Rush Creek Project, FERC Project No. 1389

AQ 6 – Fish Population and Barriers Technical Study Report

January 2025

Southern California Edison Company
Regulatory Support Services
2244 Walnut Grove Ave. Rosemead, CA 91770

This Page Intentionally Left Blank

Table of Contents

List of Tables

List of Figures

List of Maps

List of Appendices

List of Acronyms

AMSL	above mean-sea-level
CDFW	California Department of Fish and Wildlife
CPUE	catch per unit effort
FERC	Federal Energy Regulatory Commission
FL	fork length
ft^2	square foot/feet
GPS	global positioning system
ISR	Initial Study Report
lbs/acre	pounds per acre
lbs/mile	pounds per mile
m	meter
mm	millimeter
Project	Rush Creek Project
RC	Rush Creek
RM	River Mile
SCE	Southern California Edison Company
TSP	Technical Study Plan
TSR	Technical Study Report
UAV	unmanned aerial vehicle

1 INTRODUCTION

This Technical Study Report (TSR) describes survey methods and results developed by Southern California Edison Company (SCE) associated with implementation of the AQ 6 – Fish Population and Barriers Technical Study Plan (AQ 6 – TSP) for the Rush Creek Project (Project). The AQ 6 – TSP was included in SCE's Revised Study Plan[1] and was approved by the Federal Energy Regulatory Commission (FERC) on October 26, 2022, as part of its Study Plan Determination for the Project. After the first year of study, the AQ 6 – TSP was modified by FERC. California Fish and Wildlife (CDFW) filed comments[2] to the Initial Study Report (ISR)[3] requesting an additional year of fish sampling due to anomalous wet year conditions during the 2023 study season. SCE proposed in response to the ISR comments[4] that if 2024 was a normal or dry water year, then SCE would collect another year of fish population data at four stream reaches in Rush Creek below Agnew Dam[5]. On February 23, 2024, FERC's determination on requests for modifications to the approved study plan required an additional year of study at the four study sites proposed by SCE. This report describes the methods and results of AQ 6 –TSP, implemented in 2023 and the additional data collection in 2024 at four sites below Agnew Dam.

2 STUDY OBJECTIVES

The AQ 6 – TSP included four study objectives addressing fish population and fish barriers/migration as described below.

2.1 FISH POPULATION

- Document fish species composition, distribution, and relative abundance in Project-affected stream segments and Project reservoirs.

- Characterize fish growth, condition factor, and population age structure in Project-affected stream segments and Project reservoirs.

2.2 FISH BARRIERS/MIGRATION

- Document the location, nature, and characteristics of fish barriers in Project-affected stream segments.

- Identify Project facilities and operations (e.g., dam, reservoir operations, instream flow releases) that may affect fish migration.

[1] SCE filed a Proposed Study Plan on May 26, 2022 (SCE 2022a). Four comment letters were filed on the Proposed Study Plan, and six study plans were revised. SCE filed a Revised Study Plan on September 23, 2022 (SCE 2022b). FERC subsequently issued a Study Plan Determination on October 26, 2022, approving the AQ-6 TSP (FERC 2022a).

[2] California Fish and Wildlife filed Initial Study Report comments with FERC on December 20, 2023.

[3] The Initial Study Report was filed with FERC on October 27, 2023.

[4] SCE filed a response to the Initial Study Report comments with FERC on October 26, 2024.

[5] The four study sites below Agnew Dam included Below Agnew Dam (RM 18.55), above Silver Lake (RM 17.05 and 17.55), and below Silver Lake (RM 15.2)

3 STUDY IMPLEMENTATION

A summary of the study elements that have been completed and any deviations or proposed modifications to the AQ-6 – TSP are discussed in the following subsections.

3.1 STUDY ELEMENTS COMPLETED

In 2023, all study elements were completed at all sites except in South Rush Creek, which was dry during the fish population surveys. In 2024, based on FERC's modification to the study plan, an additional year of sampling was completed at four study sites below Agnew Dam (Below Agnew Dam [RM 18.55], above Silver Lake [RM 17.05 and 17.55], and below Silver Lake [RM 15.2]).

3.2 VARIANCES FROM THE AQ 6 – TSP

Fish were not sampled in South Rush Creek in 2023. The South Rush Creek channel was dry during the study implementation. Conditions at the South Rush Creek site at the time of field survey was documented with photographs.

3.3 OUTSTANDING STUDY ELEMENTS

There are no outstanding study elements.

4 STUDY AREA AND STUDY SITES

The study area for the assessment of fish population and migration includes Project-affected stream segments and Project reservoirs.

Stream and reservoir fish population sampling locations are identified in Table AQ 6-1 and Map AQ 6-1. Additional detailed descriptions of fish population sampling locations are provided in Appendix A.

Qualitative barrier surveys were conducted along the entire length of the Project-affected stream segments. Additional quantitative barrier surveys were conducted for barriers occurring at Project dams or other instream infrastructure.

5 STUDY APPROACH

5.1 STUDY SITES

The locations of study sites selected for developing fish species composition, distribution, and standing crop estimates (fish per mile [fish/mile] and/or pounds per acre [lbs/acre]) are presented in Table AQ 6-1 and Map AQ 6-1. Stream sampling sites in Rush Creek (RC) were named based on the River Mile (RM) where they were located except for South Rush Creek, which is a side channel and was given a separate (South Rush Creek) designation. Stream sampling sites (for electrofishing and/or snorkeling) were generally 100 meters (m) long so they would include multiple habitat types. Habitat types, lengths, and sampling methods for selected stream segments and Project reservoirs are provided in Table AQ 6-1.

The results of the AQ 5 – Geomorphology TSP mesohabitat mapping were used to identify representative reach sampling sites with mesohabitat types in similar proportion to the larger geomorphic river segments. Where possible, sampling sites were chosen that overlapped with the instream flow study sites (see the AQ 1 – Instream Flow TSP). The specific locations of sampling sites were determined in the field to represent habitat conditions in the surrounding reach considering the presence of barriers (i.e., waterfalls) and access. The site below Rush Meadows Dam was the same site used for previous compliance monitoring (Read and Sada 2012; Sada and Rosamond 2010).

Appendix A includes photos of the specific stream sampling sites, along with site dimensions and sampling methods. Detail on reservoir gillnet sampling locations is provided in Appendix B.

