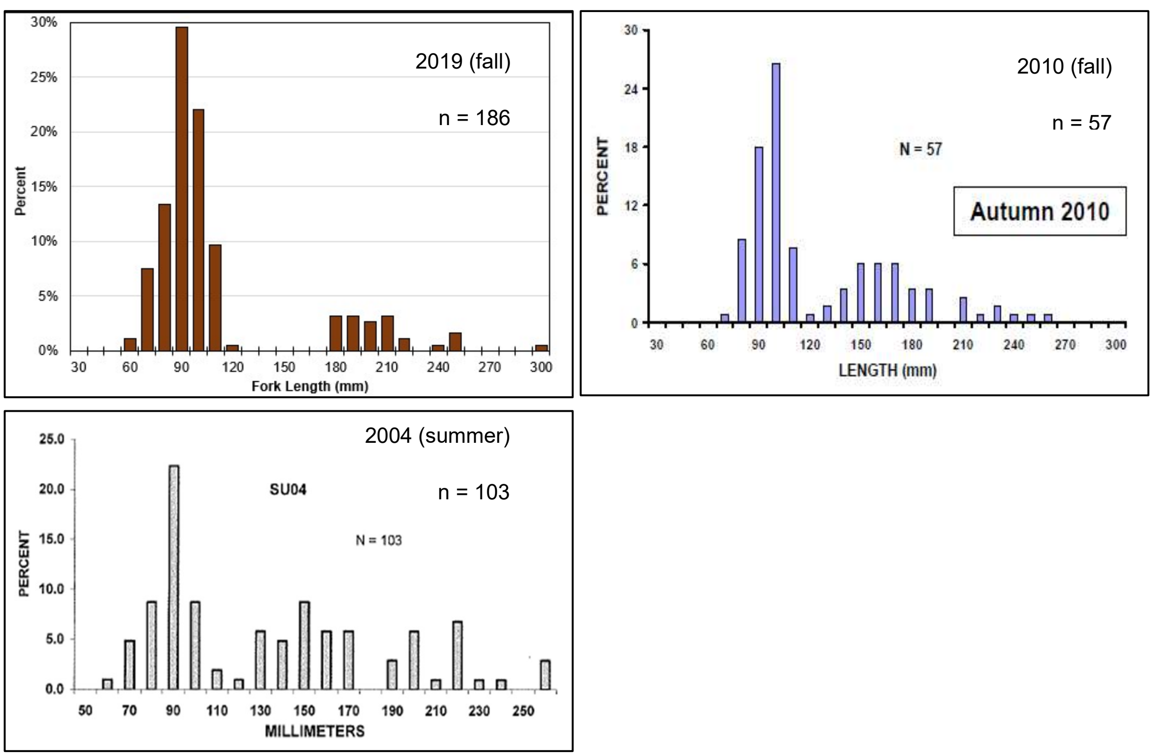
9.7.6.2 Age Class Distribution and Fish Condition

On average, brown trout captured at the Sada 5 sample site during 2019 were slightly smaller than fish captured during the two previous survey years, whereas brown trout captured at the Sada 3 sample site during 2019 were slightly larger than fish captured during previous years (Table 9.7-8). The age class distribution of brown trout in Bishop Creek at the Sada 5 sample site appeared similar across all sample years, showing a typical length-frequency distribution where YOY have the highest abundance followed by fewer numbers of each subsequent age class, typically reflecting attrition due to natural mortality, and angling exploitation Figure 9.7-10). Length-frequency histograms for the Sada 3 sample site show a more typical distribution for brown trout in 2019, whereas populations in previous monitoring years indicated lower recruitment, demonstrated by a higher proportion of older age classes (Figure 9.7-11).

Table 9.7-8 Average Brown Trout Length and Weight for the Sada 5 and Sada 3 Sample Sites during 2019 and Previous Studies in Bishop Creek

SAMPLE YEAR (SEASON)	N	MEAN FORK LENGTH (MM)	RANGE (MM)	AVERAGE WEIGHT (G)	RANGE (G)
Sada 5					
2019 Fall	186	106.2	53–299	23.3	1.8–326.8
2010 Fall	117	121.4	67–259	29.3	3.2–165.6
2004 Summer[a]	103	130.6	54–263	24.4	1.2–127.1
1991 and 1992[b]	--	--	--	--	--
Sada 3					
2019 Fall	103	147.9	66–289	51.8	3.6–235.4
2010 Fall	57	127.8	70–287	29.8	4.1–179.0
2004 Summer[a]	130	132.0	77–205	49.6	7.5–152.5
1991 Fall	120	147.5	73–250	38.5	4.7–100.5
1992 Fall	143	135.4	69–213	32.5	3.7–101.9

[a] The Sada 5 and Sada 3 sample sites were not sampled during the fall of 2004 due to high flows.
[b] The Sada 5 sample site was dry during the 1991 and 1992 monitoring efforts.



Note: Brown trout were not observed at the Sada 5 sample site during 1991 and 1992 when the stream channel was dry.

Figure 9.7-10 Brown Trout Length-frequency Distribution at the Sada 5 Sample Site

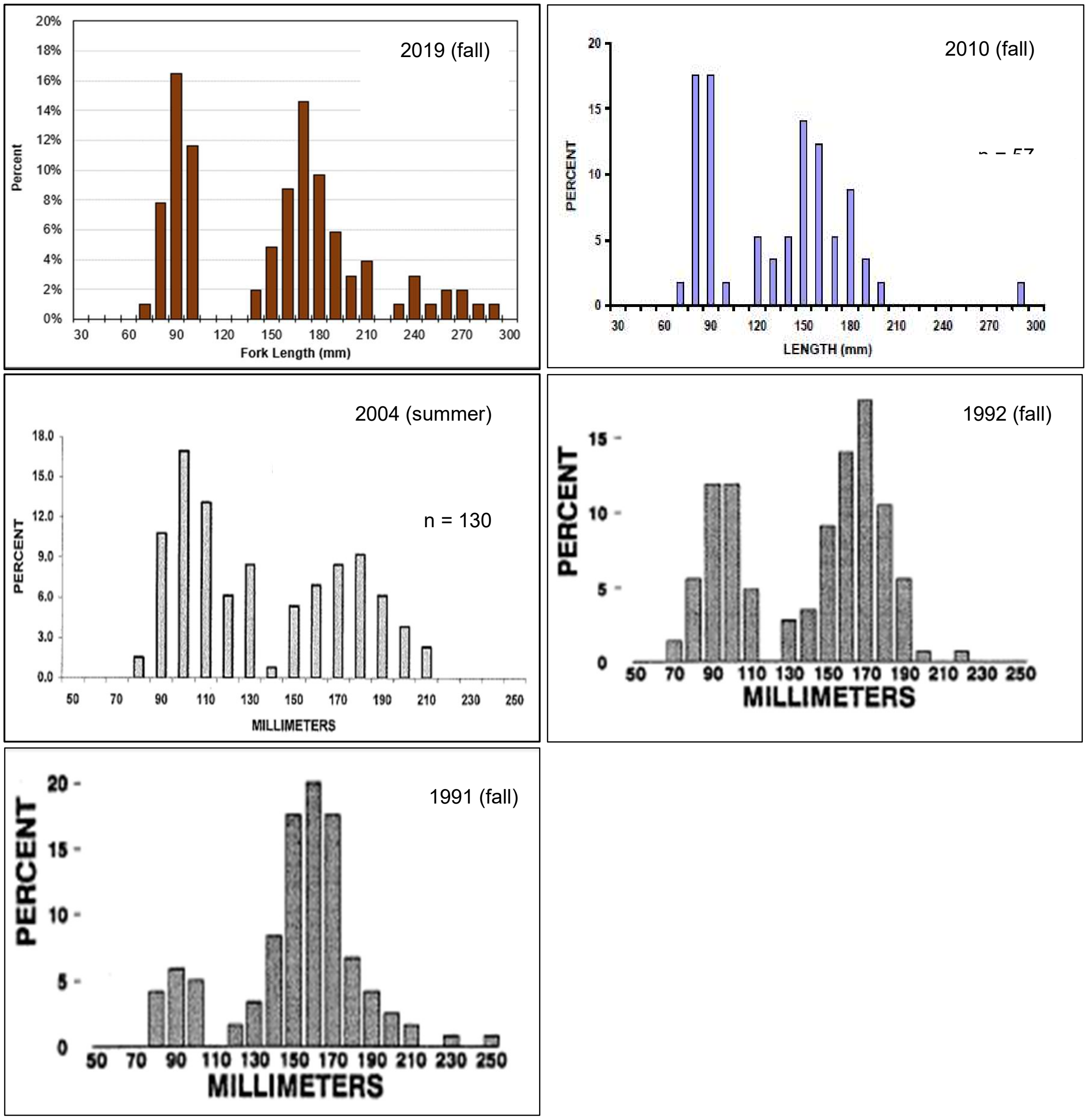


Figure 9.7-11 Brown Trout Length-frequency Distribution at the Sada 3 Sample Site

The average fish condition was similar across years at both the Sada 5 and Sada 3 sample sites (Table 9.7-9).

Table 9.7-9 Brown Trout Condition at the Sada 5 and Sada 3 Sample Sites during 2019 Compared to Historic Values

Sample Period	(N)	Mean Condition
Sada 5		
September 2019	186	1.090
Fall 2010	117	0.990
Summer 2004	130	0.999
Fall 1991–1992[a]	0	--
Sada 3		
September 2019	103	0.970
Fall 2010	57	0.980
Fall 2004	103	0.998
Fall 1991	120	0.98
Fall 1992	143	0.99

[a] The Sada 5 sample site was dry during 1991 and 1992 sampling efforts.

9.8 Discussion

9.8.1 Fish Populations and Distribution in Project-Influenced Stream Reaches

The 2019 surveys found no evidence of Owens sucker recruitment in the reaches of Bishop Creek below Lake Sabrina and South Lake. Only three trout fish species were observed in the study area; brown trout and rainbow trout were distributed throughout Bishop Creek downstream of South Lake and Lake Sabrina while brook trout have a more limited distribution. If other fish species are present within the study area, they are only expected to occur in very low abundance with limited distribution.

Based on the lack of stocking (CDFW, 2019), presence of YOY and broad age-class distribution throughout most of the study area, and presence of suitable spawning habitat at most sample sites where brown trout of reproductive age (age 3+ and 4+ [Taube 1976]) were present, brown trout populations appear to be naturally reproducing and sustaining. Locations with multiple years of data (Sada 5 and Sada 3 sample sites) suggests that the brown trout population size is stable or increasing. Three out of the four sample sites showed high numbers of YOY fish indicating signs of recruitment; and while the South Fork sample site did not have high numbers of YOY, the habitat conditions at that location were not favorable for YOY brown trout; however, YOY brown trout habitat appears abundant in nearby higher gradient locations where larger substrate is found. This is likely a source of recruitment to the population of larger fish in the South Fork sample site.

Scale analysis from brown trout estimated fish over 7 years old were captured during this study (Table 9.7-9), which is considered fairly long lived in California where the oldest brown trout aged was estimated to be 9 years old (Moyle, 2002). In addition, several brown trout were estimated to be age 3+ or older based on both scale analysis and length frequency distribution which indicates that the population has reproductive adult fish.

Although the brown trout captured during this study, were estimated to be fairly old, fish rarely exceeded 250 mm tended to have slower growth compared to other locations; although highly variable, brown trout often grow approximately 100 mm per year for the first three years and then roughly 50 mm per year thereafter (Simpson and Wallace, 1982, as cited in Adams et al. 2008). Fish condition factors were within the range considered healthy for trout populations in Sierra Nevada mountain streams (Ebasco Environmental, 1993; Wilcox, 1994; EA, 1986; Beak, 1991).

Comparison of the naturally reproducing brown trout populations to the levels documented at historical monitoring locations indicate that naturally reproducing brown trout populations at the Sada 5 and Sada 3 sample sites are generally consistent with levels documented during monitoring from 1991 through 2010. Overall, the brown trout population at the Sada 5 sample site appears to be stable or growing compared to previous levels; during this study, the Sada 5 sample site had higher brown trout density, partially driven by higher numbers of YOY fish in 2019, and slightly higher fish condition factors with a broader range of sizes present. At the Sada 3 sample site, the brown trout population data collected during this study were generally within range of prior studies (1991–2010), although results were more variable at this site across survey years.

9.9 Consultation Summary

During studies, biologists consulted and coordinated with CDFW to analyze fish scale samples collected during the 2019 surveys. CDFW provided scale age analysis results on February 7, 2020. These results were summarized in the Bishop Creek Stream Fish Distribution Technical Memorandum, distributed as a draft in April 2020.

Site selection and placement was determined in in consultation with CDFW and the U.S. Forest Service (USFS) in 2019.

Additionally, SCE distributed three periodic progress reports on the following schedule:

- Progress Report 1: December 19, 2019
- Progress Report 2: April 14, 2020
- Progress Report 3: July 24, 2020

A technical memorandum summarizing the 2019 study results was submitted with Progress Report 2. Following that filing, SCE hosted a TWG meeting on May 7, 2020 to discuss the 2019 study season, work completed to date and the technical memoranda. After the meeting, TWG members submitted comments on the technical memoranda and SCE provided a general response to those comments as part of Progress Report 3. Table 9.9-1 below includes updated responses to those comments.

Table 9.9-1 Updated Responses to Comments from the May 7, 2020 Technical Working Group Meeting

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response- to be confirmed
28	Bishop Creek Fish Distribution Technical Memo	May 21, 2020	CDFW	[SCE] Addressed but did not specifically refer to naturally reproducing brown trout populations. CDFW recommends the technical memorandum assess the distribution of the naturally reproducing brown trout populations. [Referring to *Assess distribution of other fish species in Bishop Creek downstream from Lake Sabrina and South Lake.*]	Where possible, the findings in this ISR have been updated to include a more complete description of the naturally reproducing population of brown trout in the study area, further analysis will be provided in the Final Technical Report in 2021.
28	Bishop Creek Fish Distribution Technical Memo	May 21, 2020	CDFW	An analysis was done but no real discussion. CDFW recommends the technical memorandum provide a discussion of the population comparison and the evaluation showing the populations are self-sustaining consistent with levels documented during the 1990s through 2010. [Referring to *Obtain population data sufficient to identify the extent to which self-sustaining brown trout populations are consistent with levels documented during the 1990s through 2010 at historic monitoring sites.*]	Where possible, the results in this ISR have been updated to include a more complete description of brown trout populations compared to historic levels. The analysis is ongoing and final results will be presented in the Final Technical Report in 2021.
30	Bishop Creek Fish Distribution Technical Memo	May 21, 2020	CDFW	Reported in Appendix AQ-3B but not evaluated. [Referring to *Evaluate select, localized water quality parameters that may affect the growth and distribution of fish species*.]	Localized water quality parameters that may affect the growth and distribution of fish species is currently being analyzed and will be addressed in the Final Technical Report in 2021.

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response- to be confirmed
31	Bishop Creek Fish Distribution Technical Memo	May 21, 2020	CDFW	The technical memorandum determined that study results suggest that trout populations within Bishop Creek sample sites are in line with the 'Desired Conditions' described in the Land Management Plan for the Inyo National Forest (USDA 2018). It is unclear how this determination was made. CDFW recommends the technical memorandum provide more detail on the methodology and assessment.	Rationale for this conclusion will be included in the Final Technical Report in 2021.
32	Bishop Creek Fish Distribution Technical Memo	May 21, 2020	CDFW	Page 21. The discussion should define what the authors mean by 'healthy.' This conclusion is said to be based upon individual fish size and condition, age class distribution, and fish density. We offer the alternative interpretation that small average size and a notable absence of older age classes indicates an impaired condition.	The results in this ISR have been updated to include a description of criteria used to describe the health of the brown trout fishery.

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APPENDIX AQ-3A SITE PHOTOS

See Volume II

APPENDIX AQ-3B

BISHOP CREEK STREAM FISH DISTRIBUTION STUDY SAMPLE SITE HABITAT AND WATER QUALITY DATA SEPTEMBER 2019

See Volume II

APPENDIX AQ-3C

TROUT ABUNDANCE, DENSITY, AND BIOMASS AT THE SADA 5 AND SADA 3 SAMPLE SITES SEPTEMBER 2019

See Volume II

APPENDIX AQ-3D

FISH CAPTURE DATA FOR THE BISHOP CREEK STREAM FISH DISTRIBUTION STUDY SEPTEMBER 2019

See Volume II

10 BISHOP CREEK RESERVOIRS FISH DISTRIBUTION INTIAL STUDY REPORT (AQ 4)

10.1 INTRODUCTION

During TWG meetings, SCE and stakeholders identified the need for a baseline study of fish distribution in Project reservoirs. Project operations may directly or indirectly influence fish resources occupying Project waters, primarily by regulating water levels of reservoirs, or by altering flows in stream reaches. Effects on fisheries may be direct (e.g., altered habitat due to reservoir water level management) or indirect (e.g., public access to Project areas). The objectives of the Bishop Creek Reservoirs Fish Distribution Initial Study (AQ 4) is to evaluate the effects of Project operations on fish populations in Project reservoirs and assess whether Project facilities and operations are consistent with the Desired Conditions described in the Land Management Plan for the INF (USDA, 2018) as they relate to ecological sustainability and diversity of plant and animal communities. This study focuses on identifying the presence and distribution of fish species within the two Project reservoirs (South Lake and Lake Sabrina). This section of the ISR details SCE's study objectives, study area, methods, and preliminary results for the effort. A separate effort that examines fish distribution in the creeks below the reservoirs and diversions is described in Section 9.0, Bishop Creek Fish Distribution Baseline Initial Study.

10.2 REVIEW OF EXISTING INFORMATION

Project facilities, including 13 dams and diversions and 5 powerhouses, are sited along Bishop Creek and its tributaries as well as Birch and McGee creeks. Bishop Creek has a total drainage area of approximately 70-square-miles from its headwaters to the confluence with the Owens River. South Lake and Lake Sabrina are the major storage reservoirs in the watershed. SCE manages the water releases from the storage reservoirs, for purposes of hydro-generation and meeting water allocation requirements in accordance with the Chandler Decree. Water from McGee and Birch creeks (combined drainage area of approximately 25-square-miles) is diverted to Bishop Creek through the hydroelectric facilities.

This network of creeks and reservoirs supports both stocked and self-sustaining non-native trout fisheries, including brown trout, brook trout, and rainbow trout introduced by CDFW to support angling. Natural spawned trout from tributary headwater creeks upstream of the reservoirs may migrate downstream into Project reservoirs. However, the Project reservoir and lakes provide a heavily stocked put-and-take rainbow trout fishery; the abundance of rainbow trout in the reservoirs is a function of stocking intervals and angler catch rates, and residency time for most stocked rainbow trout in the reservoirs is believed to be very short (N. Buckmaster, CDFW, personal communication). Stocking is also required to support heavy angling pressure in Project stream reaches, although segments of the lower reaches of Bishop Creek support self-sustaining brown trout populations, and McGee and Birch creeks maintain scattered populations of self-sustaining brook trout. Edison monitored Bishop Creek brown trout populations between 1988 and 2010 (Sada and Rosamond 2010). Sada and Rosamond (2010) found that population parameters such as growth, age, and abundance remained similar to that of other regional Sierra creeks throughout most of the study period; however, abundance declined by 2010, the last year of monitoring.

Owens sucker have been informally introduced into Lake Sabrina (N. Buckmaster, CDFW, personal communication). They are not believed to have colonized other portions of the watershed. Owens sucker is a state of California species of special concern; it has no federal classification, and therefore, no formal species management plan. The species native range includes waters of the Owens River Valley but they have emigrated via the Owens Aqueduct to the Santa Clara River drainage.

Adult Owens sucker were observed spawning in a shallow arm of Lake Sabrina near the eastern end of the dam during an early June 2018 field visit. EA Engineering (1987) netted an unidentified sucker from Lake Sabrina, which the authors speculated was an Owens sucker. The species prefers soft-bottomed runs in cool-water streams and the bottoms of lakes and reservoirs. Owens suckers feed at night on aquatic insects, algae, detritus and organic matter, and spawn from early May through early July. Larval suckers become juveniles at approximately 19–22 mm (TL) and hide under cover along stream margins and in backwaters. Within the Owens River, Owens sucker are most common in stream reaches with long runs and few riffles (Deinstadt et al. 1986, as cited in CDFW, n.d.) where habitat is characterized by fine substrate and water temperatures ranging from 7–13°C and pH ranging from 7.9–8.0 (CDFW, n.d.). Adult Owens sucker are bottom-oriented in pool habitat and in lakes regardless of depth (CDFW, n.d.).

10.3 Study Objectives

Study objectives were determined based on input received in consultation with stakeholders participating in the Aquatic Resources TWG from March to June 2018, information reviewed from SCE files, a Project area site visit during June 2018, TWG input obtained on August 14, 2018, and written comments received by August 31, 2018. The TWG stated that there is no current information regarding the distribution of either game or non-game fish species of management interest in the Project area.

Study Plan objectives include the following:

- Characterize populations and status of fish species in Lake Sabrina and South Lake;
- Document presence and/or absence of Owens sucker in Lake Sabrina and South Lake;
- Assess distribution of other fish species in Project reservoirs;
- Evaluate selected, localized water quality parameters that may affect the growth and distribution of fish species; and
- Ensure that future Project facilities and operations are not inconsistent with the Desired Conditions described in the Land Management Plan for the INF (USDA 2018) as they relate to ecological sustainability and diversity of plant and animal communities.

10.3.1 Study Area

The study area includes South Lake, Lake Sabrina, and Longley Lake. Individual sites within each Project reservoir are described below.

10.4 Methods

Reservoir fish surveys were conducted from June 3 to 16, 2020 and September 7 to 11, 2020. Fish sampling methods included:

- weekly daytime boat electrofishing and beach seining surveys targeting Owens sucker spawning habitat to document the presence and/or absence of Owens sucker at Lake Sabrina and South Lake during the spawning season;
- early and late summer night electrofishing surveys to characterize reservoir fish population assemblages in Lake Sabrina and South Lake (September); and
- a single, late-summer gill netting effort to characterize the reservoir fish population assemblage in Longley Lake (September).

Additionally, South Lake and Lake Sabrina reservoir bathymetry was mapped using vessel-mounted, single beam echo-sounder systems from July 27 to August 6, 2020 to allow assessment of fish habitat in the reservoirs.

10.4.1 Owens Sucker Surveys

Owens sucker surveys were conducted during peak spawning season to increase the likelihood of capture. Surveys were conducted in each reservoir once per week over a three-week period between June 3 and16, 2020. Monitoring locations targeted suitable spawning habitat (i.e., shallow locations with flowing or well-aerated water and coarse sand and/or gravel substrates) but also included locations along the reservoir margins with larger substrate (i.e., boulders) to get full coverage of available habitat. Start and end points for each sample site were obtained using a handheld global positioning system (GPS).

Surveys were conducted during the day using standard beach seining and boat electrofishing methods (Reynolds 1996). Suitable beach seine locations (e.g., shallow water free of obstructions such as large rocks and woody debris) were rare in both reservoirs; therefore, boat electrofishing was used as the primary method. Electrofishing shock time was recorded for each pass.

As fish were captured (netted), they were placed in aerated containers with ambient reservoir water until the completion of each pass. Captured fish were processed after sampling at each location. Fish data recorded included species identification, total length (TL; millimeters [mm]), fork length (FL; mm), and weight (grams [g]). A subset of 27 Owens suckers were sacrificed to obtain operculum samples for fish aging and scale samples; all other captured fish were returned to the source water immediately following processing. Operculum bones were removed and placed in individually labeled envelopes. Scales were taken from the left side of the body below the dorsal fin and above the lateral line and placed in individually labeled envelopes. Scale samples were also collected opportunistically from other species (e.g., rainbow trout and brook trout). Operculum and scale analyses to characterize fish age/size class will be conducted by CDFW in their Bishop laboratory.

During each monitoring event, biologists recorded the date and time of sampling, and measured in situ water conditions approximately 1 meter below the water surface, including temperature, dissolved oxygen, conductivity, and pH using a calibrated YSI Pro Plus multiparameter meter, and noted other conditions including water clarity and climatic conditions (i.e., air temperature, wind speed, and cloud cover/precipitation). Photos were taken at each monitoring location to document general habitat conditions, which primarily focused on bank substrate types (e.g., sand, gravel, boulders), shoreline steepness, and tributary inflow. In addition, any observations of Owens sucker spawning activities (e.g., redd formations or spent adults) were documented.

10.4.2 Reservoir Fish Assemblage Surveys

Reservoir fish assemblage surveys were conducted using nighttime boat electrofishing during June 10 to 12, 2020 and September 9 to11, 2020. Four sites, ranging from approximately 1,600 ft to 2,200 ft in length, were established along the shorelines of both lakes. Sample sites were established in representative near-shore habitat (Figure 10.4-1 through Figure 10.4-3). Start and end points for each sample site were obtained using hand-held GPS. Electrofishing shock time was recorded. As fish were captured (netted), they were placed in aerated containers with reservoir water until the completion of the pass. Captured fish were processed after sampling at each location. Fish data recorded included species identification, TL (mm), FL (mm), and weight (g). Water temperature and dissolved oxygen profiles were measured with a YSI meter near the dam of each reservoir. Measurements were recorded at one-meter intervals from the water surface down to the substrate.

Reservoir fish assemblage surveys were conducted at Longley Lake using gill netting September 7–8, 2020. Two gill nets, approximately 80 feet (ft) long by 6 (ft) tall with variable mesh sizes ranging from 0.75 inch to 2.50 inches, were deployed in different sections of the reservoir. One net was deployed at the cove in front of the dam with each end attached to the shore and the middle section resting on the reservoir bottom at depth of approximately 20 feet. The other net was deployed near the southeast corner of the reservoir, oriented perpendicular to the shoreline with one end attached to the shore and the other end anchored in water approximately 20 feet deep (Figure 10.4-3). Both gill nets were deployed for two extended periods spanning from 1500 on September 7 to midnight on September 8 and from approximately 0100 to noon on September 8. Captured fish were placed in an aerated container with ambient reservoir water for processing. Fish data recorded included species identification, TL (mm), FL (mm), and weight (g). Date, time, sample duration, and prevailing weather conditions for each net set period were recorded. Water temperature and dissolved oxygen were measured with a YSI meter calibrated at the lake.

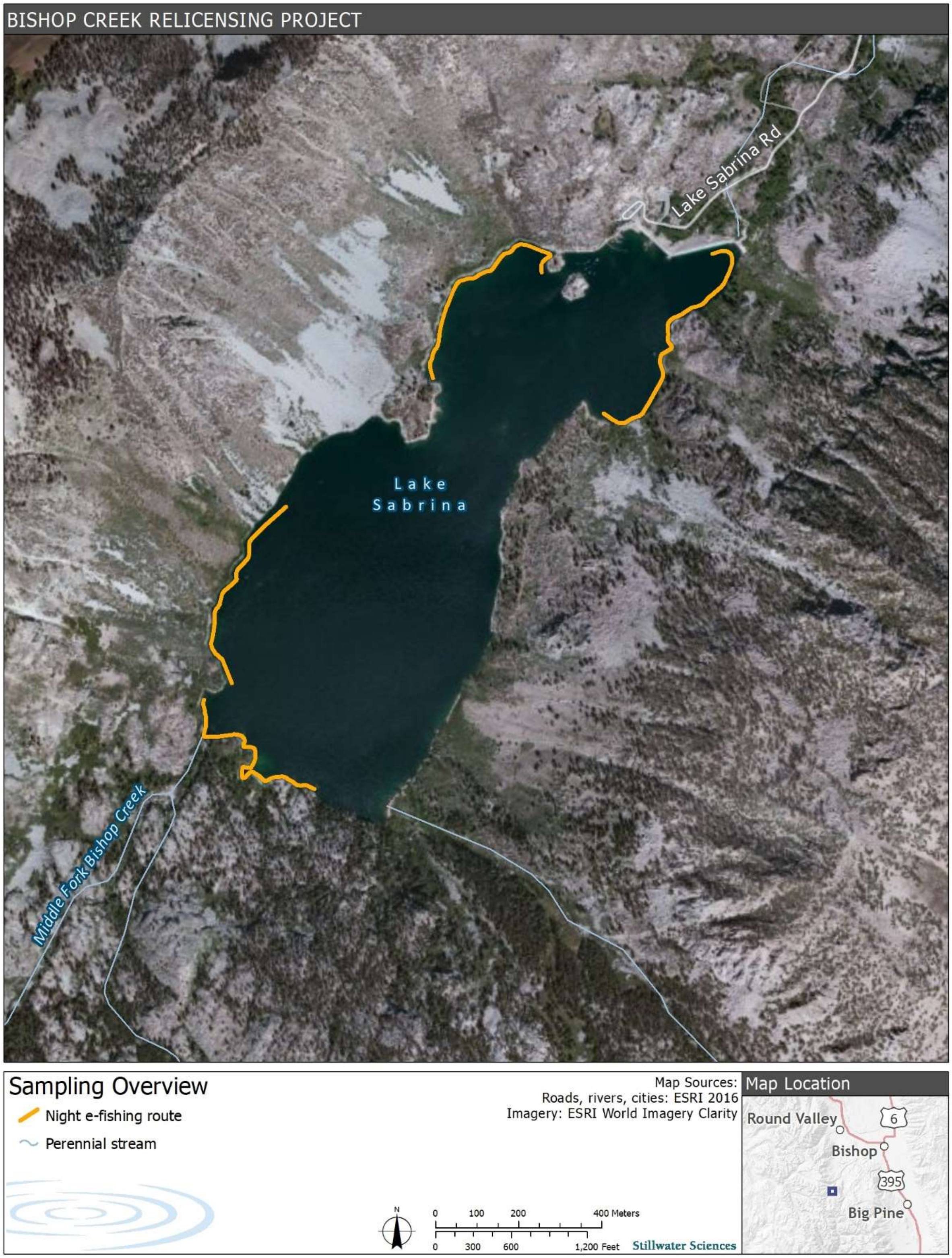

Figure 10.4-1 Lake Sabrina Night time Boat Electrofishing Locations

Figure 10.4-2 South Lake Night time Boat Electrofishing Locations

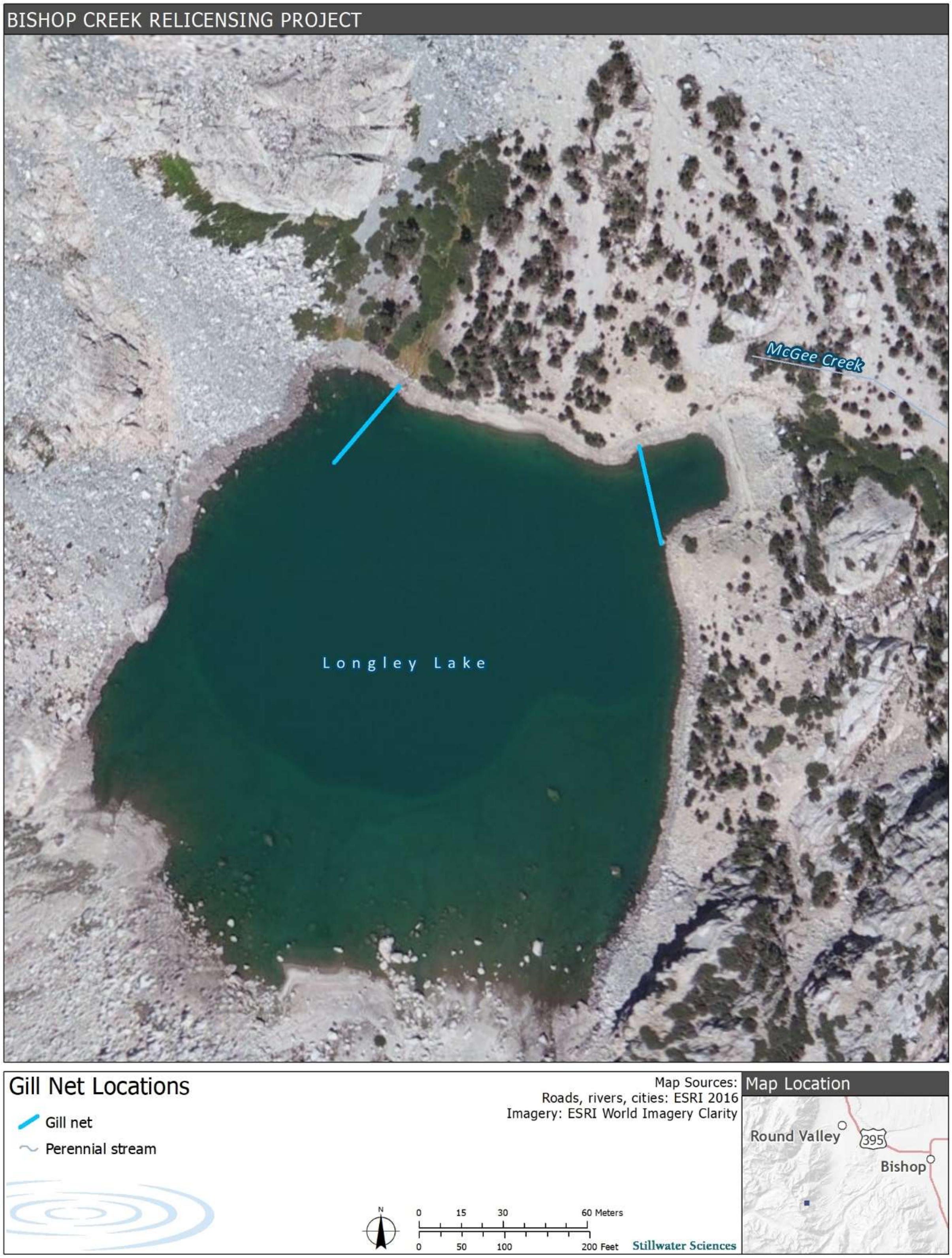

Figure 10.4-3 Longley Lake Gill Net Placement, September 2020

10.4.3 Reservoir Bathymetry

South Lake and Lake Sabrina reservoir bathymetry was mapped between July 27, 2020 and August 6, 2020. Prior to conducting the reservoir bathymetry surveys, semi-permanent benchmarks were installed in large bedrock outcrops at both reservoirs, and coordinates were established with National Geodetic Survey Online Positioning User Service (NGS OPUS) processing service. The benchmarks were used as the Global Navigation Satellite System (GNSS) base station location for subsequent reservoir bathymetry and water surface elevation surveys. A CEEPULSE 200-kiloHertz (kHz) single beam system and an Ohmex SonarMite 235-kHz single-beam system were used to measure reservoir depth.

A 16-foot aluminum survey vessel with a 20-horsepower outboard motor and an electric trolling motor were utilized to survey the deep, open water reservoir areas; an inflatable kayak was utilized to survey the perimeters and other shallow water areas. Both single beam systems consisted of a transducer hardwired to a small, portable black box echo processing unit and processed depths were output via cable or Bluetooth. For each system, the transducer was mounted directly beneath a GNSS real-time kinematic (RTK) antenna or robotic total station (RTS) prism, and depth soundings were fed directly to Trimble TSC3 survey controllers and recorded by the survey software. With this setup, precise horizontal and vertical coordinates were recorded simultaneously with depth soundings as a rotobic total station tracked the survey vessel as it moved along transect lines.

Planning transect lines were created prior to fieldwork and loaded on the survey controllers to serve as a navigation guide and ensure adequate transect spacing. The planning transect lines were created with a nominal minimum grid spacing of 200 ft and adjusted to increase transect density in shallow water areas, which were identified as the most likely critical Owens sucker habitat. During data collection, the survey vessels moved along transect lines at speeds up to approximately 4 knots and continuously recorded position and depth at time intervals ranging from 2–5 seconds. Small course corrections or irregular vessel tracks occurred where it was necessary to avoid obstructions and other recreational vessels and to remain on track when strong winds made it difficult to navigate in straight survey lines. An example survey course of South Lake is shown in Figure 10.4-4.

A bar check was performed at the start of each survey day to ensure adequate function of the echo sounder systems. The bar check consisted of holding the sounder in a fixed position over a flat hard surface (bedrock or boat ramp) and comparing continuous depth soundings to physical depth measurements. Cross track survey lines were also conducted and will be used to evaluate bathymetry reliability.

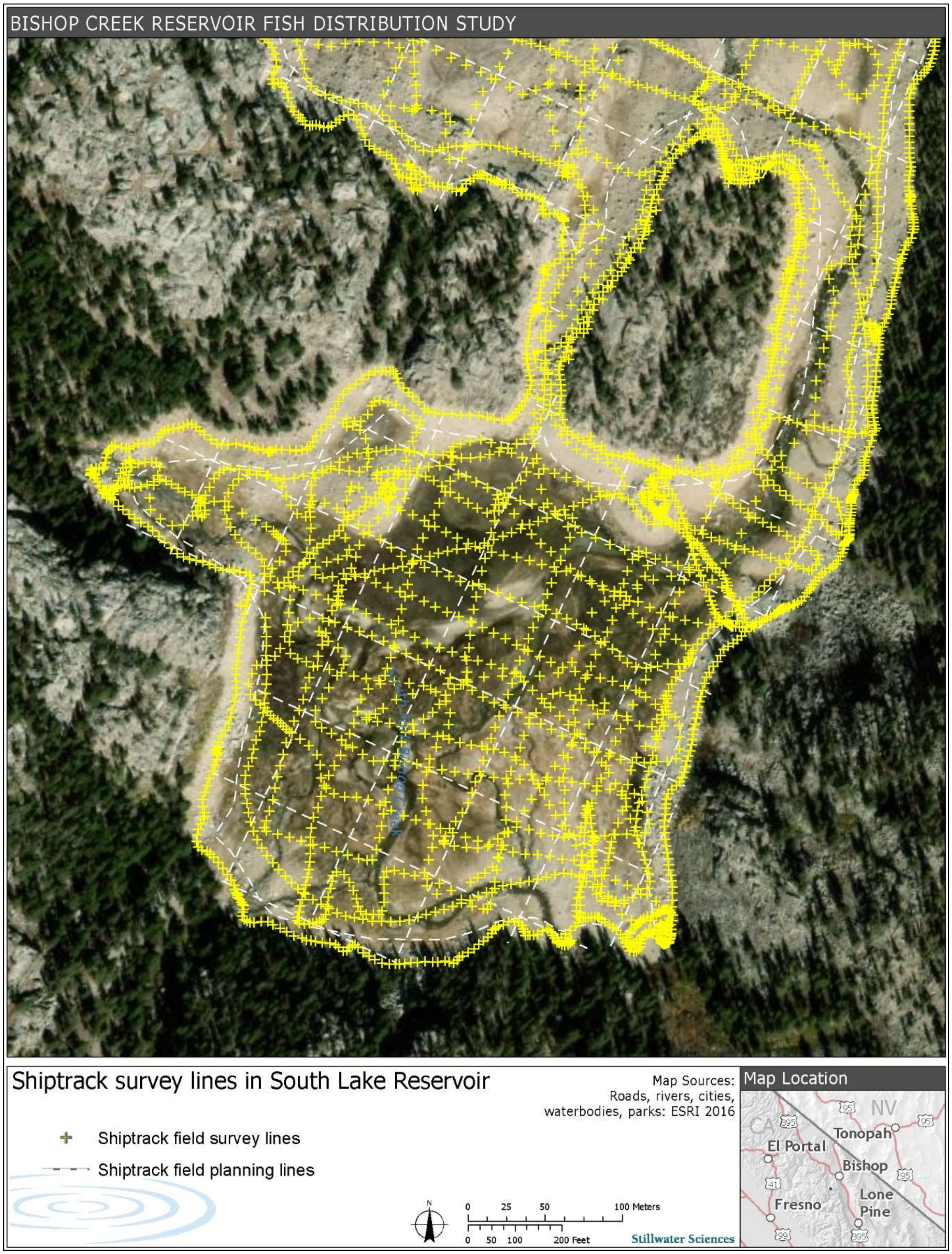

Figure 10.4-4 Reservoir Bathymetry Planning Transect and Shiptrack Survey Lines in South Lake, July 2020

10.4.4 Owens Sucker and Reservoir Fish Assemblage Analysis Methods

Data were entered into an Excel spreadsheet for reduction, tabulation, and summary. Capture data were summarized by species composition and capture method. In addition, length-frequency histograms were developed for all fish species captured to estimate age-class structure and growth rates. Breaks or modalities within the histogram were evaluated for each trout species andcompared to available literature to determine approximate age classes. Fish scales were collected from a subsample of fish and opercula were collected from a subsample of Owens suckers to provide to CDFW for analysis and to refine fish age estimates.

Fish capture results are reported both as total catch and in terms of catch per unit effort (CPUE). CPUE for fishes captured by beach seine and electrofishing was calculated by dividing number of fish of each species captured by the total surface area of water sampled using site lengths obtained with the hand-held GPS and widths that were estimated based on the boat's distance from shore and the effective shock area around the anodes. CPUE for fishes captured by gill net was calculated by dividing number of fish captured by the dimensions of the gill net and length of time fished (e.g., fish/[ft2 x hr]). CPUE was summarized by reservoir and species.

The weight-to-length relationship of individual trout was assessed as a method of identifying the nutritional state or health of the fish related to size and growth. Fulton's condition factor (Ricker 1975), a measure of this nutritional state, was calculated for each trout. Individual condition factors (k) were calculated by the following formula:

$$\mathrm{k} = \frac{\text{wet weight (g)} \times 10^5}{[\text{fork length (mm)}]^3}$$

The mean condition of trout was calculated by averaging individual condition factors for each trout species at each sample site.

10.5 Modifications to Methods

The methods for the reservoir fish assemblage surveys described in the RSP stated that sampling for Owens sucker would include a site visit to each monitoring station at least once per week during the spawning season (approximately early May through early July) to confirm presence/absence of the species. This design assumed that suckers would be potentially difficult to collect. However, large schools of Owens sucker were observed congregating in shallow water along the lake margins in early June, and were observed building redds by mid-June with sufficiently high number of fish captured at Lake Sabrina (n = 105) to confirm presence. These data and observations collected between June 3, 2020 and June 16, 2020 were adequate to characterize the Owens sucker population, identify spawning areas, and observe spawning activity. Therefore, the surveys were concluded on June 16, 2020.

Total gill net set times in Longley Lake included one approximately 9-hour set time and one approximately 11-hour set time, which were both slightly less than the 12-hour set times included in the study plan. Sampling at Longley Lake occurred during severe wildfire events nearby that complicated already difficult access conditions at Longley Lake. These conditions required longer than anticipated travel time to and from the lake, and premature termination of the sampling due to safety concerns, which resulted in a minor decrease in total set times for gill nets. However, sampling periods included times of day when trout species are most active (evening, night, and dawn hours) and when capture efficiency is highest, and it is anticipated that fish capture data collected during this study is sufficient to characterize the fish population in Longley Lake.

10.6 RESULTS

10.6.1 HABITAT CONDITIONS

Both South Lake and Lake Sabrina showed signs of thermal stratification during the June sampling effort, while DO levels remained similar throughout the water column (Figure 10.6-1and 10.6-2). Thermal stratification occurred between 5 and 6 meters below the water surface in South Lake and between 6 and 8 meters below the water surface in Lake Sabrina. Water temperatures ranged from 6.0 degrees Celsius (°C) to 10.9°C in South Lake and from 9.5°C to 12.8°C in Lake Sabrina. Thermal stratification was not observed during the September sampling effort with both South Lake and Lake Sabrina showing uniform temperatures throughout the water column. DO levels in South Lake were slightly lower during September than in June. Equipment malfunction during the September effort resulted in unreliable DO readings below the water surface in Lake Sabrina; however, DO levels measured near the water surface (with a different instrument) showed a similar decrease in levels compared to surface DO levels observed at South Lake. Overall, water temperatures were cool and DO levels were high throughout the study area. Water quality conditions observed in each reservoir are summarized in Table 10.6-1.

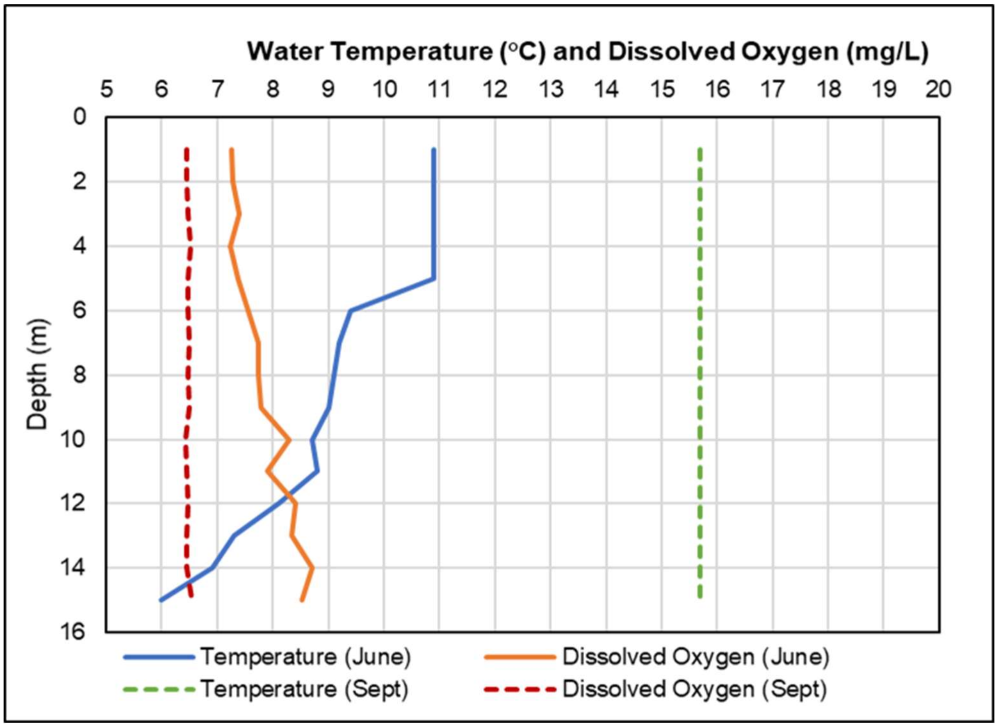

Figure 10.6-1 Water Temperature and Dissolved Oxygen Profiles for South Lake, June and September 2020

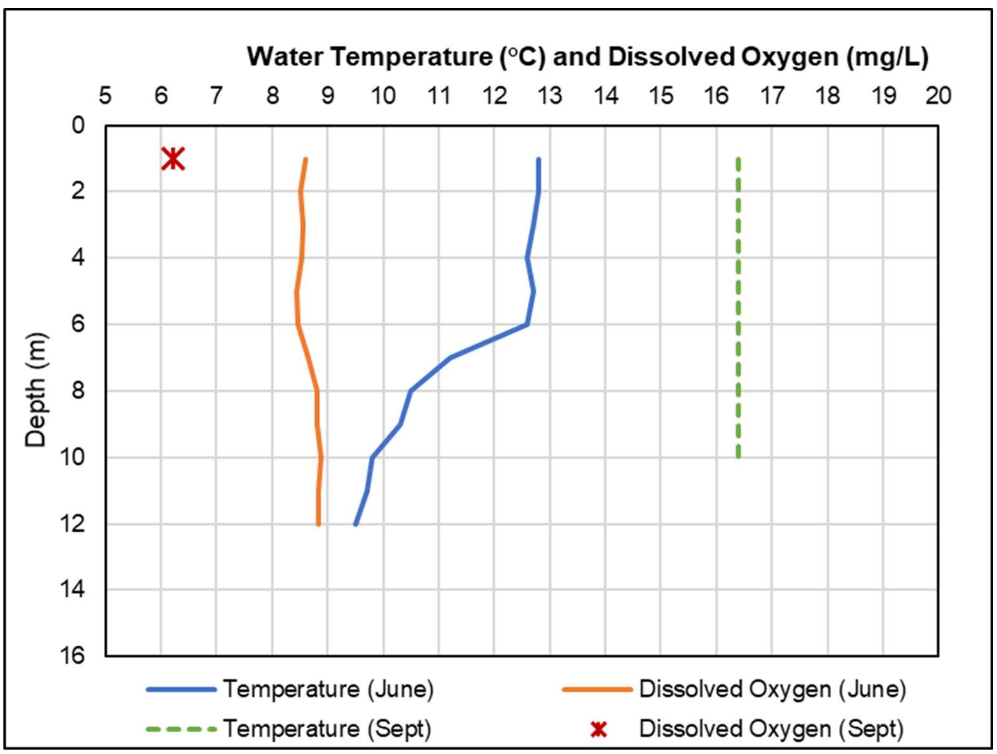

Figure 10.6-2 Water Temperature and Dissolved Oxygen Profiles for Lake Sabrina, June and September 2020

Table 10.6-1 Water Quality Conditions at Fish Sampling Locations in Project Reservoirs during June and September 2020

RESERVOIR	SURVEY MONTH	DISSOLVED OXYGEN mg/L		CONDUCTIVITY µS/cm (25 °C)		CONDUCTIVITY µS/cm (adjusted to °C)		WATER TEMP. (°C)		PH	
		min	max	min	max	min	max	min	max	min	max
South Lake	June	8.60	10.06	15.0	25.8	18.5	25.8	11.4	12.7	5.57	7.9
	Sept.	6.42	6.42	14.6	16.0	17.7	19.8	15.5	15.8	8.13	8.43
Lake Sabrina	June	8.18	9.94	14.5	19.4	14.1	19.2	9.6	11.2	6.36	7.04
	Sept.	5.83	6.21	13.0	13.1	15.6	15.6	16.4	16.6	8.07	8.46
Longley Lake	Sept.	6.31	6.31	7.0	7.0	9.2	9.2	12.8	12.8	7.85	7.85

10.6.2 SPECIES COMPOSITION AND DISTRIBUTION

A total of 677 fish were captured during the June and September 2020 reservoir surveys (including combined Owens sucker and reservoir fish assemblage surveys). The captured species indicate that the fishery in South Lake, Lake Sabrina, and Longley Lake is composed of coldwater trout species. Lake Sabrina also supports a large self-sustaining population of Owens sucker (Table 10.6-2). Rainbow trout were the most abundant trout species captured in Lake Sabrina and South Lake (Figure 10.6-3 and 10.6-4), likely as a result of frequent stocking, while brook trout was the only fish species captured in Longley Lake (Figure 10.6-5).

Table 10.6-2 Fish Species and Number Captured during 2020 Reservoir Sampling Efforts

Family	Scientific Name	Common Name	Lake Sabrina		South Lake		Longley Lake	Total
			June	Sept.	June	Sept.	Sept.	
Salmonidae	*Salmo trutta*	Brown Trout	1	0	26	31	0	58
	Oncorhynchus mykiss	Rainbow Trout	81	58	128	48	0	315
	Salvelinus fontinalis	Brook Trout	27	19	57	24	27	154
Catostomidae	*Catostomus fumeiventris*	Owens Sucker	105	45	0	0	0	150
Total			214	122	211	103	27	677

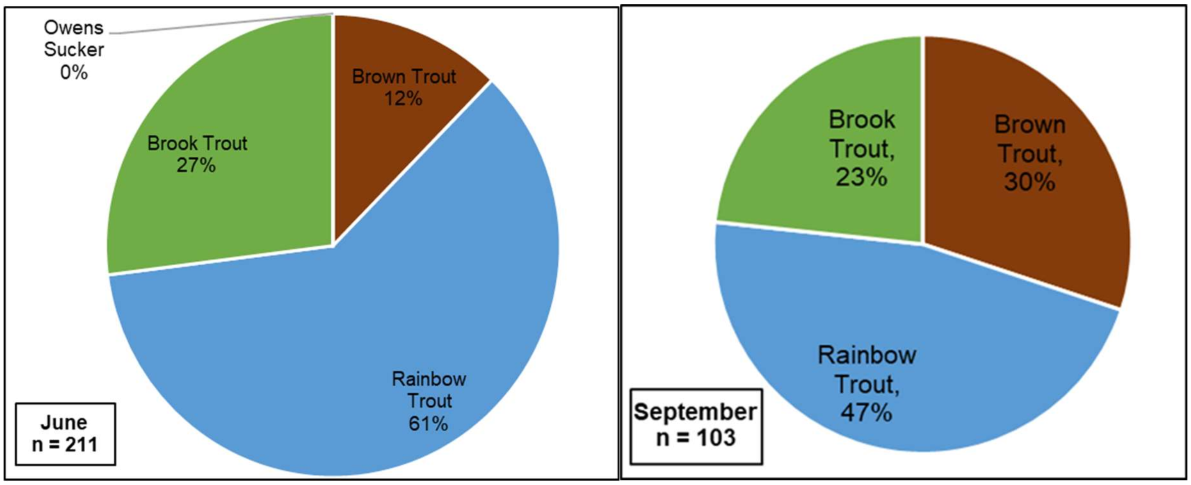

Figure 10.6-3 Fish Species Composition for South Lake during 2020 Sampling Efforts

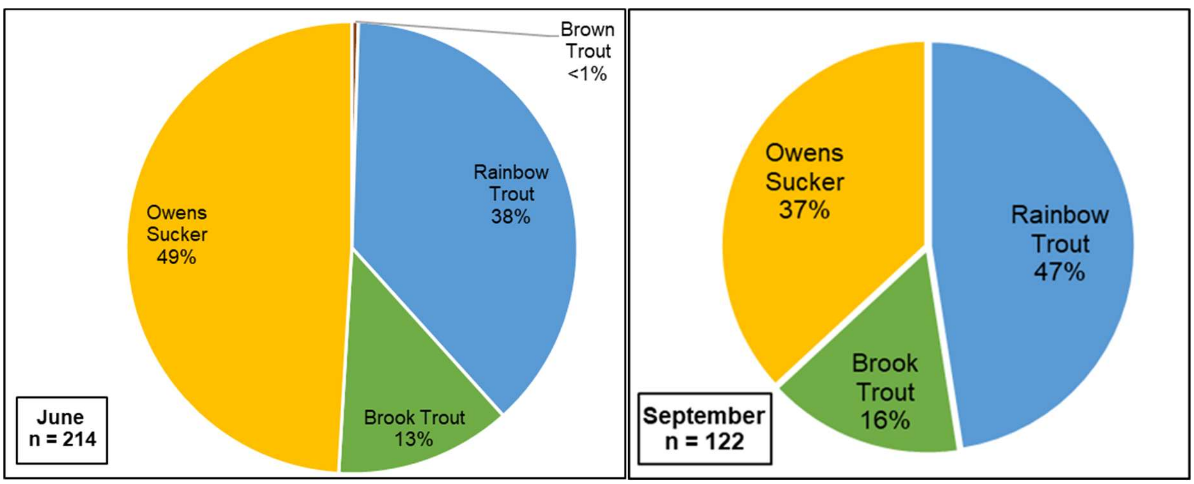

Figure 10.6-4 Fish Species Composition for Lake Sabrina during 2020 Sampling Efforts

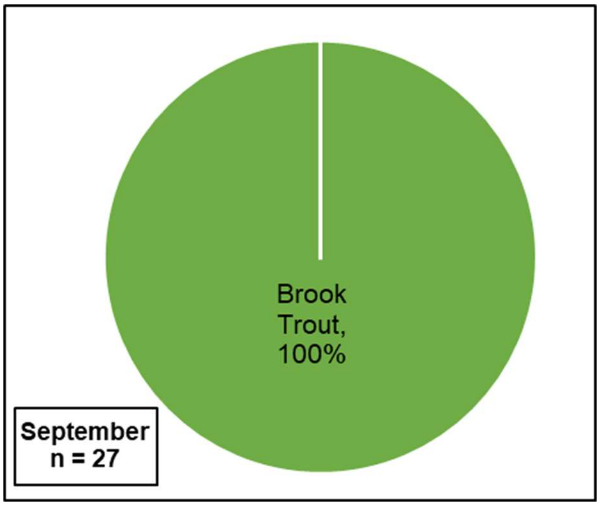

Figure 10.6-5 Fish Species Composition for Longley Lake, September 2020

CPUE for fishes captured during spring and fall showed some variability by gear type, location and season (Table 10.6-3). Overall, CPUE comparisons were fairly similar when comparing similar methods between South Lake and Lake Sabrina, while CPUE for gill netting in Longley Lake had the highest CPUE.

Table 10.6-3 Catch per Unit Effort for Fish Species Captured by Survey Method

Reservoir	Method	Catch per Unit Effort (CPUE)[a] x 1,000				
		Brown trout	Rainbow trout	Brook trout	Owens Sucker	Total
June Sampling Efforts						
South Lake	Daytime Boat Electrofishing	0.06	0.29	0.23	0	0.63
	Nighttime Boat Electrofishing	0.18	0.96	0.15	0	1.15
	Beach Seine	0.13	0.13	2.13	0	1.28
Lake Sabrina	Daytime Boat Electrofishing	0	0.26	0.13	0.31	0.55
	Nighttime Boat Electrofishing	0.01	0.59	0.14	0.79	1.25
September Sampling Efforts						
South Lake	Nighttime Boat Electrofishing	0.28	0.43	0.22	0.00	0.93
Lake Sabrina	Nighttime Boat Electrofishing	0.00	0.69	0.22	0.53	1.44
Longley Lake	Gill Net	0.00	2.12	0.00	0.00	2.12

a CPUE Gill Nets= Fish/(ft2 x hr), CPUE Electrofisher and Beach Seine= Fish/ft2

10.6.3 AGE CLASS DISTRIBUTION

The length-frequency histogram for fish species captured in South Lake in June and September indicates multiple age-classes of each species are present, including young-of-the-year (YOY) (Figure 10.6-6). In Lake Sabrina, the length-frequency distribution suggests multiple age-classes of rainbow trout and brook trout were present, including YOY; however, only one brown trout was captured (Figure 10.6-7). Based on the very large size of the brown trout captured (648 mm FL), it was likely over 5 years old. Owens sucker captured during the June and September sampling efforts in Lake Sabrina also had multiple age classes (Figure 10.6-8). More detailed age-class estimates for Owens sucker will be provided following analysis of the opercula collected in June 2020 and included in the Final Technical Report. The presence of YOY trout indicates natural spawning is occurring in South Lake and Lake Sabrina since the CDFW stocking schedule only indicates catchable size trout were planned for stocking in 2019 and 2020 (CDFW 2019). The brook trout captured in Longley Lake ranged from 190 mm to 255 mm (FL) and likely only represented a few age classes (Figure 10.6-9); however, the lack of YOY fish captured in Longley Lake was likely a result of the gill net mesh size which is selective for fish over approximately 100 mm.

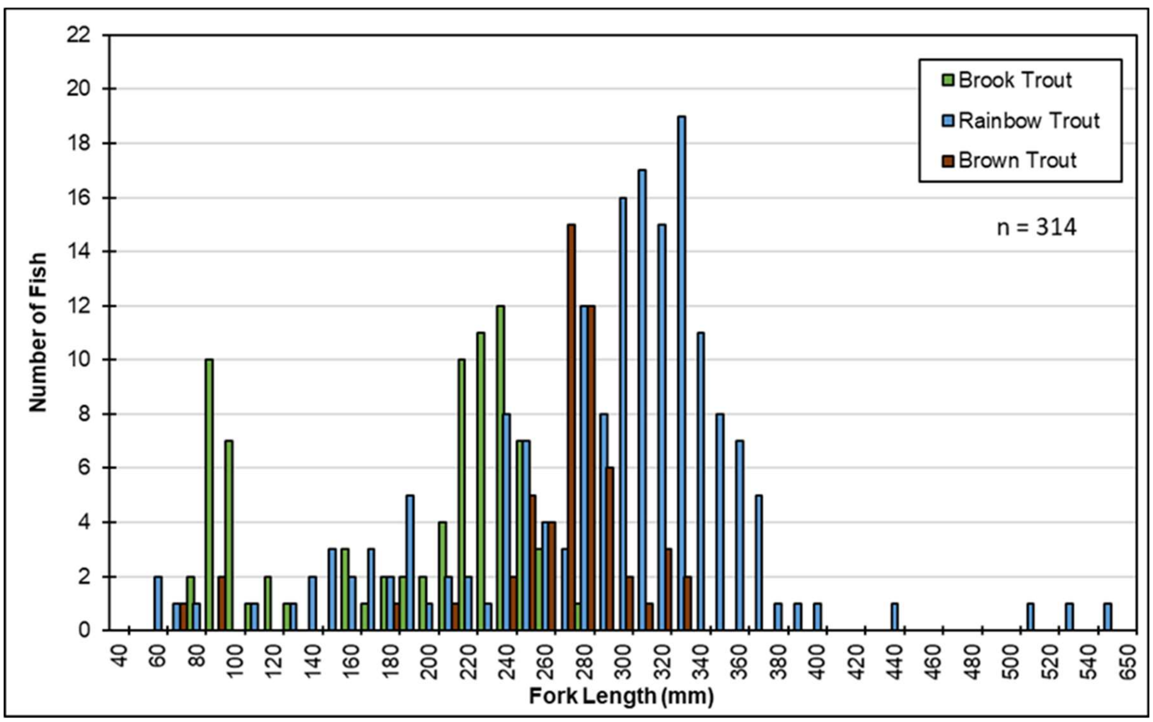

Figure 10.6-6 Length Frequency Histogram for all Fish Species Captured in South Lake during 2020 Sampling Effort

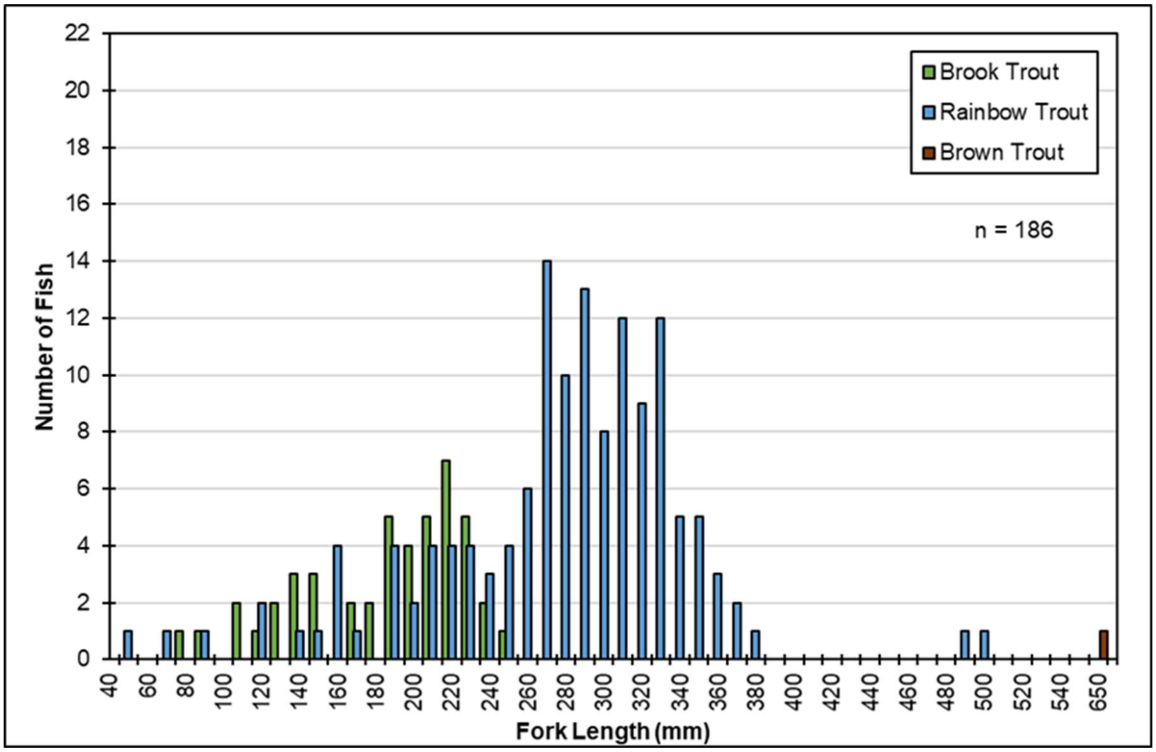

Figure 10.6-7 Length Frequency Histogram for Trout Species Captured in Lake Sabrina during 2020 Sampling Efforts

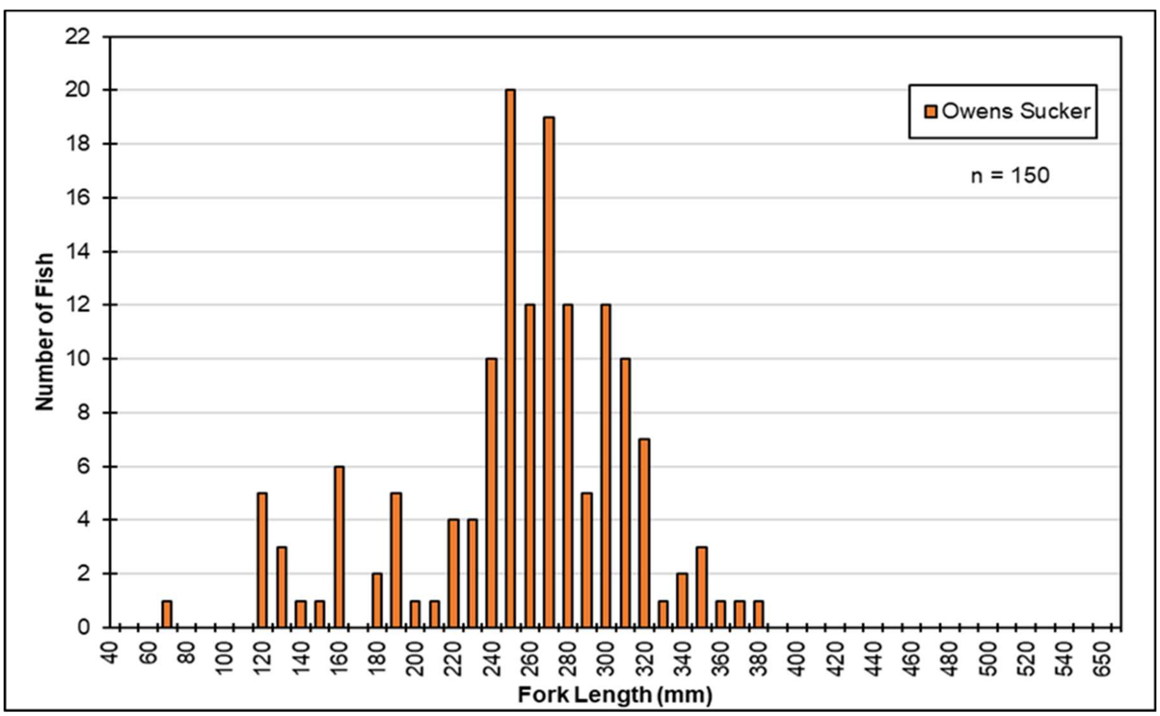

Figure 10.6-8 Length Frequency Histogram for Owens Sucker Captured in Lake Sabrina during 2020 Sampling Efforts

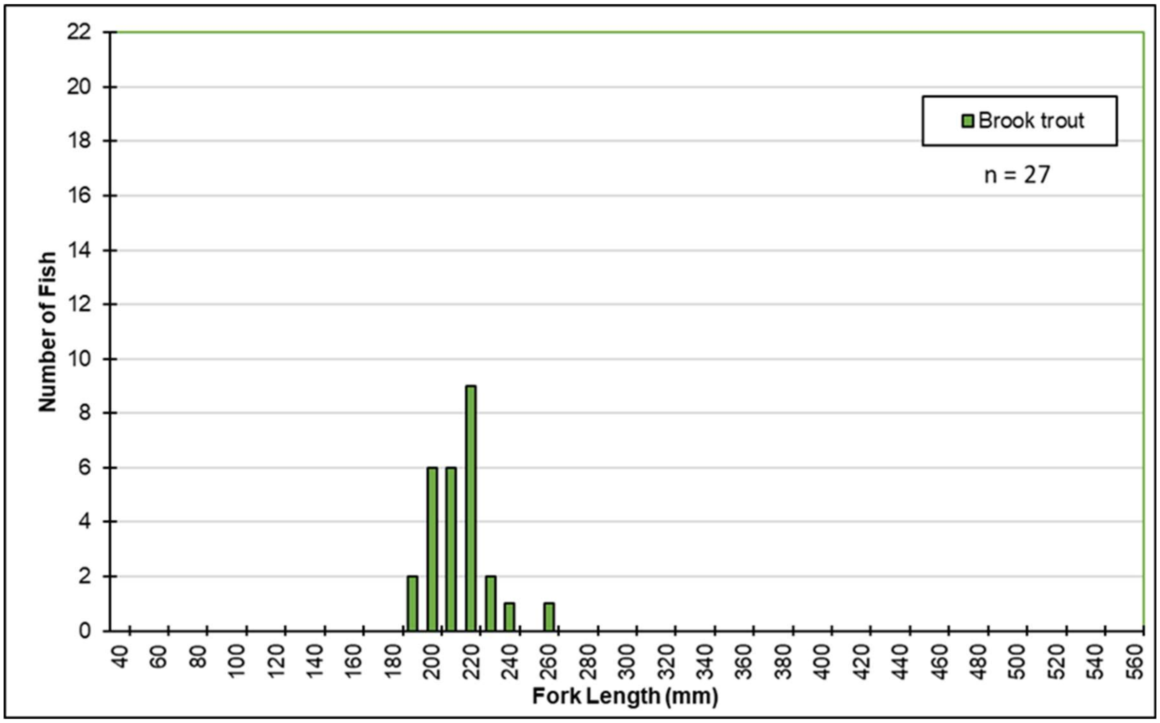

Figure 10.6-9 Length Frequency Histogram for Fish Captured in Longley Lake during 2020 Sampling Effort

10.6.4 FISH CONDITION

The mean trout condition within the Project Reservoirs sampled in June 2020 ranged from 1.06–1.34 (Table 10.6-4).

Table 10.6-4 Condition Factors (k) for Fish Captured in Project Reservoirs during 2020 Sampling Effort

Reservoir	*Species*	*Number captured*	*Fork Length (mm)*		*Average k-value*[a]
			min	*max*	
June Sampling Effort					
South Lake	*Brook trout*	*57*	*85*	*280*	*1.16*
	Brown trout	*26*	*68*	*330*	*1.08*
	Rainbow trout	*128*	*58*	*437*	*1.12*
Lake Sabrina	*Brook trout*	*27*	*77*	*239*	*1.19*
	Brown trout	*1*	*648*	*648*	*--*[b]
	Rainbow trout	*81*	*44*	*380*	*1.11*
	Owens sucker	*105*	*114*	*360*	*1.34*
September Sampling Effort					
South Lake	*Brook trout*	*24*	*195*	*255*	*1.12*
	Brown trout	*31*	*180*	*313*	*1.06*
	Rainbow trout	*48*	*168*	*168*	*1.07*
Lake Sabrina	*Brook trout*	*19*	*130*	*246*	*1.22*
	Brown trout	*0*	*na*	*na*	*na*
	Rainbow trout	*58*	*90*	*495*	*1.12*
	Owens sucker	*45*	*61*	*375*	*1.26*
Longley Lake	*Brook Trout*	*27*	*190*	*255*	*1.27*

Notes: -- Not calculated, mm = millimeters, na = not applicable

[a] Fulton's condition factor

[b] Fish weight exceeded scale capacity

10.6.5 Reservoir Bathymetry

Bathymetric maps will be completed for the upcoming Final Technical Report and the Updated Study Report in 2021.

10.7 Discussion

Analysis of 2020 data is ongoing. Conclusions will be summarized in a standalone Reservoir Fish Technical Report in 2021 and included in the Updated Study Report in November 2021.

10.8 Consultation Summary

Biologists contacted CDFW on May 21, June 1, and June 2, 2020 to coordinate the reservoir sampling approach and CDFW's aging of Owens sucker opercula collected during the June 2020 surveys.

10.9 REFERENCES

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11 BISHOP CREEK WATER QUALITY INTIAL STUDY REPORT (AQ 5)

11.1 INTRODUCTION

During the TWG meetings, and in written comments, stakeholders identified the need to develop an understanding of water quality parameters in the Project area. This Study Plan is intended to inform the environmental analysis of FERC and the State Water Resources Control Board (SWRCB).

Although the Project is located in a relatively clean granitic watershed with limited factors to impact water quality, stakeholders expressed a need to establish baseline conditions to establish a baseline for the future. Water storage and diversion activities could affect water quality in Project waters or contribute to water quality issues downstream.

11.2 REVIEW OF EXISTING INFORMATION

The state of California has responsibility for maintaining water quality standards through the federal Clean Water Act (CWA). The SWRCB and Lahontan Regional Water Quality Control Board (LRWQCB) are responsible for the protection of beneficial uses of water resources within its jurisdiction and use planning, permitting, and enforcement authorities to meet this responsibility. Every water body within the LRWQCB jurisdiction is designated a set of beneficial uses that are protected by appropriate water quality objectives as described in the Basin Plan for the Lahontan Region ([Basin Plan], LRWQCB, 1995).

For smaller tributary streams in which beneficial uses are not specifically designated, they are designated with the same beneficial uses as the streams, lakes, or reservoirs to which they are a tributary. Table 11.2-1 lists the water bodies to which this Project drains and their beneficial use designations.

The Basin Plan defines the beneficial use abbreviations as the following:

- **Municipal and Domestic Supply (MUN) –** Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.
- **Agricultural Supply (AGR) –** Beneficial uses of waters used for farming, horticulture, or ranching, including, but not limited to, irrigation, stock watering, and support of vegetation for range grazing.
- **Industrial Process Supply (PRO)** – Uses of water for industrial activities that depend primarily on water quality.
- **Industrial Service Supply (IND) –** Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, geothermal energy production, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.
- **Ground Water Recharge (GWR)** - Beneficial uses of waters used for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.

- **Freshwater Replenishment (FRSH) -** Beneficial uses of waters used for natural or artificial maintenance of surface water quantity or quality (e.g., salinity).
- **Hydropower Generation (POW) –** Uses of water for hydroelectric power generation.
- **Water Contact Recreation (REC-1) –** Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing, or use of natural hot springs.
- **Non-Contact Water Recreation (REC-2) –** Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tide pool and marine life study, hunting, sightseeing, and aesthetic enjoyment in conjunction with the above activities.
- **Commercial and Sportfishing (COMM) -** Beneficial uses of waters used for commercial or recreational collection of fish or other organisms including, but not limited to, uses involving organisms intended for human consumption.
- **Cold Freshwater Habitat (COLD) –** Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.
- **Wildlife Habitat (WILD)** – Uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
- **Preservation of Biological Habitats of Special Significance (BIOL)** - Beneficial uses of waters that support designated areas or habitats, such as established refuges, parks, sanctuaries, ecological reserves, and areas of special biological significance (ASBS), where the preservation and enhancement of natural resources requires special protection.
- **Spawning, Reproduction, and/or Early Development (SPWN)** – Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

The water quality objectives include both numeric and narrative standards for surface water that are based on criteria that protect both human health and aquatic life. If water quality is maintained at levels consistent with these objectives, beneficial uses are considered protected. Applicable water quality objectives and standards in the Basin Plan are provided in Table 11.2-2 and Table 11.2-3.

Table 11.2-1 Water Body Beneficial Use Designations

SURFACE WATER BODY	Beneficial Use: MUN Municipal and Domestic Supply	AGR Agricultural Supply	PRO Industrial Process Supply	IND Industrial Service Supply	GWR Groundwater Recharge	FRSH Freshwater Replenishment	NAV Navigation	POW Hydropower Gen.	REC1 Water Contact Recreation	REC-2 Non-Contact Water Recreation	COMM Commercial and Sport Fishing	AQUA Aquaculture	WARM Warm Freshwater Habitat	COLD Cold Freshwater Habitat	SAL Inland Saline Water Habitat	WILD Wildlife Habitat	BIOL Special Biological Habitats	RARE Rare, Threatened & Endangered Species	MIGR Migration of Aquatic Organisms	SPWN Spawning, Reproduction & Dev.	WQE Water Quality Enhancement	FLD Flood Peak Attenuation/Flood Water Storage
Upper Owens Hydrologic Area Hydrologic Unit 603.20																						
McGee Creek	X	X			X	X		X	X	X	X			X		X	X			X		
Bishop Creek (above intakes)	X	X						X	X	X	X			X		X				X		
Intake 2 Reservoir	X							X	X	X	X			X		X						
Bishop Creek (below intakes)	X							X	X	X	X			X		X				X		
Bishop Creek (below last Powerhouse)	X	X		X	X				X	X	X			X		X				X		

Source: LRWQCB 1995

Table 11.2-2 Water Quality Objectives for Hydrologic Unit 603.20 Upper Owens River Hydrologic Unit

CONSTITUENT/ PARAMETER	WATER QUALITY OBJECTIVE
Ammonia	Shall not exceed the values in Tables 3-1 to 3-4 in LRWQCB Basin Plan.
Bacteria	The fecal coliform concentration during any 30-day period shall not exceed a log mean of 20/100 milliliters (ml), nor shall more than 10 percent of all samples collected during any 30-day period exceed 40/100 ml.
Biostimulatory Substances	Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect the water for beneficial uses.
Chemical Constituents	Waters designated as MUN shall not contain concentrations of chemical constituents exceeding the maximum contaminant level (MCL) or secondary maximum contaminant level (SMCL) based upon drinking water standards specified in Title 22.
Chlorine, total residual	For the protection of aquatic life, total chlorine residual shall not exceed either a median value of 0.002 mg/L or a maximum value of 0.003 mg/L. Median values shall be based on daily measurements taken within any 6-month period.
Color	Water shall be free of discoloration that causes nuisance or adversely affects beneficial uses.
Dissolved Oxygen (DO)	The DO concentration, as percent saturation, shall not be depressed by more than 10 percent, nor shall the minimum DO concentration be less than 80 percent of saturation. For waters with the beneficial uses of COLD, COLD with SPWN, WARM, and WARM with SPWN, the minimum DO concentration shall not be less than that specified in Table 3-6 of the LRWQCB Basin Plan.
Floating Material	Water shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.
Oil & Grease	Waters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect the water for beneficial uses.
pH	In fresh waters with designated beneficial uses of COLD or WARM, changes in normal ambient pH levels shall not exceed 0.5 pH units. For all other waters of the region, the pH shall not be depressed below 6.5 nor raised above 8.5.
Radioactivity	Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life or that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life.
Sediment	The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.
Settleable Material	Waters shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.
Suspended Material	Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.
Tastes and Odors	Waters shall not contain taste or odor-producing substances in concentrations that impart undesirable tastes or odors to fish or other edible products of aquatic origin, that cause nuisance, or that adversely affect the water for beneficial uses.

Temperature	The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Quality Control Board (RWQCB) that such alteration in temperature does not adversely affect beneficial uses.
Toxicity	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.
Turbidity	Waters shall be free of changes in turbidity that cause nuisance or adversely affect the water for beneficial uses. Increases in turbidity shall not exceed natural levels by more than 10 percent.

Source: LRWQCB 1995

Table 11.2-3 Water Quality Objectives for Project Water Bodies in Upper Owens River Hydrologic Unit

SURFACE WATERS	**OBJECTIVE (mg/L) [a,b]**						
	TDS	**Cl**	**F**	**B**	**NO_3-N**	**Total N**	**PO_4**
Lake Sabrina	10	2.0	0.10	0.05	0.2	0.3	0.03
	17	3.0	0.10	0.05	0.3	0.6	0.05
South Lake	12	3.7	0.10	0.02	0.1	0.1	0.03
	20	4.3	0.10	0.02	0.1	0.4	0.04
Bishop Creek (Intake 2)	27	1.9	0.15	0.02	0.1	0.1	0.05
	29	3.0	0.15	0.02	0.2	0.4	0.09

Source: LRWQCB, 1995

a Annual average value/90th percentile value.

b Objectives are in mg/L and are defined as follows:

B = Boron

Cl = Chloride

F = Fluoride

N = Nitrogen, Total

NO3-N = Nitrate as Nitrogen

PO4 = Orthophosphate, dissolved

TDS = Total Dissolved Solids (Total Filterable Residue

In 1974, ESE (1975) in cooperation with the University of California at Los Angeles conducted an environmental baseline study of the water quality of Bishop Creek. The report concluded that the water quality of Bishop Creek was excellent and displayed the following characteristics:

- Total dissolved solids (TDS) remained very low throughout the summer, less than 30 mg/L
- Calcium (Ca) was the predominant cation in all sampled waters and surface water composition reflected the general geology of the drainage basin

- Nitrate and phosphate levels were low, generally less than 0.10 mg/1 and 0.05 mg/L, respectively

Water temperatures generally increased downstream; the report further stated that Ca was the dominant cation and that North Fork had higher values than other drainages and appeared to be related to the geology (marble roof pendants) that is found in the upper reaches of North Fork. In addition, the report noted that as flow decreased in Bishop Creek increases in various ions were noted and was attributed to groundwater providing a larger percentage of the baseflow of the stream. The groundwater generally has more contact time with the underlying bedrock resulting in higher concentrations of major ions (ESE, 1975).

In 1986, the University of California at Riverside conducted a water quality investigation of Bishop Creek and selected eastern Sierra Nevada lakes for SCE (Lund, n.d.). The following discussion presents the results of that investigation.

11.2.1 BISHOP CREEK

The ESE report (1975) determined that similar water characteristics that were reported from previous investigations with increasing dissolved constituents coincides with decreasing elevation. The dominant anion was bicarbonate, and the dominant cations were Ca and sodium. In addition, the water quality of Bishop Creek at the furthest downstream site (below Powerhouse No. 6) had lower concentrations of alkalinity and dissolved constituents. The ESE report (1975) stated that the likely reason for the decrease was the routing of water for power generation purposes. Table 11.2-4 provides a summary of the water quality characteristics for the various watersheds sampled.

Minor amounts of boron, barium, aluminum, iron, and manganese were found in the various drainages with the highest levels generally found in Bishop Creek below the confluence with South Fork.

11.2.2 SOUTH LAKE AND LAKE SABRINA

Like most Sierra reservoirs, South Lake and Lake Sabrina have very steep sides and considerable annual fluctuations in surface elevations which severely limit the production of littoral aquatic vegetation. There have been no comprehensive limnological studies of these lakes. Limited water quality profiling of the lakes was conducted from June 1986 until November 1987 and are presented in Table 11.2-6 and Table 11.2-7. Field measurements of water temperature, pH and DO was conducted at one location on each lake. In general, water temperature varied from lows of 32.3°F in March to 59.7°F in late August. In general, water temperature decreased with increasing depth. DO ranged from 11.98 mg/L in early March to 2.44 mg/L in late August and was generally above 100 percent saturation except in August when DO values dropped to less than 38 percent saturation.

Table 11.2-4 Bishop Creek - Project No. 1394 Physical and Chemical Characteristics of North and Middle Forks of Bishop Creek June-November 1974

	Sample Location										
	S1	**S2**	**S2A**	**S3**	**S4**	**S6**	**S6A**	**S7**	**S8**	**S19 Bishop Creek @ Hwy 395 (*)**	
Parameter	**Range**	**Range**	**Range**	**Range**	**Range**	**Range**	**Range**	**Range**	**Range**	**Spring**	**Fall**
Ca (mg/L)	1.7-3.7	2.3-4.9	1.9-2.9	1.9-3.2	2.2-2.6	2.3-3.0	2.3-3.3	2.1-2.7	2.1-3.0	9.6	8.8
Magnesium (mg/L)	0.1-0.16	0.13-0.18	0.12-0.16	0.14-0.22	0.17-0.19	0.18-0.22	0.18-0.23	0.13-0.22	0.13-0.16	0.7	0.5
Sodium (mg/L)	0.4-0.8	0.8-1.1	0.6-1.0	0.5-1.0	0.6-0.8	0.80.8-1.1	0.7-1.1	0.8-1.2	0.6-0.7	4.5	3.4
Nitrate as N (mg/L)	0.03-0.11	0.08-0.13	0.05-0.12	0.05-0.1	0.05-0.12	0.05-0.13	0.06-0.12	0.06-0.12	0.06-0.1	0.3	0.8
Phosphate as P (mg/L)	0.03-0.04	0.02-0.05	0.02-0.05	0.02-0.04	0.02-0.05	0.02-0.03	0.01-0.03	0.01-0.04	0.01-0.03	--	--
TDS (mg/L)	6-27	8-26	7-20	8-21	9-16	11-21	20	11-21	8-10	--	--
Water Temperature (deg °C)	10.0-11.5	8.5-11.0	10.0-13.5	9.0-13.5	10.0-14.0	10.0-15.0	12.5-14.5	11.0-15.0	9.9-15.0	12.5	8.5
pH (units)	5.5-7.5	5.0-7.1	5.0-8.8	5.0-7.4	5.0-6.8	5.0-8.2	5.5-7.2	5.0-8.4	5.0-7.3	7.5	7.29
DO (mg/L)	6.6-8.1	6.7-9.4	6.8-9.1	6.8-8.8	6.8-7.5	6.4-8.6	6.3-7.7	7.46.6-8.1	6.2-7.8	9.2	9.3

Source: ESE, 1975
(*) Spring: May 1974; Fall: November 1974
(--) indicates analysis not performed.

Table 11.2-5 Physical and Chemical Characteristics of Middle and South Forks of Bishop Creek, McGee Creek and Birch Creek ([a, b]) May 1986 - December 1987

	Watershed/Sample Locations (c)					
	Middle Fork of Bishop Creek	South Fork of Bishop Creek	Bishop Creek Below South Fork	McGee Creek	North Fork of Birch Creek	South Fork of Birch Creek
Parameter	**1, 2, 3, 4**	**1S, 2S, 3S, 4S**	**5, 6, 7, 8, 9, 10, 17**	**11, 12**	**13, 14,**	**15, 16**
Calcium (mg/L)	1.3-10.0	2.5-47.3	4.1-20	2.58-10.3	5.5-13.9	13.8-15.3
Magnesium (mg/L)	0.1-0.9	0.3-5.7	0.4-4.9	0.20-0.77	0.3-0.5	1.34-1.59
Sodium (mg/L)	0.3-2.7	0.7-4.8	1.2-16.7	1.00-2.77	1.8-2.5	1.93-2.85
Potassium (mg/L)	0.04-1.0	0.4-3.3	0.1-2.0	0.50-1.67	0.6-1.3	1.38-1.56
ANC (µeq/L) (d)	122-447	146-2,532	235-1,537	153-651	321-789	893-1,006
Chloride (mg/L)	0.1-0.5	0.2-1.0	0.2-5.6	0.12-0.28	0.2-0.3	0.23-0.25
Nitrate (mg/L)	ND(e)-1.1	ND-0.8	ND-1.2	0.55-0.59	ND-0.5	ND
Sulfate (mg/L)	0.1-13.3	1.3-23.2	1.7-13.0	1.16-2.76	2.9-3.5	1.78-2.25
Silica (mg/L)	1.5-9.1	2.52-13.9	5.65-22.7	NS (f)	9.65-11.4	16.63-19.58
Boron (mg/L)	ND-0.01	ND-0.02	ND-0.04	NS	ND	ND
Barium (mg/L)	ND	ND-0.019	ND-0.054	NS	ND-0.003	0.001-0.005
Aluminum (mg/L)	ND-0.07	ND-0.09	ND-0.60	NS	ND-0.16	ND-0.15
Iron (mg/L)	ND-0.83	ND-0.19	ND-0.74	NS	ND-0.002	0.02-0.04
Manganese (mg/L)	ND-0.042	ND-0.035	ND-0.028	NS	ND	ND-0.002

Source: Lund, n.d.
a - Derived from Lund undated.
b - Values presented are estimated. Original values were reported in µmoles/L (Lund, n.d.) and converted to mg/L.
c - ANC=Acid Neutralizing Capacity.
d - ND=Not detected (no detection limit provided).
e - NS=Not sampled.

Table 11.2-6 1986 Field Water Quality Depth Profiles for Lake Sabrina

DATE	DEPTH (meters)	WATER TEMPERATURE (deg °C)	pH (units)	DISSOLVED OXYGEN	
				mg/L	% Saturation
06/24/86	0.5	12.61	7.25	8.31	108.3
	2.5	11.16	7.26	8.72	110.1
	4.5	9.33	7.33	9.07	110.0
	6.5	8.64	7.34	9.31	111.3
	8.5	8.01	7.43	9.46	111.5
	10.3	7.50	7.46	9.59	111.8
08/19/86	0.5	15.41	7.27	7.93	109.9
	2.5	15.25	7.23	7.72	106.6
	4.5	15.23	7.25	7.63	105.3
	6.5	14.91	7.45	8.11	111.1
	8.5	14.50	7.71	8.23	111.8
	10.3	14.03	8.06	8.44	113.5
	12.5	12.81	7.89	8.45	110.6
	14.5	10.82	7.65	8.43	105.7
	16.5	10.05	7.30	6.97	85.9
10/27/86	0.5	7.29	6.81	9.33	108.3
	2.5	7.29	7.01	8.96	104.0
	4.5	7.31	7.09	8.91	103.4
	6.5	7.30	7.13	8.85	102.7
	8.5	7.26	7.15	8.82	102.3

Source: Lund, n.d.

Table 11.2-7 1987 Field Water Quality Depth Profiles for Lake Sabrina

Date	Depth (meters)	Water Temperature (deg °C)	pH (units)	Dissolved Oxygen	
				mg/L	% Saturation
03/18/87	0.5	0.14	7.14	11.98	114
	1.0	0.49	7.21	11.03	106
	2.0	1.66	7.26	10.45	105
	3.0	2.24	7.31	10.09	103
	4.0	2.80	7.35	9.70	100
	4.6	2.94	7.38	9.47	98
06/30/87	0.0	14.8	*	8.61	121
	0.5	14.5	*	8.70	122
	1.5	14.4	*	8.64	121
	2.5	14.4	*	8.62	120
	3.5	14.3	*	8.64	120
	4.5	14.3	*	8.64	120
	5.5	14.3	*	8.61	120
	6.5	14.2	*	8.74	122
	7.5	13.7	*	9.05	124
	8.5	13.1	*	9.26	126
	9.5	12.8	*	9.41	127
	10.5	12.1	*	9.64	128
	11.5	11.6	*	9.81	128
	12.5	10.5	*	10.41	133
08/24/87[1]	0.5	15.39	7.74	2.58	37
	2.5	15.42	7.69	2.44	35
	4.5	15.42	7.66	2.44	35
	6.5	15.41	7.66	2.44	35
	8.5	15.37	7.62	2.48	35
	10.5	14.91	7.62	2.55	36
	12.5	13.47	7.63	2.60	36
	14.5	12.25	7.78	2.71	36
	15.l	11.92	7.75	2.72	36
11/03/87	0.5	8.48	7.04	8.42	102
	2.5	8.50	7.23	8.25	100
	4.5	8.52	9.32	7.87	95
	6.5	8.51	7.55	8.34	101
	8.5	8.53	7.66	8.07	98
	10.5	8.42	7.40	7.82	95
	11.0	8.52	7.66	8.14	99

Source: Lund, n.d.
[1] Low DO readings do not appear to correspond with any reported fish-kill and may be suspect. However, the Lund report shows similar data at other lakes in the Sierras at the same time-period, include Gem and Waugh lakes.

DO inversely followed water temperature and decreased values were observed as water temperatures increased. Values for pH ranged from 6.81 to 9.32; however, most values were between 7 and 8 pH units.

Measurements of the chemical characteristics of the lakes were taken in fall 1985 and are presented in Table 11.2-8. The chemical composition of these lake waters appears typical for reservoirs in the Sierra Nevada elevation and latitude. There are three basic factors which cause the high elevation reservoirs of this portion of the High Sierra to be mineral and nutrient-poor. First, the watersheds are generally undisturbed and support very little human habitation. Second, the substrates in these drainages are dominantly igneous intrusive rocks, and third, the drainages contain very shallow and poorly vegetated soils. The combination of these factors results in very little leaching of minerals and nutrients into waters entering the reservoirs.

Table 11.2-8 Chemical Characteristics for South Lake and Lake Sabrina[a]

Parameter	South Lake		Lake Sabrina	
	Surface	Bottom	Surface	Bottom
Calcium (mg/L)	1.98	1.98	1.94	1.88
Magnesium (mg/L)	0.16	0.16	0.11	0.11
Sodium (mg/L)	0.34	0.34	0.18	0.28
Potassium (mg/L)	0.98	0.98	0.78	0.78
Nitrate as N (mg/L)	0.035	0.026	0.016	0.013
Sulfate as S (mg/L)	0.438	0.399	0.136	0.138
Bicarbonate	---	---	---	---

Source: Lund, n.d.

Notes: a - Samples collected September 1985.

Collection of water temperature data was not required as part of the 4(e) monitoring program for the existing license. However, beginning in 2004, the technology used for recording stream stage allowed for simultaneous collection of water temperature data. These data were not reported but are contained in Microsoft Excel data files that were used to supplement data collected as part of this effort. Air temperature was recorded by a barologger[9] kept in dry housing outside the stream. This barologger was used to calibrate the stream stage data (i.e. eliminate “noise” from pressure changes due to weather rather than changes in stream flow).

As part of the California's Surface Water Ambient Monitoring Program (SWAMP) for perennial streams, the California SWRCB undertook a water quality monitoring program

[9] An accurate method of obtaining changes in water level to compensate for atmospheric pressure fluctuations. https://www.fondriest.com/solinst-barologger-edge.htm. Accessed September 20, 2020.

on Bishop Creek from 2013 to 2016. The results of the study are summarized in Table 11.2-9.

The water quality was similar to that observed in previous studies with Ca and sodium the dominant cations. TDS was low, ranging from 25 to 66 mg/L, but averaged above the Basin Plan value of 27 mg/L above Intake 2. Water temperature was generally less than 62.6°F. Two biological parameters detected were fecal coliform and *Escherichia coli* (E coli.) and ranged from 1 to 66 colony forming units (cfu) per100 ml and 1 cfu to 61 cfu per 100 ml, respectively; exceeding the basin standard of 20 cfu/100 ml for fecal coliform.

Samples collected over the 2-year period of 2015 and 2016 indicated non-detectable values for fecal coliform or *E. coli* for Bishop Creek (total of three samples) at the USFS boundary. Studies conducted by the RWQCB for Bishop Creek concluded that the impaired portion of Bishop Creek was located below Powerhouse No. 6 and was likely the result of cattle grazing in or near Bishop Creek and potentially leaking sanitary sewer systems in lower Bishop Creek (Knapp and Craig, 2016).

Table 11.2-9 Summary of SWAMP Water Quality Sampling on Bishop Creek at National Forest Boundary (Station 603BSP111)

PARAMETER/CONSTITUENT (A)	UNITS	NO. OF SAMPLES	MAXIMUM	MINIMUM	MEAN	BASIN STANDARDS
Oxygen, dissolved	(mg/L)	1	10.7	10.7	'---	varies
Water Temperature	(deg °C)	12	16.4	2.2	9.84	NA
pH	(units)	12	**10.3**	7	7.97	6.5-8.5 (b)
Alkalinity (as calcium carbonate [$CaCO_3$])	(mg/L)	12	44	19	30.4	NA (c)
Turbidity	(NTU)	12	1.54	0.33	0.724	5 (d)
Specific Conductance	(µS/cm)	12	104.4	40.7	74.63	900-1,600 (d)
TDS	(mg/L)	12	**66**	25	**46.0**	27 (a)
Ca	(mg/L)	12	13.7	0.6	7.99	NA
Magnesium	(mg/L)	11	1.63	0.43	1.032	NA
Sodium	(mg/L)	11	4.82	1.1	3.085	NA
Potassium	(mg/L)	10	2.86	0.31	1.636	NA
Chloride	(mg/L)	12	1.6	0.36	0.884	1.9 (a)
Sulfate (as SO_4)	(mg/L)	12	9.55	3.15	6.157	250-500 (d)
Fluoride	(mg/L)	11	0.143	0.046	0.1014	0.15 (a)
Boron	(mg/L)	12	**0.481**	0.0058	0.1271	0.2 (a)
Nitrate and Nitrite (as N)	(mg/L)	11	0.0475	0.0065	0.01999	10 (e)
Nitrogen, Total	(mg/L)	12	**0.125**	0.049	0.0794	0.1 (a)
Phosphorus as P	(mg/L)	9	0.0094	0.0054	0.00752	NA
Orthophosphate as P	(mg/L)	12	0.0132	0.0051	0.00880	0.05 (a)
Fecal Coliform	cfu/100 ml(f)	27	**66**	**1**	**8.9**	20 (g)
E. coli	cfu/100 ml	24	**61**	**1**	**8.0**	100/320 (h)

Source: CEDEN, 2018
Notes:
a – Basin Plan for Bishop Creek at Intake 2
b - United States Environmental Protection Agency (USEPA) secondary standard for pH
c – NA = Not Applicable – no current MCL
d – California Drinking Water Program (CDWP) secondary MCL
e - CDWP primary MCL.
f –.cfu
g – Lahontan Basin Plan
h –Basin Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California
BOLD Equal to or above current MCLs or notification levels.