5.2 FISH SAMPLING

5.2.1 Stream Sites

Stream sampling sites were surveyed to identify the spatial distribution and abundance of fish species. Sampling in 2023 was conducted from September 25 to September 29, 2023, during the late-summer/early-fall base flow period using a combination of electrofishing (shallow water) and snorkeling (deep water) at each representative sampling site (Table AQ 6-1).[6] Sampling in 2024 was conducted from August 19 to August 22 at the sites below Agnew Dam using electrofishing and snorkel methods identical to the previous year. Multi-pass electrofishing (e.g., Reynolds 1996; Van Deventer and Platts 1989) was used to sample and estimate fish populations in shallow stream habitats (<1.5 m). The sampling sites were partitioned into mesohabitat types for sampling using block nets. Captured fish from each pass in each mesohabitat type were kept in separate live wells. Fish were enumerated, identified to species, and measured (fork length [FL] and weight). Scale samples were obtained from a subsample of fish measuring over 75 millimeters (mm) in length during the 2023 sampling. Fish were returned to the sampling site when the survey was completed. Sampling protocols and field data forms were consistent with those described by Flosi et al. (1998). The lengths and widths of the habitat units sampled were recorded to calculate fish abundance by length and area (density) of stream sampled.

Snorkeling (Dolloff et al. 1996) was used to assess fish populations in deep-water habitats (≥1.5 m) at each representative stream sampling site (Table AQ 6-1). Three sites contained no snorkel units due to shallow pool depth (<1.5 m), and one site consisted entirely of snorkel units due to consistent depth over 1.5 m. Snorkelers surveyed in lanes within the stream and identified, counted, and estimated the length of each fish observed. Fish data were recorded by mesohabitat type. Snorkeling protocols and field data forms were consistent with those described by Flosi et al. (1998).

[6] No sampling was conducted at South Rush Creek RM 0.15 (South Rush Creek 0.15), as this site was dry during the fish surveys.

5.2.2 Reservoir Sites

Variable-mesh gillnets were set in Project reservoirs to characterize fish species composition, relative abundance, and size. Gem Lake and Agnew Lake were sampled from August 28 to August 29, 2023, and August 29 to August 30, 2023, respectively, using a rowed cataraft at each reservoir.[7] The sampling locations were distributed evenly along the length of each reservoir to sample both deep water and littoral zone habitats. One net at each location was set perpendicular from the shore in the littoral zone, with small mesh near the shore, and the other net was set in deeper water vertically, with small mesh near the surface (Appendix B, Map B-1 and Map B-2). One vertical deep-water gillnet was also placed at three sampling locations in Gem Lake and two sampling locations in Agnew Lake (Appendix B, Table B-1). Gillnets were set in the afternoon of one day and retrieved and processed the morning of the following day. Upon retrieval of each gillnet, fish were enumerated, weighed, and measured (FL). Severely injured fish were euthanized, and dead fish were placed in deep water after their air bladders were punctured to sink the carcass and return the biomass back to the ecological system. Data from gillnet sampling were used to summarize fish composition, size, relative abundance, and body condition in each Project reservoir.

5.3 FISH BARRIERS/MIGRATION

Biologists surveyed the Project-affected stream segments and Project reservoirs in 2023 to identify and classify potential fish barriers. Initial qualitative fish barrier surveys were conducted in 2022 in conjunction with AQ 5 – Geomorphology TSP mesohabitat mapping to identify the location and nature (natural or Project-related) of potential barriers (e.g., natural falls, tributary junctions, road crossings, shallow riffles, and dams). The Project-affected reaches were surveyed visually on foot. Inaccessible locations such as steep cliffs and waterfalls (e.g., Horsetail Falls) outside the wilderness area were surveyed using video footage from unmanned aerial vehicle (UAV) overflights. Naturally occurring barriers were evaluated qualitatively by classifying each potential barrier identified in the field or from UAV footage into the falls, chute, and cascade types defined by Powers and Orsborn (1985) or as critical riffles (Thompson 1972). Reaches with repeated naturally occurring barriers throughout the reach were classified as barrier reaches. Naturally occurring barriers within an otherwise passable reach were identified individually and evaluated qualitatively. Project dams and other instream infrastructure (i.e., stream gages) representing barriers were evaluated using quantitative techniques including the general fish barrier assessment methodologies outlined by Powers and Orsborn (1985) and Thompson (1972), which were modified, where necessary, for the specific species (e.g., rainbow trout [*Oncorhynchus mykiss*] and brook trout [*Salvelinus fontinalis*]) and barriers within the study area; leaping and swimming capabilities of the fish based on the literature (Powers and Orsborn 1985; Hoar and Randall 1978); and a classification approach consistent with Flosi et al. (2010) for road crossings.

[7] Gill net sampling was not conducted in Waugh Lake as the low-level outlet was open and the area did not represent reservoir habitat.

5.4 DATA REPORTING

A combination of English and metric units was used for data reporting as identified in the AQ-6 Fish Population and Barriers TSP and to facilitate comparison to previous reports.

5.4.1 Stream Sites

The following analyses were completed:

- Fish abundances from sampling events were used to summarize fish standing crop estimates in terms of linear and areal density (e.g., fish/mile and fish/square foot [ft^2]) and biomass (pounds per mile [lbs/mile] and lbs/acre). Abundance and biomass were totaled for individual sampled mesohabitat units at each sampling site. For deep-water mesohabitat units that were snorkeled, the number of fish observed during snorkeling was used to estimate fish abundance. As fish were not weighed (only measured visually) at snorkel sites, their weight was calculated using a Project- and species-specific length-weight regression.[8] The midpoint length of each fish-size class bin was used to calculate average biomass. Snorkeling biomass estimates were used as a relative measure of biomass as they were likely not as accurate as those at electrofishing-only sites as the fish were categorized by size using visual estimates (underwater visual observations calibrated with a ruler).

- Density and biomass data from the legacy sampling site below Rush Meadows Dam was compared to previous results from 2010 (Read and Sada 2012).

- Fish standing crop estimates for all Project stream sampling sites were compared to similar datasets from nearby streams.

- A fish life-stage periodicity chart (by calendar month) was developed for each species for each sampling site based the work of Moyle (2002) and Read and Sada (2012).

- Length-frequency histograms of sampled fish data were generated to examine distribution modality and, in conjunction with scale data, to determine the age structure of fish populations.