11.3 Study Objectives

The goals and objectives of this study are:

- Monitor water quality[10] for 2 years on a regular basis at multiple monitoring sites
    - Above-Project--establish reference baseline conditions of inflow from natural runoff in watershed
    - In-Project--assess how/if water quality changes throughout various facilities within Project area (i.e., various depths and locations in South Lake and Lake Sabrina, powerhouse discharges)
    - Below-Project--assess any/all impacts Project operations may have on water quality that is leaving the Project area
- Monitor water temperature for 2 years on a regular basis at multiple monitoring sites
    - Above-Project--establish reference baseline conditions of inflow from natural runoff in watershed
    - In-Project--assess how/if water temperature changes throughout various facilities within Project area (various depths and locations in South Lake and Lake Sabrina, powerhouse discharges)
    - Below-Project--assess any/all impacts Project operations may have on water temperature that is leaving the Project area
- Ensure that future Project facilities and operations are:
    - Consistent with the water quality goals and objectives for Bishop Creek in the Basin Plan) for the Lahontan Region (LRWQCB, 1995)
    - Consistent with the desired conditions described in the 2018 Land Management Plan for the INF for Social and Economic Sustainability and Multiple Uses with the desired conditions described in Land Management Plan for the INF (USDA, 2018) as they relate to ecological sustainability and diversity of plant and animal communities.

11.3.1 Study Area

Figure 11.3-1 presents the proposed study area for the Bishop Creek Water Quality Study.

[10] DO, water temperature, turbidity, conductivity, TDS, orthophosphate, nitrate, and total nitrogen

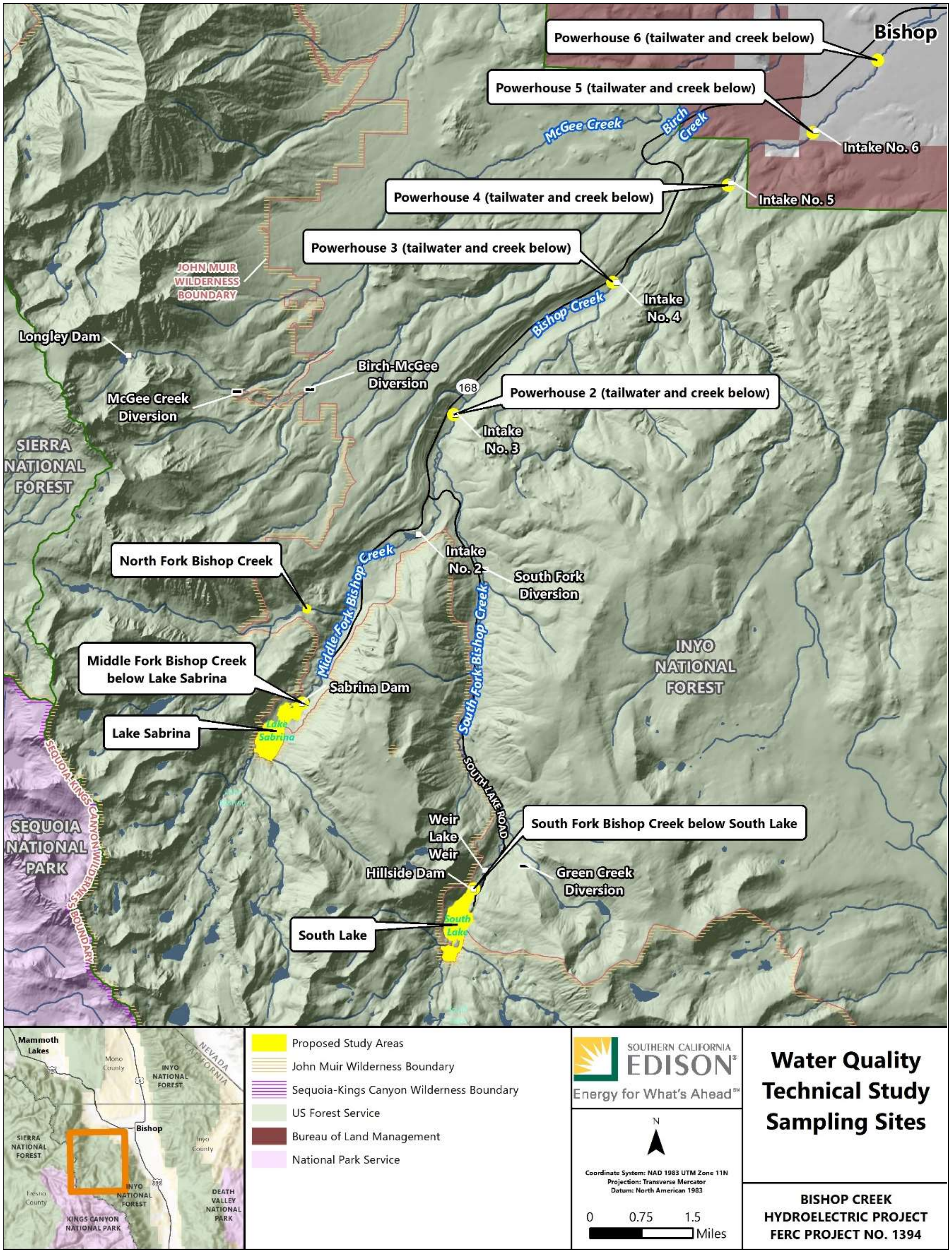


Figure 11.3-1 Water Quality Sampling Sites

11.4 METHODS

The Study Plan identified the below parameters to be monitored:

- Water Temperature (in °C)
- TDS
- DO (in mg/l)
- Conductivity (in µmhos/cm)
- Total Nitrogen
- Nitrate (NO3) as Nitrogen
- Orthophosphate (PO4) as P (dissolved)
- Turbidity
- Water Clarity (Secchi Disk)
- Escherichia coli (*E. coli*)

11.4.1 VERTICAL PROFILES OF DISSOLVED OXYGEN AND WATER TEMPERATURE

Vertical profiles of DO and temperature would be collected at the deepest location(s) in South Lake and Lake Sabrina. The purpose of the survey is to identify the timing, extent, and duration of any lake stratification. Vertical profiles of DO and temperature would be taken monthly beginning in June and ending in October. The following schedule is proposed for collecting the vertical profiles: June, July, August, September, and October.

The following sampling locations were proposed:

- Deepest point in Lake Sabrina (estimated at 78-feet-deep at full capacity)[11]
- Deepest Point in South Lake (estimated at 130-feet-deep at full capacity)

When collecting DO and temperature profiles, the same sampling location would be visited each time so that the relative change in the profile (DO and temperature) can be determined throughout the summer. DO and temperature readings would be taken every meter from the water surface to the lake bottom using USFS approved equipment. Each lake surface elevation would also be recorded during each sampling date.

11.4.2 CREEK DISSOLVED OXYGEN AND TEMPERATURE SAMPLING

It was proposed that creek sampling would be conducted during the same periods as the lake sampling, monthly in June and October 2020 and bi-weekly from early July 2020 and terminating in late September 2020. DO and temperature measurements would be sampled mid-depth in the middle, if accessible, otherwise adjacent to the bank of the stream. Temperature data would be recorded using a calibrated hand-held digital

[11] As discussed in Section 11.5, sampled depths in Lake Sabrina were modified.

thermometer; DO concentrations would be sampled with USFS approved equipment. The following sampling locations were proposed:

- North Fork Bishop Creek (background)
- Middle Fork Bishop Creek below Lake Sabrina
- South Fork Bishop Creek below South Lake
- Bishop Creek below Powerhouse No. 2
- Tailwater of Powerhouse No. 2
- Bishop Creek below Powerhouse No. 3
- Tailwater of Powerhouse No. 3
- Bishop Creek below Powerhouse No. 4
- Tailwater of Powerhouse No. 4
- Bishop Creek below Powerhouse No. 5
- Tailwater of Powerhouse No. 5
- Bishop Creek below Powerhouse No. 6
- Tailwater of Powerhouse No. 6

11.4.3 Sampling for Secchi Disk, Turbidity, Conductivity, Total Dissolve Solids, Orthophosphate, Total Nitrogen and Nitrate

11.4.3.1 Secchi Disk Readings Sampling Process

- Sampling Duration: Summer 2020 and Summer 2021
- Sampling Period: June, July, August, September, and October 2020 and 2021
- Sampling Locations: within deepest portion of Lake Sabrina and South Lake at the same locations used for temperature and DO profiles
- Sampling Protocol: One sample per site using the Secchi disk to approximate depth of the euphotic zone/light penetration

11.4.3.2 Turbidity, Conductivity, Total Dissolve Solids, Orthophosphate, Total Nitrogen and Nitrate Sampling Process

- Sampling Duration: Summer 2020 and Summer 2021
- Sampling Frequency: A minimum of 1 sampling per month during June, July, August, and late September 2020 and 2021
- Sampling Locations
  - Lakes
    - Within a deep hole of Lake Sabrina and South Lake

- Sampling would be performed at two points: one above and one below the thermocline[12]
  - Riverine Segment
    - North Fork Bishop Creek (background)
    - Middle Fork Bishop Creek below Lake Sabrina
    - South Fork Bishop Creek below South Lake
    - Bishop Creek below Powerhouse No. 2
    - Bishop Creek below Powerhouse No. 3
    - Bishop Creek below Powerhouse No. 4
    - Bishop Creek below Powerhouse No. 5
    - Bishop Creek below Powerhouse No. 6
- Sampling Protocol: USGS sampling protocol and procedures.

11.4.3.3 *E. Coli* Sampling Process

- Sampling Duration: Summer 2020 and Summer 2021
- Sampling Frequency: Six separate time periods beginning July 1 and ending August 15, 2020 and 2021
- Sampling Locations
  - South Lake and Lake Sabrina
  - Adjacent to the boat ramp
  - Intake 2 Forebay
    - Any easily accessible location adjacent to shore

11.4.3.4 General Sampling Process

At each of the creek sampling events the following information would be recorded:

- Streamflow (in cfs)
- Air temperature
- Wind speed and direction
- Percent cloud cover
- Date, duration, and amount of most recent precipitation event (if known or obtainable)

[12] If a thermocline is not identified then a sample will be collected at one-half of the Secchi disk depth and 80 percent of the total depth of the lake at the time of sampling.

11.5 MODIFICATIONS TO METHODS

The original Study Plan required the use of the Sierra Nevada Aquatic Research Laboratory (SNARL) to conduct the laboratory analysis of *E. coli* and MST (qPCR). Due to the 2020 Covid-19 conditions within California, SNARL was not available to conduct the analyses. Weck Laboratories was engaged to conduct the *E. coli* analysis using Standard Method 9223B along with a holding time of 24-hours which followed the SWAMP guidelines for monitoring *E. coli* in ambient water. LRWQCB agreed to the holding time prior to sampling. Source Molecular, in Florida, was engaged to conduct the MST (qPCR) analysis for any samples that exceeded 50 MPN/100 ml of *E. coli*. No samples exceeded the 50 MPN/100 ml of *E. coli* so no MST (qPCR) analysis was performed.

In addition, the lakes total depth was greater than was previously reported. Equipment used to collect vertical profiles of DO and water temperature were unable to obtain the maximum depth of the lakes during the June 2020 sampling period. Additional equipment was obtained to reach the bottom of the lakes in subsequent profiles conducted in July 2020 as well as ongoing profiling periods. Reservoir depths will be verified with results of the bathymetry data collected as part of the Reservoir Fish Distribution Study and incorporated into the Final Technical Report in 2021.

11.6 RESULTS

11.6.1 SOUTH LAKE

11.6.1.1 Dissolved Oxygen and Water Temperature Profiles

June 2020

A DO and water temperature profile was conducted on June 15, 2020 at the deepest point in South Lake. DO ranged from 9.61 mg/L at a depth of 59.1 feet BWS to 0.13 mg/L at a depth of 165.7 feet BWS. No thermocline[13] was identified. Figure 11.6-1 presents a profile of DO and water temperature over the surveyed water column and Appendix AQ-5A (Table AQ-5A-1) presents the individual values recorded for each depth interval.

[13] A thermocline is defined as the horizontal plane in a thermally stratified lake located at the depth where water temperature decreases most rapidly (greater than 1 ºC per meter) with depth.

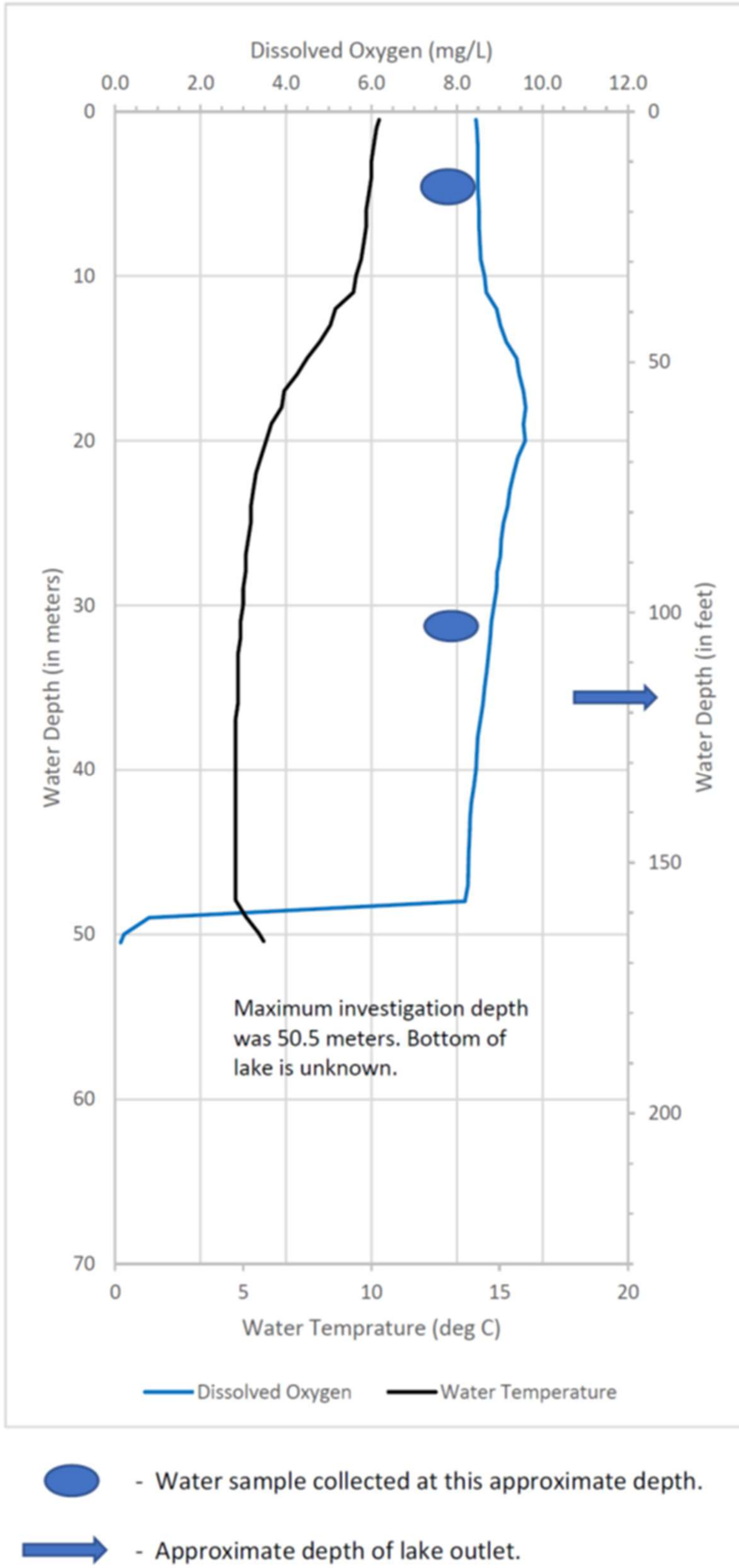


Figure 11.6-1 South Lake Dissolved Oxygen and Water Temperature Profile June 2020

July 2020

The DO and water temperature profile was conducted on July 28, 2020 at the deepest point in South Lake. The maximum depth at the profile point on July 28, 2020 was 68 meters (223.1 feet) with a lake surface elevation of 9747.82 feet msl. DO ranged from 9.45 mg/L at a depth of 65.6 feet BWS and 0.00 mg/L at a depth of 187.0 feet BWS. No thermocline was identified. Figure 11.6-2**.** presents a profile of DO and water temperature over the surveyed water column and Appendix AQ-5A (Table AQ-5A-2) presents the individual values recorded for each depth interval.

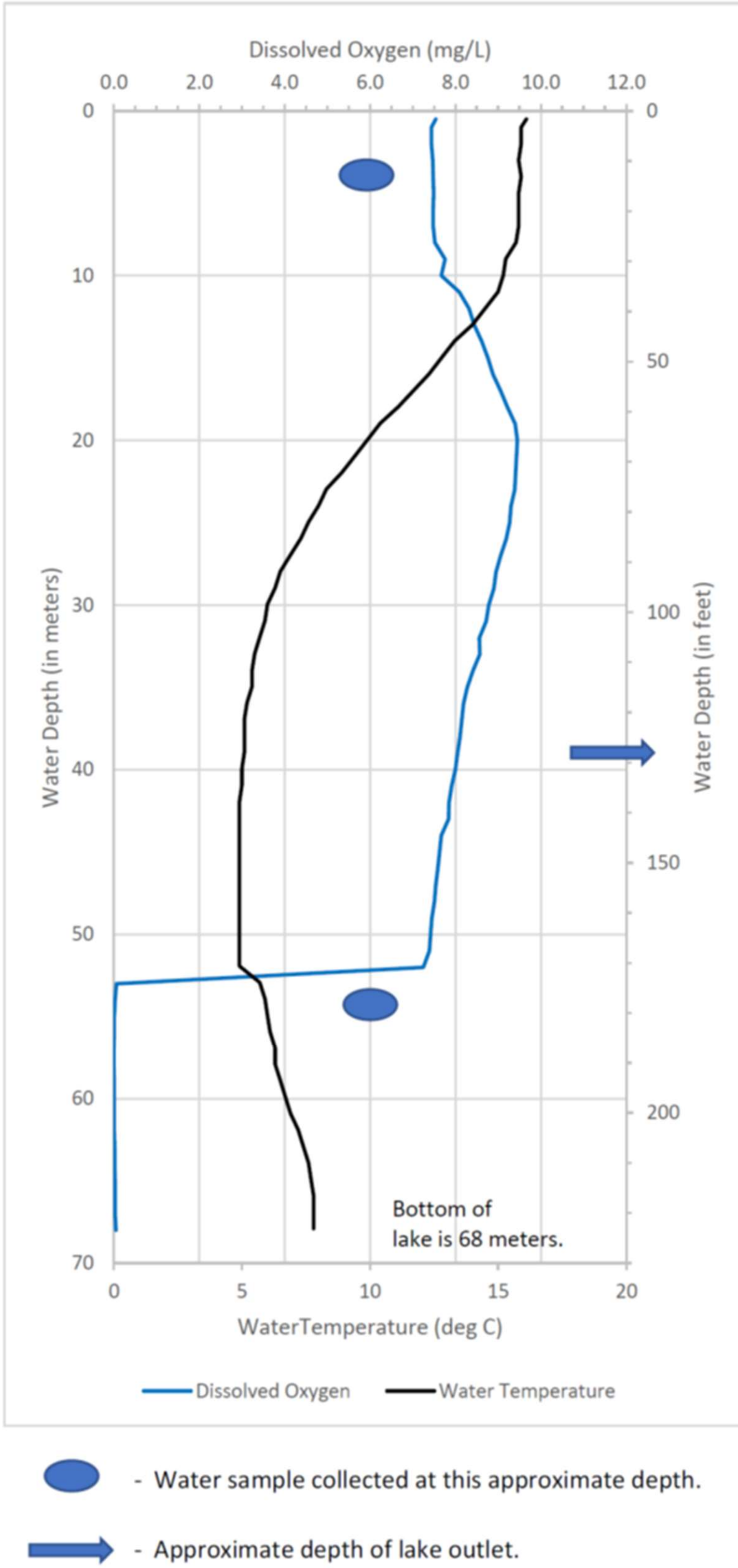


Figure 11.6-2 South Lake – Dissolved Oxygen and Water Temperature Profile – July 2020

General Water Quality

Field water quality testing and laboratory water quality samples were collected during the same time periods that DO profiles were conducted and are presented in Table 11.6-1. Field measurements indicated Secchi disk depth of 10.5 meters for the June sampling period and 8.5 meters for the July sampling period. Conductivity ranged from 30 microSiemens/cm (µS/cm) at 5 meters BWS to 110 µS/cm at 31.5 meters BWS during the June sampling period and 30 µS/cm at 4 meters BWS to 1,880 µS/cm at 54 meters BWS during the July sampling period.

Laboratory water quality analysis for June and July sampling periods indicated values of TDS ranging from not detected (ND) <10 mg/L to 1,100 mg/L.

Nitrate as Nitrogen (NO_3-N) was ND<0.110 for all samples collected in South Lake. Total nitrogen as N was detected once at 5.2 mg/L at a depth of 54 meters during the July sampling period. Orthophosphate as phosphorus (PO_4-P) ranged from ND<0.010 mg/L to 0.17 mg/L. Generally, the ND values of PO_4-P were collected in the shallow (4-5 meters BWS) water samples and detectable values of PO_4-P in the deeper (31.5-54 meters BWS) samples.

Bacteriological

Bacteriological samples were collected between July 1 and August 15, 2020 and analyzed for *E. coli*. A total of seven samples were collected and only one sample had a detectable value of *E. coli* with 1 most probable number in 100 milliliters (MPN/100ml). All other samples were non-detect at ND<1.0 MPN/100 ml and are presented in Table 11.6-2.

Table 11.6-1 Field Water Quality Measurements and Laboratory Results of Lake Samples, June - July 2020

							FIELD MEASUREMENTS (a)		LABORATORY ANALYSIS					
LOCATION	SAMPLE DESIGNATION	DATE	TIME	LAKE SURFACE ELEVATION (b) (ft msl)	THERMO-CLINE	SAMPLE DEPYH (meters)	Secchi Disk Depth (meters)	Conductivity (micro siemens/cm @25C)	Total Dissolved Solids (mg/L)	Nitrate as N (mg/L)	Total Nitrogen (mg/L)	Nitrite + Nitrate as N (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ortho phosphate as P (mg/L)
South Lake	SL-DP-5	6/15/2020	9:15	9738.50	No	5	10.5	30	15	ND<0.110	ND<0.30	ND<0.200	ND<0.10	ND<0.010
	SL-DP-31.5	6/15/2020	9:00			31.5		110	16	ND<0.110	ND<0.30	ND<0.200	ND<0.10	0.011
	SL-DP-4	7/28/2020	10:30	9747.82	No	4	8.5	30	ND<10	ND<0.110	ND<0.30	ND<0.200	ND<0.10	ND<0.010
	SL-DP-54	7/28/2020	10:05			54		1,880	1,100	ND<0.110	5.2	ND<0.200	5.2	0.17
Lake Sabrina	LS-DP-8	6/17/2020	9:00	9116.20	Yes, 11-12 meters	8	7.5	30	16	ND<0.110	ND<0.30	ND<0.200	ND<0.10	ND<0.010
	LS-DP-15	6/17/2020	9:30			15		20	25	ND<0.110	0.30	ND<0.200	0.30	ND<0.010
	LS-DP-7	7/29/2020	11:25	9118.62	Yes, 9-14 meters	7	12.0	20	11	ND<0.110	ND<0.30	ND<0.200	ND<0.10	ND<0.010
	LS-DP-16	7/29/2020	10:55			16		30	12	ND<0.110	ND<0.30	ND<0.200	ND<0.10	ND<0.010

Notes:
a - For dissolved oxygen and water temperature, see vertical profiles.
b - At time of sampling.
ND=Not detected at the indicated detection limit.

Table 11.6-2 Summary of Water Quality Analysis for *E. Coli* from Various Lakes in the Bishop Creek Watershed July 1 - August 15, 2020

DATE	*E. COLI* (MPN/100 ml)		
	South Lake Boat Ramp	Lake Sabrina Boat Ramp	Intake 2 Reservoir
7/13/2020	ND<1.0	ND<1.0	24
7/16/2020	1.0	ND<1.0	3.1
7/27/2020	ND<1.0	ND<1.0	18
7/30/2020	ND<1.0	ND<1.0	6.3
7/31/2020	ND<1.0	ND<1.0	6.3
8/3/2020	ND<1.0	ND<1.0	ND<1.0
8/5/2020	ND<1.0	3.1	1.0

11.6.2 LAKE SABRINA

11.6.2.1 Dissolved Oxygen Profiles

June 2020

A DO and water temperature profile was conducted on June 17, 2020 at the deepest point in Lake Sabrina. DO ranged from 9.80 mg/L at a depth of 45.9 feet BWS and 7.90 mg/L at a depth of 164 fee) BWS. A thermocline was identified between 36.1 feet and 39.4 feet BWS. Figure 11.6-3 presents a profile of DO and water temperature over the surveyed water column and Appendix AQ-5A (Table AQ-5A-3) presents the individual values recorded for each depth interval.

July 2020

The DO and water temperature profile was conducted on July 29, 2020 at the deepest point in Lake Sabrina. The maximum depth at the profile point on July 29, 2020 was 71 meters (232.9 feet) with a lake surface elevation of 9118.62 feet msl. DO ranged from 9.47 mg/L at a depth of 49.2 feet BWS and 1.85 mg/L at a depth of 232.9 feet BWS. A thermocline was identified between 29.5 feet and 45.9 feet BWS. Figure 11.6-4 presents a profile of DO and water temperature over the surveyed water column and Appendix AQ-5A (Table AQ-5A-4) presents the individual values recorded for each depth interval.

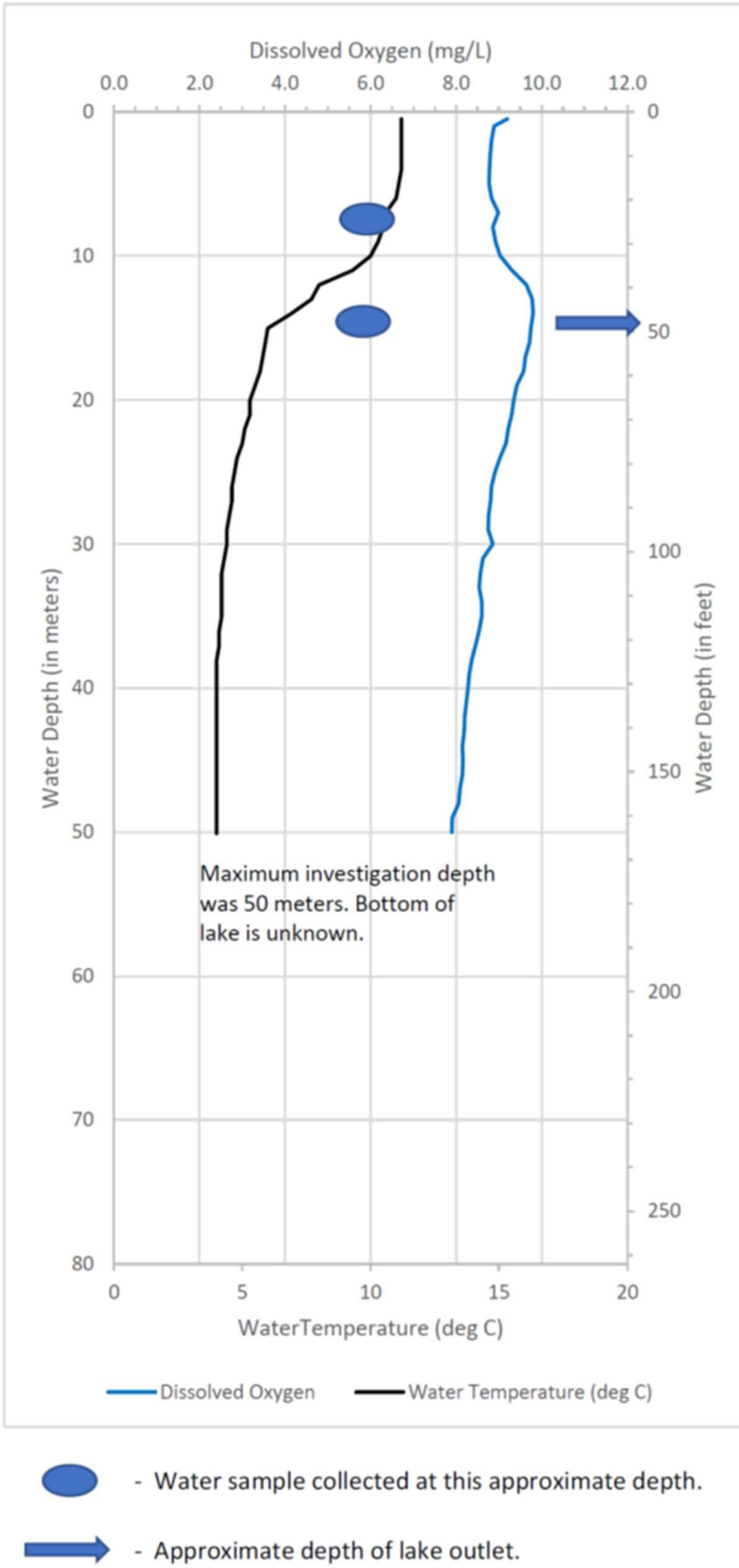
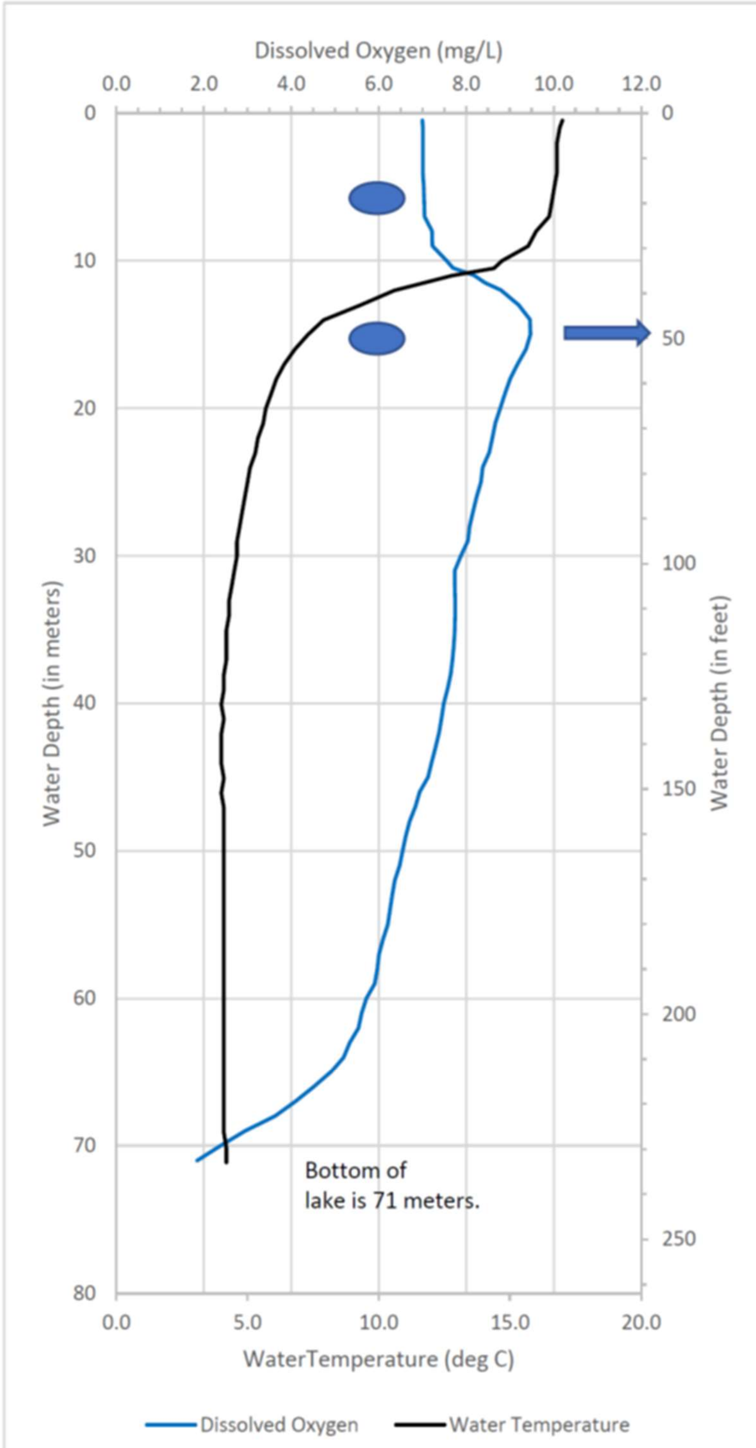


Figure 11.6-3 Lake Sabrina – Dissolved Oxygen and Water Temperature Profile – June 2020



- Water sample collected at this approximate depth.

- Approximate depth of lake outlet.

Figure 11.6-4 Lake Sabrina – Dissolved Oxygen and Water Temperature Profile – July 2020

11.6.2.2 General Water Quality

Field water quality testing and laboratory water quality samples were collected during the same time periods that DO profiles were conducted and are presented in Table 11.6-1. Field measurements indicated Secchi disk depth of 7.5 meters for the June sampling period and 12 meters for the July sampling period.

Thermoclines were identified at 11 to 12 meters in the June sampling period and 9-14 meters in the July sampling period and the following measurements are based on collection of measurements above and below the thermoclines. Conductivity ranged from 30 µS/cm at 8 meters BWS to 20 µS/cm at 15 meters BWS during the June sampling period and 20 µS/cm at 7 meters BWS to 30 µS/cm at 16 meters BWS during the July sampling period.

Laboratory water quality analysis for June and July sampling periods indicated very low values of TDS ranging from 11 mg/L to 25 mg/L.

NO_3-N was ND<0.110 for all samples collected in Lake Sabrina. Total nitrogen as N was detected once at 0.3 mg/L at a depth of 15 meters during the June sampling period. PO_4-P was ND<0.010 mg/L for all samples collected in Lake Sabrina.

11.6.2.3 Bacteriological

Bacteriological samples were collected between July 1 and August 15, 2020 and analyzed for *E. coli.* A total of seven samples were collected and only one sample (collected on August 5, 2020) had a detectable value of *E. coli* at 3.1 MPN/100ml. All other samples were non-detect at ND<1.0 MPN/100 ml. Table 11.6-2 summarizes the results for *E. coli* for Lake Sabrina.

11.6.3 Intake 2 Reservoir

11.6.3.1 Bacteriological

A total of seven samples were collected for *E. coli* and ranged from ND<1.0 MPN/100 ml to 24 MPN/100 ml. Only one sample, collected on August 3, 2020 had a non-detectable value of *E. coli* at ND<1.0 MPN/100 ml. Table 11.6-2 summarizes the results for *E. coli* for Intake 2 Reservoir.

11.6.4 Bishop Creek

11.6.4.1 Field Water Quality

Water temperature ranged from 6.9 °C to 17.8 °C with the lower values occurring near the upper reaches of Bishop Creek and the higher values generally occurring in the lower reaches of Bishop Creek. DO occurred in a narrow range from 7.16 mg/L to 9.23 mg/L. DO appeared to be fairly evenly distributed throughout Bishop Creek with the highest and lowest values occurring in the upper reach station locations. Table 11.6-3 presents the field water quality values obtained during the June-August 2020 monitoring period.

11.6.4.2 Laboratory Water Quality

Laboratory water quality samples were collected along Bishop Creek in June and July 2020 and are summarized in Table 11.6-4. TDS ranged from 12 mg/L to 38 mg/L with the highest concentration occurring below Powerhouse No. 6 in July 2020.

NO_3-N was reported to below the detection limit (ND<0.110 mg/L) in all samples. Total Nitrogen was detected in only two samples at 1.1 mg/l in the South Fork of Bishop Creek below South Lake in June 2020 and at 0.41 mg/L in the Middle Fork of Bishop Creek below Lake Sabrina in June 2020. All other samples reported Total Nitrogen below the detection limit of ND<0.30 mg/L.

PO_4-P ranged from ND<0.010 mg/L to 0.044 mg/L. The highest concentration was detected in North Fork of Bishop Creek in July 2020.

11.6.5 Powerhouse Tailwater

11.6.5.1 Field Water Temperature and Dissolved Oxygen

Water temperature ranged from 11.3 °C to 15.4 °C with generally the lower values occurring in tailwater in the powerhouses in the upper reaches of Bishop Creek and the higher values generally occurring in the powerhouse tailraces from the lower reach of Bishop Creek. DO occurred in a very narrow range from 8.17 mg/L to 9.09 mg/L. DO appeared to be fairly evenly distributed throughout the tailraces from the various powerhouses. Table 11.6-5 presents the field DO and water temperature values obtained from the various tailraces during the June-August 2020 monitoring period.

Table 11.6-3 Field Water Quality Measurements for Bishop Creek June - August 2020

LOCATION	STATION DESIGNATION	DATE	TIME	MEAN DAILY DISCHARGE (cfs)	FIELD MEASUREMENTS: Air Temperature Measured (deg F)	Air Temperature Calculated (deg C)	Water Temperature (deg C)	Dissolved Oxygen (mg/L)	Barometric Pressure (in Hg)
North Fork of Bishop Creek	BC-NF-1	6/16/2020	7:40	24	50	10.0	9.1	8.71	---
		7/13/2020	14:40	17	88	31.1	17.8	8.08	21.6
		7/31/2020	9:00	14	61	16.1	13.8	7.63	21.65
		8/6/2020	10:20	14	62	16.7	15.4	8.29	21.43
South Fork of Bishop Creek below South Lake	BC-blw-SL	6/16/2020	12:30	16	60	15.6	7.1	9.23	---
		7/13/2020	16:00	22	86	30.0	7.0	8.86	21.3
		7/31/2020	10:00	33	68	20.0	6.9	9.00	21.30
		8/6/2020	12:00	35	66	18.9	8.9	8.62	21.15
Middle Fork of Bishop Creek below Lake Sabrina	BC-blw-LS	6/16/2020	7:00	40	50	10.0	10.7	8.09	---
		7/13/2020	15:05	42	85	29.4	15.4	7.58	21.7
		7/31/2020	9:20	36	61	16.1	15.7	7.16	21.79
		8/6/2020	10:45	34	62	16.7	17.0	7.22	21.59
Bishop Creek below Powerhouse No. 2	BC-blw-PH2	6/16/2020	9:30	14	64	17.8	10.6	8.94	---
		7/14/2020	10:30	14	78	25.6	13.5	8.30	23.20
		7/30/2020	10:15	14	80	26.7	12.9	8.41	23.27
		8/6/2020	9:45	14	68	20.0	14.0	8.17	23.15
Bishop Creek below Powerhouse No. 3	BC-blw-PH3	6/16/2020	10:40	5.9	70	21.1	12.1	8.97	---
		7/14/2020	9:50	6	80	26.7	14.6	8.31	23.90
		7/30/2020	9:40	5.9	80	26.7	14.7	8.28	23.96
		8/6/2020	9:20	6	73	22.8	13.5	8.44	23.84
Bishop Creek below Powerhouse No. 4	BC-blw-PH4	6/16/2020	11:55	20	79	26.1	13.0	9.13	---
		7/14/2020	8:55	20	80	26.7	14.8	8.60	24.90
		7/30/2020	9:00	20	83	28.3	14.7	9.01	24.92
		8/6/2020	8:42	21	71	21.7	13.6	8.88	24.79
Bishop Creek below Powerhouse No. 5	BC-blw-PH5	6/16/2020	12:25	0.52	79	26.1	16.1	9.01	---
		7/14/2020	8:20	2.9	79	26.1	15.0	8.47	25.20
		7/30/2020	8:30	2.1	79	26.1	14.7	8.54	25.29
		8/6/2020	8:20	2.4	71	21.7	13.8	8.68	25.13
Bishop Creek below Powerhouse No. 6	BC-blw-PH6	6/16/2020	13:00	115	81	27.2	14.4	9.15	---
		7/14/2020	7:45	108	78	25.6	15.3	8.73	25.40
		7/30/2020	7:45	110	71	21.7	16.6	8.34	25.53
		8/6/2020	8:05	106	71	21.7	14.5	8.84	25.36
				Maximum	88	31.1	17.8	9.23	25.53
				Minimum	50	10.0	6.9	7.16	21.15

Table 11.6-4 Field Water Quality Measurements and Laboratory Results of Bishop Creek Samples for Bishop Creek June - July 2020

					FIELD MEASUREMENTS*						Total Nitrogen			
LOCATION	STATION DESIGNATION	DATE	TIME	MEAN DAILY DISCHARGE (cfs) **	Water Temperature (deg C)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Conductivity (µS/cm@25C)	Total Dissolved Solids (mg/L)	Nitrate as N (mg/L)	Total Nitrogen (mg/L)	Nitrite + Nitrate as N (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Ortho-phosphate as P (mg/L)
North Fork of Bishop Creek	BC-NF-1	6/16/2020	8:00	24	9.1	8.71	1.92	30	21	ND<0.110	ND<0.30	ND<0.200	0.16	ND<0.010
		7/31/2020	9:00	14	13.8	7.63	1.38	30	28	ND<0.110	ND<0.30	ND<0.200	0.12	0.044
South Fork of Bishop Creek below South Lake	BC-blw-SL	6/16/2020	12:30	16	7.1	9.23	0.43	30	33	ND<0.110	1.1	ND<0.200	1.1	0.013
		7/31/2020	10:00	33	6.9	9.00	1.11	40	17	ND<0.110	ND<0.30	ND<0.200	ND<0.10	0.043
Middle Fork of Bishop Creek below Lake Sabrina	BC-blw-LS	6/16/2020	7:15	40	10.7	8.09	4.16	20	25	ND<0.110	0.41	ND<0.200	0.41	0.010
		7/31/2020	9:20	36	15.7	7.16	1.44	20	12	ND<0.110	ND<0.30	ND<0.200	ND<0.10	0.017
Bishop Creek below Powerhouse No. 2	BC-blw-PH2	6/16/2020	9:30	14	10.6	8.94	2.72	40	28	ND<0.110	ND<0.30	ND<0.200	0.11	ND<0.010
		7/30/2020	10:15	14	12.9	8.41	0.68	40	20	ND<0.110	ND<0.30	ND<0.200	ND<0.10	ND<0.010
Bishop Creek below Powerhouse No. 3	BC-blw-PH3	6/16/2020	10:40	5.9	12.1	8.97	69.6	40	27	ND<0.110	ND<0.30	ND<0.200	0.11	ND<0.010
		7/30/2020	9:40	5.9	14.7	8.28	0.60	50	35	ND<0.110	ND<0.30	ND<0.200	ND<0.10	ND<0.010
Bishop Creek below Powerhouse No. 4	BC-blw-PH4	6/16/2020	11:55	20	13.0	9.13	1.55	50	35	ND<0.110	ND<0.30	ND<0.200	ND<0.10	ND<0.010
		7/30/2020	9:00	20	14.7	9.01	0.76	50	27	ND<0.110	ND<0.30	ND<0.200	ND<0.10	ND<0.010
Bishop Creek below Powerhouse No. 5	BC-blw-PH5	6/16/2020	12:25	0.52	16.1	9.01	1.27	60	37	ND<0.110	ND<0.30	ND<0.200	ND<0.10	ND<0.010
		7/30/2020	8:30	2.1	14.7	8.54	0.36	50	26	ND<0.110	ND<0.30	ND<0.200	ND<0.10	ND<0.010
Bishop Creek below Powerhouse No. 6	BC-blw-PH6	6/16/2020	13:00	115	14.4	9.15	2.03	50	35	ND<0.110	ND<0.30	ND<0.200	ND<0.10	ND<0.010
		7/30/2020	7:45	110	16.6	8.34	1.10	50	38	ND<0.110	ND<0.30	ND<0.200	ND<0.10	ND<0.010

Notes:
* - Concurrent measurements when laboratory samples were collected.
** - Instantaneous measurements made on North Fork of Bishop Creek. All other values were calculated on a mean daily average discharge.

Table 11.6-5 Field Water Quality Measurements for Powerhouse Tailwater June - August 2020

LOCATION	STATION DESIGNATION	DATE	TIME	FIELD MEASUREMENTS				
				Air Temperature		Water Temperature (deg C)	Dissolved Oxygen (mg/L)	Barometric Pressure (in Hg)
				Measured (deg F)	Calculated (deg C)			
Tailwater at Powerhouse No. 2	TW@PH2	6/16/2020	9:15	64	17.8	11.3	8.85	---
		7/14/2020	10:10	79	26.1	13.8	8.17	23.20
		7/30/2020	10:00	80	26.7	13.8	8.21	23.27
		8/6/2020	9:32	70	21.1	13.8	8.26	23.11
Tailwater at Powerhouse No. 3	TW@PH3	6/16/2020	10:25	69	20.6	11.4	8.84	---
		7/14/2020	9:30	80	26.7	14.2	8.41	23.90
		7/30/2020	9:20	80	26.7	13.7	8.42	23.96
		8/6/2020	9:10	73	22.8	13.5	8.47	23.81
Tailwater at Powerhouse No. 4	TW@PH4	6/16/2020	11:35	79	26.1	12.4	9.07	---
		7/14/2020	8:40	80	26.7	14.7	8.58	24.90
		7/30/2020	8:45	82	27.8	14.7	8.60	24.92
		8/6/2020	8:37	71	21.7	13.9	8.72	24.77
Tailwater at Powerhouse No. 5	TW@PH5	6/16/2020	12:15	79	26.1	13.0	9.09	---
		7/14/2020	8:10	79	26.1	15.0	8.52	25.20
		7/30/2020	8:15	76	24.4	14.9	8.42	25.29
		8/6/2020	8:16	71	21.7	13.8	8.58	25.13
Tailwater at Powerhouse No. 6	TW@PH6	6/16/2020	12:50	81	27.2	14.6	8.88	---
		7/14/2020	7:15	77	25.0	15.4	8.30	25.40
		7/30/2020	7:30	70	21.1	15.1	8.80	25.50
		8/6/2020	7:58	71	21.7	14.0	8.82	25.38
			Maximum	82	27.8	15.4	9.09	25.50
			Minimum	64	17.8	11.3	8.17	23.11

11.7 DISCUSSION

The Water Quality Study is in the initial stages of the proposed 2-year investigation. Preliminary data has been collected on water quality of upstream lakes and creeks as well as Project facilities. Continuation of the program will assist in achieving current characteristics of the upstream and downstream water quality and will assist in establishing baseline conditions and assist in assessing any impacts that the Project operations may have on the existing water quality. In addition, the water quality data will assist in assuring Project facilities and operations are consistent with the current water quality goals and objectives for Bishop Creek in the Water Quality Control Plan.

11.8 CONSULTATION SUMMARY

SCE distributed three periodic progress reports on the following schedule:

- Progress Report 1: December 19, 2019
- Progress Report 2: April 14, 2020
- Progress Report 3: July 24, 2020

Eight technical memoranda summarizing the 2019 study implementation were submitted with Progress Report 2. Following that filing, SCE hosted a TWG meeting on May 7, 2020 to discuss the 2019 study season, work completed to date and the technical memoranda. After the meeting, TWG members submitted comments on the technical memoranda and SCE provided a general response to those comments as part of Progress Report 3. Table 11.8-1 includes updated responses to those comments.

Table 11.8-1 Updated Responses to Comments from the May 7, 2020 TWG Meeting

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response- to be confirmed
33	Water Quality Technical Memorandum	May 21, 2020	CDFW	In Section 5.2, CDFW recommends identifying the range of minimum as well as maximum possible depths in this section, as well as use of consistent units of depth (feet or meters) in future reports.	The Final Water Quality Study Technical report will provide the total depth of the lake at the monitoring point at the time of sampling in both feet and meters. The report will be available in 2021 and incorporated into the Updated Study Report.
34	Water Quality Technical Memorandum	May 21, 2020	CDFW	Section 6.1.1 indicates vertical profiles will be taken at 1-meter increments. To better understand the strength and stability of potential thermal stratification, CDFW recommends adding an additional vertical station at the spacing of 0.5 m wherever the temperature difference between two vertical stations is equal to or greater than 2°C.	SCE does not believe that the additional granularity is warranted for the vertical DO and water temperature profiles planned at South Lake and Lake Sabrina. See note in Section 6.1.1 of the WQ Implementation Plan (submitted to the TWG in February 2020) where thermocline is defined as greater than 1 °C per meter with depth. The Study Plan as well as the Water Quality Implementation Plan were previously distributed to the TWG for comment (most recently on Feb 14, 2020). The INF and the SWRCB both provided comments which were addressed; at this point, the methods and level of effort have been established. As provided for in the ILP process, the TWG can discuss whether a change of methods is warranted during Study Report meeting scheduled for November 10, 2020.

11.9 REFERENCES

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APPENDIX AQ-5A

DISSOLVED OXYGEN AND WATER TEMPERATURE PROFILES FOR SOUTH LAKE AND LAKE SABRINA JUNE-JULY 2020

See Volume II

12 SEDIMENT AND GEOMORPHOLOGY INITIAL STUDY REPORT (AQ 6)

12.1 INTRODUCTION

During the TWG meeting, stakeholders identified the need to understand the sediment dynamics in Bishop Creek, including understanding what flows mobilize sediment and what Project operations could be modified to mobilize sediments (assumed to be gravels suitable for spawning/rearing habitat) and large woody material (LWM) from forebays above the diversion dams into reaches that have a low sediment supply. This study focuses on the reaches between Powerhouse No. 2 and 6, provides additional information pertaining to riparian and fisheries habitat assessments, and has the potential to reduce maintenance needs of the Project by limiting the accumulation of LWM and sediment in the forebays.

This Sediment and Geomorphology ISR summarizes the objectives, methods, results, and discussion of findings to date. The ISR will be amended based upon the completion of field data gathering and analysis, to be conducted in 2021 and included in the Final Technical Report.

12.2 REVIEW OF EXISTING INFORMATION

The analysis for this study relies on existing data gathered as part of the existing Project license, as well as additional data gathered to support the understanding of flow and sediment dynamics in the study reach. Therefore, this section reviews sources of existing data and discusses limitations on stream flow management at the Project.

12.2.1 GEOMORPHOLOGICAL DATA

As part of the study investigating stream geomorphology and riparian vegetation, the Simons, Li, & Associates (SLA) Report (Simons, 1990) evaluated stream channel processes in the Project area. This report included a review of Project geomorphology, hydrology, hydraulics, and incipient motion of particles at six locations from the confluence of the South Fork and the Middle Fork of Bishop Creek down to Powerhouse No. 6. The reader is referenced to SLA Report (Simons, 1990) for a summary of geology and hydrology near the Project; this report covered the following:

- Overview of site geology
- Baseline geomorphic survey from 1989 field work
- Eight cross-sections and a longitudinal profile at each of six monitoring sites
- Bed particle size, bar particle size, and incipient motion analyses
- Pre-instream flow hydrology summary

Following completion of the SLA Report, riparian vegetation monitoring (Read, 2015; Read and Sada, 2013; Psomas, 2005) and aquatic habitat monitoring (Read and Sada, 2013; Psomas, 2005) has occurred approximately every 5 years at the Project as part of the current license. These reports provide good historical data spanning an approximate 30-year period that can be used to inform this study, including the following information.

Riparian Monitoring

- Baseline (1991 to 1993) and repeat surveys (field surveys in 2004, 2009 and 2014)
- Re-surveyed cross-sections that can be used to indicate channel stability
- Riparian tree sizing, age, and mortality
- Presence of LWM in the riparian zone
- Geomorphic parameter summary by site

Aquatic Habitat Monitoring

- Baseline (1991 to 1993) and repeat surveys (field surveys in 2005 and 2009)
- Characterization of channel width, depth, and velocity during three seasons in a monitoring year
- Substrate size distributions for each study reach
- Substrate embeddedness

Since the SLA Report, Sites 3, 4, 5, and 6 have been located and they served as the basis for the study reaches in this report. The subsequent riparian vegetation and aquatic habitat monitoring surveys generally aligned with the initial geomorphic study sites, but over time, some sites were abandoned due to vandalism and site disturbance. While the post-1993 (after the start of minimum instream flows) study sites may not align directly with the proposed study reaches for this Study Plan, the information will be useful for calibrating a hydraulic model and understanding channel geomorphology.

Subsequent to the SLA Report, Sada and Hawkins (1997) performed an evaluation of the impacts of released impoundment sediment (fines, sands, and gravel) on sediment depth in pools, substrate type in pools, and pool bottom elevations. This report evaluated conditions immediately downstream of Intake 3 and Intake 4 twice prior to sediment release, immediately after sediment release, and after a 200 cfs, 24-hour flushing flow for these areas. Sada and Hawkins (1997) found that the released sediment, while equally deposited in riffles and pools (filling some to depths of more than 50 centimeters [cm] immediately after the release), generally was transported to the next intake impoundment by the flushing flow. The substrate in the pools was not found to be substantially different when comparing the pre-sediment release and post-flushing flow conditions in any of the pools below Intake 3 and in 12 of 15 pools below Intake 4. The study determined there were no differences in pool substrate coverage by sediment in either reach when comparing pre-sediment release and post-flushing flow conditions, despite transport of the sediment 1300 meters and 2500 meters downstream of Intakes 3 and 4, respectively. The substrate in the pools was generally smaller than 1.5 inches (gravel) and larger than medium sand (0.012 inch). Additional information contained in this report includes:

- Turbidity monitoring during background conditions, the sediment release, and flushing flows
- Pool characteristics and substrate elevations for 15 pools in each reach
- Sediment depth, coverage, and composition for each study reach
- Summary of fish rescue and mortality during the study

To manage sediment in the impoundments, SCE has periodically removed sediment from the intake impoundments to maintain storage capacity and minimize the potential for sediment to be pulled through the powerhouses. The largest removal effort in the past 40 years occurred in response to historic flooding from Tropical Storm Olivia in 1982 that resulted in the failure of the North Lake Reservoir dam (peak flows estimated at 1500 cfs to 2000 cfs in Bishop Creek). Shortly after this flood, sediment was removed from Intakes 3, 4, 5 and 6 to restore storage capacity. Sediment was removed from Intake 2 in the late 1980s or early 1990s; Intake 2 had adequate capacity up until that time. This sediment removal effort at Intake 2 resulted in the excavation of approximately 50,000 cubic yards (CY) of sediment from the impoundment that were primarily generated from the dam failure. Since these removal efforts, periodic drawdowns of the intake impoundments have occurred (primarily for maintenance of necessary structures), but there is no regular sediment removal, sediment sluicing, or drawdown program. More recently, in 2009, 2010, and 2011, SCE removed sediment from Intakes 6, 4 and 5, generating approximately 1200 CY, 1500 CY and 2000 CY of material, respectively. Assuming approximately 25 years between sediment removals and excavation to similar extents during both excavations; the estimated sediment loading at Intakes 6, 4, and 5 may average on the order of 50 to 80 CY per year. According to Project staff, there is minimal LWM that drops from the sediment of the impoundments, based on the recently excavated sediment. Project staff indicated that while some LWM may sink, most washes over the spillway and there are no issues with large LWM flows clogging the intake structures. Staff did state that a larger LWM and sediment load could occur if 1) a higher runoff year follows a few years of lower flows, 2) and/or when the upstream beaver dams are blown out and the accumulated sediment and beaver dam materials are released.

Just downstream of the outlet from Powerhouse No. 6 on the Project, the LADWP operates a small diversion structure to supply the Main Indian Ditch Diversion with water. This impoundment is 3-feet to 5-feet-deep and has sediment removed more frequently than the Project impoundments (Charles Partridge, SCE Project Staff, *personal communication*).

12.2.2 Project Hydrology and Flow Management

The Project's relatively extensive Bishop Creek daily stream discharge (i.e., flow) dataset was utilized to evaluate channel geomorphology and sediment transport in this reach. The Operations Model Study Plan (proposed as part of this relicensing effort) was used in this study to provide ranges for flow releases that could be proposed to mobilize sediment throughout the Project. In addition, annual hydrographs and peak annual flows for the study reaches, developed by SCE, were used to evaluate sediment transport in the study reach.

As described in the Operations Model Study Plan, flow at the site varies, depending on the amount of runoff and SCE's release schedule, which is dictated by snowpack, snow melt, spring rain events, drought, power demand, and irrigation. In Bishop Creek above Powerhouse No. 6 (USGS Gauge 10271200), calculated daily mean flows (water years 1994 to 2017) range from 0.1 cfs to 420 cfs, with peak runoff generally occurring from June to August, as the snow melts in the higher mountain elevations. Over the last 24 years, annual peak daily runoff values ranged from 15 cfs to 453 cfs in Bishop Creek (Table 12.2-1). These peak flows may be the channel-forming flow in Bishop Creek and thereby an important flow to evaluate as part of this study.

The Project utilizes water from Bishop Creek to generate electricity, but there are minimum pass-by flows between the diversion dams. These pass-by flows and downstream minimum flows are documented in Section 12.2.3. Other sources of water input between the junction of the South Fork and Middle Fork to Powerhouse No. 6 include three tributaries, of which the largest is Coyote Creek, which enters Bishop Creek upstream of Powerhouse No. 4. SCE has stream gauges installed at many locations in the watershed (Figure 12.2-1) most of which have more than 20 years of data available. These gauges were utilized where necessary to evaluate flow conditions in the study reaches, including peak annual flows, average flows, and estimations of bankfull based on flow-event return period.

Table 12.2-1 Annual Peak Stream Flows in Bishop Creek above Powerhouse No. 6 since the Occurrence of Bypass Flows

Water Year	Date	Stream-Flow (cfs)
1994	September 29, 1994	71
1995	July 31, 1995	421
1996	July 29, 1996	197
1997	January 3, 1997	250
1998	July 23, 1998	453
1999	November 4, 1998	189
2000	November 4, 1999	163
2001	July 8, 2001	367
2002	November 6, 2001	194
2003	October 1, 2002	86
2004	June 8, 2004	180
2005	July 19, 2005	283
2006	July 24, 2006	310
2007	June 20, 2007	83
2008	May 22, 2008	138
2009	July 03, 2009	77
2010	July 17, 2010	362
2011	April 8, 2011	236
2012	August 16, 2012	41
2013	July 24, 2013	113
2014	March 19, 2014	15
2015	November 20, 2014	55
2016	June 30, 2016	116
2017	July 15, 2017	421
	24-year Annual Peak Stream Flow Average:	**201**

Source: USGS 2018

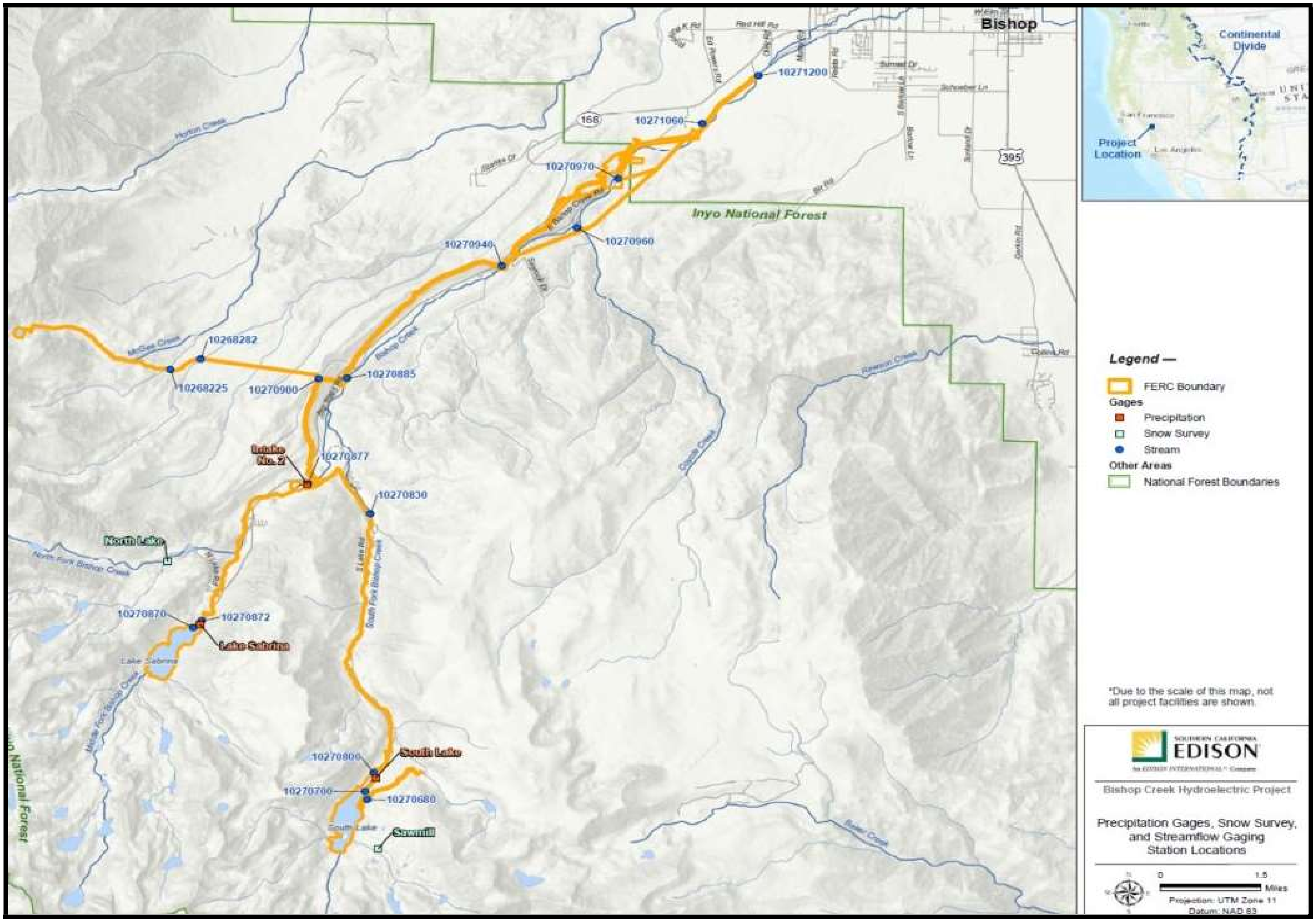


Figure 12.2-1 Stream Flow Gauging Stations along Bishop Creek

12.2.3 Regulatory and Legal Constraints

Project operations are subject to adjudicated water rights and other agreements that provide for non-power uses. The Chandler Decree is one of the primary controlling documents. The Sales Agreement between Southern Sierra Power Company and the LADWP addresses SCE's obligations with respect to the waters of Bishop Creek. Within these constraints, SCE manages the releases from the storage reservoirs, for purposes of hydro-generation and meeting water allocation requirements.

The Sales Agreement provides for seasonal maximum carry-over limits of 2147 acre-feet, as measured on or about April 1, annually. Variances from this requirement have been obtained on a case-by-case basis in the past, by mutual-agreement between SCE and LADWP. SCE meets with USFS annually to determine: 1) seasonal minimum storage requirements for recreation purposes; and 2) annual flushing flows.

The Chandler Decree and SWRCB water rights licenses determine how flows are allocated and used, as follows:

- Seasonal diversion and accumulation limit not to exceed historically measured use (i.e., not to exceed current Project capacity), including an annual limit of 1400-acre feet from Green Creek.
- Instantaneous diversion limit at all locations not to exceed historically measured use (i.e., not to exceed current Project capacity), including a daily average limit of one cfs for domestic use.
- Minimum Project flow-through (downstream delivery) requirements, for senior downstream water rights holders, are measured below Powerhouse No. 6, as required by the Chandler Decree (Table 12.2-2).
- Minimum instream flow requirement of 0.25 cfs at the Birch Creek Diversion, for senior downstream water rights holders, as stipulated by the Chandler Decree.
- Minimum instream flow requirement of 1.6 cfs during the irrigation season, and 0.4 cfs at other times, through the Abelour Ditch, for senior downstream water rights holders in the Rocking K Subdivision.

Table 12.2-2 Daily Average Flow Requirements for Flow below Powerhouse No. 6

TIME PERIOD	DAILY AVERAGE FLOW (CFS)	INSTANTANEOUS MINIMUM FLOW (CFS)
April 1-15	44	33
April 16-30	68	51
May 1-15	87	65
May 16-31	98	74
June 1 - Jul 31	106	90
August 1-31	106	80
September 1-15	76	57
September 16-30	58	44

Source: Chandler Decree, 1929

In addition, there are required minimum instream flow requirements within the Project that are mandated by Article 105 of the FERC license, as follows:

- Lake Sabrina to Intake 2: no less than 13 cfs or natural flows, whichever is less, year-round
- South Lake to South Fork Diversion: no less than 13 cfs or natural flows, whichever is less, year- round
- Intake 2 to Powerhouse No. 2: no less than 10 cfs from Friday of the last weekend in April thru October 31; no less than 7 cfs for the remainder of the year; or no less than 5 cfs in all months of dry years
- Southfork Diversion: no less than 10 cfs from Friday of the last weekend in April thru October 31; no less than 7 cfs for the remainder of the year
- Powerhouse No. 2 to Powerhouse No. 3: no less than 13 cfs year-round
- Powerhouse No. 3 to Powerhouse No. 4: no less than 5 cfs year-round
- Powerhouse No. 4 to Powerhouse No. 5: no less than 18 cfs year-round (Article 105)[14]
- Release from Powerhouse No. 6: Per Chandler Decree (Table 12.2-2**Error! Reference source not found.**)

[14] Article 114 required 18 cfs (or the natural streamflow, whichever is less), however this license condition was removed by order dated February 1, 1995 because of a conflict with the Energy Policy Act of 1992, which changed how the FLPMA treated lands which had been previously subject to a reservation under Section 24 of the Federal Power Act. The remaining language in Article 105 ambiguous as to whether the minimum flow requirement is 12 cfs or some greater amount negotiated with the CDFW. Historically SCE has been releasing 18 cfs.

12.3 Study Objectives

This study seeks to develop an understanding of sediment dynamics in Bishop Creek. This is being done by analyzing relationships between sediment and flow dynamics in Bishop Creek to assist SCE and stakeholders in understanding how Project operations interact with sediment transport in Bishop Creek. To meet this goal, this study has the following objectives:

- Determine flow conditions that mobilize sediment and LWM in the stream channel and from forebays;
- Characterize the particle size distribution of mobile sediment;
- Evaluate how flow operations (flow release timing, magnitude, and duration) affect sediment transport ; and
- Better understand how sediment flushing flows could impact reaches below Powerhouse No. 6.

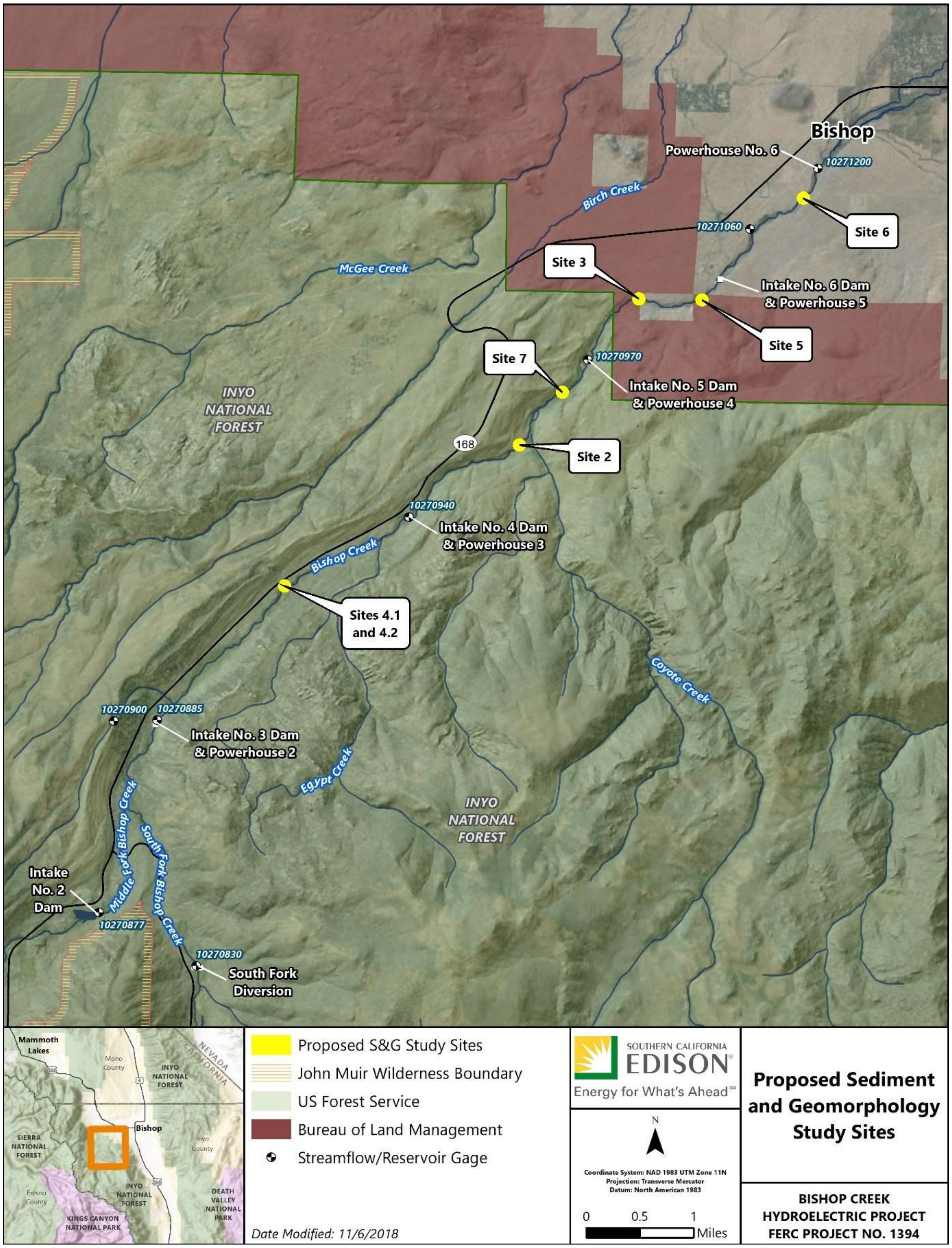
12.3.1 Study Area

Figure 12.3-1 presents the proposed study area for the Bishop Creek Sediment and Geomorphology Study Plan. The study area focused on the areas of Bishop Creek that could potentially be modified by changes in Project operation; Lake Sabrina, South Lake, and sections of Bishop Creek down to the Intake for Powerhouse No. 3 are not included in this study. The study area focused on the six of the seven[15] proposed monitoring sites identified in Figure 12.3-1. This included five monitoring sites (monitoring sites 3 through 6, including a split site at Site 4.1 and Site 4.2) that align with the monitoring sites established by Simons, Li, & Associates (1990), as well as one new monitoring site (Site 7) to characterize channel substrates and dimensions downstream of the junction with Coyote Creek.

Monitoring Sites 3 through 6 were selected because of their inclusion in earlier stream monitoring studies (Read, 2015; Simons, 1990). These sites are located at the lower end of each reach between powerhouses, which should be in more equilibrium with the stream channel relative to any site just downstream of the diversion dam where there would likely be less sediment. Monitoring Site 1 referenced in the SLA Report was omitted from the proposed study area because it had a high frequency of disturbance (due to the nearby campground), as noted in previous studies in this area. Monitoring Site 7 is a new site established for this study. It should be noted that the numbers assigned to the Bishop Creek sites correspond to the chronological order in which the sites were established prior to 1991, not their relative location along the stream. In order from upstream to downstream on Bishop Creek, the monitoring sites are numbered, Sites 4.2, 4.1, 7, 3, 5, and 6. Of these, Site 3 was originally selected because it represents one of the two major physiographic valley types present along Bishop Creek; Sites 4 through 6 were selected

[15] Seven sites were originally proposed, but Site 2 was excluded based on site conditions, as described in Section 5 of this report.

because they were considered to be sensitive to changes in streamflow or to have vegetation (or wildlife) of special interest (Read, 2015; Sada, 2009). In 1991, Site 4 was divided into two monitoring sites due to the change in slope and channel characteristics in this stream section; this aligns with the riparian vegetation monitoring sites. This numbering scheme was retained to maintain continuity between monitoring activities.



Note: Site 2 was excluded based on field conditions; see Section 12.5

Figure 12.3-1 Proposed Sediment and Geomorphology Study Sites

12.4 METHODS

The Bishop Creek Sediment and Geomorphology Study, as outlined in the Revised Study Plan, included five primary, intertwined tasks: 1) field surveys, 2) an assessment of LWM, 3) an estimate of annual sediment loading, 4) an evaluation of substrate mobility, and 5) an evaluation of flushing flows on sediment mobility and LWM dynamics. These tasks serve to clarify the objectives of this study by increasing SCE's understanding of sediment and LWM dynamics in Bishop Creek.

The general sequence of steps to complete these tasks, with additional detail is provided below:

- Perform preliminary field reconnaissance to confirm SLA Report sites (Sites 2 through 6), recover cross-sections, and select a location for monitoring Site 7. Confirm "typical" sediment size by sampling bulk piles of sediment previously excavated from impoundments throughout the Project (to inform typical sizing of sediment found in the impoundments)
- Compile and review data from the in-stream flow period (1994 to 2018) for peak annual flows and flow duration curves for the gauge nearest each site.
- Perform cross-section survey, substrate characterization, bankfull flow evaluation, and LWM assessment at each monitoring site.
- Perform bedload sediment transport measurements during estimated bankfull flows at the most upstream (monitoring Site 4.2) and most downstream (monitoring Site 6) sites.
- Utilize the FlowSed sediment transport model to estimate annual sediment loads at monitoring Site 4.2 and monitoring Site 6.
- Evaluate potential bed substrate mobility under bankfull, and flood flows, including impacts of possible flushing flows. (Scheduled 2021)
- Comment on the potential benefits, disadvantages, and outcomes of using flushing flows to mobilize sediment and LWM through the Project. (Scheduled 2021)
- Develop a summary report that outlines the methods, field work, conclusions, and recommendations as they pertain to sediment and LWM in the Bishop Creek study reach. (Scheduled 2021)
- Methods for this Study Plan Steps 4 and 5 have been modified, per the revisions described in Section 12.5, with steps 6-8 being completed in 2021.

12.4.1 TASK1: FIELD SURVEYS

The first part of Task 1 (Task 1A) was a field reconnaissance visit to recover the eight cross-sections at each of the monitoring Sites 2 through 6 (from the SLA Report Sites 2-6) and evaluate nearby locations at each for sediment sampling. The prior cross-sections were marked in the field in 1989 with rebar and aluminum tags marked S1 through S8 from downstream to upstream. Some of the sites were recoverable after approximately 30 years. For this study, field staff surveyed one cross-section in each of three separate riffles (in the upstream two-thirds of the riffle) at each site as part of a later field effort. Sediment mobility was calculated in riffles; therefore, any cross-sections in a pool, run or glide would not adequately represent the sediment transport capacity of the reach. If the SLA Report cross-sections were not in suitable locations, new cross-sections were selected, as the sediment transport modeling requires cross-sections to be in the active portion of the riffle. During the field reconnaissance visit, the location of Site 7 was evaluated and modified, based on field conditions. After this visit, the sites each had three cross-sections identified in a riffle reach suitable for evaluation of sediment transport with additional survey and data collection. This initial visit included a modified Pfankuch Channel Stability Rating (Rosgen, 2014) to evaluate the condition of the channel and inform sediment transport calculations.

To inform sediment sampler size selection and support the evaluation of sediment transport, a sieve analysis of previously excavated sediment was performed during this initial site visit. Field staff consulted with plant operators to understand the frequency of sediment removal, frequency of drawdowns, feasibility of flushing deposited sediment, and LWM mobilization at each of these impoundments. The particle size of sediments previously excavated from the impoundments was determined by sieve analysis in the field for three composite samples at identified piles of excavated sediment, including samples from removed sediment from Intakes 2, 4, 5, 6, and the LADWP impoundment directly downstream of Powerhouse No. 6. The composite samples included a sample from approximately 6-inches-below the existing surface at three well-spaced locations to minimize any sorting of particles by erosion processes on the surface of the excavated sediment.

The second part of Task 1 (Task 1B) was to collect additional field data, including cross-section and longitudinal surveys, bed substrate characterization, and bankfull bed sediment transport measurements needed to support subsequent analytical tasks.

For each of the 18 cross-sections in the SLA Report, the survey utilized the same local datum as the SLA Report to the extent possible. Three new cross-sections were established at monitoring Site 7. Each cross-section used the same cross-section endpoints (rebar), if they were recovered; otherwise new rebar monuments were established well outside the bankfull channel. Each monument (recovered and new) was recorded with a sub-meter GPS. The survey captured major breaks in topography along the cross-section, the bankfull elevation (if a defined feature could be identified in the field), and the water level; generally based on the USFS protocol (Harrelson et al. 1994). Photos of each cross-section were taken facing upstream, downstream, and the left and right banks (relative to the downstream direction) to document the conditions at the time of the survey. Additionally, representative photos of the bed substrate as well as a photo of active bars in the site reach were captured. To inform bed substrate mobility, a Wolman pebble count[16] (minimum 100 samples) was performed within the active riffles at each site, as well as a bar sediment sample (grab sample to determine D_{84} particle size), if any bars were present in the site reach. This generally aligned with the methods and approach utilized in the SLA Report, which allows for comparisons with the prior study. To characterize the slopes at each site, a longitudinal profile was established through the monitoring site cross-sections with a length of approximately 20 times the bankfull width or through three riffle-pool sequences, whichever was less.

Cross-section and longitudinal profile surveys were conducted at Sites 4.1, 4.2, and 6 (Figure 12.3-1) July 27–August 6, 2020 utilizing Trimble S7 RTS and Trimble R12 RTK GNSS survey equipment. Two semi-permanent benchmarks were installed near each study site to facilitate future monitoring efforts. The benchmarks consisted of a small magnetic nail and shiner set in large boulders or bedrock near ground level. Coordinates for one benchmark (primary benchmark) were obtained at each site by submitting static GNSS observations to the NGS OPUS. Coordinates for the secondary benchmark (backup), existing cross-section endpins, and all cross-section and longitudinal profile points were measured using standard RTK and RTS survey techniques and tied into the primary benchmark.

The cross-section survey was conducted in sufficient detail to capture any change in grade and characterize channel geometry, following standard survey procedures established by the USFS (Harrelson et al., 1994). This included capturing the bankfull elevation on both banks, the edge of water during the surveys, and the thalweg elevation. The survey approach ensured that all topographic breaks across the channel cross-section and all cross-section elevations within a given site were measured. Photos of each cross-section were taken facing upstream, downstream, towards left bank, and towards the right bank to document site conditions during the time of survey.

A longitudinal profile of the channel thalweg was surveyed through the length and extended upstream and downstream of the cross-sections for a minimum total length of 20 times the bankfull width or a minimum of three pool riffle sequences, whichever was shorter. The longitudinal profile survey followed procedures established by the USFS (Harrelson et al.1994), including surveying a sufficient number of points with which to capture the topography of pools, riffles, and other habitat features, as well as other significant breaks in channel gradient.

A Wolman style pebble count (Wolman, 1954) was performed to characterize channel bed particle size distribution along cross-sections and representative channel locations. Pebble counts entailed measuring the intermediate axis (b-axis) of 100 particles in the immediate vicinity of a cross-section transect. All silt- and sand-sized particles were

[16] The pebble count procedure (Wolman 1954) is the measurement of 100 randomly selected stones from a homogeneous population on a riverbed or bar, which yields reproducible size distribution curves for surficial deposits of gravel and cobbles. https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1752-1688.1997.tb04084.x,

classified as less than 2 mm. At Sites 4.1 and 4.2, a number of the established cross-sections are primarily composed of large immobile framework boulders and standard Wolman style pebble counts would not inform potential streambed mobility or adequately characterize overall particle size distribution; therefore the area over which pebble counts were conducted was expanded to better inform sediment dynamics. Representative photos of channel bed substrate were collected throughout the study sites.

The proposed third part of Task 1 (Task 1C) was to measure bed sediment transport, which occurred after Task 1B was completed and during a higher flow period (natural or man-made). Note that this subtask was modified as described in Section 12.5, based on field conditions. To help provide an estimate of sediment bedload transport, the proposed Study Plan included field staff measuring bedload sediment transport at Site 4.2 and Site 6. Because this bedload estimate requires much higher flows than are desired for the cross-section surveys, this was proposed as a separate field effort than Task 1B. The selection of a bankfull flow to record sediment transport is one of the key drivers of the sediment transport capacity in the system. Due to this sensitivity, three methods of evaluating the bankfull discharge were proposed to be utilized to estimate bankfull flows prior to collecting these data. The first was the bankfull discharge identified in the field during the cross-section surveys. The second was the bankfull discharge based on a return period flow of 1.5 years; a range from 1.3- to 1.8-year return period was proposed to be evaluated. The third was a calculation of bankfull area from USGS StreamStats regional curves. These data were proposed to be reviewed for similarity and the best estimate of the bankfull discharge was to be used to select the flow at which to measure the sediment transport.

SCE planned to facilitate measurements of bankfull sediment loads by releasing that desired flow into the channel along the full reach of Bishop Creek (to represent actual bankfull flows) to allow the sediment transport measurements to be determined. The flow would need to be stable (as judged by a local, temporary staff gage) for a minimum of 30 minutes prior to the start of sampling to minimize effects of the “first flush” of material that may mobilize and more accurately represent the sustained sediment transport capacity of Bishop Creek. Prior to performing the sediment transport measurements, a transect would be set up in the upper two-thirds of one of the riffles surveyed as a cross-section. Using this transect, a series of velocity (Marsh McBurney meter) and depth measurements was planned to be conducted to calculate the actual discharge for comparison to local stream gauges. Measurements of bedload transport were proposed to follow the USGS *Field Methods for Measurement of Fluvial Sediment* (2005). The bedload sampling was to be completed utilizing a Helley-Smith bedload sampler. Due to anticipated particle sizes and the remote location, at least a 3-inch by 3-inch sampler would have been required and allowed for reasonable data collection in this remote location. Should substrate larger than 3-inches in diameter be noticed to be mobilizing during this study, the methods would be re-evaluated. Recordings of local water levels were recorded every 30 minutes to ensure flow conditions did not change during the data collection period. It should be noted that bedload sediment transport rates are highly variable, based on antecedent conditions, spatial and temporal variability, rate of flow change, and upstream geomorphic changes. Therefore, this single sample of transport rates would provide an estimate of bedload sediment transport in Bishop Creek, but it should be seen as an approximation and not an accurate recording of actual sediment transport.

The outcome of these field efforts resulted in the following information for use in subsequent analysis of sediment transport in Bishop Creek:

Site-wide Data

1. Pfankuch channel stability rating
2. Channel slope (elevation change divided by stream length)
3. Riffle Substrate D_{50} and D_{84}
4. Active bar D_{50} and D_{84} (if active bars are present at the site)
5. Bedload sediment measurements at monitoring Site 4.2 and Site 6 D_{10}, D_{50}, D_{84}, and D_{100} for excavated sediments from previously excavated intake sediment disposal piles

Cross-section Specific Data

1. Bankfull cross-section area
2. Channel dimensions (width, depth, area)

12.4.2 Task 2: Assessment of Large Wood Material

To evaluate the presence and potential mobility of LWM at each monitoring site, field staff recorded the size, quantity and likelihood of mobility of LWM in three zones; 1) the wetted channel (WET), 2) above the waterline to bankfull elevation (BKF) and 3) from bankfull up to an approximate elevation of twice the bankfull depth (to characterize LWM available in flood events [FLD]). LWM that could be mobilized during flooding in the channel was considered as any wood larger than 3-inches in diameter and 4-feet-long that was not reasonably well anchored (e.g. well rooted, live vegetation, or mostly buried material) will be excluded in this count. If substantial LWM existed in an area, the average size, length, and approximate quantity were noted. The study length for this assessment was the same as the stream length utilized to measure stream slope.

12.4.3 Task 3: Annual Sediment Loading Estimation

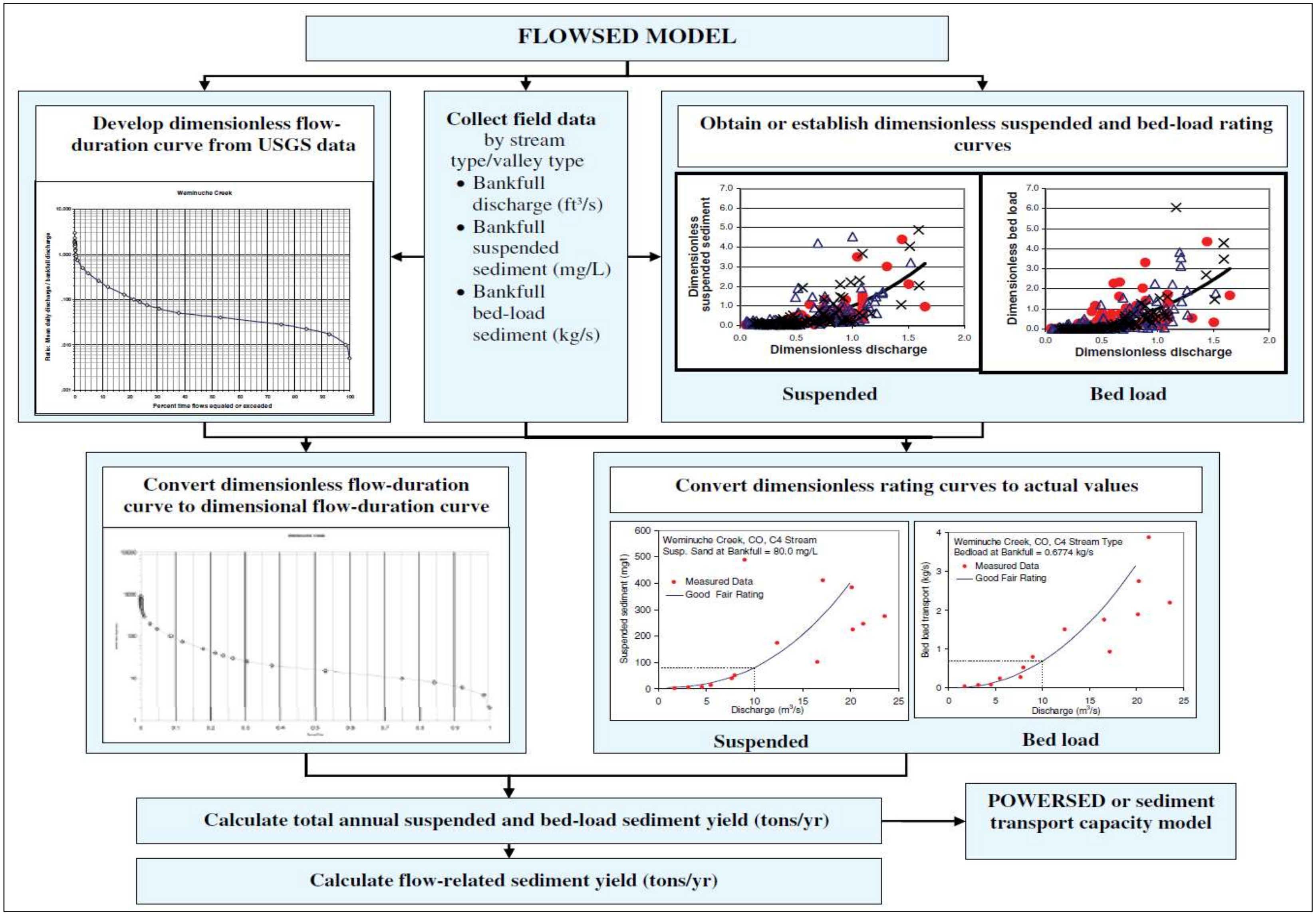
Note that this task was modified as described in Section 12.5, based on field conditions.

Annual sediment loading was proposed to be estimated utilizing the FlowSed sediment transport model and data collected as part of Task 1: Field Surveys. This model utilizes field measurements (bankfull flow, bankfull sediment loading, substrate size) to estimate a sediment load utilizing regional sediment transport equations based on empirical data. FlowSed, compared against other sediment transport models, has been shown to be one of the most accurate and easy to use sediment transport models (Hinton et al., 2018). This model was developed in a similar physiographic province (e.g., glaciated, granitic rock) near Pagosa Springs, Colorado, but has proven to be relatively accurate across the

United States, if local bedload measurements are utilized. A summary of the model is provided in Figure 12.4-1 but the model essentially utilizes a flow exceedance curve and a measurement of bankfull sediment transport to develop annual sediment loadings. This model is part of the RIVERMorph software package that is publicly available from RIVERMorph, LLC.

The data from the field was proposed to be loaded into FlowSED to estimate annual sediment loading at the most upstream site (Site 4.2, located between Powerhouse No. 2 and 3) and the most downstream site (Site 6, located between Powerhouse No. 5 and 6) in this study area. Due to the complexity of collecting sediment transport measurements, sediment transport was proposed only to be measured at the discharge that is assumed to represent the bankfull discharge at Site 4.2 and Site 6. Since the model was proposed to include flows from the smallest to the largest at each site (through the flow duration curve), all flows are represented. However, if the sediment transport measurements were not taken at the bankfull discharge (e.g., due to the timing of sampling in relation to bankfull conditions during flow-event or a mis-identified bankfull discharge), the model would become less accurate. Therefore, the three methods of estimating bankfull mentioned previously were proposed to be used to best represent this parameter.

As stated previously, sediment transport modeling is an estimation of the actual conditions observed and not an exact science. Sediment transport capacity is anticipated to be relatively low, based on the infrequent sediment excavation in the impoundments, but this would be validated with sediment transport measurements and a comparison to the assessment of sediment in the investigated impoundments.



Source: USDA-NRCS 2007

Figure 12.4-1 General Overview of the FlowSed Model

12.4.4 TASK 4: SUBSTRATE MOBILITY EVALUATION

Note that this task was modified as described in Section 12.5, based on field conditions.

Passive Integrated Transponder (PIT) tagged tracer rocks were deployed to inform sediment transport dynamics at Study Sites 4.1, 4.2, and 6 (Figure 12.3-1). Tracer rocks bracketed the range of D_{10} to D_{84} particle sizes (32 to 350 mm) present at each site, determined by 2018 pebble counts. Table 12.4-1 describes the particle size classes and total quantity of tracer rocks installed in 2020.

Table 12.4-1 Tracer Rock Size Classes and Quantities

SIZE CLASS	B-AXIS RANGE (MM)	QUANTITY
A	32–45	30
B	45–60	30
C	60–90	30
D	90–128	30
E	128–180	30
F	180–256	20
G	256–350	10

Tracer rock size classes A–F were obtained from an out of area aggregate source prior to the start of fieldwork. The out of area tracer rocks had similar lithology (igneous) and physical properties (e.g., specific gravity, sphericity, hardness, mineralogy) to native particles found at the Bishop Creek study sites. Tracer rocks in size class G were obtained on-site. The out of area tracer rocks were decontaminated with Virkon® aquatic disinfectant prior to deployment in Bishop Creek. The intermediate axis (B-axis) and mass were recorded for each particle in size classes A-F, but only the B-axis parameter was recorded for size class G particles. PIT tags were inserted into the tracers by drilling a 3/16-inch hole into each particle, cleaning out residual detritus and then sealing the PIT tag in place with a quick cure, high strength concrete, and masonry anchoring adhesive. The adhesive was smoothed over to try and mimic natural particle surface texture. The tracer particles were painted a bright, high contrast color with concrete marking paint once the adhesive was dry.

Tracer rocks were deployed along study site cross sections and at other representative geomorphic units at the three study sites. Various geomorphic units were chosen for tracer rock placement to test rock particle mobility in a range of environments. Geomorphic units included riffles, cascades, flat-water sections (runs and glides), and plunge pools. Prior to placement of individual tracer rocks, a rock of similar shape and size was removed from the streambed to create a void space and a similarly sized tracer rock was gently pressed down and worked into the void space to simulate natural streambed particle emplacement. The location of each tracer rock was surveyed with RTS or RTK GNSS equipment, and representative photographs were taken of the tracer locations.

As part of identifying the mobility of sediment in the study reach, an evaluation of sediment mobility was proposed, based on the data collected during the field effort. This included an incipient motion calculation using the Shields equation (as used in the SLA Report). In addition to the Shields equation, particle mobility was evaluated using empirical data collected for streams in Colorado and summarized in the River Stability Field Guide, Worksheet 3-14 (Rosgen, 2014). The Rosgen (2014) equation tends to show particle mobility at lower flows than the Shields equation and can provide a range of sediment particle size mobility for a given depth/shear stress. The results of the Shields and Rosgen methods was compared to the mobility anticipated in the SLA Report for the D_{65} and D_{84} particle size.

12.5 Modification to Methods

Field conditions identified during the August 2019 survey necessitated the following modifications to the data collection effort.

Site 2, and more specifically, the historic cross-section monument pins, could not be located during the August 2019 site reconnaissance. Through consultation with SCE, Site 2 was abandoned due to lack of historic data for comparison to any new cross sections and adequate characterization of the reach from adjacent Sites 7, 4.1, and 4.2. Thus, Site 2 was not evaluated during 2019 and will not be included in the sediment and geomorphology study efforts or reporting.

Collection of stream bed samples under bankfull flow conditions (Task 1C) could not be completed due to safety concerns during the bankfull flow conditions and lack of suitable locations from which to sample. Based on the 2019 field effort, the bankfull flows in Bishop Creek were estimated to range from approximately 60 to 160 cfs, as “typical” bankfull indicators were not apparent during the field survey. These estimated bankfull discharges would result in estimated average bankfull velocities ranging from 2.5 to 3.7 feet per second. However, it was clear that flows substantially larger than approximately 2 to 20 cfs (as observed during the September 2019 site visit), in combination with the large substrate size, pose considerable safety issues with regard to foot entrapment and would preclude wading in the stream channel under high flow conditions. Thus, the proposed Study Plan Task 1.C, which included wading in the channel to procure bed sediment samples at bankfull flows, was not feasible. A potential alternative would have been to use a truck-mounted crane on a bridge over the creek to obtain these samples. However, the ideal bridge would be situated over Bishop Creek, would provide access to a riffle, and be located well downstream of the impoundments in an area that is representative of the reach. Such a bridge does not exist in the Project area, and therefore, it was not feasible to implement this task as approved in the Study Plan. This means that the annual sediment budget cannot be developed for this site without some major assumptions that cannot be validated to confirm the accuracy of any work performed using these assumptions. The rationale for excluding the stream bed sample was detailed in the memorandum prepared for the April 2020 Sediment and Geomorphology Study Progress Report, which was presented to the TWG on May 7, 2020.