- Fish growth and age data were summarized using length frequency and scale analysis. The scale analysis used the narrower growth rings (circuli) during the cold-water season compared to other times of the year to identify the number of growth years (i.e., number of annuli). The reading of magnified scales was done by an experienced fish biologist.

- Fulton's condition factor (Ricker 1975) was calculated for sampled fish. Fulton's fish condition factor provides a relative index of the nutritional state (e.g., storage of muscle and lipids) of individual fish but varies by size and species. The average

[8] Length-weight regression formulas used the equation $(W = aL^b)^1$, where W=Weight (grams); a=constant; L=length(mm); and b=constant.

condition factor for each species at each sampling site was calculated using individual condition factors. Across all species captured, fish smaller than 50 mm FL were excluded from the condition factor analysis because these weights are more likely to be influenced by minor environmental factors (e.g., wind or water droplets) when weighed, which could result in erroneous condition factor calculations.

- CDFW fish stocking data for reservoir, lake, and stream reaches of the Rush Creek watershed were obtained through unpublished data and personal communication with CDFW biologists.

5.4.2 Reservoir Sites

Fish composition, size, and relative abundance were summarized for Gem Lake and Agnew Lake. Catch per unit effort (CPUE) was calculated and length-frequency histograms were generated. Data from 2023 reservoir sampling was compared to historical reservoir sampling data from 2002 (CDFW 2021).

5.4.3 Fish Barriers/Migration

The locations of all barriers were mapped with a Trimble sub-meter global positioning system (GPS) unit. All anthropogenic barriers (Project dams and other instream infrastructure) were photographed in the field for visual reference. Descriptions of observed barriers were developed and are provided along with photos in Appendix C.

6 STUDY RESULTS

6.1 FISH SAMPLING

6.1.1 Fish Species Distribution

Although Rush Creek was historically fishless, it is occupied by trout species introduced from Europe (brown trout [*Salmo trutta*]), eastern North America (brook trout [*Salvelinus fontinalis*]), various West Coast watersheds (rainbow trout [*Oncorhynchus. mykiss*]) and other regions of California (golden trout [*O. aguabonita*] and Lahontan cutthroat trout [*O. clarkii henshawi*]) (Moyle 2002).

The current fish populations in the Rush Creek reservoirs and stream sites are influenced by a combination of CDFW fish stocking, natural reproduction, and fishing/predation. From 1942 through 1965, CDFW stocked rainbow trout in Waugh Lake annually. After 1965, CDFW ceased stocking Waugh Lake in favor of a self-sustaining fishery. Gem and Agnew Lakes are presently managed as stocked lakes with “put and grow” fisheries; aerially planted annually with fingerling rainbow trout (10,000 fish / 100 lbs). Silver Lake is managed as a stocked lake with both “put and take” and “put and grow” fisheries. It is stocked with rainbow trout triploid catchable trout weekly/bi-weekly; Lahontan cutthroat trout diploid fingerlings once annually. The stocking allotment is 25,000 rainbow-catchable (12,500 lbs); 10,000 fish /100 lbs Eagle Lake trout fingerling; 10,000 fish / 100 lbs Lahontan cutthroat trout fingerling. Rush Creek from Silver Lake downstream to

Grant Lake has an annual stocking allotment of 10,000 rainbow trout / 5,000 lbs. (G. Meese, CDFW, pers. comm. With C. Addley, 2024).

Results from 2023 and 2024 fish population sampling events were used to characterize the distribution of fish species in Rush Creek (Table AQ 6-2 and Appendix D, Table D-1). Brook and rainbow trout were the most widely distributed species. Brook trout were found at all stream and reservoir sampling sites. Rainbow trout were found at all but the highest elevation stream sampling site above Waugh Lake.. At the historical/legacy sampling site in Rush Creek below Rush Meadows Dam, rainbow trout appeared to be mostly rainbow trout X golden trout hybrids as identified in previous studies (Read and Sada 2012). Rainbow X golden trout hybrids were also observed in smaller numbers in Rush Creek below Agnew Dam, above Horsetail Falls. These hybrid fish are referred to as rainbow trout in this report and analysis. Brown trout had the smallest distribution and were found in the Rush Creek sampling sites below Horsetail Falls.

Observed fish distribution and elevations of stream sampling sites are shown in Figure AQ 6-1. All sampling sites were above 7,000 feet above mean-sea-level (AMSL), and three sampling sites were above 9,000 feet AMSL.

6.1.2 Life-Stage Periodicity

A fish life-stage periodicity (or life-history chronology) chart by month for species in the sampling sites was developed based on available literature (Moyle 2002; Read and Sada 2012), discussion with qualified fisheries biologists, and review of the 2023 fish population sampling information (Table AQ 6-3). Periodicities were adjusted based on Project elevation and associated environmental factors (e.g., water temperature), where appropriate.

6.1.3 Stream Sites

6.1.3.1 Fish Density and Biomass

In total, 442 rainbow trout, 1,254 brown trout, and 543 brook trout were captured or observed in the stream sampling sites in 2023 and 2024 (Table AQ 6-4). Fish densities (fish/mile, fish/ft^2) and biomass (lbs/mile, lbs/acre) by mesohabitat type and totals for each sampling site are shown in Table AQ 6-4. Fish density and biomass at the sampling sites is illustrated in Figure AQ 6-2. Fish densities by individual species at sampling sites varied widely, ranging from 9 to 7,035 fish/mile. Total density for all species ranged from 144 to 8,449 fish/mile.

The highest linear combined trout densities were found in Rush Creek below Silver Lake (RC 13.9) (6,147 and 8,449 fish/mile in 2023 and 2024, respectively) and in Rush Creek above Highway 158 (RC 17.55) (2,399 and 5,625 fish/mile in 2023 and 2024, respectively) and below Agnew Dam (RC 18.55) (3,504 and 4,126 fish/mile in 2023 and 2024, respectively). Intermediate densities were found in in Rush Creek above Waugh Lake (1,374 fish/mile) and in Rush Creek below Rush Meadows Dam (1,198 fish/mile) in 2023. The lowest densities were found in Rush Creek as it flows through the Waugh Lake bed (451 fish/mile in 2023) and in Rush Creek above Silver Lake (RC 17.05) (144 and

523 fish/mile in 2023 and 2024, respectively). Areal density (fish/ft^2) generally exhibited a similar pattern as linear density (Table AQ 6-5; Figure AQ 6-2).