Collection of active bar samples to calculate bar sediment D_{84} size (under Task 1B) was not possible because gravel bar formation was not observed at the six study sites. Thus, a bar sediment sample could not be collected, as originally proposed in the Study Plan. Considering the above, the following modifications to the Study Plan were proposed during the May 7, 2020 TWG meeting. While the information gained during the 2019 field effort informed several of the questions raised by the TWG related to sediment, there is one major area where additional clarity could be provided to resolve these questions. This is in relation to the sizes of particles that are transported during higher (e.g. near bankfull) flows. To build upon the findings of the 2019 field efforts, address study objectives, and address this outstanding question, SCE proposed to modify and add to the approach for Study Plan Tasks 1, 3, 4, and 5 as follows:

Task 1 (Field Studies) and Task 3 (Annual Sediment Loading Estimation): Omit the bed sediment sampling field effort and annual sediment loading estimate due to safety concerns and higher than anticipated bankfull conditions identified in this previously that prohibit this data collection.

Task 4 (Substrate Mobility Evaluation): Add a tracer rock study to supplement the previously proposed bed substrate mobility calculations utilizing data available from 2019 field efforts. This new tracer rock study is intended to meet the objectives for this study plan by: 1) confirming that the observations of coarse substrate in riffles indicate that most smaller (less than 60 mm) substrates are mobilized through the Project during bankfull flows, and 2) providing a better understanding of substrate mobility during a period of normal summer flows and a period of higher spring flows in Bishop Creek. This tracer rock study would occur at previously surveyed riffles at Site 4 (most upstream, steep site) and Site 6 (most downstream, lower gradient) over a period of high flows (near bankfull) and lower flows. This study involves tagging (paint and PIT tag) rocks of desired size classes (8 to 360 mm, capturing most of the surveyed riffle D_{50} rock sizes), placing the tagged rocks in target riffles, and then locating the tagged rocks after a high-flow event to determine if they were mobilized. The schedule will depend on anticipated flows in Bishop Creek; the placement of tracer rocks occurred July 27–August 6, 2020, with recovery planned for the spring of 2021 (after higher spring flows).

Task 5 (Flushing Flow Evaluation): This task will essentially remain unchanged. SCE will rely on previous studies at the site, field data collected during 2019, and the tracer rock study (proposed Task 4) to consider the impacts of utilizing flushing flows to mobilize sediment and large woody material in Bishop Creek, including a qualitative assessment of potential impacts to macroinvertebrates.

12.6 RESULTS

As part of the 2019 field survey, three cross-sections were surveyed at each monitoring site. During the reconnaissance trip and field survey trip, the historic SLA cross-sections, 8 cross-sections at each site, were evaluated to determine which were in the active portion of a riffle (to better inform sediment transport assessments). The most ideal cross-sections were surveyed in 2019. For the purposes of analysis, a representative riffle cross-section was selected from the three surveyed cross-sections. Table 12.6-1 summarizes the geometry of each representative cross-section.

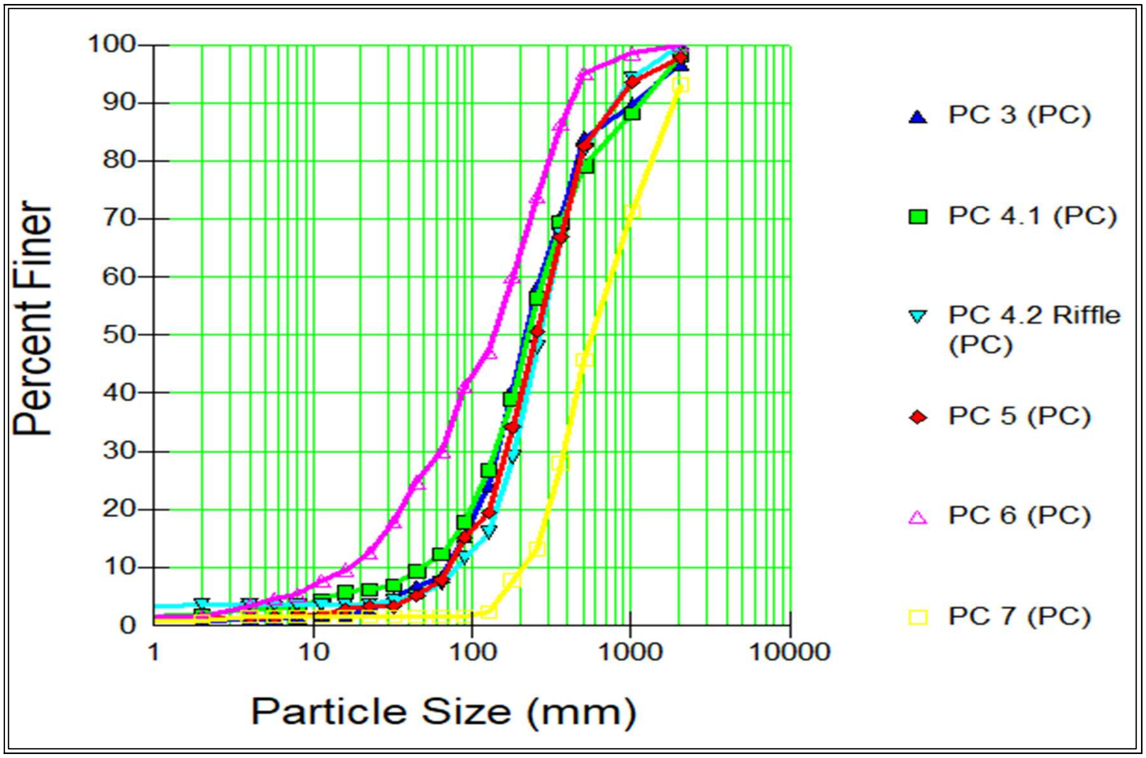
Table 12.6-1 Representative Cross Section

Site	Cross Section ID	Bankfull Width (ft)	Bankfull Depth (ft)	Bankfull Area (ft^2)
4.1	4.9	30.1	1.1	31.5
4.2	4.4	28.2	1.2	33.2
7	7.1	28.4	1.6	44.2
3	3.2	26.7	1.6	42.6
5	5.3	37.1	1.0	37.0
6	6.5	16.1	1.3	21.6

Notes: Sites are ordered from upstream to downstream and bankfull was estimated based on geomorphic characteristics observed during the field survey.

The variability in bankfull area is to be expected as each of the reaches has different minimum flows and hydro generation capacities, tributary inputs, and local slopes that dictate this dimension. A comparison of these values with historic data will be completed as part of further analysis.

A Wolman pebble count was conducted in the active riffles at each site to characterize the riffle substrate size. This pebble count was a composite sampling of the active riffles surveyed by the cross-section survey at each site. The riffle substrate D_{50} (meaning that 50 percent of the particles measured by the pebble count were equal to or less than this value) for the study sites ranged from 139 mm (large cobble) to 597 mm (medium boulder). The riffle substrate D_{84} for the study sites ranged from 342 mm (small boulder) to 1622 mm (large to very large boulder). The riffle substrate particle size distribution is shown in Figure 12.6-1 with a representative photo of the riffle substrate provided in Figure 12.6-2. A comparison with historic survey data from the 1990 SLA report shows relatively strong agreement on the D_{50} particle size found during the 2019 field effort, with the historic data indicated D_{50} particle sizes for Sites 1 to 6 ranging from approximately 200 to 600 mm.



Note: Number in legend is the site number

Figure 12.6-1 Riffle Substrate Particle Sizes

Figure 12.6-2 Riffle Substrate at Site 6

The representative riffle cross-section geometry, riffle substrate D_{50}, and bankfull slope were utilized to classify the Rosgen stream type at each site. Bankfull slope were measured in RIVERMorph based on the bankfull indicators surveyed in the long profile survey of each site, conducted during 2019. At sites where it was very difficult to find "typical" bankfull indicators (Sites 4.1, 4.2, and 7), head of riffle bed and water surface elevations were utilized to determine channel slope for classification and analysis. The Rosgen Stream Types are shown below in Table 12.6-2.

Table 12.6-2 Rosgen Stream Classification

Site	Width / Depth Ratio (W_{BKF}/D_{BKF})	Maximum Depth (D_{MBKF}, ft)	Entrenchment Ratio (ER)	Riffle Substrate D_{50} (mm)	Slope (S, ft/ft)	Stream Type
4.1	28.7	2.8	1.7	228	0.048	B3a
4.2	23.9	2.6	2.0	267	0.039	B2
7	18.2	3.5	1.8	597	0.080	B2
3	16.7	3.0	2.5	220	0.041	B3a
5	36.9	1.7	1.1	252	0.050	B3a
6	12.0	2.0	2.0	139	0.029	B3

At each site, channel stability was evaluated qualitatively during the field survey. These evaluations were documented using the modified Pfankuch Channel Stability Rating (Rosgen, 2014) form. Stability ratings for the study sites ranged from Fair to Good; however, this rating was for free-flowing streams, thus it may not be directly applicable to the more-regulated Bishop Creek. The completed Pfankuch forms are included as Appendix AQ-6 of this ISR.

Sieve analyses of the sediment piles dredge from the project intakes and LADWP intake, just below Powerhouse No. 6, were conducted during the 2019 reconnaissance and field survey trips. Generally, the dredge sediment is a mixture of sand and gravel with some cobble. The dredge sediment D_{84} ranges from 6 mm (fine gravel) to 129 mm (large cobble). The previously dredged sediment particle size distribution is shown in Figure 12.6-3, with Figure 12.6-4, and Figure 12.6-5 providing examples of the dredged sediment from Intake 2 and 5 sediment piles, respectively. However, it should be noted that due to the dredging and relocating of sediments from these intakes, as well as the uncertainty if the dredged material was all sediment deposited by the channel (or if it was over-excavation of native soils), there is a small level of uncertainty in this data. Despite this uncertainty, field observations generally supported the evidence that most sediment in the intakes is sand and small gravel, with limited cobbles and boulders.

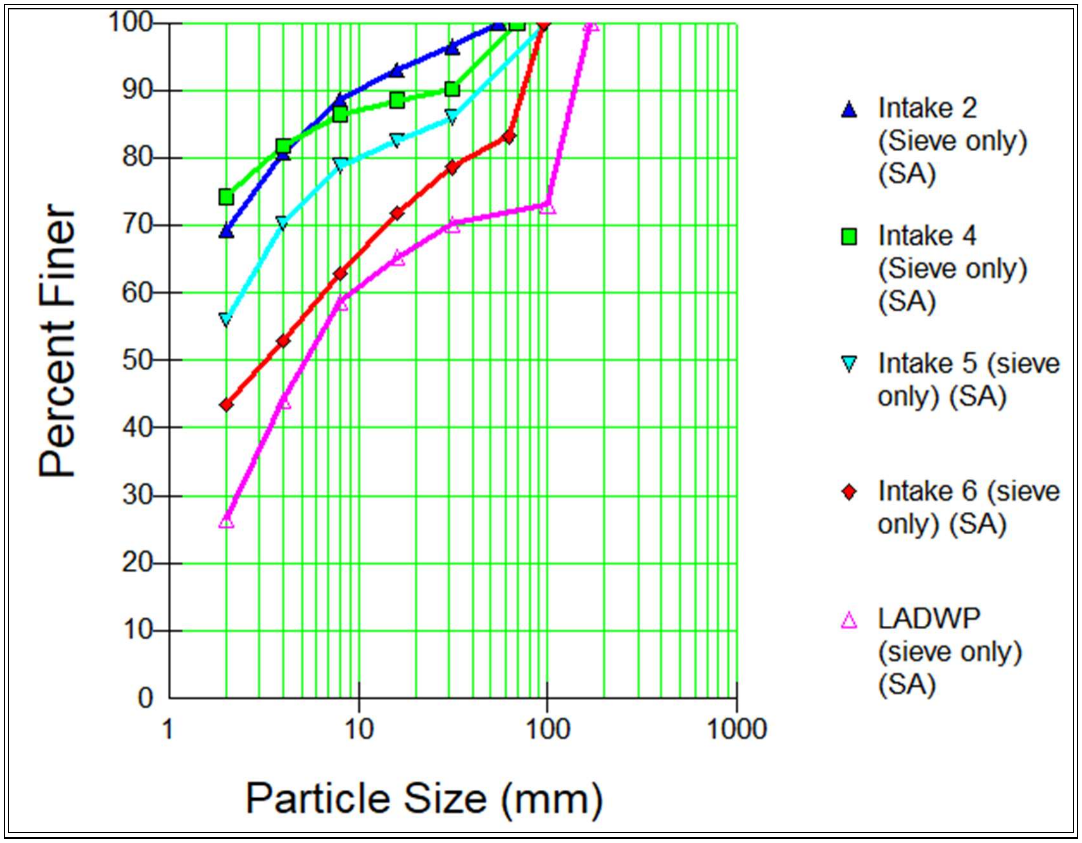


Figure 12.6-3 Dredged Sediment Particle Sizes

Figure 12.6-4 Sediment Pile from Intake 2

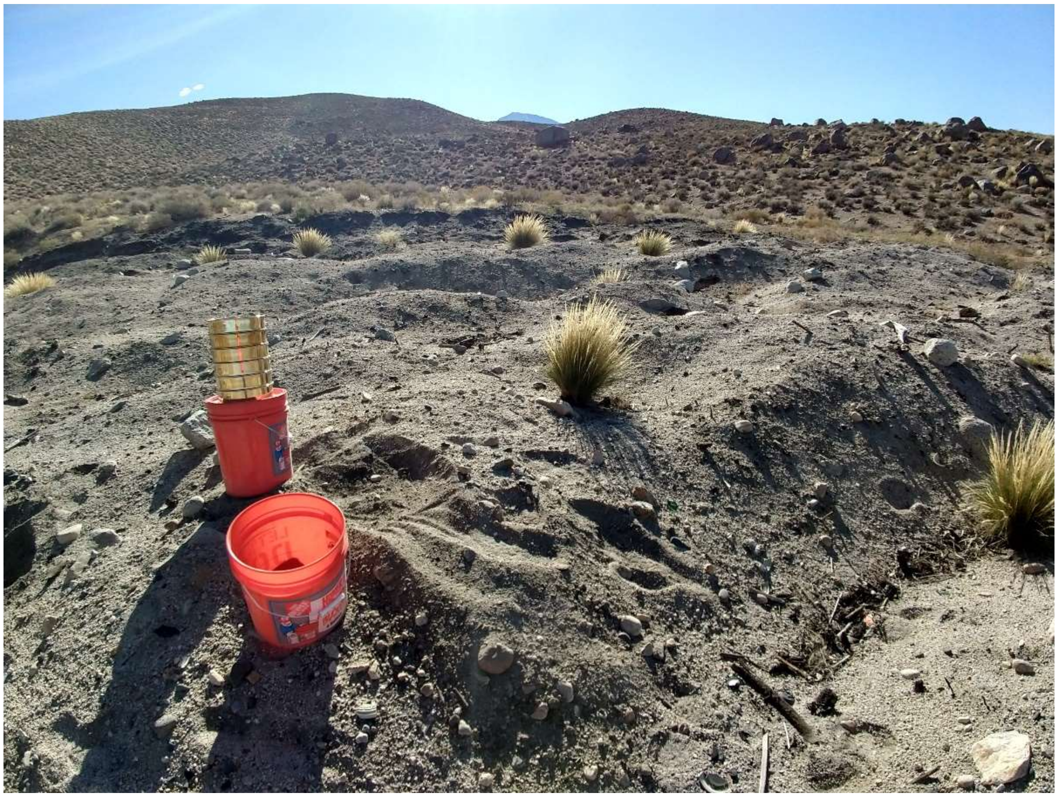


Figure 12.6-5 Sediment Pile from Intake 5

Based upon a representative cross-section of each site's geometry, bankfull slope, and riffle substrate particle size distribution, the bankfull velocity, discharge, and shear stress was calculated in RIVERMorph. Jarrett's Equation was utilized to calculate the Manning's n at each site for the estimated bankfull velocity and discharge. The estimated bankfull shear stress was utilized along with the Shields Curve and Colorado Curve to predict the largest movable particle size. The results from the Shield Curve ranged from 198 mm (large cobble) to 660 mm (medium boulder). The results from the Colorado Curve ranged from 293 mm (small boulder) to 686 mm (medium boulder). Table 12.6-3 the predicted largest movable particle size for each study site and provides the historic data from the earlier 1990 SLA report for comparison.

Table 12.6-3 Predicted Largest Movable Particle under Estimated Bankfull Flow Conditions

Site	Cross-Section ID	Estimated Bankfull Velocity (ft/sec)	Estimated Bankfull Discharge (ft^3/sec)	Bankfull Shear Stress (lbs/ft^2)	Predict Largest Movable Particle (mm)	
					Shields Curve	Colorado Curve
4.1	4.9	2.8	128.9	3.6	298	392
4.2	4.4	2.6	86.2	2.8	231	328
7	7.1	3.7	162.8	7.8	660	686
3	3.2	3.5	147.3	4.1	341	431
5	5.3	2.5	91.4	3.1	252	348
6	6.5	2.7	59.3	2.4	198	293

During the 2019 field survey LWM at the site was documented. Only dead wood larger than 4 inches in diameter and longer than 4.5-feet that could be mobilized by flow was documented. The stream channel was divided into three different zones and the location of LWM was categorized into five different zones/combinations of zone; some LWM was only categorized in two different zones. Thus, the location of the LWM was documented as a combination of those two zones. The three zones were WET (in baseflow), BKF, and “RIP” (riparian within floodplain). Table 12.6-4 summarizes the amount of LWM at each site, with Figure 12.6-6 and Figure 12.6-7 providing the presence/absence of LWM at Sites 3 and 7, respectively.

Table 12.6-4 Large Woody Material

Site	Site Length (ft)	Zones										Total	
		WET		WET/BKF		BKF		BKF/RIP		RIP			
		# of pieces	pieces /100 LF	# of pieces	pieces /100 LF	# of pieces	pieces /100 LF	# of pieces	pieces /100 LF	# of pieces	pieces /100 LF	# of pieces	pieces /100 LF
4.1	258	1	0.4	8	3.1	2	0.8	7	2.7	1	0.4	19	7.4
4.2	231	1	0.4	0	0.0	8	3.5	0	0.0	16	6.9	25	10.8
7	290	5	1.7	3	1.0	21	7.2	0	0.0	235	81.0	264	91.0
3	278	0	0.0	5	1.8	0	0.0	0	0.0	3	1.1	8	2.9
5	285	2	0.7	0	0.0	8	2.8	0	0.0	15	5.3	25	8.8
6	249	0	0.0	0	0.0	1	0.4	0	0.0	12	4.8	13	5.2

Figure 12.6-6 Minimal LWM within and Along the Site 3 Channel

Note: Location is below the outlet of Covote Creek Tributary

Figure 12.6-7 Substantial LWM in Riparian Zone of Site 7 Channel

12.7 DISCUSSION

The objective of the study is to better understand sediment dynamics in Bishop Creek. Specifically, the study was designed to understand what size particles are typically mobile in Bishop Creek, evaluate flow conditions under which mobilization of sediment and LWM occurs within the channel, evaluate how Project operations may affect sediment transport flows, and understand how higher in-stream flows and sediment flushing may effect downstream reaches below Powerhouse No. 6.

The final Sediment and Geomorphology Study Report will be prepared that describes the scope and objectives of this Study Plan, field methods, reviews the findings of Tasks 2 through 5, and provides, as appendices, key tables, plots, or figures.

12.7.1 SEDIMENT MOBILIZATION

Collecting bed sediment samples at bankfull flows was based on a desire to estimate an annual sediment transport budget and evaluate the particle sizes that are mobilized during higher flows. While empirically confirming this condition may not be feasible using conventional bedload sampling techniques, it is possible to draw some inferences about this condition based on the 2019 data collected. It appears that Bishop Creek is relatively stable, even after a summer of near-bankfull flows, as in 2019, as no substantial recent erosion was observed in the vicinity of the monitoring sites. The D_{50} of substrate observed in the riffles of Bishop Creek was generally cobbles and boulders (150 to 600 mm, Figure 12.6-1), which aligned relatively well with D_{50} particle sizes found at these sites in the 1990 SLA Report. This supports the theory that this channel has reached equilibrium with the flow regime that is present and there is only minor flushing of sediment through the system as small sections of bank collapse, or surface runoff carries sediment into the channel from outside the primary Bishop Creek channel (such as Coyote Creek).

The sediment found in the dredge piles from past dredging at Intakes 2, 4, 5, 6 ,and the LADWP intake confirm that while there are some large particles that are deposited in the impoundments, the majority of the material is sand (all D_{50} values less than 6 mm, most less than 2 mm; Figure 12.6-3).

The transport of sand-grained material through the system aligns generally with the findings of the Sada and Hawkins (1997) study that looked at the pulse of sediment that was released when the low level outlet was opened at Intakes 3 and 4. That study concluded that the intake sediment (fines, sand, gravel, but predominantly sand) was generally deposited within 2,500 meters of the intake and was equally distributed across pools and riffles. After a flushing flow of 200 cfs for 24 hours was applied, most of the intake sediment in the pools was removed by the flushing flow. In all except 3 of the 30 pools surveyed, there was no substantial change to substrate composition due to the sediment release.

12.7.2 LARGE WOODY MATERIAL MOBILIZATION

For most of the study sites, the LWM present was located within the riparian zone (Table 12.6-4), which is generally inaccessible for transport; except for flows that substantially exceed bankfull flows in the channel. This is not surprising given the sustained near-bankfull flow in the summer of 2019 prior to the field survey. During that time, LWM in the WET and BKF zones was likely mobilized and deposited in the downstream riparian zone or collected in the downstream intake. The amount of LWM documented at Site 7 (91 pieces per 100-linear-feet, Table 12.6-4) is disproportionally higher than the amount of LWM documented at the other study site (3 to 11 pieces per 100-linear-foot, Table 12.6-4). Site 7 was a newly established site to better understand the sediment and LWM transport dynamics in Bishop Creek below an unimpeded major tributary (Coyote Creek).

12.8 Consultation Summary

SCE distributed three periodic progress reports on the following schedule:

- Progress Report 1: December 19, 2019
- Progress Report 2: April 14, 2020
- Progress Report 3: July 24, 2020

Eight technical memoranda (including one for the sediment and geomorphology study) summarizing the 2019 study implementations were submitted with Progress Report 2. Following that filing, SCE hosted a TWG meeting on May 7, 2020 to discuss the 2019 study season, work completed to date and the technical memoranda. After the meeting, TWG members submitted comments on the technical memoranda and SCE provided a general response to those comments as part of Progress Report 3. Table 12.8-1 includes updated responses to those comments.

Table 12.8-1 Updated Responses to Comments from May 7, 2020 Technical Working Group Meeting

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response- to be confirmed
35	Sediment and Geomorphology Technical Memorandum	May 21, 2020	CDFW	The technical memorandum states that an assessment of LWM was completed in July and September of 2019 but no results were included in the technical memorandum. The technical Memorandum should include estimates of instream LWM, discuss historical removal practices, and discuss the feasibility of passing LWM over or around the intake dams, to reduce impact to this component of fish habitat	The technical reports, provided as a supplement to the progress reports, are interim work-products intended to summarize work to date and help the team prepare for additional field work and were not intended to be full “Study Reports.” LWM is discussed in Section 12.7.2. The ILP provides that the TWG can discuss additional information if needed during Study Report meeting scheduled for fall 2020.
36	Sediment and Geomorphology Technical Memorandum	May 21, 2020	CDFW	The technical memorandum states that an assessment of LWM was completed in July and September of 2019 but no results were included.	The technical reports, provided as a supplement to the progress reports, are interim work-products intended to summarize work to date and help the team prepare for additional field work and were not intended to be full “Study Reports. Section 12.7.2 discusses findings from LWM assessments, and further results and conclusions will be addressed in the Final Technical Report in 2021.
37	Sediment and Geomorphology Technical Memorandum	May 21, 2020	CDFW	This goal/objective was not addressed in the Technical Study Plan but should be addressed after 2020 surveys. [Referring to *Evaluate how operations (flow release timing, magnitude, and duration) could be modified to provide sediment transport flows.*]	SCE previously thought to include this in the ISR but will defer until and effects analysis can be completed following the Final Technical Report. SCE will wait until the tracer study is completed in 2021 to complete this analysis.

Comment Number	Study	Date of Comment	Entity	Comments	SCE Response- to be confirmed
38	Sediment and Geomorphology Technical Memorandum	May 21, 2020	CDFW	This goal/objective was not addressed in the Technical Study Plan but should be addressed after 2020 surveys. [Referring to *Understand potential sediment inputs and impacts from higher flows to reaches below Powerhouse No. 6 from changes in flow/operations.*]	SCE notes CDFW's observation and will address this in the Final Technical Report once the tracer study is completed in 2021.

12.9 REFERENCES

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APPENDIX AQ-6

PFANKUCH FORMS

See Volume II

13 RECREATION USE AND NEEDS INITIAL STUDY REPORT (REC 1)

13.1 INTRODUCTION

During TWG meetings, SCE and stakeholders identified the need to conduct a Recreation Use and Needs (RUN) Study (REC 1) to evaluate current recreational use and future recreational needs for the Project. Most recreation within or adjacent to the Project is located within the INF. Therefore, the USFS has FPA Section 4(e) conditioning authority to prescribe conditions that may mitigate the impact of hydropower projects on national forest service lands. Beyond the assessment of amenities within the Project boundary and required by SCE, it is reasonable to include other INF recreation sites that intersect or are immediately adjacent to the Project boundary, that may have been induced or could be indirectly affected by the presence of the Project. Further, trout angling is an important recreational activity occurring within the Project boundary, most notably at Project reservoirs and along portions of Bishop Creek. To the extent that Project operations induce or affect angling in the area, it is reasonable to include those sites in this study.

13.2 REVIEW OF EXISTING INFORMATION

This study reviews and incorporates existing information related to RUN identified at the Project. The following is a list of studies and reports analyzed as part of this study:

- 2015 Licensed Hydropower Development Recreation Report, FERC Form No. 80 (SCE, 2015a)
- 2014 SCE Recreation Use Study Report for Eastern Hydro Division (SCE, 2015a)
- 2015 California Statewide Comprehensive Outdoor Recreation Plan (SCORP) (CDPR, 2015)
- National Visitor Use Monitoring (NVUM) Reports for INF (USFS, 2006; 2011; 2018d)
- INF Special Use Permits and Concessionaire Data
- INF Alternative Transportation System Study (USDA, 2013)
- CDFW Stocking and Historic Creel Survey Data

The study analyzes relevant management plans for the area, including Inyo County General Plan (IC, 2001), Land Management Plan for the Inyo National Forest (USDA, 2018), and the Bureau of Land Management's Bishop Resource Management Plan Record of Decision (BLM, 1993).

13.3 Study Objectives

This Study Plan includes the following goals and objectives:

- Characterize existing RUN
  - Conduct a basic inventory of facilities and amenities at each study site
  - Compile existing use data for historic and current use patterns
  - Identify current patterns of use (type, volume and daily)
  - Identify current patterns of public access to recreation opportunities
  - Survey to determine current user needs and preferences
- Characterize existing RUN of anglers in the study area
  - Compile existing use data for historic and current use patterns
  - Target anglers to determine current angler timing, demographics, effort, harvest, composition and success
  - Estimate catch-per-unit effort by species
- Evaluate adequacy of existing recreation opportunities to meet current needs
  - Determine the carrying capacity of existing recreation opportunities
  - Assess the suitability of facilities to provide universal access to recreation opportunities, where feasible
  - Assess the adequacy of existing public safety measures near Project features
- Estimate future Project-related recreational demand and needs
  - Estimate future use, demand and capacity
  - Assess the need for expansion or alteration of existing recreation facilities
- Ensure that future Project facilities and operations are consistent with the Desired Conditions, Goals, Standards, and Guidelines described in the Land Management Plan for the Inyo National Forest (USDA, 2018)

13.3.1 Study Area

Based on a November 7, 2019 conference call with the INF, study areas associated with REC 1 activities were revised, most notably to focus on the three main recreation areas adjacent to the Project (Lake Sabrina, South Lake, and Intake No. 2 recreation areas). Should surveys be collected at INF campgrounds, they will be administered by campground hosts according to a randomly generated schedule. In addition to indirectly surveying recreationists for angling activities at the sites discussed above, certain areas and efforts will specifically target anglers, including South Lake, Lake Sabrina, and Intake No. 2 recreation areas and forks, and Big Trees and Four Jeffreys campgrounds. Trail counters will be utilized at three informal trails adjacent to the Project. Table 13.3-1 summarizes the specific sites to be included in this study.

Table 13.3-1 Survey and Data Collection Sites

Site ID[1]	Name	On-Site Recreation Survey	Creel Survey	Trail Counter
Middle Fork Bishop Creek				
MF01	Lake Sabrina Recreation Area[1]			
MF01a	*Sabrina Basin Trailhead & Informal Road Parking*	✓		
MF01b	*Lake Sabrina Boat Landing & Marina*	✓	✓	✓
MF02	Intake No. 2 Recreation Area[1] (Day Use Area and Fishing Access)	✓	✓	
MF03	Forks Campground		✓	
MF04	Big Trees Campground		✓	
South Fork Bishop Creek				
SF01	South Lake Recreation Area[1]			
SF01a	*Weir Lake & Parking Area*	✓	✓	
SF01b	*South Lake Launching Facility, Marina, & Day Use Area*	✓	✓	
SF01c	*Bishop Pass Trailhead*	✓	✓	
SF01d	*Green Creek Diversion Trailhead & Day Use Area*	✓		✓
SF01e	*La Hupp Picnic Area*	✓		
SF01f	*Tyee Day Use Area*	✓		
SF02	Four Jeffrey Campground		✓	
Bishop Creek				
BC01	Little Egypt Trail (informal access to climbing area)			✓

[1]Note: The only Project-required recreation facilities are the South Lake boat ramp, Lake Sabrina boat ramp, and Intake No. 2 fishing platforms (SCE, 2014). All other facilities are non-Project.

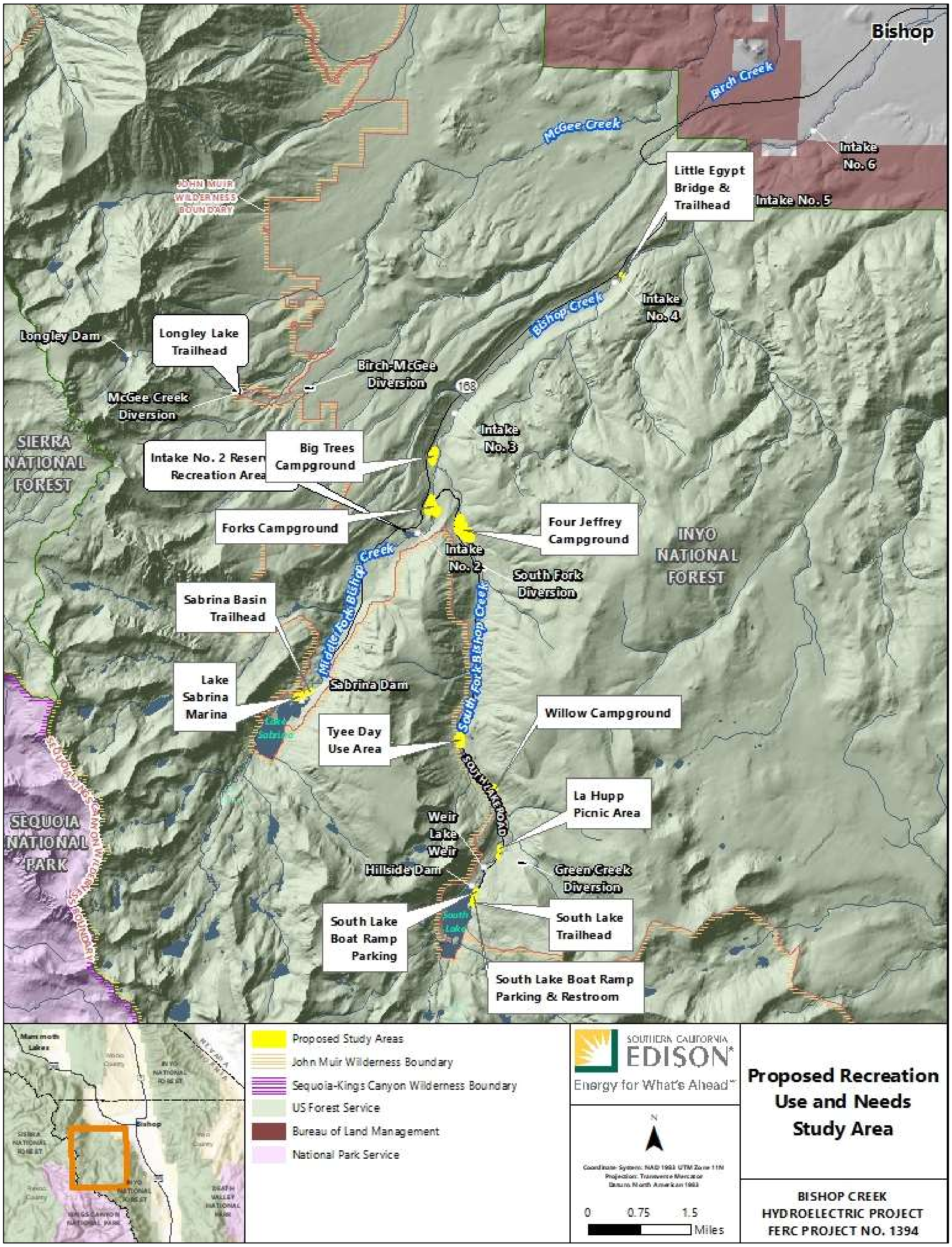

Figure 13.3-1 Proposed Recreation Use and Needs Study Area

13.4 METHODS

To accomplish the goals and objectives of this study, SCE is proposing a variety of data collection techniques to compile both historic and current recreation use and needs patterns for the Project. Historic use patterns will be determined by analyzing the studies, reports and management plans described above. Current use and needs information will be collected through on-site recreation surveys, off-site recreation surveys, creel surveys, a general recreation site inventory, spot counts, and traffic and trail counter data. A description of each collection technique is provided below.

13.4.1 ON-SITE RECREATION SURVEYS

Visitor surveys will be conducted on-site using a survey form (available in both English and Spanish) at each on-site recreation survey site listed in Table 13.3-1 to collect recreation user characteristics and demographics (e.g., origin, gender, age, and group size), satisfaction, type of activities, length of stay and perception of crowdedness, site conditions, fees, and site needs. The data collected will be used to provide a general pattern of recreation use (e.g., type, volume, and daily) and assist in the development of recreation use estimates for the Project area. The data will provide recreation user inputs on “crowdedness” and potential facility needs. Based on continued consultation with the INF during the winter of 2019-2020, an on-site recreation survey instrument was finalized on January 14, 2020, and is included in this report as Appendix REC-1A.

In October 2019, SCE conducted a review of past recreation use and needs studies and relevant recreation and statistics research to determine a statistically relevant number of surveys needed to drive the implementation of general recreation surveys for the Project. In most cases, surveyors designed methods to generalize a population at a 95 percent confidence level with a +/- 5 percent margin of error. Depending on the population size, the sample size needed can vary below approximately 10,000; population sizes above this value tend to level out and eventually require the same sample size for a population of 1 million as 1 billion (Dillman, 2007; Salant & Dillman, 1994). As shown in Table 13.4-1, sample size plateaus at 384 for a conservative approach. Needham and Vaske (2008) suggest that, based on this data, most parks, recreation, and human dimension studies consider a sample size of 400 to be “suitable for generalizing to a population at a 95 percent confidence level with a +/-5 percent margin of error.”

Table 13.4-1 Completed Sample Sizes Needed for Population Sizes and Characteristics at Three Levels of Precision

Sample size for the 95% confidence level						
Population	+/-3% sampling error		+/-5% sampling error		+/-10% sampling error	
	50/50 split	*80/20 split*	*50/50 split*	*80/20 split*	*50/50 split*	*80/20 split*
100	92	87	80	71	49	38
200	169	155	132	111	65	47
400	291	253	196	153	78	53
600	384	320	234	175	83	56
800	458	369	260	188	86	57
1,000	517	406	278	198	88	58
2,000	696	509	322	219	92	60
4,000	843	584	351	232	94	61
6,000	906	613	361	236	95	61
8,000	942	629	367	239	95	61
10,000	965	640	370	240	95	61
20,000	1,013	661	377	243	96	61
40,000	1,040	672	381	244	96	61
100,000	1,056	679	383	245	96	61
1,000,000	1,066	683	384	246	96	61
1,000,000,000	1,067	683	384	246	96	61

Source: Dillman, 2007; Salant & Dillman, 1994

This information was discussed with the INF during the winter of 2019-2020, and it was decided that on-site recreation surveys would focus on the three main recreation areas adjacent to the Project (Lake Sabrina, South Lake, and Intake No. 2 recreation areas) with the goal of achieving at least 400 surveys for each recreation area. For each site, the exact days for sampling will be randomly generated throughout the recreation season (April 25, 2020 to November 15, 2020). A sampling day is assumed be a 6-hour period generally ranging from 11am to 5pm in an attempt to encounter the most recreationists and to gather surveys from recreationists exiting in both the morning and afternoon. Calculations for number of surveys assume an average of four surveys completed per hour (Needham and Vaske, 2008). Surveys will be conducted in the 2021 field season and will attempt to gather a representative sample of weekday, non-peak weekend, and peak weekend use.

All survey clerks for both the on-site recreation surveys and creel surveys discussed below will be trained thoroughly as a means of quality control. Survey clerks will be provided with detailed information on the study schedule, appropriate materials to aid in data collection, and direction on appropriate interviewing techniques and attire.

13.4.2 OFF-SITE RECREATION SURVEYS

While there is no direct nexus to the Project, an off-site, web-based survey was developed in early 2020 at the request of and in consultation with the INF. The off-site survey will be posted on SCE's Relicensing Website and on the INF's website; the survey may also be sent directly to known recreationists or recreation user groups in the area to solicit feedback. Off-site surveys will attempt to gain recreation use and needs information on a broader, more general scale, while attempting to understand whether certain aspects of recreational opportunities at the Bishop Creek Reservoirs may be deterring users from visiting the area. The off-site survey data will be compiled and analyzed separately from the relicensing on-site survey data, but both will be analyzed and included in the final report.

13.4.3 CREEL SURVEYS

Creel surveys will be conducted using a field data sheet (Appendix REC-1B) at each creel survey site listed in Figure 13.3-1 to collect angler characteristics (e.g., origin, gender, age and group size), determine current angler timing, effort, harvest, composition, success, and an estimate of catch-per-unit effort by species.

Creel surveys will be conducted at least monthly on weekends during angling season (approximately May to October) with the intent of spending at least 1 hour at each designated survey point. Additional surveys may be opportunistically conducted by survey clerks encountering anglers while performing other studies such as the general recreation surveys. The objective will be to complete a combined total of at least 50 surveys at creel survey sites during the field season.

13.4.4 GENERAL RECREATION SITE INVENTORY

A basic inventory of general recreation facilities will be conducted using a facilities inventory form (Appendix REC-1C) at each recreation site listed in Figure 13.3-1 in conjunction with initial survey activities. The type, number, and size of facilities (including campsites, restrooms, parking areas, boat ramps and picnic tables) will be summarized and included in the final summary report.

13.4.5 SPOT COUNTS

Spot counts will be conducted at each recreation site listed in Figure 13.3-1 in conjunction with the general recreation surveys outlined above. Spot counts will allow for documentation of the number of vehicles and trailers at each parking area as a means of estimating the number of users currently at the site along with weather, time, and license plate data.

13.4.6 TRAFFIC COUNTERS

Where traffic counters are currently installed to record the number of vehicles that enter and exit the recreation sites, a minimum of 1 year of traffic counter data will be collected and analyzed to help determine use and patterns of public access at the site. The number and location of traffic counters will be determined in consultation with the INF prior to the 2021 field season.

13.4.7 Trail Counters

At three locations, trail counter data will be collected and analyzed for a minimum of 1 year to determine use and patterns of informal access to the following informal trails adjacent to the Project boundary:

- Inlet Trail, as it is labeled on a map at the Lake Sabrina Boat Landing, where an informal trail has been created, extending from the marina along the western shore of Lake Sabrina to the Bishop Creek inlet.
- Green Creek Diversion Pipeline, where users are informally using of the pipeline right-of-way as a trail.
- Little Egypt Trail, an informal stream crossing and trail near Powerhouse No. 3 that is used to access the Little Egypt climbing area.

13.5 Modifications to Methods

Along with the modifications to the study area as described above, the schedule for this Study Plan has also been modified. As proposed in SCE's Revised Technical Study Plan, the first field season associated with REC 1 was scheduled for the 2020 recreation season. In January 2020, the USFS notified the relicensing team of planned heavy road construction on South Lake Road that would significantly affect the recreational use patterns and scheduled activities for the 2020 recreation season (most notably user counts and surveys). Based on this development, SCE developed a revised implementation schedule for REC 1 in consultation with the USFS that moved the general recreation field surveys to the 2021 recreation season. On-going consultation efforts with the INF resulted in changes to study methods.

The anticipated study schedule is identified in Table 13.5-1. Once surveys are complete, data will be analyzed and included in a Final Technical Report to be available in 2021.

Table 13.5-1 Anticipated Study Schedule

TASK	RESPONSIBLE ENTITY	SCHEDULE MILESTONES
First Field Season	SCE	2021
Final Study Report	SCE	September 14, 2021
License Application	SCE	June 2022

SCE filed updated Technical Study Plans in 2019 to address comments received from during the scoping process. As part of the response to the USFS' July 18, 2019 comments, SCE committed to continue to collaborate with USFS staff prior to the 2020 field season to determine an appropriate frequency of summer and winter general recreation surveys that would provide a statistically supported assessment of average use and adequate qualitative feedback regarding user perceptions and experience at each site.

SCE and USFS staff conducted a conference call on July 31, 2019, to discuss SCE's response to comments and to schedule discussions to resolve outstanding items before the 2020 field season, specifically to:

- determine an appropriate frequency of summer and winter general recreation surveys that would provide a statistically supported assessment of average use and adequate qualitative feedback regarding user perceptions and experience at each site; and
- develop and finalize both on-site and off-site survey instruments and methodologies.

A subsequent memorandum was provided to the USFS on October 28, 2019, that proposed an approach to general recreation survey implementation to be discussed on a November 7, 2019 conference call. Following the November 7, 2019 conference call, SCE and USFS staff came to agreement on certain revisions to the survey schedule and instruments. A second memorandum summarizing these changes was provided to the USFS on December 10, 2019.

A follow-up conference call was conducted on January 8, 2020, to discuss revisions to the proposed schedule and survey instruments. During that call, the USFS provided news of a recent development in the Bishop Creek area – construction activity along South Lake Road – that would negatively affect the scheduled activities for the 2020 recreation season, most notably user counts and surveys. Based on these discussions, a January 14, 2020 memorandum was provided with a revised implementation schedule for the REC 1 and REC 2 study plans.

During a January 15, 2020 follow-up conference call, there was general discussion as to whether, despite road construction, both on-site and off-site surveys should be considered for both the 2020 and 2021 recreation seasons. SCE stated that on-site recreation use surveys and counts in 2020 would not provide a representative sample of use, given the major disruption to recreational access to one of the three major recreation areas (South Lake, Lake Sabrina, and Intake No. 2 recreation areas), and that the likelihood of skewed data would make determination of Project related effects and identification of appropriate protection, mitigation, and enhancement measures difficult. Therefore, as summarized in a January 22, 2020 follow-up memorandum, SCE proposed to move the relicensing recreation use surveys and counts to 2021 and proposed roles and responsibilities regarding the development of off-site surveys requested by the USFS.

Based on the discussions of a subsequent January 23, 2020 conference call, a February 6, 2020 memorandum provided a revised implementation schedule and proposed roles and responsibilities regarding off-site surveys. Over various conference calls from March through July 2020, an off-site, web-based survey was finalized with the INF.

13.6 RESULTS

The anticipated study schedule is identified in Table 13.5-1**Error! Reference source not found.**. Once surveys are complete, data will be analyzed and included in a Final Technical Report to be available in 2021.

13.7 DISCUSSION

The following sections provide a description of the approach used to estimate existing and future recreational use, recreation site capacity and use density percentages, and recreation needs. A report will be prepared documenting the analysis results and will include a summary of all collected information and discussion of the analyses described below. The report will address all applicable desired conditions, goals, standards, and guidelines of the Land Management Plan for the Inyo National Forest (USDA, 2018).

13.7.1 CURRENT RECREATION USE AND DENSITY ESTIMATES

Average recreation use will be calculated utilizing spot counts, traffic and trail counters, and general recreation and creel survey data. For vehicle estimates, it will be assumed, on average, a total party size per vehicle of 2.5 people, as estimated in the INF's most recent NVUM report (USFS, 2018d). Estimates will be categorized by site; site type; and activity based on weekday, weekend, holiday, morning, afternoon, or evening use as well as by monthly total use. For the purposes of this study, the carrying capacity for a recreation site is defined as the number of vehicles and boat trailers that can be parked at a recreation site at one time, based on the number of available parking spaces associated with the particular site. For paved parking lots, this will be achieved by counting the number of designated parking spaces available at the recreation site. For unmarked parking, maximum vehicle space will be estimated. Use density at each site will be estimated based on the average number of vehicles observed divided by the parking capacity of that site.

13.7.2 FUTURE RECREATION USE ESTIMATES

Estimated projections of future recreation use will be developed using the average annual increase in population growth over the past 10 years, as reported by the U.S. Census Bureau. These estimates will be augmented with discussion of trends reported in the 2015 SCORP (CDPR, 2015); 2006, 2011, 2016, and 2021 NVUM reports for INF (USFS, 2018d; 2011; 2006), and Land Management Plan for the INF (USDA, 2018). Estimated projections will be provided in 5-year intervals for the anticipated term of the license up to 50 years into the future.

While it is acknowledged that future changes in the supply of recreation resources, either in their quantity, accessibility and/or quality may influence future demand and use, the demand analysis undertaken for this study does not attempt to predict future changes or how they might specifically affect levels of use at Project facilities. Therefore, the demand analysis results should be viewed as a general guide of potential future recreation pressure developed for planning purposes only.

13.7.3 RECREATION NEEDS ASSESSMENT

Estimates of future Project-related recreational demand and needs will rely on the results provided by the recreation use assessment and visitor surveys for user preferences and opinions on needs and crowding.

The need for new recreation opportunities, new site development, or modification of existing recreation resources will be assessed based on the results of facility condition assessments, site capacity estimates, user surveys that provide user preferences and opinions on needs, crowding at each site, and the Project area as a whole. Based on these results, recommendations will be proposed to address future Project facilities and operations, consistent with the desired conditions, goals, standards, and guidelines described in the Land Management Plan for the INF (USDA, 2018).

13.8 CONSULTATION SUMMARY

A summary of correspondence since the Revised Study Plans were filed for REC 1 and REC 2 study plans can be found in Table 13.5-1.

Table 13.8-1 Consultation Since Filing of Revised Study Plans (REC 1 and REC 2)

Date of Consultation	Entities Involved	Description
09/30/2019 (Email to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFSrvice Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email in preparation of an October 30th conference call providing a tentative agenda to discuss two goals of continued consultation: (1) develop and finalize both on-site and off-site survey instruments and methods; and (2) determine an appropriate frequency of summer and winter general recreation surveys that would provide a statistically supported assessment of average use and adequate qualitative feedback regarding user perceptions and experience at each site.
10/28/2019 (Email and Memo to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email in preparation of a November 7th conference call (moved from October 30th). Memo proposing an appropriate frequency of summer and winter general recreation surveys that would provide a statistically supported assessment of average use and adequate qualitative feedback regarding user perceptions and experience at each site.
11/07/2019 (Conference Call with USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Conference call to discuss an appropriate frequency of summer and winter general recreation surveys that would provide a statistically supported assessment of average use and adequate qualitative feedback regarding user perceptions and experience at each site. Many changes to study plans discussed as detailed in a 12/10/2019 memo.
12/10/2019 (Email, Memo, Survey Instrument, and Meeting Notes to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email to schedule an upcoming call and provide a draft revised recreation survey instrument, meeting notes from 11/7/2019, and a memo regarding survey frequency, schedule, and instruments based on the previous conversation.
01/08/2020 (Email, Survey, and Conference Call with USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email providing revised general recreation survey instrument for discussion. Conference call to discuss survey frequency, schedule, and instruments based on the previous conversation. USFS provided news of a recent development in the Bishop Creek area – construction activity along South Lake Road – that would negatively affect the scheduled activities for the 2020 recreation season, most notably user counts and surveys.

Date of Consultation	Entities Involved	Description
01/14/2020 (Email and Memo to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenze, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email providing memo regarding 1/8/2020 conference call. General recreation survey instrument finalized. Revisions to survey frequency and implementation schedule based on discussion, including altering of schedule based on news of South Lake Road construction that would negatively affect the scheduled activities for the 2020 recreation season, most notably user counts and surveys.
01/15/2020 (Conference Call with USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Conference call discussing whether, despite road construction, both on-site and off-site surveys should be considered for both the 2020 and 2021 recreation seasons. SCE believed that on-site recreation use surveys and counts in 2020 would not provide a representative sample of use, given this major disruption to recreational access to one of the three major recreation areas (South Lake, Lake Sabrina, and Intake No. 2 recreation areas). The likelihood of skewed data would make determination of Project-related effects and identification of appropriate protection, mitigation, and enhancement measures difficult. Therefore, SCE proposed to move the relicensing recreation use surveys and counts to 2021 and will assist the USFS in the development off-site surveys (supplemental data) requested by the USFS in late 2019.
01/15/2020 (Email and Survey to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Follow up to conference call providing Word version of the provided survey instrument so that the USFS may mark it up in tracked changes.
01/22/2020 (Email and Memo to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email providing a memo discussing a revised implementation schedule and proposed roles and responsibilities regarding off-site surveys, which will then be discussed on an upcoming January 23, 2020 conference call.
01/23/2020 (Conference Call with USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Phillip Desenzo, USFS Nora Gamino, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt	Conference call discussing 1/22/2020 memo.

Date of Consultation	Entities Involved	Description
	Matthew Harper, Kleinschmidt	
01/23/2020 (Follow-Up Email with USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Follow up email providing a Word version of the same survey instrument so that USFS folks could provide edits in tracked changes.
02/06/2020 (Email and Memo to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email providing memo regarding 1/23/2020 discussion.
02/06/2020 (Email and Survey to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email providing a Spanish version of the approved on-site recreation survey instrument.
03/13/2020 (Conference Call with USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email
03/25/2020 (Email from USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt	Email from USFS regarding staff unavailability due to COVID-19 response.

Date of Consultation	Entities Involved	Description
	Matthew Harper, Kleinschmidt	
04/04/2020 (Conference Call with USFS and Survey Comments from USFS)	Tristan Leong, USFS Sheila Irons, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Call to discuss off-site recreation survey and comments provided by the USFS.
05/13/2020 (Email and Survey to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Incorporation of USFS comments and porting of off-site survey into a web-based format.
05/13/2020 (Conference Call with USFS)	Tristan Leong, USFS Sheila Irons, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Discussion of web-based survey to be used off-site.
05/13/2020 (Follow-Up Email and Survey to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Incorporation of USFS comments during 5/13/2020 call and redistribution.
05/13/2020 (Email to USFS)	Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Harper, Kleinschmidt	Email regarding upcoming REC 2 fieldwork.
05/26/2020 (Email to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt	Follow-up with revised link to most recent web-based, off-site survey.

Date of Consultation	Entities Involved	Description
	Matthew Harper, Kleinschmidt	
05/27/2020 (Conference Call and Survey with USFS)	Tristan Leong, USFS Sheila Irons, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Discussion of most recent version of web-based, off-site survey.
07/07/2020 (Email to USFS)	Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Harper, Kleinschmidt Bryan Cole, MacKay Sposito	Email regarding upcoming REC 2 fieldwork and requesting conference call.
07/09/2020 (Conference Call with USFS)	Tristan Leong, USFS Sheila Irons, USFS Matthew Harper, Kleinschmidt	Discussion of most recent version of web-based, off-site survey.
07/21/2020 (Emails with USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Follow-up with revised link to most recent web-based, off-site survey. Concurrence emails from Tristan Leong, Diana Peitrasanta, and Phillip Desenzo. Follow up with final link to live survey to be embedded on USFS and SCE websites.
07/07/2020 (Emails with USFS)	Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Harper, Kleinschmidt	Emails regarding upcoming REC 2 fieldwork.

13.9 REFERENCES

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APPENDIX REC-1A

ON-SITE SURVEY INSTRUMENT

See Volume II

APPENDIX REC-1B

CREEL SURVEY FIELD DATA SHEET

See Volume II

APPENDIX REC-1C

FACILITIES INVENTORY FORM

See Volume II

14 RECREATION FACILITIES CONDITION AND PUBLIC ACCESSIBILITY INTITIAL STUDY REPORT (REC 2)

14.1 INTRODUCTION

During TWG meetings, SCE and stakeholders identified the need to conduct a Recreation Facilities Condition and Public Accessibility Study (REC 2) to assess the condition of and accessibility to existing recreation facilities at the Project. The study will estimate future facility and accessibility needs, as well as analyze the economics of current and future O&M of Project-related recreation facilities. For the purposes of this Study Plan, Project-related recreation facilities are considered all facilities related to the South Lake, Lake Sabrina, and Intake 2 recreation areas, as described in Section 14.3.1. This report provides an update to SCE's proposed study objectives, study area, methods, and a schedule for the REC 2 study.

14.2 REVIEW OF EXISTING INFORMATION

This study will review and incorporate existing information related to recreational access and condition of existing facilities at the Project. The following studies and reports will be analyzed as part of this study:

- 2015 Licensed Hydropower Development Recreation Report, FERC Form No. 80 (SCE, 2015a)
- 2014 SCE Recreation Use Study Report for Eastern Hydro Division (SCE, 2015a)
- 2015 California SCORP (CDPR, 2015)
- NVUM Reports for INF (USFS, 2006; 2011; 2018d)
- INF Special Use Permits and Concessionaire Data
- INF Alternative Transportation System Study (USDA, 2013)

The study will also analyze relevant management plans for the area, including Inyo County General Plan (IC, 2001), Land Management Plan for the Inyo National Forest (USDA, 2018), and the BLM Bishop Resource Management Plan Record of Decision (BLM, 1993).

14.3 STUDY OBJECTIVES

This study includes the following goals and objectives:

- For Project-related recreation areas, assess the condition of existing recreation facilities
- Full facility condition assessment and inventory at existing recreation facilities directly related to the Project, including an evaluation of signage, public safety features, and visual and aesthetic qualities
- Assess the condition and potential for universal accessibility, where feasible

- Assess the condition of access roads and parking areas associated with Project-related recreation
- For both Project-related recreation areas and other recreation sites near the Project, document the presence of dispersed use outside of the boundary of developed recreation sites
- Assess the carrying capacity and potential need for expansion, or alteration of existing recreation facilities
- Assess the need to formalize or reclaim (due to environmental concerns) dispersed or informal use areas
- Analyze economics of current and future Project-related O&M of recreation facilities
- Conduct an economic analysis to understand the current cost of ownership and maintenance performance by concessionaires
- Analyze options for improving concessionaire agreements and/or leveraging funds or resources to help offset costs of facility improvements and ongoing O&M for recreation facilities
- Ensure that future Project facilities and operations are consistent with the Desired Conditions, Goals, Standards, and Guidelines described in the Land Management Plan for the Inyo National Forest (USDA, 2018) for Social and Economic Sustainability and Multiple Uses

14.3.1 STUDY AREA

Table 14.3-1 lists the general sites that were studied in this effort. A full facility condition assessment was performed by a landscape architect on the three recreation areas directly related to the Project: Lake Sabrina Recreation Area, South Lake Recreation Area, and Intake 2 recreation area[17]. Both the three recreation areas and other INF recreation sites in the Project area were assessed for dispersed use impacts. At those locations, dispersed use data was collected at all developed facilities, reservoir shorelines, and islands within each reservoir. At the three main recreation areas, dispersed use data was collected at the following detailed locations:

Intake 2 (campground is assessed separately)

- Day use area adjacent to campground, including restroom facility and day use parking
- Fishing access, universally accessible fishing pier
- Fishing access, bank fishing along northern shore up to dam
- Informal trails, day use area to southeast side of reservoir
- Informal trails and camping areas, south side of reservoir between inlet and dam

[17] A basic inventory of all sites will be conducted as part of the Recreation Use and Needs Study Plan.

Lake Sabrina

- Trailhead, Sabrina Basin Trailhead, and associated information kiosk
- Fishing access, small lake behind weir below dam and south of bridge
- Informal parking, fishing access and Sabrina Basin Trailhead along road
- Boat launch area, Lake Sabrina Launching Facility
- Marina, Lake Sabrina Boat Landing
- Parking, Lake Sabrina Boat Landing, two lots, including restroom facilities
- Informal trail, along western shore of reservoir, called Inlet Trail on map at marina, much of this is outside of Project boundary and in wilderness
- Informal camping, on south shore of reservoir, accessed by Inlet Trail and by boat, all of which is out of Project boundary and in wilderness

South Lake

- Bishop Fishing access, Weir Lake
- Parking, Weir Lake
- Informal parking, along road between dam and Weir Lake
- Boat launch area, South Lake Launching Facility
- Marina, South Lake Landing
- Parking, for boat launch
- Day use area, picnic tables along shore, between marina and dam
- Day use area, fishing/dock access south of ramp
- Parking, day use area, including restroom facilities
- Trailhead, Bishop Pass Trailhead, and associated information kiosk
- Parking, for Bishop Pass Trailhead and Green Creek Diversion trail, including restroom facilities
- Picnic/day use area, two picnic tables along diversion trail just above parking area
- Informal camping, on ridge above boat ramp parking, on island in southern portion of reservoir, and at various locations on the south end of the reservoir
- Informal trail, connecting Pass and Green Creek Diversion trails
- Informal trails and fishing access, at Bishop Pass Trailhead

Table 14.3-1 Sites Studied in 2020 Fieldwork

Site ID[1]	Name	Full Facility Condition Assessment	Dispersed Use Assessment Only
Middle Fork Bishop Creek			
MF01	Lake Sabrina Recreation Area[1]		
MF01a	Sabrina Basin Trailhead & Informal Road Parking	✓	
MF01b	Lake Sabrina Boat Landing & Marina	✓	
MF02	Sabrina Campground		✓
MF03	Bishop Park Campground		✓
MF04	Bishop Park Group Campground		✓
MF05	Intake 2 Campground		✓
MF06	Intake 2 Recreation Area[1] (Day Use Area and Fishing Access)	✓	
MF07	Forks Campground		✓
MF08	Big Trees Campground		✓
South Fork Bishop Creek			
SF01	South Lake Recreation Area[1]		
SF01a	Weir Lake & Parking Area	✓	
SF01b	South Lake Launching Facility, Marina, & DUA	✓	
SF01c	Bishop Pass Trailhead	✓	
SF01d	Green Creek Diversion Trailhead & DUA	✓	
SF02	La Hupp Picnic Area		✓
SF03	Willow Campground		✓
SF04	Tyee Day Use Area		✓
SF05	Table Mt Group Campground		✓
SF06	Mountain Glen Campground		✓
SF07	Four Jeffrey Campground		✓
Bishop Creek			
BC01	Bitterbrush Campground		✓
BC02	Little Egypt Trail (informal access to climbing area)		✓

Resource: SCE, 2015a

[1]Note: The only Project-required recreation facilities are the South Lake boat ramp, Lake Sabrina boat ramp, and Intake 2 fishing platforms. All other facilities are non-Project.

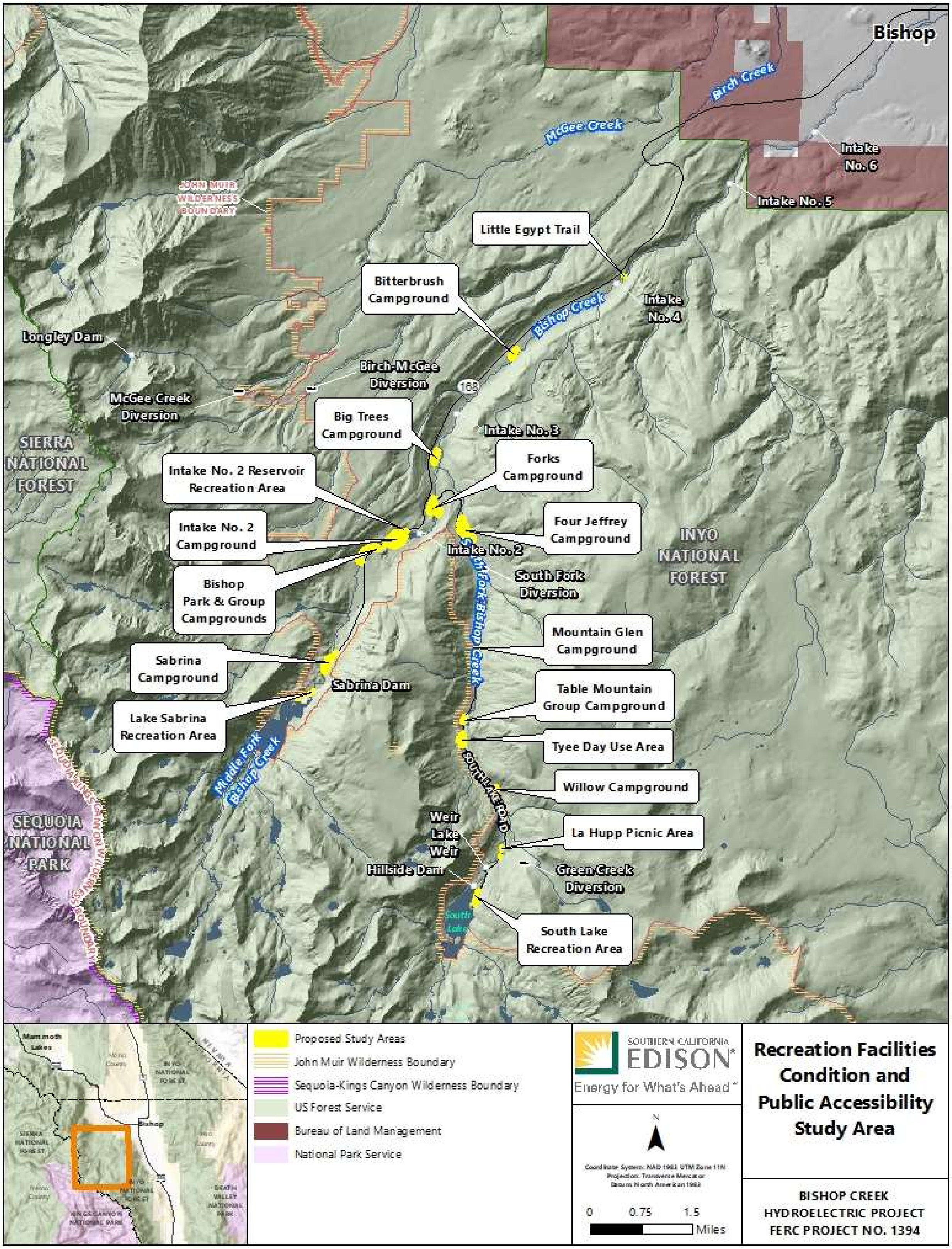

Figure 14.3-1 Recreation Facilities Condition and Public Accessibility Study

14.4 METHODS

14.4.1 FULL FACILITY CONDITION ASSESSMENT AND INVENTORY

A full facility condition assessment was performed on the three recreation areas directly related to the Project: Lake Sabrina Recreation Area, South Lake Recreation Area, and Intake 2 Recreation Area. This inventory is intended to supplement and provide greater detail for these three recreation areas. INF directives were reviewed for condition assessment definitions and purposes to develop methods and forms for use in conducting condition assessments and facility inventories. Generally, the study included an inventory and cursory condition assessment of the following, within the study area:

- Specialized systems (e.g., water, electrical, septic)
- Building envelope, structural elements, and interior soundness
- Systems and equipment to ensure they operate effectively and appropriately
- Visual and aesthetic quality of facilities
- Universal accessibility of facilities
- Public safety measures
- Signage and wayfinding
- Access roads, internal circulation roads, campsite spurs and parking areas

The survey documented the current status of routine maintenance and equipment servicing and any items in need of correction, repair, replacement, or similar action, noting facility condition according to Table 14.4-1. All inventories will be documented with photographs and integrated into a geographic information system (GIS) database with relevant attributes to facilitate future analysis and ongoing assessments based on relevant attributes to facilitate future analysis and ongoing assessment.

Table 14.4-1 Facility Condition Ratings Table

ID	CATEGORY	DESCRIPTION
N	Needs replacement	Facility is non-functional or has broken or missing components
R	Needs repair	Facility has structural damage or is in an obvious state of disrepair
M	Needs maintenance	Facility needs maintenance, such as cleaning or painting
G	Good condition	Facility is functional and well maintained

14.4.2 DISPERSED USE ASSESSMENT

A dispersed use assessment was conducted August 4 to 7, 2020 at certain sites as designated in Table14.7-1[18]. The study initially consisted of a desktop exercise to scan aerial imagery for evidence of dispersed use or informal access areas such as social trails, brown out areas or impromptu parking around the perimeter of each study area. These initial indications of dispersed use, along with personal communication with INF regarding sites of concern, provided a basis for ground truthing dispersed use in the study area. As dispersed use was discovered, GIS data, photographs, calculations, and notes were collected at each site, which are subject to a quality assessment/quality control (QA/QC) process to formalize the dataset and relevant attributes (e.g., spatial location, number of fire rings, area affected, or length of roads or trails) to facilitate analysis and the preparation of a detail technical report. Additional qualitative information regarding potential issues or possible accommodations or future recreation opportunities at the sites was also noted.

14.4.3 OPERATIONS AND MAINTENANCE ECONOMICS ASSESSMENT

A desktop study will be conducted to analyze the current economics of the O&M of the three recreation areas directly related to the Project: Lake Sabrina Recreation Area, South Lake Recreation Area, and Intake 2 recreation area. Past operation costs will be gathered from INF and its concessionaires and analyzed in conjunction with data collected in the full facility condition assessment to determine the true costs of O&M these sites. Modifications to Methods and Continued Consultation

As proposed in SCE's Revised Technical Study Plan, the first field season associated with REC 2 was scheduled for the 2020 recreation season. Due to travel concerns and uncertainty related to COVID-19, field work for both the Full Facility Condition Assessment and Inventory and Disperse Use Assessment were conducted later in the field season than originally anticipated (August 4 to 7, 2020). The anticipated study schedule to complete the Study Plan is identified in Table 14.4-2.

Table 14.4-2 Anticipated Study Schedule

TASK	RESPONSIBLE ENTITY	SCHEDULE MILESTONES
First Field Season Technical Memorandum	SCE	January/February 2021
Final Study Report	SCE	September 14, 2021
License Application	SCE	June 2022

[18] Note that for Lake Sabrina, South Lake, and Intake 2 Recreation Areas, the perimeter of each reservoir and islands within each reservoir were included in the assessment.

14.5 RESULTS

Due to delay in schedule, as described above, a complete assessment of collected data has not been completed. SCE is obtaining the necessary information from the USFS and its concessionaires to conduct an Operations and Maintenance Economics Assessment. A summary of all initial analyses performed under REC 2 will be provided as a technical report in early 2021.

14.6 DISCUSSION

The need for new recreation opportunities, new site development, or modification of existing recreation resources will be assessed based on the results of these full facility condition assessments, dispersed use assessments, site capacity estimates, and user surveys that provide user preferences and opinions regarding needs and crowding for each site and the Project area as a whole. Based on these results, recommendations will be proposed to address future Project facilities and operations, consistent with the Desired Conditions described in the Land Management Plan for the INF (USDA, 2018), and then discussed with the TWG.

A technical report will be prepared documenting the findings of this study and submitted to the TWG in 2021. The report will include a detailed inventory and assessment of all site facilities and appurtenant features, including applicable maps and illustrations in addition to an analysis of current and future O&M. The report will address all applicable desired conditions, goals, standards, and guidelines of the Land Management Plan for the INF (USDA, 2018).

14.7 CONSULTATION SUMMARY

A summary of correspondence since the Revised Study Plans were filed for REC 1 and REC 2 study plans can be found below in Table14.7-1.

Table14.7-1 Consultation Since Filing of Revised Study Plans (REC 1 and REC 2)

Date of Consultation	Entities Involved	Description
09/30/2019 (Email to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email in preparation of an October 30th conference call providing a tentative agenda to discuss two goals of continued consultation: (1) develop and finalize both on-site and off-site survey instruments and methodologies; and (2) determine an appropriate frequency of summer and winter general recreation surveys that would provide a statistically supported assessment of average use and adequate qualitative feedback regarding user perceptions and experience at each site.
10/28/2019 (Email and Memo to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email in preparation of a November 7th conference call (moved from October 30th). Memo proposing an appropriate frequency of summer and winter general recreation surveys that would provide a statistically supported assessment of average use and adequate qualitative feedback regarding user perceptions and experience at each site.
11/07/2019 (Conference Call with USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Conference call to discuss an appropriate frequency of summer and winter general recreation surveys that would provide a statistically supported assessment of average use and adequate qualitative feedback regarding user perceptions and experience at each site. Many changes to study plans discussed as detailed in a 12/10/2019 memo.
12/10/2019 (Email, Memo, Survey Instrument, and Meeting Notes to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email to schedule an upcoming call and provide a draft revised recreation survey instrument, meeting notes from 11/7/2019, and a memo regarding survey frequency, schedule, and instruments based on the previous conversation.
01/08/2020 (Email, Survey, and Conference Call with USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email providing revised general recreation survey instrument for discussion. Conference call to discuss survey frequency, schedule, and instruments based on the previous conversation. USFS provided news of a recent development in the Bishop Creek area – construction activity along South Lake Road – that would negatively affect the scheduled activities for the 2020 recreation season, most notably user counts and surveys.

Date of Consultation	Entities Involved	Description
01/14/2020 (Email and Memo to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenze, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email providing memo regarding 1/8/2020 conference call. General recreation survey instrument finalized. Revisions to survey frequency and implementation schedule based on discussion, including altering of schedule based on news of South Lake Road construction that would negatively affect the scheduled activities for the 2020 recreation season, most notably user counts and surveys.
01/15/2020 (Conference Call with USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Conference call discussing whether, despite road construction, both on-site and off-site surveys should be considered for both the 2020 and 2021 recreation seasons. SCE believed that on-site recreation use surveys and counts in 2020 would not provide a representative sample of use, given this major disruption to recreational access to one of the three major recreation areas (South Lake, Lake Sabrina, and Intake 2 recreation areas). The likelihood of skewed data would make determination of Project-related effects and identification of appropriate protection, mitigation, and enhancement measures difficult. Therefore, SCE proposed to move the relicensing recreation use surveys and counts to 2021 and will assist the USFS in the development off-site surveys (supplemental data) requested by the USFS in late 2019.
01/15/2020 (Email and Survey to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Follow up to conference call providing Word version of the provided survey instrument so that the USFS may mark it up in tracked changes.
01/22/2020 (Email and Memo to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email providing a memo discussing a revised implementation schedule and proposed roles and responsibilities regarding off-site surveys, which will then be discussed on an upcoming January 23, 2020 conference call.
01/23/2020 (Conference Call with USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Phillip Desenzo, USFS Nora Gamino, USFS Matthew Woodhall, SCE	Conference call discussing 1/22/2020 memo.

Date of Consultation	Entities Involved	Description
	Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	
01/23/2020 (Follow-Up Email with USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Follow up email providing a Word version of the same survey instrument so that USFS folks could provide edits in tracked changes.
02/06/2020 (Email and Memo to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email providing memo regarding 1/23/2020 discussion.
02/06/2020 (Email and Survey to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Email providing a Spanish version of the approved on-site recreation survey instrument.
03/13/2020 (Conference Call with USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	
03/25/2020 (Email from USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE	Email from USFS regarding staff unavailability due to COVID-19 response.

Date of Consultation	Entities Involved	Description
	Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	
04/04/2020 (Conference Call with USFS and Survey Comments from USFS)	Tristan Leong, USFS Sheila Irons, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Call to discuss off-site recreation survey and comments provided by the USFS.
05/13/2020 (Email and Survey to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Incorporation of USFS comments and porting of off-site survey into a web-based format.
05/13/2020 (Conference Call with USFS)	Tristan Leong, USFS Sheila Irons, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Discussion of web-based survey to be used off-site.
05/13/2020 (Follow-Up Email and Survey to USFS)	Tristan Leong, USFSDiana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Incorporation of USFS comments during 5/13/2020 call and redistribution.
05/13/2020 (Email to USFS)	Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Harper, Kleinschmidt	Email regarding upcoming REC 2 fieldwork.
05/26/2020 (Email to USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE	Follow-up with revised link to most recent web-based, off-site survey.

Date of Consultation	Entities Involved	Description
	Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	
05/27/2020 (Conference Call and Survey with USFS)	Tristan Leong, USFS Sheila Irons, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Discussion of most recent version of web-based, off-site survey.
07/07/2020 (Email to USFS)	Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Harper, Kleinschmidt Bryan Cole, MacKay Sposito	Email regarding upcoming REC 2 fieldwork and requesting conference call.
07/09/2020 (Conference Call with USFS)	Tristan Leong, USFS Sheila Irons, USFS Matthew Harper, Kleinschmidt	Discussion of most recent version of web-based, off-site survey.
07/21/2020 (Emails with USFS)	Tristan Leong, USFS Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Phillip Desenzo, USFS Matthew Woodhall, SCE Kelly Larimer, Kleinschmidt Finlay Anderson, Kleinschmidt Matthew Harper, Kleinschmidt	Follow-up with revised link to most recent web-based, off-site survey. Concurrence emails from Tristan Leong, Diana Peitrasanta, and Phillip Desenzo. Follow up with final link to live survey to be embedded on USFS and SCE websites.
07/07/2020 (Emails with USFS)	Diana Pietrasanta, USFS Sheila Irons, USFS Nora Gamino, USFS Matthew Harper, Kleinschmidt	Emails regarding upcoming REC 2 fieldwork.

14.8 REFERENCES

Bureau of Land Management (BLM). 1993. Bishop Resource Management Plan Record of Decision. Bakersfield District, Bishop, CA.

California Department of Parks and Recreation (CDPR) 2015. 2015 Statewide Comprehensive Outdoor Recreation Plan. California Department of Parks and Recreation, Sacramento, CA.

California Department of Parks and Recreation (CDPR). 2014 and 2012. Survey on Public Opinions and Attitudes on Outdoor Recreation in California Complete Findings. California Department of Parks and Recreation, Sacramento, CA.

California Department of Parks and Recreation (CDPR). 2013. Outdoor Recreation in California's Regions 2013. California Department of Parks and Recreation, Sacramento, CA.

Inyo County (IC). 2001. Inyo County General Plan. Inyo County Planning Department, Bishop, CA.

Southern California Edison (SCE). 2015a. Form 80 and Recreation Report Filing: 2014 Recreation Use Study Report for Eastern Hydro Division.

U.S. Forest Service (USFS). 2018d. Visitor Use Report, Inyo NF, USDA Forest Service, Region 5, National Visitor Use Monitoring Data collected FY 2016. United States Department of Agriculture.

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U.S. Forest Service (USFS). 2006. Visitor Use Report, Inyo NF, USDA Forest Service, Region 5, National Visitor Use Monitoring Data collected FY 2006. United States Department of Agriculture.

United States Department of Agriculture (USDA). 2018. Land Management Plan for the Inyo National Forest. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd589652.pdf.

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APPENDIX REC-2A

GENERAL RECREATION SURVEY

See Volume II

APPENDIX REC-2B

CREEL FIELD DATA SHEET

See Volume II

APPENDIX REC-2C

FACILITIES INVENTORY FORM

See Volume II

15 PROJECT BOUNDARY AND LANDS INITIAL STUDY REPORT (LAND 1)

15.1 INTRODUCTION

During TWG meetings, stakeholders identified the need to conduct a Project Boundary and Lands Study (LAND 1) that would evaluate the necessity for potential modifications to the Project boundary to account for future Project facilities O&M. According to FERC requirements (18 CFR §4.41), the Project boundary must encompass all lands necessary for Project purposes, including the O&M of the Project over the term of the FERC license. FERC further requires (18 CFR §11.2) that a licensee recompense the United States for the use, occupancy, and enjoyment of its lands or its property. The annual charge for such use of government lands is calculated, in part, based on the amount of federal acreage within the Project boundary, and therefore a distinction must be made between federal and non-federal lands when filing a Project boundary and associated data. Therefore, this study is to ensure that an accurate representation of both Project boundary and land classification is presented in a final license application (FLA). The process of identifying potential issues with or changes to the Project boundary and Project lands is an ongoing process that will continue until the submission of a FLA. This report provides an update of proposed study objectives, study area, methods, and a schedule.

15.2 REVIEW OF EXISTING INFORMATION

In performing this desktop exercise, the following existing information and data sources guided the analysis:

- Approved Project boundary GIS data (filed 4-2-2010)
- Approved Project exhibit drawings
- Inyo County tax parcel GIS data
- Federal land ownership GIS data
- Aerial imagery
- Land Management Plan for the Inyo National Forest (USDA, 2018)

15.3 STUDY OBJECTIVES

This Project Boundary and Lands Study has the following goals and objectives:

- This assessment will be designed as a desktop exercise to assess potential modifications to the Project boundary to account for future O&M of Project facilities.
  - Assess the current Project boundary for accuracy
  - Confirm base ownership of Project lands in terms of title, easements, and other jurisdictional overlays
  - Assess the Project area for roads used predominantly for Project purposes
  - Assess the Project area for ancillary and unintended uses arising from authorized Project activities

- Determine if certain Project facilities will be removed or abandoned under the term of the next license, and how they will be treated, consistent with relevant management plans and objectives, including the Land Management Plan for the INF (USDA, 2018).

15.3.1 Study Area

The proposed study area includes lands within the current Project boundary or those lands identified throughout the relicensing process as the having potential to be added or removed from the Project boundary (Figure 15.3-1).

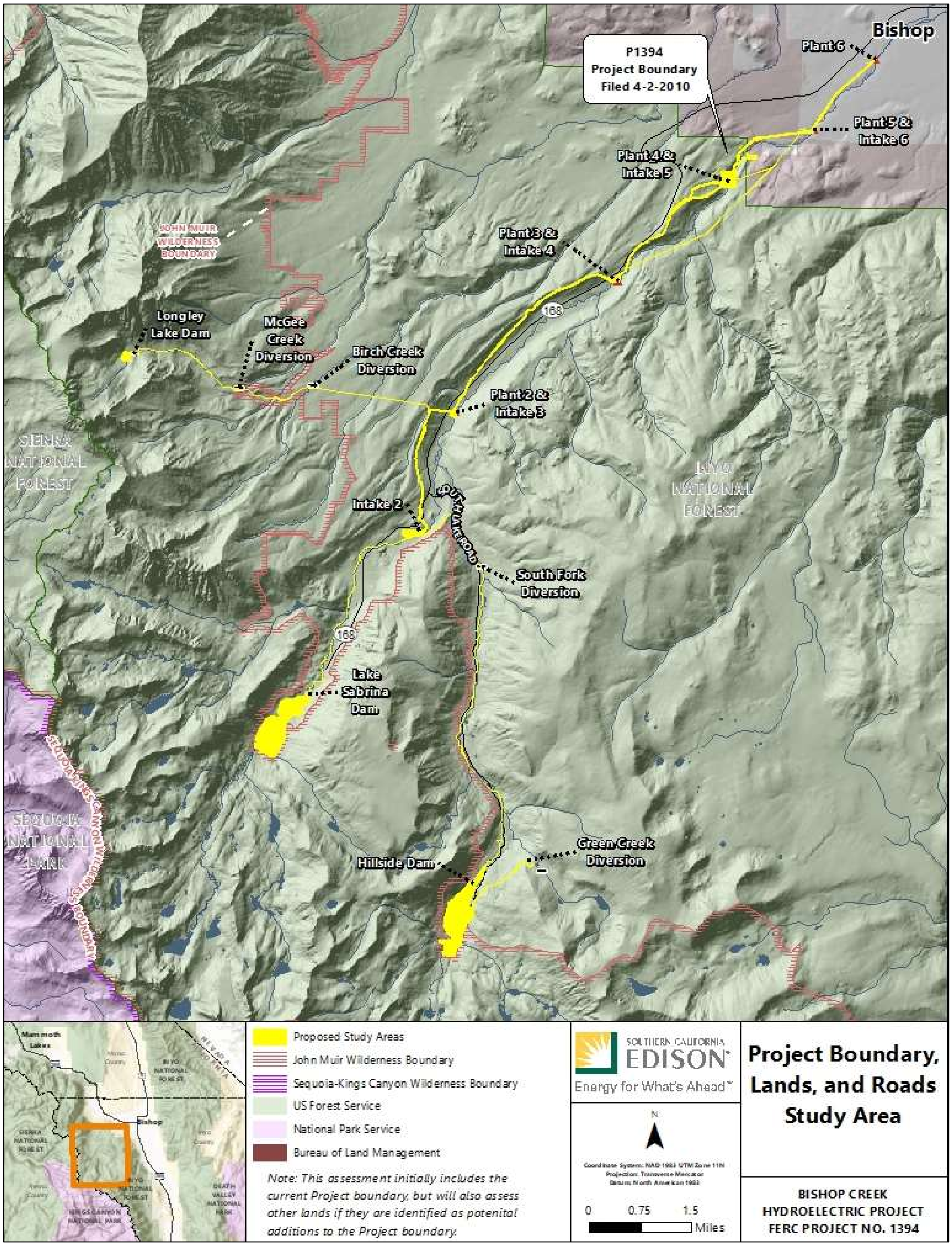

Figure 15.3-1 Proposed Project Boundary and Lands Study Area

15.4 METHODS

To ensure that the Project boundary conforms with 18 CFR 4.41 (Exhibit G) requirements, SCE assess and potentially proposes modifications to the Project boundary under the term of a new license based on the following methods.

1. Assess the current Project boundary for accuracy
    a. Compile currently filed and approved Project boundary GIS data and Exhibit G drawings.
    b. Analyze current boundary and adjacent lands within GIS software to determine any mapping errors, omissions, or potential removal or addition of lands to the future Project boundary.
2. Assess current Project lands ownership information
    a. Gather accurate land ownership data for all lands currently within or with the possibility to be added to the Project boundary.
    b. Ensure that Project lands are correctly distinguished within applicable GIS layers between federal and non-federal lands and are further separated into USFS and BLM lands.
3. Assess Project area to identify roads currently or proposed to be used predominantly for Project purposes, such as operation, maintenance, or access to Project recreation
    a. Obtain most recent GIS data of USFS roads
    b. Identify roads currently or proposed to be used predominately for Project purposes, such as O&M or access within the Project boundary for recreation

The results of other studies may influence potential modifications to the Project boundary. As relevant study results and analyses are completed, SCE will consult with USFS, BLM, and other landowners to determine if other Project-related resource areas should be removed or included in the Project boundary.

15.5 MODIFICATIONS TO METHODS

No changes or modifications have been made to this Study Plan.

15.6 RESULTS

To date, SCE has conducted an initial review within a GIS of current boundary and lands based on its Project boundary, aerial imagery, Inyo County tax data, federal lands data, and current Project features. Conversations with SCE O&M staff were conducted to identify operational needs that may require boundary changes.

Results of this Study Plan will be incorporated into a Final Technical Report in 2021. The anticipated study schedule is identified in Table 15.6-1.

Table 15.6-1 Anticipated Study Schedule

TASK	RESPONSIBLE ENTITY	SCHEDULE MILESTONES
Second Field Season	SCE	2021
Final Study Report	SCE	September 14, 2021
License Application	SCE	June 2022

15.7 DISCUSSION

Initial results from this study are still being analyzed and will be discussed in the Final Technical Report in 2021.

15.8 REFERENCES

U.S. Department of Agriculture (USDA). 2018. Land Management Plan for the Inyo National Forest. https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd589652.pdf.

16 CULTURAL RESOURCES INITIAL STUDY REPORT (CUL 1)

16.1 INTRODUCTION

SCE and stakeholders identified the need to conduct cultural resource studies including archaeological, built environment, traditional cultural properties (TCP), and tribal cultural resources. This ISR details the study objectives, study area, methods, and results for the non-native American TCPs, archaeological, and built environment cultural resource studies. The results of all studies will result in the development of an Historic Properties Management Plan (HPMP).

The HPMP will consider direct and indirect effects of continued Project O&M on the National Register of Historic Places (NRHP) listed or eligible Tribal Resources, including public recreation activities, that may have an adverse effect on historic properties. The effect may be direct (e.g., result of ground-disturbing activities), indirect (e.g., public access to Project areas), or cumulative (e.g., caused by a Project activity or public access in combination with other past, present, and reasonably foreseeable future projects). Several terms used throughout this Study Plan warrant definition at the outset.

- ***Historic property(ies)***, as defined under 36 CFR §800.16(l) (1), are prehistoric or historic archaeological sites, buildings, structures, objects, districts, or TCPs included in, or eligible for inclusion in, the NRHP. Historic properties are identified through a process of evaluation against specific NRHP criteria in 36 CFR § 60.4.
- ***A district*** is a geographic area containing a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically, or aesthetically by plan and physical development. Examples of districts include (but are not limited to) prehistoric archaeological site complexes, hydroelectric projects, residential areas, commercial zones, mining complexes, transportation networks, rural villages, canal systems, irrigation systems, or large ranches (NPS 1997).
- ***Cultural Resource(s)***, for the purpose of this document, is used to discuss any prehistoric or historic-period district, archaeological site, building, structure, object, landscape, or Traditional Cultural Resource (TCR), regardless of its National Register eligibility.

Licensing of the Project is a federal undertaking; therefore, compliance with the National Historic Preservation Act (NHPA) is required. For historic properties, appropriate study areas are defined by regulations under 36 CFR § 800 as the area of potential effects (APE). The APE for the Project is further defined in Section 16.4 of this ISR.

16.2 REVIEW OF EXISTING INFORMATION

16.2.1 SUMMARY OF RECORD SEARCHES ARCHIVAL RESEARCH

SCE conducted an initial search of SCE archived records and maps, the INF, BLM, and the Eastern Information Center (EIC) of the California Historical Resources Information Center at University of California, Riverside. The purpose of this search was to gather existing information regarding previously recorded cultural resources within the APE, and to assess which areas of the APE had been surveyed previously. The record searches included all lands within the APE plus a study area extending 1 mile around all Project features.

An additional research of the SCE archives to update the previous information was planned for August 2020 prior to the planned fieldwork in September and October of 2020. Due to the COVID-19 closure of INF and EIC, the previous record searches conducted at those repositories, as well as others such as SCE records stored at the Huntington Library, could not be conducted as planned. This additional information will be gathered once these repositories re-open and it will be incorporated into the Cultural Resource Report for the relicensing.

Research revealed that the Project area is highly sensitive for archeological and historic-period built environmental resources and that many areas within the Project have already been surveyed. However, research revealed that some areas within the APE had not yet been surveyed and that some areas should be resurveyed to meet current professional standards. These areas will be surveyed during the September-October 2020 surveys and the initial results will be included in the Final Technical Report in 2021.

16.2.2 PREVIOUS CULTURAL RESOURCES STUDY

One hundred twenty-one previous cultural resource investigations were previously identified within the study area (Table 16.2-1). Approximately 90 percent of the studies within the APE occurred more than 10 years ago, provide insufficient information in the reports to determine the adequacy of the survey coverage, or otherwise did not fully cover the areas included in those projects. Thus the majority of APE will be surveyed to current professional standards during the September-October 2020 surveys.

Table 16.2-1 Previous Cultural Resource Studies Conducted within the Project Study Area

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
IN-000026	1080265			King, Thomas F. 1973	Archaeological Impact Evaluation: Control-Casa Diablo Transmission Line, Southern California Edison Company, Phases I & II
IN-000113	1083235			Clay, Vicky L. and M.C. Hall 1988	Results of the 1987 Field Season Cultural Resources Survey for the Historic and Archaeological Preservation Plan for the Lee Vining Creek Hydroelectric Project (FERC #1388) and the Rush Creek Hydroelectric Project (FERC #1389)
IN-000114	1082268			Stornetta, S. 1984	An Intensive Archaeological Survey of a Proposed 115 kilovolt (kV) Transmission Line, Dixie Valley, Nevada to Bishop, California
IN-000183	1081933			Crist, Michael K. 1982a	A Cultural Resource Reconnaissance of the Rancho Riata Hydroelectric Project, Inyo County, California
IN-000250	1082572	ARR #05-04-351		Hall, M.C. 1986	Report on a Cultural Resources Survey of Proposed Electrical Interconnection Routes, Inyo and Mono Counties, California: United States Bureau of Land Management, Los Angeles Department of Water and Power, and Southern California Edison Company Properties
IN-000265	1082743			Macko, M.E. 1986	Results of the 1986 Field Season, Cultural Resources Survey for the Historic and Archaeological Preservation Plan for the Bishop Creek Hydroelectric Project; Part I: Reservoirs, Powerhouses, Transmission Lines and Miscellaneous Facilities
IN-000266	1083231			White, David R.M. 1988a	An Evaluation of Significance for Archaeological Sites Discovered during the 1986 Field Season, Historic and Archaeological Preservation Plan for the Bishop Creek Hydroelectric Project (FERC Project 1394), Inyo County, California
IN-000267	1083252			York, A. 1988	Final Report: An Evaluation of Fifteen Archaeological Sites on the Bishop Creek Hydroelectric Project, Inyo County, California
IN-000278	1082794			Diamond, Valerie H., Stephen G. Hemlich, and Robert A. Hicks 1988	Evaluation of the Historic Resources of the Bishop Creek Hydroelectric System

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
IN-000279	1083232			Clerico, Robert and Ana Beth Koval 1986	An Architectural And Historical Evaluation Of Structures Associated With The Bishop Creek Hydroelectric Power System, Inyo County, California
IN-000305	1083254			Burton, Jeffery F. 1990	An Archaeological Survey of the Contel Mammoth to Bishop Fiber Optics Line, Mono and Inyo Counties, California
IN-000388	1084268			White, David R.M. 1992	Results of Archaeological Survey for Groundwater and Riparian Vegetation Studies in Connection with the Lundy and Bishop Creek Hydroelectric Projects, Mono and Inyo Counties, California
IN-000389	1084269			White, David R.M. 1992	Results of Subsurface Testing at CA-INY-4500, A Sparse Lithic Scatter Located along Bishop Creek, Inyo County, California
IN-000442	1084586			Burton, Jeffery F. 1994	An Archaeological Survey of the Eastern Sierra College Center, Inyo County, California
IN-000624				Jordan, Stacey C. 2006	Archaeological Survey Report for the Southern California Edison Company Tap Control--Inyo Fiber Optic Cable Project Inyo County, California (WO#8458-0461)
IN-000842				White, David R.M. 1989	Management Plan for Historic and Archaeological Resources Associated with the Historic and Archaeological Preservation Plan for the Bishop Creek Hydroelectric Project (FERC Project 1394), Inyo County, California
IN-000859			BLM-C-S9	Hemphill, M.L. 1987	Report on a Cultural Resources Survey of Proposed Electrical Interconnection Routes, Inyo and Mono Counties, California: United States Bureau of Land Management, Los Angeles Department of Water and Power, and Southern California Edison Company Properties
IN-000884				Manske, K. and M.A. Giambastiana 2007	Class III Cultural Resource Inventory for the Replacement of One Utility Pole on the Southern California Edison Control-Mt. Tom 55 kV Line, Inyo County, California
IN-000912				Pollock, Katherine H. 2008a	Archaeological Assessment Report Bishop Creek Hydroelectric Project (FERC Project No. 1394), Intake 3, 4, 5, and 6 AVM Replacements, INF, Inyo County, California
IN-00099	1081091	ARR #05-04-0081		Miller, Brian 1980b	Archaeological Reconnaissance of Starlite Estates Water Diversion

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
IN-00102				Miller, Brian 1980a	Archaeological Reconnaissance Report - Sabrina Campground Rehabilitation
IN-00123	1083557			Cutts, Janette S. 1989	An Archaeological Reconnaissance Report: High Desert Off Highway Vehicle (OHV) Inyo and Mono Counties, California
IN-00125	1081364	ARR #05-04-0115		Faust, Nicholas 1980b	Archaeological Reconnaissance Report - Bishop Creek Canyon Recreation Development Project
IN-00129	1081380	ARR #05-04-0040		Miller, Brian C. 1976	Archaeological Reconnaissance Report: South Lake Road Construction
IN-00141	1081571			Faust, Nicholas 1980a	Archaeological Reconnaissance Report - Coyote Creek Unmanned Entrance Station
IN-00144	1081581	ARR #05-04-0220		Taylor, W. 1981	Archaeological Reconnaissance Report - Winter Parking, CA (Highway) 168
IN-00147	1081608	R1979050400088		Miller, Brian C. 1979	Archaeological Reconnaissance Report: North Lake Campground Well
IN-00148	1081609	ARR #05-04-0083		Miller, Brian 1981	Archaeological Reconnaissance Report - Willows Campground Waterline and Well/Spring
IN-00149	1085132	HRR #05-04-83-1		Sawinski, Tamara 1997	Heritage Resources Report - Willow Campground Trail
IN-00169	1081707	ARR #05-04-0257		Crist, Michael K. 1982b	A Cultural Reconnaissance of the Horton Creek Hydroelectric Project, Inyo County, California
IN-00191	1081996			Firby, Valerie 1982	A Historic Overview of the Wilshire-Bishop Creek (Cardinal) Mine
IN-00192	1081997			Zeier, Charles D., Valerie Firby, and Jane Russell Armstrong 1982	An Intensive Archaeological Reconnaissance of the Bishop Creek Powerhouse No. 1 Project Area, Inyo County, California
IN-00203	1081769	ARR #05-04-0243		Farrell, Mary 1982	Archaeological Reconnaissance Report - Cataract Road Relocation
IN-00222	1082195	ARR #05-04-0278		Miller, Brian 1983	Archaeological Reconnaissance Report - Bishop Creek Road Realignment (Flood Damage)
IN-00230	1082265	R1984050400318		Snyder, Toni 1984	Archaeological Reconnaissance Report: Sabrina and South Lake Boating Facilities
IN-00235	1082354			Weaver, R.A. 1985	Archaeological Reconnaissance Report: Saga Mineral Exploration

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
IN-00243	1082425			Macko, Michael E. and Jill Weisbord 1985	Sylmar Expansion Project: Cultural Resources Inventory and Significance Evaluation - Final Report--Cultural Resource Use Permit No. 16053
IN-00247	1082482	ARR #05-04-0331		Miller, Brian 1986	Archaeological Reconnaissance Report - Parcher's Resort Rehabilitation
IN-00251	1084231			Hall, M.C. 1987	Recommendations Regarding the National Register Eligibility of Cultural Resources Sites on a Proposed Electrical Interconnection Route, Inyo and Mono Counties: US BLM Lands
IN-00252	1084253			Hall, M.C. 1990	The Oxbow Archaeological Incident Investigations at Twenty-Three Locations between Owens Valley, Eastern California and Walker Basin, Southwestern Nevada
IN-00264	1082599			White, David R.M. 1986	Results of the 1986 Field Season, Cultural Resources Survey for the Historic and Archaeological Preservation Plan for the Bishop Creek Hydroelectric Project (FERC Project 1394), Inyo County, California; Part II, South Fork Diversion
IN-00290	1082840			Miller, Brian 1987	Archaeological Reconnaissance Report: Starlight Well and Grazing Stations
IN-00292	1082842			Mapel, Tim 1987	Archaeological Reconnaissance Report: Buttermilk Meadows Rehabilitation Project
IN-00295	1082957			White, David R.M. 1988b	Cultural Resources Inventory for Proposed Modification of the Spillway on Intake Number Two Dam, Bishop Creek Hydroelectric Project (FERC Project 1394) Inyo County, California
IN-00325	1083301	ARR #05-04-474		Reynolds, Linda A. 1988	Archaeological Reconnaissance Report: Big Trees Campground Test Drill Holes/SCE
IN-00393	1084307	CRR #05-04-588		McLean, Vernon 1992	Cultural Resources Report #05-04-588, White Mountain Spring Developments
IN-00408	1084391	HRR NO.05-04-593		Reynolds, Linda A. 1993	Cultural Resources Report, Parson's Small Tract Act/Starlight
IN-00423	1084513			Valdez, Sharynn-Marie, and Nelson Siefkin 1993	Archaeological Survey Report of Bishop Creek No. 3 Flowline Replacement Project, Inyo County, California