In 2023, the highest linear trout biomass (292 lbs/mile) was observed in Rush Creek below Agnew Dam (RC 18.55) (Table AQ 6-6). In 2024, the highest linear trout biomass was observed in Rush Creek above Silver Lake (RC 17.05) (431 lbs/mile) due to the presence of large rainbow and brown trout (18$^+$ inches). The lowest linear trout biomass in 2023 was found in Rush Creek above Silver Lake (RC 17.05) (49.7 lbs/mile) and in and Rush Creek where it flowed through the Waugh Lake bed (RC 23.4) (12.4 lbs/mile). In 2024, the lowest linear trout biomass was observed in Rush Creek below Silver Lake (58.4 lbs/mile) due to the small size of the fish.

Density and biomass observed in 2024 at the lower sampling sites (below Agnew Dam) were similar to 2023, except for a couple of notable differences:

- The Rush Creek sampling site below the Rush Creek Powerhouse (RC 17.05) had the highest fish biomass of all sites in 2024 compared to having one of the lower biomass estimates in 2023 (Figure AQ 6-2). This occurred because 29 large trout (21 rainbow and 8 brown trout) 18+ inches in length were observed during snorkeling. Few smaller fish were observed at the site compared to other sampling sites (i.e., the site had low fish density). It is possible this reach of river, upstream from Silver Lake, is heavily foraged by large predatory trout from the lake. In 2023 these larger fish were not observed (possibly missed or possibly present at night when predation typically occurs). Summer water temperature in the reach is suitable for high growth of both juvenile and larger trout (e.g., 46 to 64°F) (Figure AQ 6-3; SCE 2025a).

- In Rush Creek above Highway 158 (RC 17.55) and Rush Creek below Silver Lake (RC 13.9) the density of brown trout increased in 2024 compared to 2023 due to an increase in juvenile fish spawned the previous fall.

Density and standing crop estimates from 2023 sampling conducted at the legacy sampling site below Rush Meadows Dam were compared to historical sampling data from 1999-2002 and 2010 (Read and Sada 2012, Sada 2001, Sada 2003; Table AQ 6-7). Brook trout density was higher in 2023 than in previous sampling years at 907 fish/mile. However, standing crop (biomass density) was moderate at 18.08 lbs/acre. Historical brook trout density and standing crop ranged from 128 fish/mile and 3.57 lbs/acre to 784 fish/mile and 30.33 lbs/acre. Rainbow trout density and biomass in 2023 (291 fish/mile, 8.39 lbs/acre) was mid-range compared to historical sampling, which ranged from 96 fish/mile and 3.57 lbs/acre to 320 fish/mile and 13.38 lbs/acre.

Data from the 2023 and 2024 sampling efforts in Rush Creek were also compared to available density and biomass information from other Eastern Sierra Nevada stream systems within a comparable elevation range (Figure AQ 6-4). Comparison data were sourced from SCE's Bishop Creek and Lee Vining Hydroelectric Projects (SCE 2021, 2022c), historical Rush Creek data (Read and Sada 2012), and publicly available reports from the Inland Desert Region of California Department of Fish and Wildlife's (CDFW)

Heritage and Wild Trout Program (CDFW 2008, 2012). The dataset was limited to Eastern Sierra Nevada streams in Inyo, Mono, and Alpine counties at elevations between 5,000 and 10,000 feet.

Observed fish density (fish/mile) and biomass (lbs/acre) at low- and mid-elevation Rush Creek sampling sites (below Agnew Lake) was generally higher than in other streams at similar elevations (Figure AQ 6-4). At high-elevation Rush Creek sampling sites, fish density was slightly lower yet comparable to that from available datasets at similar elevations such as Lee Vining Creek below Saddlebag Lake.

6.1.3.2 Length Frequency and Age Structure

Length-frequency histograms for each species across the sampling sites are provided in Figure AQ 6-5a–6-5c and in Appendix E for each individual sampling site. A length versus weight regression for each species is also provided in Figure AQ 6-6.

In general, there were differences in growth and length-at-age based on sampling site elevation and species. Small (<90 mm FL) rainbow trout and brown trout were captured during sampling across all sites but made up a larger proportion of the catch at lower elevation sites. Small rainbow trout (<90 mm) made up a lower proportion of total catch at high-elevation sites, consistent with the findings of Sada and Rosamond (2010). Small rainbow trout included both 0+ and 1+ juvenile fish, with high-elevation sites associated with lower first and second year size ranges. A relatively large proportion of moderately sized brook trout (90–200 mm FL) were observed at higher elevation sites. Brown trout primarily consisted of small to moderately sized individuals (<175 mm FL), some moderately to larger sized fish (200 – 250 mm FL), and a smaller proportion of large individuals (>250 mm FL). Rainbow trout and brook trout exhibited a more even distribution of fish sizes across all sites (Figure AQ 6-6). Minimum sizes for 0+ fish varied by species. Young-of-the-year for autumn-spawning trout (brown and brook) spawned in the calendar year (2023, 2024) were not available for capture at the time of sampling, and all 0+ fish of these species were almost a full year old at the time of capture. Young-of-the-year rainbow trout spawned in 2023 and 2024 were available for capture, although they were uncommon at high-elevation sites where recruitment is relatively low (Read and Sada 2012).

Observed length frequency, and therefore age structure and recruitment, varied between sample years (2023 and 2024). More juvenile trout were captured during electrofishing at the sites below Agnew Lake in 2024 (Figures AQ 6-5 a, b and c; Appendix E). Counts of adult size classes of rainbow trout were roughly comparable overall at sites below Agnew between 2023 and 2024 (Figure AQ 6-5a). However, additional large adult rainbow and brown trout were observed above Silver Lake (RC 17.05) in 2024. Higher counts of small brown trout were observed in 2024 than in 2023 at the lower elevation sites below Horsetail Falls, and more brook trout of all sizes were observed in 2024 than in 2023 at all sites below Agnew Lake.

Ages of fish were estimated from scale samples collected in 2023 (Figure AQ 6-7 and Appendix D, Table D-2). Scale analysis was used to verify age class determinations in length-frequency histograms. A discussion of fish length and age derived from the 2023 scale analysis is provided below by species.