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
IN-00450	1084623	HRR #05-04-639		Cutts, Janette and Linda Reynolds 1994	Heritage Resources Report: Campground Accessibility Upgrades 1994
IN-00453	1084653	HRR #05-04-642		Cutts, Janette S. 1994	Heritage Resources Report: Hornick-Cutts Wedding Special Use Permit
IN-00458	1084669			Hall, M.C. 1994	Cultural Resources Survey of a Proposed Fence Line around Department of Fish and Game Land in the Buttermilk Country, Eastern Sierra Nevada, Inyo County, California
IN-00473	1084838	HRR #05-04-670		Klein, Bruce A. 1995	Heritgate Resources Report: Bishop Creek Sewer Ponds
IN-00475	1084878	HRR #05-04-651		Reynolds, Linda A. 1994	Heritage Resources Report: Piute Pass Capital Improvement Project, Inyo County, California
IN-00533	1085099			Burton, Jeffery F. 1997	An Archaeological Survey of the Coyote Valley Road Aggregate Site Near Bishop, Inyo County, California
IN-00536	1085139	HRR #. 05-04-643		Reynolds, Linda and Marilyn Loughrey 1998	Heritage Resources Report: Climbing Shoe Demo Day; Recreation Event
IN-00539	1085145	R1997050400749		Loughrey, Marilyn 1998	Heritage Resources Report: Bishop Creek Rec. Residence Septic Tank Installation
IN-00574	1085603	HRR #05-04-766		Faust, Nicholas 1999	Heritage Resources Report Bishop Creek Recreation Enhancement
IN-00591	1082208	ARR #05-04-0319		Teixeira, Serna S. 1984	Archaeological Reconnaissance Report: Bishop Creek Treatment Plant Fence
IN-00623			BLM - CA-170-05-11	McCormick, Erica D. 2004	Cultural Resources Inventory Report (Yaney Mine Closures)
IN-00684		HRR No. 05-04-660		Cutts, Janette S. 1995	Heritage Resources Report (Sabrina Trail Maintenance and Reconstruction)
IN-00696				Jordan, Stacey C. and K. Ross Way 2004	FINAL: Archaeological Survey Report Southern California Edison, Bishop Powerhouse No. 2 New Circuit Installation, Tungsten Hills Area, INF, Inyo County, California
IN-00698		HRR No. 2004-05-04-00802		Hilton, Michael R. 2005c	Heritage Resources Report (White Caps Mill Site CERCLA Response Action)
IN-00699		HRR No. 2004-05-04-01076		Hilton, Michael R. 2005d	Heritage Resources Report (Buttermilk Mountains Common Garden)

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
IN-00700		R2004050400984		Faust, Nicholas 2005	Heritage Resources Report: Horse Creek Prescribed Fire Project
IN-00792				Hilton, Michael R. 2007b	HRR No. 2007-05-04-01261, Heritage Resources Report, Rainbow Pack Station Spring Box Replacement
IN-00828				Hilton, Michael R. 2007a	HRR: No. 2008-05-04-01193, Heritage Resources Report
IN-00858		HRR No. 2004-05-04-01073(b)		Hilton, Michael R. 2005b	Heritage Resources Report: Off-Highway Vehicle (OHV) Route Designation Strategy
IN-00861		R2002050400897		Mountain Heritage Associates 2003	Archaeological Survey of Recreation Residence Tracts in the INF
IN-00864		HRR No. 2004-05-04-01073		Hilton, Michael R. 2005a	Heritage Resources Report: Off-Highway Vehicle (OHV) Route Designation Strategy
IN-00888		R2010050401450		Catacora, Andrea 2008b	Letter Report: Negative Cultural Resources Inventory Letter Report for Work Order 4770-0346 and 4703-0401
IN-00892				Catacora, Andrea 2008a	Letter Report: Southern California Edison Monitoring Work, W.O. 4770-0081, J.O. 2090
IN-00895				Schmidt, James J. 2009	Letter Report: Forks Fire Emergency Monitor/Survey Program, INF, Bishop and Horse Creek Areas, Inyo County, California
IN-00911		R2008050401320		Pollock, Katherine H. 2008c	Archaeological Assessment Report Bishop Creek Hydroelectric Project Green Creek Diversion Dam and Flowline Retirement, INF, Inyo County, California
IN-00928				Leach-Palm, Laura, Paul Brandy, Jay King, Pat Mikkelsen, Libby Seil, Lindsay Hartman, Jill Braden, Bryan Larson, and Joseph Freeman 2010	Cultural Resources Inventory of Caltrans District 9 Rural Conventional Highways in Inyo, Eastern Kern, Mono, and Northern San Bernardino Counties, Summary of Methods and Findings
IN-00935		R2010050401496		Switalski, Hubert and Andrea Bardsley 2011	Heritage Resources Inventory Report for the Southern California Edison Company's Replacement of Four Deteriorated H-Frame Structures on the Casa Diablo-Control 115kV Transmission Line (4750-1613) and One Deteriorated Pole Structure on the Sabrina

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
					12kV Distribution Circuit (6085-4800, 0-4828), INF, Bishop Creek and Lake Crowley, Inyo and Mono Counties, California
IN-00948				Switalski, Hubert 2009	Archaeological Survey Report for the SCE Co's Replacement of 17 Deteriorate Power Poles
IN-00964		R2010050401533		Sibley, Krisstin I. and Mark A. Giambastiani 2011	Final Report: An Archaeological Survey for the Sabrina Bridge Replacement Project, Northern Inyo County, California
IN-01001				O'Neil, Laura 2013	Historic American Engineering Record, Bishop Creek Hydroelectric System, Hillside Dam
IN-01019				Basgall, Mark E. and Michael G. Delacorte 2012	Middle Archaic Cultural Adaptations in the Eastern Sierra Nevada, Data Recovery Excavations at CA-INY-1384/H, INY-6249/H, INY-6250, and INY-6251/H
IN-01020				Pollock, Katherine H. 2006	Archaeological Assessment Report Bishop Creek Intake 2 AVM and Pipe Installation INF, Inyo County, California
IN-01043				Hoornbeek, Paul 2013	Cultural Resources Report: Recording Three Department of Water Resources Snow Survey Shelters (CRR No. R2013050401831)
IN-01051				Ugan, Andrew and Jeffrey Rosenthal 2013	Archaeological Survey of 12,457 Acres of the Naval Air Weapons Station China Lake North and South Ranges, Inyo, Kern, and San Bernardino Counties, California
IN-01063		R2016050401996		Brodie, Natalie 2014	Archaeological Survey Report for the Southern California Edison Company Replacement of One Deteriorated Power Pole on the Sabrina 12kV Circuit (TD902324), INF, Inyo County, California
IN-01069		R2015050401956		Morgan, Christopher, Jacqueline Hall, and Roderic McLean 2014	Archaeological Survey Report for the Southern California Edison Company Replacement of Sixteen Deteriorated Power Poles on an Unnamed Circuit (TD712048, TD712051, and TD831459), INF, Inyo County, California
IN-01155	1043463			Mortland, Carol 1974	PRELIMINARY CASE REPORT: No. 2 Control-Casa Diablo 115 kV Transmission Line

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
		R2016050402000		Beidl, Jacqueline 2015	SCE Sabrina 12kV Deteriorated Pole Replacement Equipment Access (TD432148)
		R2017050402100		Beidl, Jacqueline 2016	Braveheart Trails LLC Cardinal Mine Trail Ford Reroute
		R2018050402243		Beidl, Jacqueline 2018	CalTrans Bishop Creek Camp Road Emergency Culvert Repair
		R2017050402108		Blythe, Ashley A. 2017	Bishop Pass Trail CMLG
		R2011050401644		Duran, Christopher A. 2013	Bishop Creek 1,362 Acre Cultural Resources Survey, INF, Inyo County, California
				Hall, J. and N. Brodie 2016	Archaeological Survey Report for the Southern California Edison Company Grid Reliability and Maintenance Program for the Sabrina 12kV Preventative Maintenance Project, TD1144535, INF, Inyo County, California
		R2016050402069		Hall, Jacqueline and Natalie Brodie 2016	Archaeological Survey Report for the Southern California Edison Company Grid Reliability and Maintenance Program for the Sabrina 12 kV Preventative Maintenance Project, TD1144535, INF, Inyo County, California
		R2017050402192		Hall, Jacqueline and Natalie Brodie 2017	Archaeological Survey Report for the Southern California Edison Company Grid Reliability and Maintenance Program for the Control-Powerhouse No. 2, Carrier Solutions Fiber Optic Cable Install, SAP 801416782, INF, Inyo County, California
		R2016050401997		Heidelberg, Kurt 2014	Archaeological Survey Report for Southern California Edison's Replacement of Twenty-Eight Deteriorated Power Poles on the Sabrina 12 kV (TD712035, TD712055, TD712061, TD750069 AND TD759728), Control-Silver Peak 55kV (TD681877, TD682236, TD681942 T/L, D682030 T/L, TD712988 T/L,), and Other Unnamed Circuit (TD750072), in INF near Bishop, Inyo County, California
		R2016050402060		Heidelberg, Kurt 2016	Archaeological Survey Report for Southern California Edison's Removal of Fourteen Power Poles, Replacement of One Deteriorated Power Pole, and Installation of Fourteen Power Poles on the Sabrina 12 kV (TD1044613) Circuit, in INF near Aspendell, Inyo County, California

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
				Heidelberg, Kurt and Gabrielle Duff 2015	Archaeological Survey Report for Southern California Edison's Replacement of Three Deteriorated Power Poles on the Sabrina 12 kV Circuit (TD801675), in INF, Inyo County, California
		R2015050401936		Heidelberg, Kurt and Ronald Norton 2015	Archaeological Survey Report for Southern California Edison's Grid Reliability and Maintenance Project on the Sabrina 12 kV Circuit (TD801675), in INF near Aspendell, Inyo County, California
		R2004050401073(c)		Hilton, Michael R. 2006	Heritage Resources Report: Off-Highway Vehicle (OHV) Route Designation Strategy
		R2007050401261		Hilton, Michael R. 2008	Heritage Resources Report: Rainbow Pack Station Spring Box Replacement
		R2008050401193		Hilton, Michael R. 2009	Heritage Resources Report: UNAVCO Plate Boundary Observation Table Mountain Amendment
		R2000050400807		Hornick, Martin 2000	Bishop Pass Trail Complex - CIP2003
		R2017050402097		Jacobs Engineering Group 2016	South Lake Road Cultural Resources Assessment
		CRR No. R2011050401616		Lee, Mary 2011	Upper Owens Bishop Creek Restoration OHV Planning South Zone
		R2010050401454		Long, Montana and Kari Sprengeler 2009	Class III Cultural Resource Inventory for the Replacement of One Utility Pole on the Control-Morgan-Powerhouse No. 2 55 kV Line and One Utility Pole on the Control-Silver Peak "A" 55 kV Line, Inyo County, California
		R1987050400423		Mapel, Timothy E. 1987	Archaeological Reconnaissance Report: Buttermilk Meadows Rehabilitation Project
		R1984050400331		Miller, Brian C. 1986	Parcher's Resort
				Millington, Chris, Laura Hoffman, Sara Dietler 2015	Cultural Resources Survey for the Southern California Edison Control-Powerhouse No. 5-Powerhouse No. 6, 55 kV Reconductor Project (IO329583), Inyo County, California
				Newcomb, A. 2016a	Cultural Resources Survey Report for Southern California Edison’s Proposed Replacement of Six Deteriorated Poles (TD1122646) Located in the White Mountain Ranger District within the INF, Inyo County, California

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
				Newcomb, Alyssa 2016b	Cultural Resources Survey Report for Southern California Edison's Proposed Replacement of Six Deteriorated Poles (TD1122646) Located in the White Mountain Ranger District within the INF, Inyo County, California
				Newcomb, Alyssa 2016b	Archaeological Survey Report for Southern California Edison's Infrastructure Replacement Project (TD1018871) on the Birchim 12 kV Circuit on Private Land, Inyo County, California
		HRR No. R0211050401616		Nicholas, Colleen 2013	Upper Owens Bishop Creek Phase I Restoration South Zone
		R2015050401952		Parr, Robert E. 2015	Archaeological Site Monitoring Report for the Southern California Edison Company Bishop Creek Hydroelectric Project (FERC Project No. 1394), Inyo National Forest, Inyo County, California
		R2012050401718		Switalski, Hubert and Timothy Kelly 2008	A Heritage Resource Inventory for the Southern California Edison Company's Replacement of 19 Deteriorated Power Poles, INF, Inyo and Mono Counties, California
		R2008050401321		Pollock, Katherine H. 2008b	Archaeological Assessment Report Bishop Creek Hydroelectric Project (FERC Project N. 1394) Southfork Flowline Replacement, INF, Inyo County, California
		R2015050401967		Wisniewski, Peter 2015	FY 15 SZ OHV Ground Operations
		R2015050401990		Wisniewski, Peter and Jacqueline Beidl 2015	Lamarck Trails and Watershed Project
				Millington, Chris and Alyssa Newcomb 2015	Cultural Resources Construction Monitoring Report for the Southern California Edison Bishop Creek Hydroelectric Control-Powerhouse No. 5-Powerhouse No. 6 55 kV Reconductor and Equipment Yard Expansion Project, Inyo County, California
				Switalski, Hubert and Sonia Hutmacher 2010	Heritage Resources Inventory Report for the Southern California Edison Company's Replacement of Two Deteriorated Pole Structures on the Control-Morgan-Powerhouse No. 2 55kV Transmission Line (4770-0355) and Two H-Frame Structures on the Lee Vining-Poole 115kV Transmission Line (4750-1597), INF, Between Bishop and Lee Vining Creek, Inyo and Mono Counties, California

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
				White, R. M. 1985	Results of the 1984 Field Season, Cultural Resources Survey for the Historic and Archaeological Preservation Plan for Eastern Sierra Hydroelectric Projects in Mono and Inyo Counties, California: Lundy (FERC Project 1390), Lee Vining Creek (FERC Project 1388), Rush Creek (FERC Project 1389), and Bishop Creek (FERC Project 1394)
				White, R. M. 1992	An Evaluation of Effects on Historic Properties Resulting from Replacement of the Bishop Creek Powerhouse No. No. 5 Flowline, Bishop Creek Hydro Project (FERC Project 1394), Inyo County, California
				White, R. M. 1992	1989-1991 Monitoring of Cultural Resources Associated with the Bishop Creek Hydroelectric Project (FERC Project 1394), Inyo County, California

Source: Research Conducted at SCE 2018, EIC 2018, INF 2018, and BLM 2018

16.2.3 PREVIOUSLY RECORDED ARCHAEOLOGICAL SITES

The archaeological inventory is in progress. Research conducted to date indicates that there are 52 prehistoric, 30 multi-component (prehistoric and historic-period), and 76 historic-period previously recorded archaeological sites within the study area. The different types of sites and their NRHP eligibility are listed in Table 16.2-2. Prehistoric sites primarily include bedrock milling stations, lithic scatters, and midden deposits. Multi-component sites include lithic and debris scatters and historic-period debris (e.g., can scatters, domestic debris scatters). Historic-period sites include historic-period debris and the remains of buildings or structures. The majority of the archaeological sites within the APE and study area have not been evaluated for their eligibility for listing in the NRHP.

Table 16.2-2 Previously Recorded Archaeological Resources within the Bishop Creek Hydroelectric Project Study Area

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In APE	In Study Area	Property Owner
P-14-000469	CA-INY-000468/469/H	05-04-53-000084/85		P/H	Obsidian and Chert Lithics, groundstone, BRM, rock wall, Historic Debris	Eligible		X	USFS
P-14-002529	CA-INY-002529H	05-04-53-000010		H	Remains of Historic Mine and Associated Village	Unknown	X	X	USFS
P-14-002769	CA-INY-002769	05-04-53-000126		P	House Ring, Milling Slick, BRM, Obsidian Lithics	Unknown	X	X	USFS
P-14-002770	CA-INY-002770/H	05-04-53-000127		P/H (Mostly H) Field Check if in APE	Poss. Pit Toilets, Hunting Blind (recent?), Historic Debris	Unknown		X	USFS
P-14-002791	CA-INY-002791			P	Obsidian and Chert Lithics	Unknown		X	Unknown
P-14-003282	CA-INY-003282/H		BLM-C-S1	P/H	Obsidian and Cryptocrystalline Lithics, Historic Debris	Unknown		X	BLM
P-14-003448	CA-INY-003448	05-04-53-000181		P	Obsidian, Chalcedony, and Quartzite Lithics, Flow Line and Valve House Associated with SCE S. Fork Diversion and Reservoir 2	Unknown	X	X	USFS
P-14-003449	CA-INY-003449H	05-04-53-000182		H	Domestic Debris	Unknown	X	X	USFS
P-14-003450	CA-INY-003450	05-04-53-000184		P	Grayware Sherds, Obsidian Lithics	Code 2-Eligible (Record does not indicate if it has been tested)	X	X	USFS

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In APE	In Study Area	Property Owner
P-14-003457	CA-INY-003457/H	05-04-53-000154		P/H	Obsidian Lithics, Granite Mano, Historic Debris	Unknown	X	X	USFS
P-14-003458	CA-INY-003458	05-04-53-000155		P	Obsidian Lithics, 2 Metates	Code 2-Eligible (Record notes previous testing and recommendation but not sure if concurrence was received)	X	X	USFS
P-14-003459	CA-INY-003459/H	05-04-53-000156		P/H	Obsidian and Chert Lithics, Historic Debris, Hearth (maybe Prehistoric)	Unknown	X	X	USFS
P-14-003460	CA-INY-003460H	05-04-53-000157		H	Donkey Engine, Rock-lined Pit, Penstock Section, Historic Debris	Unknown	X	X	USFS
P-14-003461	CA-INY-003461/H	05-04-53-000158		P/H	BRM, Obsidian Lithics, Mixed Historic Period Debris	Eligible	X	X	USFS
P-14-003462	CA-INY-003462/H	05-04-53-000159		P/H	Obsidian and Basalt Lithics, Post-1950 Cans	Eligible		X	USFS
P-14-003463	CA-INY-003463	05-04-53-000161		P	Obsidian, Chert, Calcedony, MetaV Lithics, Portable Milling Slicks, Rock Wall	Eligible		X	USFS
P-14-003464	CA-INY-003464	05-04-53-000162		P	Obsidian Lithics, Rock Shelter, BRM, Portable Milling Slick	Eligible		X	USFS
P-14-003465	CA-INY-003465	05-04-53-000160		P	Obsidian Flakes	Unknown	X	X	USFS
P-14-003466	CA-INY-003466/H	05-04-53-000163		P/H	Obsidian Flakes, Hexagonal Bead, Historic Debris	Unknown		X	BLM and USFS

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In APE	In Study Area	Property Owner
P-14-003467	CA-INY-003467/H	05-04-53-000164		P/H	Grinding Slick, Historic Debris	Unknown	X	X	BLM and USFS
P-14-003468	CA-INY-003468/H	05-04-53-000165		P/H	Obsidian and Chert Lithics, Grinding Slicks, Rock Wall, Historic Debris	Unknown	X	X	USFS
P-14-003469	CA-INY-003469H	05-04-53-000167		H	Historic Debris, Remains of Cottage 39	Unknown		X	USFS
P-14-003470	CA-INY-003470	05-04-53-000168		P	Obsidian and Jasper Lithics (unable to relocate in 2006)	Unknown		X	Unknown
P-14-003471	CA-INY-003471	05-04-53-000169		P	Obsidian and Chert Lithics, Rock Carin, Grinding Slick	Unknown		X	USFS
P-14-003472	CA-INY-003472	05-04-53-000170		P	Obsidian, Basalt, and Chert Lithics	Unknown	X	X	USFS
P-14-003473	CA-INY-003473/H	05-04-53-000172		P/H	Obsidian Lithics, Historic Debris and Features Related to Cashbaugh and Kilpatrick Occupations	Eligible	X	X	USFS
P-14-003474	CA-INY-003474	05-04-53-000173		P	Obsidian Lithics	Unknown	X	X	USFS or BLM
P-14-003475	CA-INY-003475	05-04-53-000175		P	Obsidian Lithics, Grinding Slick	Unknown	X	X	USFS
P-14-003686	CA-INY-003686H	05-04-53-000343		H	Collapsed Mine Shaft and Associated Features	Unknown		X	USFS
P-14-003687	CA-INY-003687H	05-04-53-000344		H	Bishop Crk. PH-1 (failed attempt at construction)	Unknown		X	USFS
P-14-003705	CA-INY-003705			P	Obsidian Lithics, BRM	Unknown		X	
P-14-003936	CA-INY-003936	05-04-53-000530		P	Obsidian Lithics, Mano, Owens Valley Brownware Sherds, BRM	Unknown		X	USFS

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In APE	In Study Area	Property Owner
P-14-004499	CA-INY-004499	05-04-53-000582		P	Obsidian and Basalt Lithics, Milling Slicks	Unknown	X	X	USFS
P-14-004500	CA-INY-004500	05-04-53-000584		P	Obsidian Lithics	Unknown		X	Unknown
P-14-004501	CA-INY-004501H	05-04-53-001377		H	Non-Diagnostic Historic Trash	Unknown		X	USFS
P-14-004505	CA-INY-004505	05-04-53-000581, 05-05-53-001378		P	Obsidian Lithics	Unknown		X	USFS
P-14-004506	CA-INY-004506	05-04-53-00585		P	Obsidian Lithics	Unknown		X	USFS
P-14-004507	CA-INY-004507H	05-04-53-00589		H	Historic Trash	Unknown		X	USFS
P-14-004700	CA-INY-004700			P	Obsidian and Basalt Lithics	Unknown		X	Unknown
P-14-004701	CA-INY-004701	05-04-53-001370		P	Obsidian Lithics	Unknown		X	USFS
P-14-004702	CA-INY-004702	05-04-53-001372		P	Obsidian Lithics	Unknown		X	USFS
P-14-004703	CA-INY-004703H	Record notes it's on USFS Land		H	Historic Debris	Unknown		X	Unknown
P-14-004704	CA-INY-004704H	05-04-53-001374		H	Historic Debris	Unknown	X	X	USFS
P-14-004705	CA-INY-004705	Record Notes it's on USFS Land		P	Obsidian Lithics, BRM, Rock Wall, Possible Midden	Unknown		X	USFS
P-14-004706	CA-INY-004706H	05-04-53-001376		H	2- ½ Mile Portions of Bishop Creek Road	Unknown	X	X	USFS

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In APE	In Study Area	Property Owner
P-14-004723	CA-INY-004723/H	Record Notes it's on USFS Land		P/H	Obsidian Lithics, Historic Debris	Unknown		X	USFS
P-14-004767	CA-INY-004767/H			P/H	Obsidian and Basalt Lithics, Historic Debris	Unknown	X	X	Unknown
P-14-004768	CA-INY-004768H			H	Historic Debris	Unknown		X	Unknown
P-14-004769	CA-INY-004769H			H	Historic Debris	Unknown		X	Unknown
P-14-005185	CA-INY-005185	05-04-53-001383		P	Obsidian Lithics, Bed Rock Mortar, Milling Slick, Rock Ring	Unknown		X	USFS
P-14-005187	CA-INY-005025	05-04-53-001384		P	Obsidian and Quartzite Lithics	Unknown		X	USFS
P-14-005443	CA-INY-005192H			H	Ditch and Historic Debris	Unknown		X	Unknown
P-14-005444	CA-INY-005193H			H	Concrete and Rock Foundation, Domestic Historic Debris	Unknown		X	Unknown
P-14-005445	CA-INY-005194H			H	Historic Debris	Unknown		X	Unknown
P-14-005448	CA-INY-005197H			H	Historic Debris	Unknown		X	Unknown
P-14-005449	CA-INY-005198H			H	Historic Debris	Unknown		X	Unknown
P-14-005450	CA-INY-005199/H			P/H	Obsidian Flake, Historic Debris	Unknown		X	Unknown
P-14-005451	CA-INY-005200H			H	Historic Debris	Unknown		X	Unknown
P-14-005452	CA-INY-005201H			H	Historic Debris	Unknown		X	Unknown
P-14-005453	CA-INY-005202H			H	Historic Debris	Unknown		X	Unknown
P-14-005454	CA-INY-005203H			H	Historic Debris	Unknown		X	Unknown

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In APE	In Study Area	Property Owner
P-14-005455	CA-INY-005204H			H	Historic Debris	Unknown		X	Unknown
P-14-005456	CA-INY-005205H			H	Historic Debris	Unknown		X	Unknown
P-14-005457	CA-INY-005026H			H	Historic Debris	Unknown		X	Unknown
P-14-005585	CA-INY-005241/H			P/H	Obsidian Lithics, Milling Station, Milling Equipment, Historic Debris	Unknown		X	Unknown
P-14-005586	CA-INY-005242/H			P/H	Obsidian and Cryptocrystalline Lithics, Historic Debris	Unknown		X	Unknown
P-14-005587	CA-INY-005243			P	Obsidian and Cryptocrystalline Lithics	Unknown		X	Unknown
P-14-005588	CA-INY-005244			P	Obsidian Lithics	Unknown		X	Unknown
P-14-005590	CA-INY-005246/H			P/H	Obsidian Lithics, Historic Debris	Unknown		X	USFS
P-14-005591	CA-INY-005247			P	Obsidian and Cryptocrystalline Lithics	Unknown		X	Unknown
P-14-005592	CA-INY-005248/H			P/H	Obsidian and Cryptocrystalline Lithics, Groundstone, Bedrock Mortar, Historic Debris	Unknown		X	Unknown
P-14-005596	CA-INY-005252H			H	Historic Debris, Rock Alignment, Road, Ditch	Unknown		X	Unknown
P-14-005597	CA-INY-005253H			H	Historic Debris	Unknown		X	Unknown
P-14-005599	CA-INY-005255/H			P/H	Obsidian, Basalt, and Cryptocrystalline Lithics, Midden, Milling Equipment, Historic Debris	Unknown		X	Unknown
P-14-005661	CA-INY-005308	05-04-53-001379		P	Obsidian Lithics, Pictograph	Unknown		X	USFS

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In APE	In Study Area	Property Owner
P-14-006761	CA-INY-005788	05-04-53-001449		P	Obsidian Lithics, BRM	Unknown		X	USFS
P-14-006901	CA-INY-005789	05-04-53-001450		P	Obsidian Lithics, Bedrock Milling Station	Unknown		X	USFS
P-14-006940	CA-INY-005924H	05-04-53-001502		H	Milling and Mining Related Debris and Buildings	Unknown		X	USFS
P-14-007088	CA-INY-006023H			H	Owens River Canal (Abandoned)	Undetermined		X	Unknown
P-14-007089	CA-INY-006024H			H	Road F55	Unknown		X	Unknown
P-14-007090	CA-INY-006025H			H	Road F57	Unknown		X	
P-14-007416	CA-INY-006292H	05-04-53-007721		H	Mining Debris, Cabins, Mining Related Structures	Unknown		X	USFS
P-14-007849	CA-INY-006510H			H	Historic Domestic Debris	Unknown		X	Unknown
P-14-007850				H	Historic Debris	Unknown		X	Unknown
P-14-008304	CA-INY-006615	05-04-53-001778		P?	Three Rock Rings	Undetermined		X	USFS
P-14-008317	CA-INY-006626	05-04-53-001782		P	Obsidian Lithics	Undetermined		X	USFS
P-14-008318	CA-INY-006627	05-04-53-001783		P	Obsidian Lithics	Undetermined		X	USFS
P-14-008326	CA-INY-006634	05-04-53-001791		P	Obsidian Lithics	Undetermined		X	USFS
P-14-008328	CA-INY-006637	05-04-53-001793		P	Lithics and Rock Ring	Undetermined		X	USFS
P-14-008329	CA-INY-006638	05-04-53-001794		P	Obsidian and Basalt Lithics	Undetermined		X	USFS
P-14-008331	CA-INY-006640H	05-04-53-001797		H	Historic Mining Features	Undetermined		X	USFS
P-14-008600	CA-INY-006758H	05-04-53-001900		H	Historic Fire Pits	Unknown		X	USFS

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In APE	In Study Area	Property Owner
P-14-008601	CA-INY-006759	05-04-53-001901		P	Obsidian Lithics	Unknown		X	USFS
P-14-008602	CA-INY-006760H	05-04-53-001902		H	Historic Camp and Arboroglyphs	Unknown		X	USFS
P-14-008603	CA-INY-006761H	05-04-53-001903		H	Historic Debris	Unknown		X	USFS
P-14-008604	CA-INY-006762	05-04-53-001904		P	Lithics, Milling Equipment, Milling Slick	Unknown		X	USFS
P-14-009029	CA-INY-007095H	05-04-53-001993		H	Historic Debris	Unknown		X	USFS
P-14-009030	CA-INY-007096H	05-04-53-002024		H	Historic Debris	Unknown		X	USFS
P-14-0010146				H	Rock Structure and Historic Debris	Unknown		X	Unknown
P-14-010525		05-04-53-000176		H	Remains of First Bishop Creek PH	Unknown		X	USFS
P-14-010526		05-04-53-000177		H	Remains of Powerhouse No. 3 Cottages	Unknown	X	X	USFS
P-14-010527		05-04-53-000178		H	Remains of Powerhouse No. 3 Apartments	Unknown	X	X	USFS
P-14-010529		05-04-53-000171		H	Rock Terraces for Chicken Coops associated with Cottage 4 of Unknown Powerhouse	Unknown	X	X	USFS
P-14-010534	CA-INY-008001	05-04-53-002308		P	Obsidian Lithics	Unknown	X	X	USFS
P-14-010606	CA-INY-008063H	05-04-53-002226		H	Domestic Debris	Unknown		X	USFS
P-14-011340	CA-INY-008770	05-04-23-002210		P	Milling Station, Mano	Unknown		X	USFS

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In APE	In Study Area	Property Owner
P-14-011451		05-04-53-002211		P	Rock Shelter, Pictographs, Milling, Lithic Scatter	Unknown		X	USFS
P-14-011452		05-04-53-002213		H	Rock Alignment (Road?)	Unknown		X	USFS
P-14-011718	CA-INY-009014H			H	Historic Debris	Unknown		X	Unknown
P-14-011719	CA-INY-009015H			H	Historic Debris, Irrigation Ditch	Unknown		X	Unknown
P-14-011722	CA-INY-009016H	05-04-53-002349		H	Historic Debris	Unknown			USFS
P-14-011723	CA-INY-009017H	05-04-53-002346		H	Domestic Debris	Unknown		X	USFS
P-14-011724	CA-INY-009018H	05-04-53-002344		H	Historic Debris	Unknown	X	X	USFS
P-14-011725	CA-INY-009019	05-04-53-002293		H	Domestic Debris	Unknown	X	X	USFS
P-14-012257				H	Ed Powers Road	Not Eligible		X	Unknown
P-14-012258	CA-INY-009423H			H	Historic Debris	Unknown		X	Unknown
P-14-012259	CA-INY-009424H			H	Historic Debris	Unknown		X	Unknown
P-14-012260	CA-INY-009425H			H	Historic Debris	Unknown		X	Unknown
P-14-012269	CA-INY-009434H			H	Historic Debris	Unknown		X	Unknown
P-14-012270	CA-INY-009435H			H	Historic Debris	Unknown		X	Unknown
P-14-012707	CA-INY-009620	05-04-53-002270		H	Concrete Pad, Can Scatter	Unknown		X	USFS
P-14-012777	CA-INY-009677/H			P/H	Obsidian Lithics, Historic Debris	Unknown		X	Unknown
P-14-012778	CA-INY-009678/H			P/H	Obsidian Lithics, Water Conveyance, Historic Debris	Unknown	X	X	Unknown
P-14-012779	CA-INY-009679H			H	Historic Debris	Unknown	X	X	Unknown
P-14-012780	CA-INY-009680H			H	Historic Debris	Unknown	X	X	Unknown

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In APE	In Study Area	Property Owner
P-14-012781	CA-INY-009681/H			P/H	Obsidian Ligthics, Historic Debris	Unknown		X	Unknown
P-14-012782	CA-INY-009682/H			P/H	Obsidian Ligthics, Historic Debris	Unknown		X	Unknown
P-14-012783	CA-INY-009683H			H	Historic Debris	Unknown		X	Unknown
P-14-012784	CA-INY-009684H			H	Historic Debris	Unknown		X	Unknown
P-14-012785	CA-INY-009685/H			P/H	Obsidian Lithics, Historic Debris	Unknown		X	Unknown
P-14-012790	CA-INY-009689H			H	Historic Debris	Unknown		X	Unknown
P-14-012791	CA-INY-009690/H			P/H	Piaute Ditch, Historic Ditch	Unknown	X	X	Unknown
P-14-012828	CA-INY-009722H			H	Historic Debris	Unknown		X	BLM
P-14-012850	CA-INY-009741	Record Notes on USFS Land		H	Domestic Debris	Unknown		X	USFS
P-14-013136	CA-INY-009987	05-04-53-002309		P	Obsisian Lithics	Unknown		X	USFS
	CA-INY-001001	05-04-53-000157			Need Record		X	X	USFS
	CA-INY-004503	05-04-53-000587		P	Obsidian Lithics	Unknown			USFS
	CA-INY-002528	05-04-53-000122		P	Obsidian Lithics	Unknown	X	X	USFS
	CA-INY-005245				Need Record	Unknown	X	X	USFS
		05-04-53-000126		P	House Ring, Bedrock Mortar, Grinding Slick, Obsidian Lithics	Unknown		X	USFS
		05-04-53-000174		H	Clay Pigeon Fragments, Shooting Blind	Unknown		X	USFS

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In APE	In Study Area	Property Owner
		05-04-03-000179			Need Record			X	USFS
		05-04-53-000183		H	Remains of Watchman's Cabin Associated with Bishop Creek Hydroelectric Project	Unknown		X	USFS
		05-04-53-000345		H	3 Concrete and Stone Features, Water Pipe	Unknown		X	USFS
		05-04-53-001371		P/H	Obsidian Lithics, Historic Debris	Unknown			USFS
		05-04-53-001373		H	Historic Debris	Unknown		X	USFS
		05-04-53-001374		H	Historic Debris	Unknown		X	USFS
		05-04-54-001375		P	Milling Feature, Unmortared Rock Wall, Possible Midden, Obsidian Lithics	Unknown		X	USFS
		05-04-53-001376		H	Two 1/2 Mile Segments of Bishop Creek Road	Unknown		X	USFS
		05-04-53-001450		P	Obsidian Lithics, Portable Milling Feature	Unknown		X	USFS
		05-04-53-001723			Need Record		X	X	USFS
		05-04-53-001755		P	Obsidian Lithics and Tools	Unknown		X	USFS
		05-04-53-001756		P	Obsidian and Cryptocrystalline Lithics, Obsidian Tools	Unknown		X	USFS
		05-04-53-001757		P/H	Obsidian Flakes and Tools, Granite Handstone, Historic Debris	Unknown		X	USFS
		05-04-53-001758		P/H	Obsidian Flakes, Midden, Groundstone, Historic Debris	Unknown		X	USFS

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In APE	In Study Area	Property Owner
		05-04-53-001759		P	Obsidian Flakes and Tools	Unknown		X	USFS
		05-04-53-001760		P/H	Obsidian and Cryptocrystalline Flakes, Bedrock Milling Station, Groundstone, Historic Debris	Unknown		X	USFS
		05-04-53-002153		P	Obsidian Lithic Scatter	Unknown		X	USFS
		05-04-53-002171		H	Rock Ring Structural Base, Historic Debris	Unknown	X	X	USFS
		05-04-53-002279			Need Record	Unknown	X		USFS
		05-04-53-002280			Need Record	Unknown		X	USFS
		05-04-03-002281			Need Record	Unknown	X		USFS
		05-04-03-002282			Need Record	Unknown	X		USFS
		05-04-53-002292		H	Collapsed Retaining Wall	Unknown	X		USFS

Source: Research Conducted at SCE 2018, EIC 2018, INF 2018, and BLM 2018

16.2.4 PREVIOUSLY RECORDED BUILD ENVIRONMENTAL RESOURCES

16.2.4.1 Hydroelectric Related Facilities

16.2.4.1.1 Bishop Creek Hydroelectric Project

During the previous relicensing effort, SCE evaluated the Project for NRHP eligibility. The Project consists of five powerhouses each containing a set of independent, high-head, impulse water wheel, and electrical power-generating sub-systems established at various elevations along Bishop Creek on the eastern slope of the Sierra Nevada's. The Project is significant for its position in the expansion of hydroelectric generation technology, its role in the development of eastern California, and the development of transmitting electrical power across long distances. The Project is intact and is an early example of a high-head, impulse water wheel, and high-voltage electric generation project. The Project was determined eligible (by consensus) for listing in the NRHP under Criteria A and C, with a period of significance of 1905 to 1938 (Office of Historic Preservation [OHP] Letter dated September 7, 1988). The historic district is recorded as P-14-004812, with 68 contributing elements. The known historic properties and previously determined not eligible resources within the Project are listed in Table 16.2-3.

Table 16.2-3 Bishop Creek Hydroelectric Project Historic District

Primary Number	NRHP Status	Related Powerhouse	Description
14-004825	Eligible Historic District	Hydroelectric Project	Bishop Creek Hydroelectric Project
14-005741	Contributing Element	Birch Creek East	Flowline
14-005742	Contributing Element	Birch Creek East	Intake, Diversion
14-005743	Contributing Element	Birch Creek West	Flowline
14-005744	Contributing Element	Birch Creek West	Intake, Diversion
14-005750	Contributing Element	Green Creek Diversion	Flowline
14-005751	Contributing Element	Green Creek Diversion	Intake, Diversion
14-005753	Contributing Element	Lake Sabrina	Dam
14-005754	Contributing Element	Lake Sabrina	Weir, Gauging Station
14-005755	Contributing Element	Lake Sabrina	Valve House: Building 103
14-005756	Contributing Element	Longley Lake	Dam
14-005757	Contributing Element	McGee Creek	Flowline
14-005758	Contributing Element	McGee Creek	Intake, Diversion
14-005800	Contributing Element	South Lake	Dam
14-005798	Contributing Element	Southfork Diversion	Dam, Intake, Flowline
14-005799	Contributing Element	Southfork Diversion	Weir Lake Flow Monitoring Dam
14-005752	Contributing Element	Powerhouse No. 2	Intake 2

Primary Number	NRHP Status	Related Powerhouse	Description
14-005760	Contributing Element	Powerhouse No. 2	Penstock No. 2
14-005761	Contributing Element	Powerhouse No. 2	Flowline No. 2
14-005768	Contributing Element	Powerhouse No. 2	Powerhouse No. 2
14-005769	Contributing Element	Powerhouse No. 2	Transformer House
14-005777	Contributing Element	Powerhouse No. 2	Shed: Building 107
14-005736	Contributing Element	Powerhouse No. 3	Flowline No. 3
14-005762	Contributing Element	Powerhouse No. 3	Penstock No. 3
14-005767	Contributing Element	Powerhouse No. 3	Intake 3
14-005772	Contributing Element	Powerhouse No. 3	Powerhouse No. 3
14-005773	Contributing Element	Powerhouse No. 3	Battery House
14-005735	Contributing Element	Powerhouse No. 4	Cottage: Building 102
14-005737	Contributing Element	Powerhouse No. 4	Flowline No. 4
14-005759	Contributing Element	Powerhouse No. 4	Cottage: Building 103
14-005763	Contributing Element	Powerhouse No. 4	Penstock No. 1 and 2
14-005770	Contributing Element	Powerhouse No. 4	Intake 4
14-005771	Contributing Element	Powerhouse No. 4	Steam Gaging Station
14-005774	Contributing Element	Powerhouse No. 4	Cottage: Building 114
14-005775	Contributing Element	Powerhouse No. 4	Cottage: Building 115
14-005778	Contributing Element	Powerhouse No. 4	Cottage: Building 117
14-005779	Contributing Element	Powerhouse No. 4	Cottage: Building 116
14-005779	Contributing Element	Powerhouse No. 4	Cottage: Building 121
14-005780	Contributing Element	Powerhouse No. 4	Cottage: Building 122
14-005781	Contributing Element	Powerhouse No. 4	Vault: Building 125
14-005782	Contributing Element	Powerhouse No. 4	Meter House: Building 126
14-005783	Contributing Element	Powerhouse No. 4	Valve House: Building 127
14-005784	Contributing Element	Powerhouse No. 4	Fire House: Building 128
14-005785	Contributing Element	Powerhouse No. 4	Garage: Building 130
14-005786	Contributing Element	Powerhouse No. 4	Shed: Building 135
14-005787	Contributing Element	Powerhouse No. 4	Landscape Feature
14-005789	Contributing Element	Powerhouse No. 4	Powerhouse No. 4
14-005790	Contributing Element	Powerhouse No. 4	Cottage: Building 104
14-005791	Contributing Element	Powerhouse No. 4	Cottage: Building 105
14-005792	Contributing Element	Powerhouse No. 4	Cottage: Building 106
14-005793	Contributing Element	Powerhouse No. 4	Recreation Hall: Building 109
14-005794	Contributing Element	Powerhouse No. 4	Cottage: Building 113
14-005739	Contributing Element	Powerhouse No. 5	Powerhouse No. 5
14-005764	Contributing Element	Powerhouse No. 5	Penstock No. 5
14-005788	Contributing Element	Powerhouse No. 5	Intake 5

Primary Number	NRHP Status	Related Powerhouse	Description
14-005801	Contributing Element	Powerhouse No. 5	Flowline No. 5
14-005738	Contributing Element	Powerhouse No. 6	Transformer Building between Powerhouse No. 5 and 6
14-005740	Contributing Element	Powerhouse No. 6	Flowline No. 6
14-005765	Contributing Element	Powerhouse No. 6	Penstock No. 6
14-005766	Contributing Element	Powerhouse No. 6	Intake 6
14-005795	Contributing Element	Powerhouse No. 6	Powerhouse No. 6
14-005796	Contributing Element	Powerhouse No. 6	Cahbaugh Resident
14-005797	Contributing Element	Powerhouse No. 6	Utility Building
14-005734	Contributing Element	Control Station	Cottage: Building 102
14-005746	Contributing Element	Control Station	Cottage: Building 103
14-005747	Contributing Element	Control Station	Control Station: Building 101
14-005747	Contributing Element	Control Station	Cottage: Building 106
14-005748	Contributing Element	Control Station	Cottage: Building 108
14-005749	Contributing Element	Control Station	Cottage: Building 111

Source: Research Conducted at SCE, 2018

Hydroelectric-related resources not included in the historic district have been recorded in other surveys (Table 16.2-4). For example, the valve house and flow line recorded in 2010 (P-14-003448) and original intake dam for the Nevada Power, Mining, and Milling Company (now SCE Powerhouse No. 4) recorded in 1986 (P-14-010528). Additional such resources likely exist throughout the APE, and the September-October 2020 survey will inventory all such resources and evaluate whether they should be added as contributing elements to the historic district, are individually eligible, or are not eligible for the NRHP.

16.2.4.2 Recreational Facilities

A number of historic-period recreation-related facilities are located within the APE, mostly along the creek and impoundments related to the Project. Bishop Pack Outfitters (P-14-013394) and Rainbow Pack Outfitters (USFS 05-04-53-01843[19]), for example, were both recorded in 2004 as part of a larger thematic evaluation of pack stations operating within the INF and Sierra National Forests in the Eastern Sierra (Woolfenden and Conners, 2007). Other recreation-related resources recorded in the APE/study area include residences/cabins associated with the Utter Tract (USFS 05-04-53-01727), South Fork Bishop Tract (USFS 05-04-53-01726, eligible), and Lake Sabrina Tract (USFS 05-04-53-01723), all of which were recorded as part of a larger study of recreational tracts

[19] Note: USFS numbers or trinomials are given when primary number is unknown.

performed in 2003 by Mountain Heritage Associates.[20] Additionally, docks and boat houses, concessions, restrooms, campgrounds, and associated buildings and structures abound within the APE. All will be inventoried and evaluated during the September-October 2020 survey.

16.2.4.3 Mining Resources

In addition to the Project and recreational facilities within the APE are a number of mining-related buildings and structures (both in ruins and extant). Located near Camp Sabrina, the Wilshire-Bishop Creek (Cardinal) Gold Mine was recorded as archaeological site CA-INY-25294 in 1982 (P-14-002529). Mostly in ruins at that time, the site record noted the presence of a number of buildings and structures associated with the gold-mining operation that dated from 1906 to 1938. Included in the inventory were foundations, buildings (in various stages of disintegration), a mill, a headframe, adits, tunnels, a possible flume and flume box, piping, a dam, roads and bridges, and various dumps and artifact scatters. Commonly referred to at the time of recordation as the Cardinal Resort, the site was described as being in fair condition and listed as “threatened . . . possibly by SCE Project.” Another mining site located within the study area is the Whitecaps Mill Site (P-14-006940) recorded in 2000. These resources are being revisited during the fall 2020 surveys.

[20] We have not been able to definitively map each of these resources within the APE but know they are within the study area.

Table 16.2-4 Previously Recorded Architectural Resources within the Bishop Creek Hydroelectric Project Study Area

Primary Number	Trinomial	USFS Number	BLM Number	Historic Name / Current Name (if different)	Resource Type	Date of Construction/ Period of Significance	NRHP Eligibility	In APE	In Study Area	Property Owner
P-14-004825 (and other associated P numbers)		05-04-53-002311		BCHS Historic District	See Table 16.2-3 for list of contributing resources.	1905-1938	Eligible	X	X	SCE
P-14-010528		05-04-53-000179		Nevada Power, Mining & Milling Company Dam	Concrete and timber dam	1905	Unknown	X	X	?
P-14-003448	CA-INY-003448/H	05-04-53-000181			Flow Line and Valve House Associated with SCE S. Fork Diversion and Reservoir 2		Unknown	X	X	USFS
P-14-002529	CA-INY-002529/H	05-04-53-000010		Wilshire-Bishop Creek (Cardinal) Gold Mine	Remains of gold mine and associated buildings and structures		Unknown	X	X	USFS
P-14-006940	CA-INY-005924/H	05-04-53-001502		Whitecaps Mill Site	Milling and Mining Related Debris and Buildings	c. 1916-1918 through 1960-1970	Unknown	?	X	USFS
		05-04-53-001727		Utter Recreation Residence Tract	Residential cabins (4) and associated structures	1923-1959	Unknown	X	X	USFS
		05-04-53-001723		Lake Sabrina Recreation Residence Tract	Residential cabins (8) and	1923-1959	Unknown	X	X	USFS

Primary Number	Trinomial	USFS Number	BLM Number	Historic Name / Current Name (if different)	Resource Type	Date of Construction/ Period of Significance	NRHP Eligibility	In APE	In Study Area	Property Owner
					associated structures					
		05-04-53-001726		South Fork Bishop Tract	Residential cabins (10) and associated structures	1923-1959	Unknown	X	X	USFS
P-14-13394		05-04-53-01842		Bishop Pack Outfitters (North Lake)	Ancillary buildings, commercial building, gates/fences+F36	POS for thematic study is 1920-1941 (one building in this complex was original schoolhouse from Cardinal Mine, c. 1906)	Unknown	?	X	USFS
		05-04-53-01843		Rainbow Pack Outfitters	Ancillary buildings, commercial building, gates/fences	POS for thematic study is 1920-1941 / Rainbow Pack Station built c. 1924	Unknown	?	X	USFS

Source: Research Conducted at SCE 2018, EIC 2018, INF 2018, and BLM 2018

16.2.5 PREVIOUSLY RECORDED NON-NATIVE TRADITIONAL RESOURCES

No non-native traditional resources have been identified within the APE. Non-native resources anticipated to be identified within the APE are likely to be related to the Basque settlement and sheep herding, as well as recreation including pack stations.