Rainbow Trout

Rainbow trout at lower and mid-elevation sampling sites below Agnew Dam consisted of age 0+ fish with an average FL of 82 mm and age 1+ fish with an average FL of 123 mm. At higher elevation sites, age 0+ fish had an average FL of 74 mm and age 1+ fish had an average FL of 116 mm. Age 2+ rainbow trout at lower and mid-elevation sites ranged from 157 to 238 mm FL and had an average FL of 150 mm at higher elevation sites. The oldest rainbow trout (age 3+) observed had an average FL of 200 mm at higher elevation sites and ranged from 201 to 266 mm FL below Agnew Dam.

Brook Trout

Brook trout at lower and mid-elevation sampling sites below Agnew Dam consisted of age 0+ fish with an average of 98 mm FL and age 1+ fish from 112 to 138 mm FL. At higher elevation sites, age 0+ fish had an average FL of 104 mm and age 1+ fish ranged from 122 to 128 mm FL. Age 2+ fish had an average FL of 172 mm at lower elevation sites. and ranged from 157 to 205 mm FL at higher elevation sites.

Brown Trout

Scale-aged brown trout were all sampled at lower sampling sites and included age 0+ and 1+ fish up to an average FL of approximately 112 mm. Age 2+ fish averaged 162 mm FL.

6.1.3.3 Age and Growth Rates

Lengths of scale-sampled fish were plotted with estimated ages to develop the growth rate summaries shown in Figure AQ 6-7.

At lower elevation sampling sites, rainbow trout demonstrated faster rates of growth, while growth rates at higher elevation sites were slower. Conversely, brook trout generally exhibited faster rates of growth in higher elevation sites, while growth rates appeared to be slower at RC 18.55. Brook trout were less common at RC 18.55, and the apparent slower growth may be an artifact of there being fewer samples or due to increased competition for food and space with other trout species. Growth rates of brown trout were higher below Silver Lake than above Silver Lake.

6.1.3.4 Condition Factor

Over both sampling years, the average condition factors of rainbow trout in Rush Creek ranged from 0.84 in Waugh Lakebed to 1.13 below Silver Lake (Table AQ 6-8). Brown trout condition factors ranged from 1.05 above Silver Lake to 1.11 below Silver Lake, and brook trout condition factors ranged from 0.97 in Rush Creek below Rush Meadows Dam to 1.13 in Waugh Lakebed.

Overall, condition factors for rainbow, brook and brown trout at sites below Agnew Lake were similar in 2024 and 2023 (Table AQ 6-8).

Condition factors for trout can range from <0.6 to >2.0 (Carlander 1969), where starving fish often have a condition factor <0.7 (Reimers 1963; Carlander 1969), and exceptionally healthy fish have high condition factors (e.g., >1.5).

6.1.4 Reservoir Sites

6.1.4.1 Species Captured and Catch per Unit Effort

Rainbow trout and brook trout were captured during reservoir gillnetting in Gem Lake and Agnew Lake in 2023 (Table AQ 6-2). More rainbow trout than brook trout were caught in Gem Lake, and more brook trout than rainbow trout were caught in Agnew Lake (Table AQ 6-9). Only medium-sized fish between 213 and 375 mm FL were captured in the nets even though variable size mesh was used. Most fish were captured by horizontal gillnets in less than 10 feet of water.

CPUE was lower in 2023 than in 2002 in both Gem and Agnew Lakes (0.18 and 0.25 fish per net hour in Gem, compared to 0.63 and 2.31 fish per net hour in Agnew). This difference may be largely due to additional deployment of gill nets vertically away from the shore and in deep water in 2023. CPUE was very low in vertical gillnets and in the deeper segments of horizontal gillnets (>10 feet). Only single horizontal gillnets were deployed in 2002.

Additional detail on 2023 reservoir sampling, including net deployment locations, is provided in Appendix B.

6.1.4.2 Length Frequency of Captured Fish

Length-frequency histograms were created for species captured during Gem Lake and Agnew Lake gillnet sampling (Figure AQ 6-8). Fish between 230 and 260 mm FL were the most frequently caught across all reservoir sampling sites.

6.1.4.3 Condition Factor

The average condition factor of rainbow trout in Gem Lake was 1.09, and the average condition factor of brook trout was 0.99. In Agnew Lake, the average condition factor of rainbow trout was 1.01, and the average condition factor of brook trout was 1.06 (Table AQ 6-8). Based on data from Carlander (1969) and Reimers (1963), the condition factor for trout species in Project reservoirs is within the expected range of good condition.

6.2 FISH BARRIERS AND MIGRATION

Eight anthropogenic barriers, two natural barrier reaches, and eight individual natural barriers were surveyed along Rush Creek from the upstream influence of Grant Lake to approximately 0.5 mile upstream of Waugh Lake (Appendix C, Map AQ C-1). Natural barriers such as waterfalls, chutes, and cascades were abundant in Rush Creek upstream

of the Rush Creek Powerhouse. Anthropogenic barriers were assessed quantitatively and categorized based on relative passage restriction for trout (Table AQ 6-11). Complete barriers, those categorized as *not passable*, consisted of infrastructure unsuitable for the passage of any trout. Complete barriers consisted of Gem Dam and Rush Meadows Dam and the notches cut into Agnew Dam in 2017. Natural barriers occurred below all three anthropogenic complete barriers, limiting the area impacted. Although the design of the notches in Agnew Dam could allow for passage at some flows, the presence of a large cascade immediately downstream further restricts potential passage.

Two gage weirs (one below Agnew Lake and one below Silver Lake) were assessed and determined to be potentially passable for adult trout at some flows but presented jump and velocity barriers to juvenile trout at all flows and depth barriers to adult trout at low flows. Critical riffles at the upstream end of Agnew Lake and Waugh Lake present depth barriers only under seasonal low-flow conditions. Therefore, they are likely to primarily effect fall spawning species such as brook trout. The water depth at the critical riffle at the upstream end of Silver Lake (in the sediment delta) is affected by lake surface elevation and the amount of inflow. This critical riffle did not present a depth barrier in 2023 but could reach critically shallow depths when the lake surface elevation approaches 7,220.5 feet and inflow is low. The 2D model developed in the AQ 1 Instream Flow TSR (SCE 2025b) provides a tool to analyze fish passage over a range of flows.

Two road crossings (Highway 158 and the powerhouse access road) occur in the surveyed area of Rush Creek. These road crossings were assessed at a range of flows and do not represent barriers to fish passage (Appendix C).

7 REFERENCES

Addley, R.C. 2006. Habitat Modeling of river ecosystems: multidimensional spatially explicit and dynamic habitat templates at scales relevant to fish. PhD Dissertation, Utah State University, Logan, Utah.

Carlander, K.D. 1969. Handbook of Freshwater Fishery Biology, Volume 1. Iowa State University Press. pp. 752.

CDFW (California Department of Fish and Wildlife). 2008. Heritage and Wild Trout Program. East Fork Carson Summary Report.

CDFW (California Department of Fish and Wildlife). 2012. Heritage and Wild Trout Program. Wolf Creek 2012 Summary Report.

CDFW (California Department of Fish and Wildlife). 2021. CDFW High Mountain Lakes Survey Data, personal communication, Alyssa Marquez.

Dolloff, A., J. Kershner, and R. Thurow. 1996. Underwater Observation. Pages 533–554 in B.R. Murphy and D.W. Willis, editors. Fisheries Techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

FERC (Federal Energy Regulatory Commission). 2022a. Rush Creek Hydroelectric Project (FERC Project No. 1389). Study Plan Determination. October.

FERC (Federal Energy Regulatory Commission). 2022b. Rush Creek Hydroelectric Project (FERC Project No. 1389). Determination on Requests for Study Modifications. February 23, 2024.

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. California Salmonid Steam Restoration Manual, Third Edition. The Resources Agency, California Department of Fish and Game, Inland Fisheries Division, Sacramento, California.

Flosi, G., S. Downi, J. Hopelain, M. Bird, R. Coey, and B. Collins. 2010. California Salmonid Stream Habitat Restoration Manual Vol. II, Part IX, Fish Passage Evaluation at Stream Crossings. California Department of Fish and Game, Sacramento, California.

Hanson, P.C., T.B. Johnson, D.E. Schindler and J.F. Kitchell. 1997. Fish bioenergetics 3.0 for Windows. University of Wisconsin Sea Grant Institute, Madison.

Hoar, W.S. and D.J. Randall, eds. 1978. Fish Physiology. Academic Press New York.

Meese, G. 2024. California Department of Fish and Wildlife. Personal Communication with Craig Addley, Stantec. Email. July 10.

Moyle, P.B. 2002. Inland Fishes of California: Revised and Expanded. University of California Press.

Powers, P.D. and J.F. Orsborn. 1985. Analysis of Barriers to Upstream Migration: An Investigation of the Physical and Biological Conditions Affecting Fish Passage Success at Culverts and Waterfalls. BPA Report No. DOE/BP-36523-1.

Rand, P.S., D.J. Stewart, P.W. Seelbach, M.L. Jones, and F.R. Wedge. 1993. Modeling steelhead population energetics in lakes Michigan and Ontario. Transactions of the American Fisheries Society 122:977-1001.

Read, E. and D. Sada. 2012. Analysis of riparian vegetation, aquatic habitat, and fish populations Phase 2 (Year 1) and comparison to baseline. Unpublished report submitted to Southern California Edison Company. Rosemead, California.

Reimers, N. 1963. Body condition, water temperature, and over-winter survival of hatchery-reared trout in Convict Creek, California. *Transactions of the American Fisheries Society* 92(1):39-46.

Reynolds, J.B. 1996. Electrofishing. Pages 83–120 in B.R. Murphy and D.W. Willis, editors. Fisheries Techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. *Bulletin of the Fisheries Research Board of Canada* 191:1–382.

Sada. D.W. 2001. Fish population surveys in Rush and Lee Vining Creeks, Mono County, California, 1999 and 2000. Unpublished report to Southern California Edison Company. Rosemead, California.

Sada. D.W. 2003. Aquatic habitat monitoring, Rush and Lee Vining Creeks, Mono County, California, 1999, 2000, 2001, and 2002. Unpublished report to Southern California Edison Company. Rosemead, California.

Sada, D. and C. Rosamond. 2010. Fish population surveys in Rush and Lee Vining Creeks, Mono County, California, 1999 and 2000. Unpublished report submitted to Southern California Edison Company. Rosemead, California.

SCE (Southern California Edison Company). 2021. Lee Vining Hydroelectric Project (FERC Project No. 1388) Pre-Application Document. August.

SCE (Southern California Edison Company). 2022a. Rush Creek Hydroelectric Project (FERC Project No. 1389) Proposed Study Plan. May.

SCE (Southern California Edison Company). 2022b. Rush Creek Hydroelectric Project (FERC Project No. 1389) Revised Study Plan. September.

SCE (Southern California Edison Company). 2022c. Bishop Creek Hydroelectric Project (FERC Project No. 1394) Draft License Application. AQ – 3, Bishop Creek Fish Distribution Baseline Study Technical Report. January.

SCE (Southern California Edison Company). 2025a. AQ 3 – Water Temperature Technical Study Report. January. Available in Supporting Document A of the Application for New License.

SCE (Southern California Edison Company). 2025b. AQ 1 – Instream Flow Technical Study Report. January. Available in Supporting Document A of the Application for New License.

Thompson, K. 1972. Determining Stream Flows for Fish Life in Pacific Northwest River Basins Commission Instream Flow Workshop, March 15–16, 1972.

Van Deventer, J.S. and W.S. Platts. 1989. Microcomputer Software System for Generating Population Statistics from Electrofishing Data-User's Guide for MicroFish 3.0. U.S. Department of Agriculture, Forest Service. Intermountain Research Station, General Technical Report INT-254.