16.3 STUDY OBJECTIVES

This Cultural Resources Study had the following goals and objectives:

- Meet FERC compliance requirements under Section 106 of the NHPA, as amended, by determining if Project-related activities and public access will have an adverse effect on historic properties.
- Identify all archaeological resources, built environment resources, and TCRs within the APE, determine which are historic properties, and develop the HPMP based on those results.
- Ensure that future Project facilities and operations are not inconsistent with the Desired Conditions described in the "Land Management Plan for the INF" (USDA, 2018) for Social and Economic Sustainability and Multiple Uses.

16.3.1 STUDY AREA

As provided for in 18 CFR § 5.5(e), SCE, under separate cover, requested FERC to designate SCE as FERC's nonfederal representatives for purposes of initiating consultation under Section 106 of the NHPA and the implementing regulations of 36 CFR § 800.2(c)(4). Under 36 CFR 800.16(d), the APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historical properties, if any such properties exist." For archaeological, built environment, and non-native TCP's, the Project boundary (Figure 16.3-1) is the APE.

The study area encompassed a 1-mile buffer around the APE (Figure 16.3-1). The background research included the study area to facilitate our knowledge about past settlement and subsistence practices, as well as past land use. This information provided insight as to the types of archaeological resources, built environment resources, and non-native TCRs over 50 years of age present in the APE and helped formulate the strategy for conducting fieldwork.

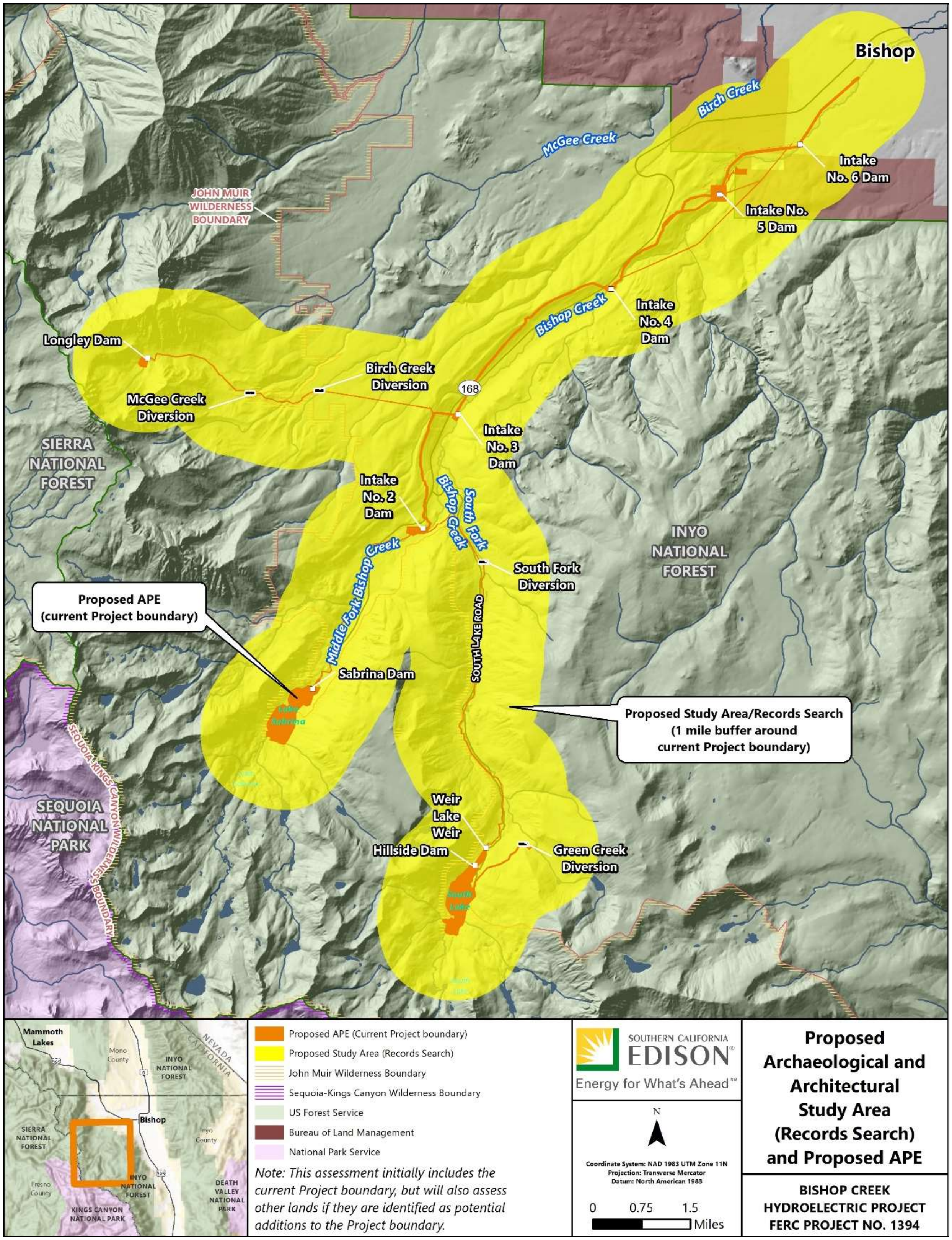

Figure 16.3-1 Archaeological and Architectural Resources Study Area and Area of Potential Effect

16.4 METHODS

SCE's performance of the study does not presume SCE is responsible as in whole or in part for resource management measures that may arise from that study.

SCE shall treat all information regarding the specific locations of archaeological sites as privileged and confidential. The GPS coordinates and maps showing the locations of such resources will not be made available to any relicensing participant other than the INF, BLM, FERC, State Historic Preservation Office (SHPO), the Eastern California Information Center (ECIC), and participating Tribes.

The following subsections describe the proposed methods.

16.4.1 ARCHIVAL RESEARCH

Currently, the majority of repositories needed by the cultural resource team are closed due to COVID-19. Once they re-open, the cultural resource team will implement the archival research methods presented in this section.

As needed during implementation of the studies, archival research will be conducted at the repositories listed below to obtain additional information specific to the prehistory, ethnography, and history of the Project area, the hydroelectric Project in whole, and its individual features. This may include contacting SCE employees, as appropriate, to gather feature-specific information. The results of the archival research will serve as the basis for preparing the prehistoric and historic contexts against which archaeological and architectural resources may be evaluated. Historical photographs located during the archival research will be cited in the text as figures and provided in a separate appendix unless subject to copyright laws. Previous NRHP evaluations of Project features will be used as much as possible (although, if previous studies are dated or lacking in necessary detail, additional, site-specific research may be required on an as-needed basis during the studies). Places to be contacted or visited shall include:

- USFS, INF Ranger District
- U.S. BLM, Bishop Field Office
- Native American Heritage Commission
- Eastern Information Center, University of California, Riverside
- Bishop Creek Paiute, Cultural Center
- Southern California Edison, Rosemead Office
- Huntington Library, SCE Collection: Records, Documents, and Photos
- Other online repositories as applicable

16.4.2 U.S. Forest Service and Bureau of Land Management Permits

To conduct the cultural resource studies, the cultural resource team was required to obtain an Organic Act Permit from INF and an Archaeological Resource Protection Act Permit from BLM. These permits were obtained prior to conducting fieldwork.

16.4.3 Archaeological Inventory

Based on the existing data described above, FERC is required to make a reasonable and good-faith effort to identify historic properties that may be affected by the Project. As described in 36 CFR § 800.4(b)(1), this may be accomplished through sample field investigations and/or field surveys that are implemented in accordance with the Secretary of the Interior's Standards and Guidelines for Identification (NPS, 1983). FERC is required to consider any other applicable professional standards and Tribal, state, or local laws or procedures to complete the identification of historic properties.

An archaeological inventory was performed in September and October 2020 to verify locations of previously recorded archaeological resources and to examine all accessible lands not previously surveyed or that need to be resurveyed to meet current professional standards.

According to INF, areas within the APE that cannot be accessed in a safe manner (e.g., locations with dense vegetation or unsafe slopes) and may not be included within the survey or recording of archaeological resources; should be identified before the survey commences and SHPO approval will be required. These areas will be identified and an explanation for survey exclusion will be provided. If additional inaccessible areas are identified during fieldwork they will be reported to SCE, INF, and BLM as they are identified, and a solution to accessing the areas or SHPO approval will be obtained. If approval cannot be obtained the Cultural Team will revisit those areas during the 2021 field season (archaeological site evaluation phase).

The field survey was supervised by qualified, professional archaeologists (i.e., individuals who meet the Secretary of the Interior's Professional Qualifications for Archaeology) that will participate in all field work. During the survey, archaeologists will walk parallel transects spaced at no more than 65.6-feet intervals (20-meters) as vegetation and terrain allows. The purpose of the field survey is to: 1) examine lands which have not been previously surveyed; 2) examine lands previously surveyed but where the field strategy is unknown; and 3) examine lands previously surveyed but for which the field strategy does not meet current professional standards, as defined in the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (NPS 1983). All artifacts encountered during the field survey will be left in place; no artifacts will be collected during the field survey.

Locations of previously recorded archaeological sites are being verified, and their site records will be updated only if the existing documentation does not meet current standards for recording, or if the condition and/or integrity of the property has changed since its previous recording. The archaeologists will determine if sketch maps for previously documented sites require revision to accurately describe current site conditions. Newly discovered archaeological resources, including isolated finds, will be fully documented following the recordation procedures outlined in Instructions for Recording Historical Resources (OHP, 1995), which utilizes CDPR forms DPR 523 A-L. A sketch map for each site recorded or an updated site will be drawn to-scale and the property photographed. Field personnel are using a GPS receiver to document the location of archaeological resources (including isolates) recorded during the survey, which will be plotted onto the appropriate USGS 7.5-minute topographic quadrangle using the UTM coordinate system. GPS data collection adheres to the INF or BLM specifications for accuracy and site-specific procedures where applicable. Additionally, the areas examined will be plotted onto the appropriate USGS 7.5-minute topographic quadrangle for comparison with previous survey coverage maps.

16.4.4 DISCOVERY AND TREATMENT OF HUMAN REMAINS

16.4.4.1 Federally Managed Land

Should human skeletal materials, burials, and/or associated funerary objects be identified during the survey or other phases of the Project or prior to license issuance on federal land, at the moment of discovery, all work in the immediate area will cease and the location of the find will be secured. Personnel responsible for the discovery will notify the INF Archaeologist or BLM Archaeologist who in-turn will notify the appropriate branch of law enforcement. SCE's Cultural Resource Specialist will also be notified. The remains will be treated in accordance with protocols of the appropriate land management agency. If the human skeletal remains are Native American and are located on INF or BLM land, FERC and SCE's cultural resources specialist shall coordinate with the appropriate agency to comply with the Native American Graves Protection and Repatriation Act (NAGPRA) pursuant to 25 United States Code (U.S.C.) 3001 et seq.

16.4.4.2 Private or State Land

Should human skeletal materials, burials and/or associated funerary objects be identified during the survey or other phases of the Project or prior to license issuance, they will be treated in accordance with California Health and Safety Code (CHSC) Section 7050.5(b). At the moment of discovery, all work in the immediate area will cease and the location of the find will be secured. Personnel responsible for the discovery will notify the SCE Cultural Resources Specialist who in-turn, given that the skeletal materials are verified as human, will contact the County Coroner and a qualified archaeologist will be secured to evaluate the find to determine, in consultation with the coroner, if the remains are Native American. The skeletal remains will be treated following CHSC Section 7050.5.

16.4.4.3 Architectural Inventory

Field inspection, documentation and subsequent NRHP evaluation (see below) of the entire Project area (APE) will be undertaken by individuals meeting the Secretary of the Interior Professional Qualifications for Architectural History. Fieldwork will be undertaken during the September-October 2020 surveys[21]. The architectural historian will record or re-record (as appropriate, to meet current CDPR standards) each individual building or structure within the APE, including those that do not yet meet the age requirement for evaluation for the relicensing effort (which has been determined in consultation with the USFS to be any building or structure that will be 45 years old as of 2024). In addition to the hydroelectric-related resources, the architectural historian be specifically looking for buildings, structures and objects associated with mining and recreation as well as any additional resources found during survey.

Fieldwork will include digital color photography of all resources and the production of sketch maps of individual features that show the relationship of buildings and structures within each complex that may be associated with them (e.g., an operational hydroelectric facility or a campground within the APE). When possible, GPS points will be taken of each resource that will then be plotted onto maps to create a comprehensive inventory of historic resources within the APE.

16.4.4.4 Non-native Traditional Resources Inventory

Based on the existing data, FERC is required to make a reasonable and good-faith effort to identify historic properties that may be affected by the Project. As described in 36 CFR § 800.4(b)(1), this may be accomplished through sample field investigations and/or field surveys that are implemented in accordance with the Secretary of the Interior's Standards and Guidelines for Identification (NPS 1983). FERC is required to consider any other applicable professional standards and Tribal, state, or local laws, or procedures to complete the identification of historic properties.

To assist FERC in meeting its compliance obligations, and to develop appropriate management measures for historic properties identified within the APE, a non-native traditional resources inventory will be performed to identify their presence.

The inventory is being coordinated with the archaeological, architectural and Native American Traditional Resource studies. Supervision is a joint effort by one or more qualified, professional archaeologists or architectural historians that will participate in all research, public outreach and field work.

If a potential resource is identified during research, public outreach, and/or field work, oral interviews and/or field verification will be conducted as appropriate. Resource locations will be verified, and they will be fully documented following the U.S. National Park Service (NPS) Guidelines for Recording Traditional Cultural Properties. The locations of all non-native TCPs identified during the survey will be entered into a GPS receiver to document the location, which will be plotted onto the appropriate USGS 7.5-minute topographic quadrangle using the UTM coordinate system. GPS data collection will adhere to the INF

[21] Fieldwork during September and October 2020 may be affected due to the COVID-19.

or BLM specifications for accuracy and site-specific procedures where applicable. This work is on-going an no non-native traditional resources have been identified to date.

16.4.5 National Register of Historic Places Evaluation

SCE is utilizing the results of the inventories to prepare, in collaboration with the INF, BLM, Tribes, and other relicensing participants, a plan to evaluate the eligibility of potential historic properties (in this case, archaeological sites, built environment resources, and non-native TCPs) for the NRHP. The plan includes an assessment of past, present, and reasonably foreseeable Project effects on potential historic properties and detail the methods of evaluation to be implemented. The evaluation plan will be provided to the INF, BLM, Tribes, and other relicensing participants for review 30 days prior to submitting to OHP.

16.4.5.1 National Register Criteria for Evaluation

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:

- are associated with events that have made a significant contribution to the broad pattern of American history
- are associated with the lives of persons significant in America’s past
- that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction
- that have yielded, or may be likely to yield, information important to prehistory or history (NPS 1997)

16.4.6 Reporting and Historic Properties Management Plan

The results of the Study Plan will be reported in Exhibit E of the License Application, which will include a summary of the information and findings of the cultural resource studies. Figures and other pertinent data supporting the summary in Exhibit E will be appended to the License Application. The archaeological records and other sensitive information will be included in a confidential appendix withheld from public disclosure, in accordance with Section 304 (16 U.S.C. 4702-3) of the NHPA.

SCE anticipates FERC will enter into a Programmatic Agreement (PA) with the Advisory Council on Historic Preservation (ACHP), OHP and any other agency or entity FERC elects to include. One of the PA stipulations will be the completion and implementation of a HPMP to be included with the license application.

The HPMP will consider direct and indirect effects of continued Project O&M on NRHP-listed or eligible archaeological, built environment, and non-native traditional resources and will require avoidance and protection of specified resources, whenever possible.

Processes and procedures will be developed for general and site-specific treatment measures, including minimization and mitigation measures to be taken should license implementation create unavoidable adverse effects to historic properties.

16.4.6.1 Coordination with Other Studies

To the extent feasible, SCE will coordinate archaeological, built environment, and non-native traditional resources field studies with other Project-related environmental studies (e.g., TCP and habitat surveys) and conduct them in a manner that does not affect other sensitive natural resources. When conducting archaeological and architectural resources or other investigations, Project sponsors and/or their contractors should not violate other federal or state laws or regulations protecting natural resources including but not limited to the ESA and the CWA. Project sponsors should consider that Tribes may utilize natural resources for subsistence or specific ceremonial uses and should avoid affecting those uses or events while conducting studies.

16.4.7 Consistency of Methods with Generally Accepted Scientific Practice

The study methods discussed in this document are consistent with the study methods followed in several recent relicensing projects. These methods have been accepted by the participating Indian Tribes, agencies and other interested parties associated with those projects. The methods presented in the Study Plan and their implementation are consistent with ACHP guidelines for compliance with the requirements of Section 106 of the NHPA found in 36 CFR 800.

16.5 Modifications to Methods

Many repositories needed by the cultural resource team are closed due to COVID-19. Once they re-open, the cultural resource team will implement the archival research methods presented in the study plan and will report the results in the technical reports.

16.6 Results

The findings of the studies will be reported in a Final Technical Report in 2021.

16.7 Discussion

The study objectives, and how data collected addresses those objectives will be reported after the completion of the September-October 2020 surveys and included in the Final Technical Report.

16.8 References

California, Office of Historic Preservation (OHP) 1995. Instructions for Recording Historical Resources. Sacramento.

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17 TRIBAL RESOURCES INITIAL STUDY REPORT (CUL 2)

17.1 INTRODUCTION

During TWG meetings, SCE and stakeholders, including federal land-managing agencies, identified the need to conduct ethnographic/tribal background research and a Native American TCP study. This Tribal Resources Initial Study Report is presented to provide a status on that stated need.

Potential resource issues include Indian Trust Assets (ITA), TCPs, Tribal economic ventures, and other resources of traditional, cultural, or religious importance to the Native American community. No ITAs are located in the Project. A TCP is defined as a property that is eligible for inclusion in the NRHP based on its associations with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community. There may be any number of gathering, hunting, or fishing areas related to cultural practices in the Project area, as the local Native American community continues to access medicine plants, food plants, materials for tools, and many other items as part of their ongoing cultural lifeways.

FERC's decision to issue a new license is considered an "undertaking" pursuant to 36 CFR 800.16(y). The NHPA requires federal agencies to consider the effect of undertakings on historic properties. Continued Project O&M and other activities, including public recreation activities, may have an adverse effect on historic properties, including Tribal Resources. The effect may be direct (e.g., result of ground-disturbing activities), indirect (e.g., public access to Project areas), or cumulative (e.g., caused by a Project activity or public access in combination with other past, present, and reasonably foreseeable future projects). Tribal Resources of traditional, cultural, or religious importance to the Native American community are among the resource types that may be affected. This study focuses on these potential Project effects to historic properties.

17.2 REVIEW OF EXISTING INFORMATION

17.2.1 SUMMARY OF RECORD SEARCHES/ARCHIVAL RESEARCH

SCE conducted an initial search of records and maps on file at SCE archives, the INF, BLM, and the EIC of the California Historical Resources Information System (CHRIS) at the University of California, Riverside. Interviews and consultation notes with various settlers and Indians in the study area are found in the Eastern California Museum and provide some knowledge of the area. SCE requested a search of the Sacred Land Files at the California Native American Heritage Commission (NAHC) and a list of Native American contacts who may have an interest in any portion of the Project area. From that list, SCE provided a notification letter to the Tribes informing them about the pending relicensing and requesting their participation. A cursory review of general ethnographic literature of the region was conducted to gather information regarding any previously recorded Tribal Resources within the APE. The records searches included all lands within the FERC boundary.

17.2.2 INITIAL RECORD SEARCH RESULTS

SCE, INF, BLM, NAHC, and the CHRIS had no information about Tribal Resources located within the APE. The Bishop Paiute Tribe participated in one TWG meeting and stated that they have an interest in a seed-gathering area to the north of the Project.

A limited review of ethnographic literature indicates that Bishop Creek and the nearby areas were inhabited by Paiute for a long time. The area was utilized for habitation and subsistence, as well as irrigation (Steward, 1933). Julian Steward's 1933 *Ethnography of the Owens Valley Paiute* depicts several places that were utilized within and near the APE. This utilization was further confirmed during a study of Owens Valley irrigation and agriculture conducted by Harry Lawton and his colleagues (Lawton et al.,1976).

17.2.3 DATA GAPS

As noted, no ethnographic background studies of Tribes appear to have been prepared for the Project area, even for the earlier license, and this absence of a database makes identification of data gaps problematic. The following are considered data gaps to be rectified in the study:

- Location and nature of Tribal Resources that could be affected by Project O&M activities.
- Native American individuals or groups unaffiliated with federally-recognized Tribes may not be identified.

Historic era and ethnographic Native American data lacking from context.

17.3 STUDY OBJECTIVES

The principal goal of the study is to assist FERC in meeting its compliance requirements under Section 106 of the NHPA, as amended, by determining if licensing of the Project will have an adverse effect upon historic properties and other Tribal Resources. Following 18 CFR §5.6 (d)(3)(xii) and §5.9(b)(1), the goals and objectives of the Tribal Resources Study Plan are to identify Tribal Resources that may be affected by O&M of FERC Project 1394. It is the goal of the study to identify Tribal Resources through archival research, oral interviews, and field inspections, and to assure that such places are not impacted by O&M. Research in state and SCE archives suggest that an ethnographic overview/background of the Project area has never been conducted, and that for the previous license issued in 1994, there was minimal tribal outreach, if any. Details regarding methods and specific information are located in Section 17.4.

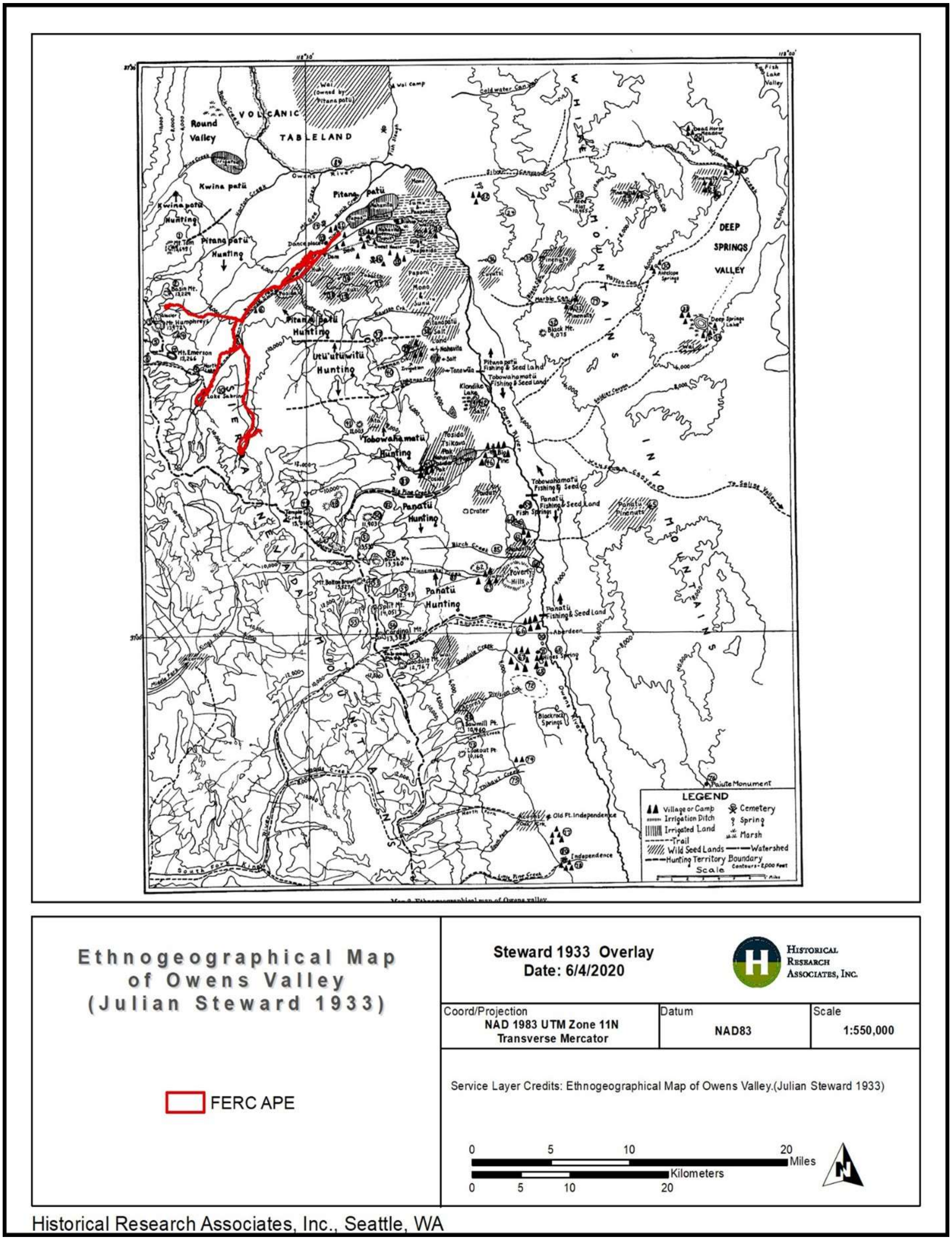

Figure 17.3-1 1933 Ethnogeographical Map 1 of Owens Valley

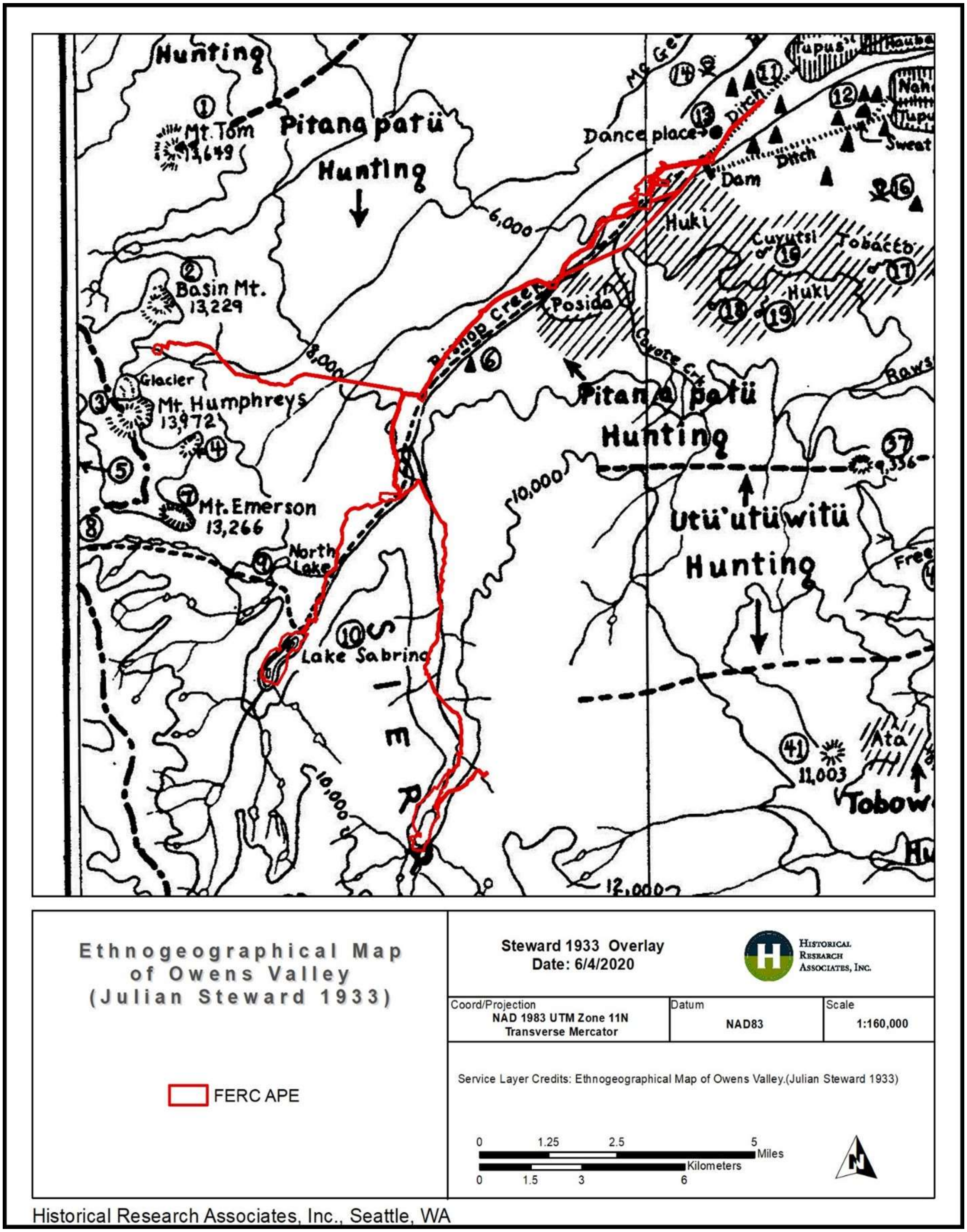

Figure 17.3-2 1933 Ethnogeographical Map 2 of Owens Valley

FERC PAD regulations (18 CFR § 5.6 [d][3][xii]) state that Tribal Resources are to be one of the content sections of the PAD, and are to include a description of Indian Tribes, tribal lands, and interests that may be affected by the Project. Components of this description include:

- Identification of information on resources to the extent that existing Project construction and operation affecting those resources may impact tribal cultural or economic interests, e.g., impacts of Project-induced soil erosion on tribal cultural sites; and
- Identification of impacts on Indian Tribes of existing Project construction and operation that may affect tribal interests not necessarily associated with resources specified in paragraphs (d)(3)(ii)-(xi) of this Section, e.g., tribal fishing practices or agreements between the Indian Tribe and other entities other than the potential applicant that have a connection to Project construction and operation.

An additional goal of the Study Plan is to ensure that tribal values and resources are identified and acknowledged from a tribal perspective. Similarly, ensuring that the land-managing agencies and any other stakeholder agencies have their program needs met with respect to the Project APE is a goal of the work. Finally, it is anticipated that any management issues will be identified so they can be described and developed in subsequent planning efforts for the life of the license.

SCE acknowledges that any Native American Tribes and Tribal or cultural stakeholders may submit other goals to the FERC in the future as a part of the comment process.

17.3.1 Study Area

Under 36 CFR§800.16(d), the APE is defined as “the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historical properties, if any such properties exist.” For Tribal Resources, the Project boundary will serve as a draft APE (Figure 17.3-3); it is acknowledged that the APE may be amended based on consultation and resource issues. In addition to the APE, an arbitrary tribal resources study area of an approximately 5-mile radius around the APE was used to capture tribal information about the Project area and is depicted in Figure 17.3-3.

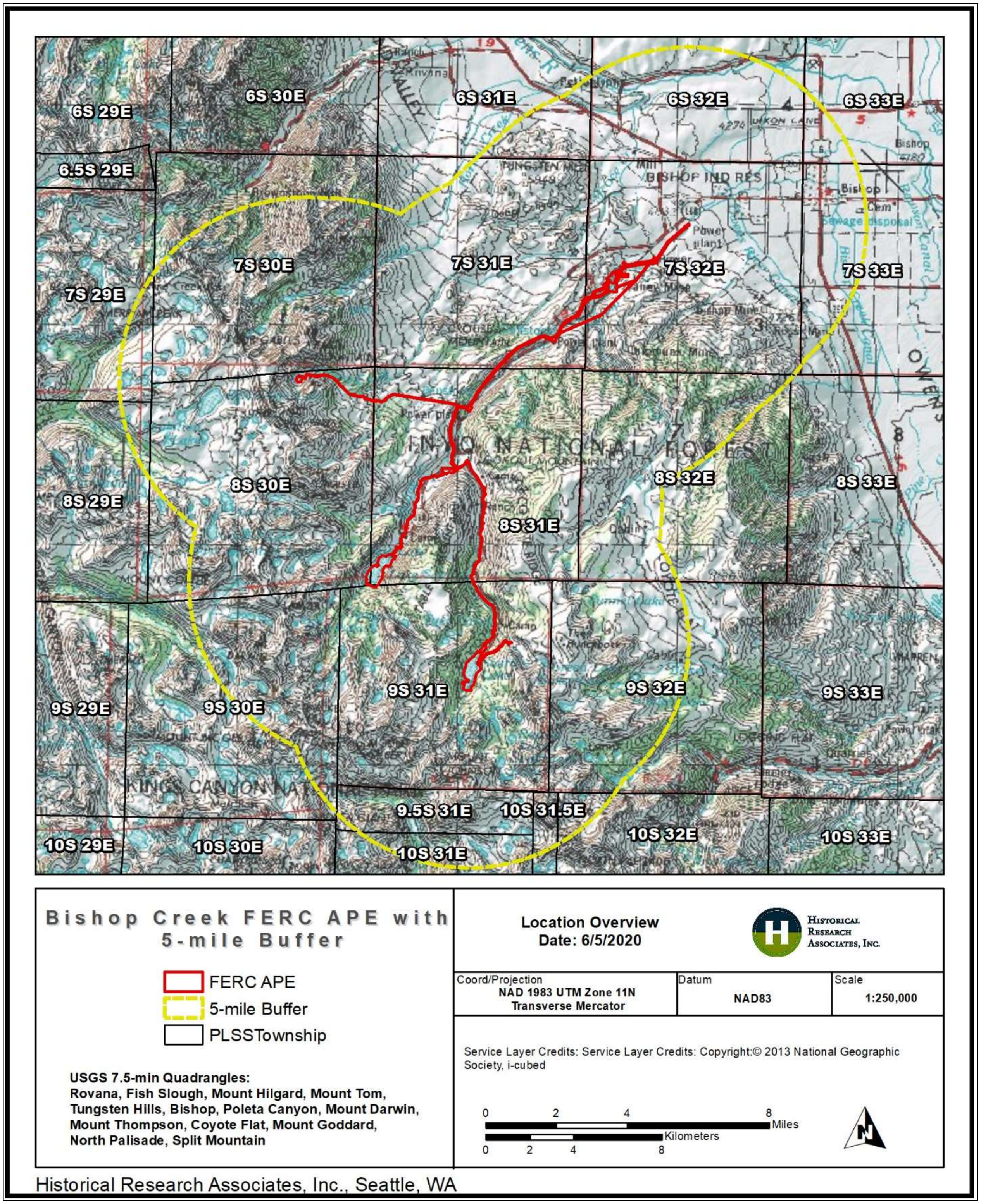

Figure 17.3-3 Tribal Resources 5-mile Buffer with APE Topo

17.4 METHODS

The Tribal Resources Study involves a multi-step process to include archival research, oral interviews, field visits, identification of resources and NRHP evaluations. These steps are being conducted in consultation with the SHPO, American Indian Tribes, INF, and BLM, as appropriate. To facilitate the Tribal Resources study, SCE retained a qualified, professional ethnographer who meets the Secretary of the Interior's Historic Preservation Professional Qualification Standards for Cultural Anthropology and the qualifications for ethnographer as defined in Appendix II of National Register Bulletin No. 38 (Parker and King, 1998). SCE coordinated the selection of the ethnographer(s) with the assistance of affected Tribes and other interested cultural/Tribal stakeholders.

Study methods are further described in the following subsections.

17.4.1 ARCHIVAL RESEARCH

As stated, no known ethnographic study has been conducted for the Project or in the Project vicinity, necessitating a baseline ethnography/ethnohistory to provide context and structure to the investigations. Archival research has been initiated to identify nearby studies and ethnographic information that can be used to establish a context by which potential Tribal Resources may be identified and evaluated. Archival data about Owens Valley are located in widespread repositories but provide a picture of native life which supplements the commonly-referenced ethnographic studies of the last century. Potential information sources have been closed during the COVID-19 Pandemic, and archival research and background data have not been conducted. The list of repositories/studies that are to be visited and/or reviewed include the following:

- Bancroft Library (University of California, Berkeley)
- California State Archives
- California State Library, California History Room
- Collections and archives at the Laws Railroad Museum and Historic Site
- Early newspaper accounts in the Annie Mitchell Local History Research Room, Tulare County Library (Visalia)
- Ford Survey
- Hulse and Essene stories
- Huntington Library
- Merriam and Harrington notes
- National Archive and Records Administration (Los Angeles and San Bruno)
- Natural History Museum of Los Angeles County (Los Angeles) Andrew Forbes photographs
- Oral-history tapes and background data held at the Eastern California Museum
- Other documents specific to the area

- Published and unpublished ethnographies
- Reports at the BLM, Bishop
- Reports at the INF, Bishop
- University of California, Davis, C. Hart Merriam Collection

Work proposed would obtain, compile, and summarize archival data available for the Bishop Creek area to develop an ethnohistorical background and contextual history.

17.4.2 TRIBAL INTERVIEWS AND IDENTIFICATION OF RESOURCES

In conjunction with the Archival Research, the SCE Ethnographer will consult with appropriate Tribal elders and other Tribal representatives to identify places, gathering areas, resources of traditional cultural or religious importance (including TCPs), and other resources that may be present in the APE. Contact will include a combination of written correspondence to tribal governments, follow-up interviews, and field visits if requested. Oral histories, if released by the interviewee, will be included in the discussion of Tribal Resources. Principal tasks anticipated are listed below:

- Contact Tribes to identify Tribal resources of traditional, cultural, or religious importance to Native Americans located within the study area.
- Gain appointments with Tribal Councils, as necessary, to acquire release documents or access to Tribal elders and representatives and to confirm interests.
- Interview Tribal elders and other representatives as required to define Tribal resources located in the study area and to establish the significance of those resources. SCE has contacted the appropriate Tribes (listed in the Tribal Resources section of the Pre-Application Document [PAD]) to notify them of Project status and to alert them to outreach by SCE's ethnographer.
- Interviews with Tribal elders or other representatives who may have knowledge of special interest areas within the Project study area/APE will be respectfully conducted and documented by a qualified ethnographer.
- The ethnographer will accompany the archaeologists during field inventory to identify unique or unusual gathering areas, tended native gardens, historic artifacts made/used by Native Americans, and other resources. This work is scheduled for September and October 2020. Photographs will be taken of potential resource areas to share with tribal stakeholders.
- Site visits with tribal representatives may be appropriate or necessary to define boundaries and the nature of potential TCPs or other Tribal Resources. Resource location information developed as part of this process will be kept confidential if necessary and will be respectfully documented by the ethnographer.
- If participating Native American Tribes do not wish to disclose the locations of potential resources due to religious, confidentiality, or other reasons, SCE will work with the Tribes to identify the general issues and concerns that the Tribe(s) may have regarding potential Project effects and will work to develop agreeable measures to alleviate these concerns. SCE will not disclose Tribal resource data to any parties

other than federal land management agencies, FERC and/or SHPO. If the participating Tribes instruct SCE in writing, SCE may disclose resource information to the ECIC.

- Interviews and resources will be documented as communicated by tribal representatives, but in all cases, sufficient information will be presented to allow reviewers to analyze resources values.

Tribal representatives and the ethnographer will determine the scope and breadth of interviews, along with various review obligations and agreements, but the nature of interview questions will involve knowledge about the heritage of Bishop Creek and relationship of the respondent to the area. Interviews conducted with reasonably available Tribal representatives will be considered similar to other consultant services, and Tribal interviewees will be compensated for their time during the interview.

17.4.3 Project Site Visit

Tribal interviewees or representatives and the ethnographer may wish to visit the Project area and archaeological sites identified during the Archaeological and Built Environment fieldwork. The purpose of the visit would be to provide Tribal representatives the opportunity to examine archaeological sites encountered during the study and for the ethnographer to obtain additional information. After the site visit(s) Tribal representatives may choose to share additional knowledge.

17.4.3.1 National Register of Historic Places Evaluation

In addition to the criteria set forth at 36 CFR § 60.4, properties can have other cultural values that should be considered. Amendments to the NHPA in 1992 (§101[d][6][A]), specify that properties of traditional religious and cultural importance to an Indian Tribe may be determined eligible for inclusion in the NRHP because of their "association with cultural practices or beliefs of a living community that are: 1) rooted in that community's history; and 2) are important in maintaining the continuing cultural identity of the community". Therefore, a property may be significant if it has traditional or ethnographic significance because of its ties to the cultural past of communities or groups, including Native Americans. Formal evaluations will be submitted to the SHPO for concurrence.

The NRHP evaluation of Tribal Resources follows the same general procedures and criteria used for determining the significance of archaeological and built-environment sites. Tribal Resources may or may not be characterized as sites in the archaeological and historical sense, so they would not necessarily be inventoried and evaluated under the Archaeological and Built Environment Study Plan implementation. There can be considerable overlap between Tribal Resources and areas categorized as archaeological sites because the physical and cultural distinctions are significant enough to provide unclear differentiation between the two and necessitate separate evaluation assessments. As an example, the archaeological document may record features and artifacts, but the Tribal Resource document might describe an important plant community associated with the site or a trail that connects the site to another place. The Tribes may be agreeable to having archaeological site descriptions expanded to include Tribal Resources in a more holistic approach.

- Develop a Tribal Resources NRHP Eligibility Evaluation Work Plan in consultation with the Tribes and resource agencies, as appropriate, and conduct studies
- Conduct Tribal Resources NRHP-eligibility studies in adherence to National Register Bulletins Number 15 (NPS, 1997) and Number 38 (Parker and King, 1998)
- NRHP evaluations will be conducted in consultation with appropriate Native American Tribes, appropriate federal land management agencies, FERC and SHPO
- The evaluations will be provided to the INF, BLM, and Tribes for review 30 days prior to submitting to the California OHP

17.4.4 IDENTIFY AND ASSESS POTENTIAL PROJECT EFFECTS ON NRHP-ELIGIBLE TRIBAL RESOURCES

Tribal resources are unique in the NRHP framework, as they are identified and evaluated by Tribal specialists in conjunction with others, such as the ethnographer, who may be assisting them in documentation. Similarly, evaluation of integrity of Tribal resources require specialized information from the community or group who has values related to the place. Integrity of relationship describes the values of the place to the relationship with the traditional or tribal activity and may not be connected to how the place looks. As long as the community maintains its association with the place, the integrity of the relationship is intact. With integrity of condition, again it is to be understood that such values are connected to what the community believes is important, even if the place looks totally disheveled to an outsider. It is the relationship of the community to the place that is important, not what it looks like to a non-community member. If the community believes the place to be significant and provides compelling information about the place, then such places may be evaluated as NRHP-eligible.

36 CFR § 800.5 describes the assessment of adverse effects and notes that the criteria of adverse effect will be applied in consultation with the SHPO and Indian Tribe (community) that attaches religious and/or cultural significance to identified historic properties. This application of effect will be within the APE. FERC shall consider any views concerning such effects which have been provided by stakeholders and other interested parties.

17.4.5 REPORTING AND HISTORIC PROPERTIES MANAGEMENT PLAN

The results of the Tribal Resources study will be documented in a Tribal Resources inventory and evaluation report (referred to as the Tribal Resources Technical Study Report) which is likely to be considered confidential and thus would not necessarily be distributed to the general public or the CHRIS. The Tribal Resources Technical Study Report will be formatted in accordance with the Secretary of the Interior (48 CFR 44720-23), OHP (1995), FERC, SCE, BLM and INF standards and guidance. This report will include, but not necessarily be restricted to the following information:

- Project location and description
- Regulatory setting
- Ethnohistory of the Bishop Creek area
- Ethnographic context of the Bishop Creek and adjacent areas
- Review of tribal and ethnographic resources
- Study methods
- Study findings
- Tribal Resource evaluations
- Management recommendations
- Relevant Project and tribal resource mapping

The Tribal Resources Technical Study Report will be submitted to BLM, INF, the Tribes and any other appropriate resource agencies and stakeholders for a 45-day review and comment period. Comments on the draft report will be addressed in the final report and distributed with the Draft License Application.

SCE anticipates FERC will enter into a PA with the ACHP, SHPO, and any other agencies or entities FERC elects to include. One of the PA stipulations will be the completion and implementation of a HPMP to be included with the license application.

The HPMP will consider direct and indirect effects of continued Project O&M on NRHP-listed or eligible Tribal resources and will require avoidance and protection of specified resources, whenever possible. Processes and procedures will be developed for general and site-specific treatment measures, including minimization and mitigation measures to be taken should license implementation create unavoidable adverse effects to historic properties.

17.4.6 Coordination with Other Studies

- Culturally important plant species locations that are identified by the Tribes will be shared with botanists if data are not confidential and will be plotted as part of the Botanical Plant Communities, Special-Status Plants, and Invasive Weeds Study, limited to the APE as defined. These maps will be included in the Tribal Resources Technical Study Report.
- Culturally important aquatic species will be shared with the Aquatic Study and will be incorporated into the Tribal Resources Technical Study Report.
- Culturally important terrestrial species information will be shared with the Wildlife Study and will be incorporated into the Tribal Resources Technical Study Report.
- Culturally important plant species locations will be considered in the Land and Project Roads and Trails Assessment, to the extent possible without divulging confidential information.

- Sites associated with prehistoric and ethnographic-period Native American occupation and use of the landscape will be shared when allowed to archaeologists and architectural historians working on the Archaeological and Built Environment Study.

17.4.7 Consistency of Methods with Generally Accepted Scientific Practices

All phases of the Tribal resources investigation will be conducted in accordance with the Native American community consultation standards outlined in Section 101 of the NHPA and discussed in the ACHP publication, *Consultation with Indian Tribes in the Section 106 Review Process: A Handbook* and policies laid out on the ACHP website at n https://www.achp.gov/indian-tribes-and-native-hawaiians/initiatives/achp-native-american-policies.

Contact, interviews, fieldwork, and tribal resource documentation will be implemented in accordance with Section 106 of the NHPA, as amended, and shall take into consideration National Register Bulletin No. 38 (Parker and King 1998).

Tribal Resources documentation will be implemented in accordance with Section 106 of the NHPA, as amended, and shall take into consideration National Register Bulletin No. 38 (Parker and King 1998).

Evaluations will be conducted in adherence to National Register Bulletins Number 15 (NPS 1997) and 38 (Parker and King, 1998).

17.5 Modifications to Methods

No changes or modifications have been made to the Tribal Resources Study Plan, but the schedule has been changed to accommodate COVID-19 restrictions. The majority of repositories needed for background research are closed due to COVID-19. Once they reopen, SCE's ethnographer will implement the archival research methods presented in the study plan and will report the results in the technical report.

17.6 Results

SCE's ethnographer accompanied SCE's archaeological teams to some portions of the Project during field surveys in Fall 2020. To date, due to COVID-19 restrictions, only one interview with a tribal informant has been conducted; this informant was also the tribal monitor who participated in the archaeological field studies.

To date, three resources of potential value to local tribes have been identified:

- A complicated and relatively intact irrigation network of no less than seven ditches, a head gate, a check dam, and several side channels ("spillways") was identified. This landscape resource appears to be a district, of which portions are located in the proposed APE and other portions are well outside the Project. The Bishop Tribe's representative for the field studies provided extensive background information on the ditch system.

- A presumed ethnohistoric site dating to the 1880s, based on artifacts remaining and a map prepared by the General Land Office (1880).
- A site of potential spiritual importance. No interviews have yet been conducted to confirm the association.

In addition to these three resources, several areas may have cultural uses particularly related to plants and their harvesting. Interviews will assist in the identification of the gathering, its location with respect to the Project, and potential effects from O&M.

Some background research has been conducted into the University of California Bancroft Library anthropological archive, the University of Califonria Davis Merriam files, and a copy of the Ford census has been acquired. Data have not yet been compiled. Final results will be included in the Final Technical Report in 2021.

17.7 Discussion

Once analysis is complete, detailed results and discussion will be included in the Final Technical Report in 2021.

17.8 References

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