TABLES

This Page Intentionally Left Blank

Table AQ 6-1. 2023–2024 Fish Population Sampling Site Locations

Study Sites[1] [2]	Downstream Starting Location (UTM)[3]		Unit Number	Unit Type[4]	Elevation (ft)	Unit Length (m)	Unit Width (m)	Survey Date	Survey Method[5]	Study Reach Description
	Easting	Northing								
Rush Creek										
RC23.9	305491	4180023	1	MCP	9549	20	6.0	9/26/2023	E	Rush Creek above Waugh Lake
	305475	4180010	2	STP	9553	20	6.5		E	
	305380	4179949	3	LGR	9577	27	6.5		E	
	305356	4179988	4	HGR	9589	26	6.0		E	
RC23.4 (Waugh Lakebed)	306188	4180357	1	LGR	9430	100	19.7	9/26/2023	E	Waugh Lakebed
RC21.65	308422	4180588	1	HGR	9308	35	9.0	9/25/2023	E	Rush Creek below Rush Meadows Dam
	308389	4180602	2	MCP	9313	20	6.3		E	
	308370	4180609	3	HGR	9314	22	7.3		E	
	308362	4180627	4	STP	9315	17	5.8	9/27/2023	E	
RC18.55	312345	4181378	1	PLP	8359	18	14.0	9/27/2023, 8/21/2024	S	Rush Creek below Agnew Dam, above Horsetail Falls
	312299	4181204	2	LGR	8461	31	3.5		E	
	312281	4181178	3	Run	8463	47	4.5		E	
	312237	4181125	4	PLP	8466	17	5.3		S	
RC17.55	313116	4181948	1	HGR	7241	18	3.2	9/29/2023, 8/19/2024	E	Rush Creek below Horsetail Falls and above Silver Lake, above Highway 158
	313111	4181931	2	Run/MCP	7246	25	3.5		E	
	313090	4181921	3	LGR	7250	28	3.5		E	
	313063	4181933	4	STP	7252	12	3.0		E	
	313052	4181938	5	HGR	7256	25	4.0		E	
RC17.05	313007	4182607	1	MCP	7242	51	5.2	9/29/2023, 8/22/2024	S	Rush Creek above Silver Lake below Highway 158
	312934	4182532	2	Run	7242	55	5.2		S	
	312923	4182427	3	CRP	7242	115	5.2		S	
	312945	4182402	4	CRP/Run	7242	74	5.2		S	
	312880	4182391	5	LSP/CRP	7242	61	5.2		S	
RC13.9[6]	314038	4186020	1	MCP	7202	26	7.0	9/28/2023, 8/20/2024	S	Rush Creek below Silver Lake
	314012	4185998	2	LGR	7202	35	9.0		E	
	313961	4185929	3	HGR	7204	18	8.0		E	
	313962	4185910	4	MCP	7204	60	13.0		S	
	313849	4185887	5	STR	7205	42	14.0		E	
SRC0.15	not sampled in 2023		-	-	-	-	-	-	-	South Rush Creek above Highway 158
Reservoirs										
Gem Lake	311249	4180598	-	Reservoir	9050	-	-	9/28-9/29/2023	G	Gem Lake
Agnew Lake	311926	4180946	-	Reservoir	8515	-	-	9/29-9/30/2023	G	Agnew Lake

[1]Site ID includes a river abbreviation and river mile location. RC = Rush Creek, RM = river mile.

[2] See Map AQ 6-1.

[3] Universal Transverse Mercator Zone 11 South, North American Datum 1983

[4] Mesohabitat unit type: MCP= Mid-channel Pool; LGR= Low Gradient Riffle; HGR= High Gradient Riffle; STR= Step Run; CRP= Corner Pool; LSP= Lateral Scour Pool; STP= Step Pool; PLP= Plunge Pool

[5] S = Snorkel, E = Electrofishing, G = Gillnet

[6] This site was re-located from RM 15.2, as originally identified in the AQ - 6 RSP, to RM 13.9 in the field due to safety and accessiblity restrictions (large woody debris present in the stream channel).

This Page Intentionally Left Blank

Table AQ 6-2. Summary of Fish Species Observed During the 2023 and 2024 Fish Population Sampling

Study Site	Date	Fish Species[1]		
		RBT	BNT	BRK
Stream Segments				
RC23.9	9/26/2023			•
RC23.4 (Waugh Lakebed)	9/26/2023	•		•
RC21.65	9/25/2023, 9/27/2023	•		•
RC18.55	9/27/2023, 8/21/2024	•		•
RC17.55	9/29/2023, 8/19/2024	•	•	•
RC17.05	9/29/2023, 8/22/2024	•	•	•
RC13.9	9/28/2023, 8/20/2024	•	•	•
SRC0.15	NA [2]	-	-	-
Reservoirs				
Gem Lake	8/28-8/29/2023	•		•
Agnew Lake	8/29-8/30/2023	•		•

[1] RBT = Rainbow Trout, BNT = Brown Trout, BRK = Brook Trout

[2] Not sampled in 2023 or 2024.

Table AQ 6-3. Species and Life-Stage Periodicities

Species	Month											
Life Stage	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Rainbow Trout												
Spawning												
Incubation												
Fry												
Juvenile												
Adult												
Brown Trout												
Spawning												
Incubation												
Fry												
Juvenile												
Adult												
Brook Trout												
Spawning												
Incubation												
Fry												
Juvenile												
Adult												

Table AQ 6-4. Summary of Fish Sampled at Stream Sampling Sites in 2023 and 2024

Study Site	Date	Sample Type[1]	Species[2]		
			RBT	BNT	BRK
RC23.9[3]	9/26/2023	E	0	-	77
RC23.4 (Waugh Lakebed)	9/26/2023	E	1	-	25
RC21.65	9/25/2023, 9/27/2023	E	17	-	38
RC18.55	9/27/2023	E	23	-	110
		S	9	-	40
	8/21/2024	E	22	-	115
		S	11	-	57
RC17.55	9/29/2023	E	39	75	41
	8/19/2024	E	24	262	8
RC17.05	9/29/2023	S	12	18	2
	8/22/2024	S	103	114	7
RC13.9	9/28/2023	E	0	172	0
		S	83	77	0
	8/20/2024	E	11	149	0
		S	87	387	23
SRC0.15	NA[4]	-	-	-	-

[1] E = Electrofishing, S = Snorkeling

[2] RBT = Rainbow Trout, BNT = Brown Trout, BRK = Brook Trout

[3] Not sampled in 2023 or 2024.

[4] Sites RC23.9, RC23.4, and RC21.65 were not sampled in 2024.

Table AQ 6-5. Species Density and Biomass at Sampling Sites in 2023 and 2024

Study Site	Habitat Type	Number of Fish Captured						Population Estimate						Species[1] Density										Species Biomass											
		RBT		BNT		BRK		RBT		BNT		BRK		RBT				BNT				BRK				RBT				BNT				BRK			
														fish/mile		fish/ft²		fish/mile		fish/ft²		fish/mile		fish/ft²		lbs/acre		lbs/mi		lbs/acre		lbs/mi		lbs/acre		lbs/mi	
		2023	2024	2023	2024	2023	2024	2023	2024	2023	2024	2023	2024	2023		2024		2023		2024		2023		2024		2023		2024		2023		2024		2023		2024	
RC23.9	MCP	0	[2]	-	-	26	-	0	-	-	-	28	-	0	0.00000	-	-	-	-	-	-	2253	0.02168	-	-	0.00	0.00	-	-	-	-	-	-	59.52	142.02	-	-
	STP	0		-		24		0		-		24		0	0.00000			-	-			1931	0.01715			0.00	0.00			-	-			40.50	104.68		
	LGR	0		-		15		0		-		15		0	0.00000			-	-			894	0.00794			0.00	0.00			-	-			23.02	59.50		
	HGR	0		-		12		0		-		12		0	0.00000			-	-			743	0.00715			0.00	0.00			-	-			17.07	40.73		
	Site Total	**0**		**-**		**77**		**0**		**-**		**79**		**0**	**0.00000**			**-**	**-**			**1367**	**0.01262**			**0.00**	**0.00**			**-**	**-**			**32.86**	**81.72**		
RC23.4 (Waugh Lakebed)	LGR	1	-	-	-	25	-	1	-	-	-	27	-	16	0.00005	-	-	-	-	-	-	435	0.00127	-	-	0.02	0.12	-	-	-	-	-	-	1.58	12.39	-	-
	Site Total	**1**		**-**		**25**		**1**		**-**		**27**		**16**	**0.00005**			**-**	**-**			**435**	**0.00127**			**0.02**	**0.12**			**-**	**-**			**1.56**	**12.25**		
RC21.65	HGR	8	-	-	-	23	-	8	-	-	-	33	-	226	0.00156	-	-	-	-	-	-	932	0.00645	-	-	5.54	18.39	-	-	-	-	-	-	17.12	56.80	-	-
	MCP	7		-		9		7		-		14		563	0.00516			-	-			1127	0.01032			15.79	39.56			-	-			21.91	54.89		
	STP	2		-		6		2		-		6		189	0.00188			-	-			568	0.00565			12.70	29.28			-	-			17.86	41.20		
	Site Total	**17**		**-**		**38**		**17**		**-**		**53**		**291**	**0.00226**			**-**	**-**			**907**	**0.00703**			**8.39**	**24.87**			**-**	**-**			**18.08**	**53.57**		
RC18.55	PLP*	9	11	-	-	40	57	9	11	-	-	40	57	414	0.00244	536	0.00361	-	-	-	-	1839	0.01086	2780	0.01872	39.98	155.40	54.93	187.29	-	-	-	-	67.73	263.25	132.89	453.07
	LGR	16	13	-	-	70	36	16	13	-	-	85	38	831	0.01370	697	0.00732	-	-	-	-	4413	0.07278	2039	0.02140	50.76	70.65	28.30	61.89	-	-	-	-	85.20	118.59	45.15	98.76
	Run	7	9	-	-	40	79	8	9	-	-	88	154	274	0.00351	308	0.00296	-	-	-	-	3013	0.03865	5273	0.05073	7.57	13.55	5.36	12.80	-	-	-	-	140.72	251.82	150.15	358.27
	Site Total	**32**	**33**	**-**	**-**	**150**	**172**	**33**	**33**	**-**	**-**	**213**	**249**	**470**	**0.00463**	**483**	**0.00420**	**-**	**-**	**-**	**-**	**3034**	**0.02989**	**3643**	**0.03169**	**31.39**	**73.15**	**29.76**	**78.53**	**-**	**-**	**-**	**-**	**93.91**	**218.81**	**119.72**	**315.93**
RC17.55	HGR	20	24	40	151	17	7	21	24	43	216	17	8	786	0.01238	898	0.01831	1609	0.02535	8084	0.16475	636	0.01002	299	0.00610	36.24	52.82	43.59	49.10	9.38	13.67	185.89	209.40	30.15	43.94	46.94	52.87
	Run/MCP	10	0	16	40	15	0	11	0	17	56	15	0	708	0.01168	0	0.00000	1094	0.01805	3605	0.04840	966	0.01593	0	0.00000	79.41	110.53	0.00	0.00	21.67	30.16	29.20	49.93	87.93	122.39	0.00	0.00
	LGR	3	0	11	41	5	0	3	0	11	45	5	0	172	0.00284	0	0.00000	632	0.01043	2586	0.03733	287	0.00474	0	0.00000	8.63	12.01	0.00	0.00	9.07	12.62	19.26	30.64	20.99	29.22	0.00	0.00
	STP	6	0	8	30	4	1	6	0	8	31	4	1	805	0.01548	0	0.00000	1073	0.02065	3838	0.09231	536	0.01032	124	0.00298	67.14	80.10	0.00	0.00	158.59	189.20	27.33	26.09	42.40	50.59	48.93	46.70
	Site Total	**39**	**24**	**75**	**262**	**41**	**8**	**41**	**24**	**79**	**348**	**41**	**9**	**611**	**0.01005**	**354**	**0.00599**	**1177**	**0.01936**	**5138**	**0.08679**	**611**	**0.01005**	**133**	**0.00224**	**42.00**	**58.63**	**14.25**	**19.37**	**26.30**	**36.72**	**77.29**	**105.04**	**42.28**	**59.02**	**19.45**	**26.43**
RC17.05	MCP*	0	7	0	11	0	2	0	7	0	11	0	2	0	0.00000	220	0.01118	0	0.00000	346	0.00771	0	0.00000	63	0.00046	0.00	0.00	1.07	2.21	0.00	0.00	0.74	1.53	0.00	0.00	0.04	0.09
	Run*	0	0	3	0	0	0	0	0	3	0	0	0	0	0.00000	0	0.00000	88	0.00097	0	0.00000	0	0.00000	0	0.00000	0.00	0.00	0.00	0.00	37.35	76.96	0.00	0.00	0.00	0.00	0.00	0.00
	CRP*	12	39	13	22	0	3	12	39	13	22	0	3	168	0.00187	546	0.00609	182	0.00203	308	0.00343	0	0.00000	42	0.00047	25.73	53.02	356.27	734.12	30.93	63.73	106.85	220.18	0.00	0.00	0.68	1.39
	CRP/Run*	0	14	0	12	0	0	0	14	0	12	0	0	0	0.00000	303	0.00338	0	0.00000	260	0.00289	0	0.00000	0	0.00000	0.00	0.00	218.21	449.65	0.00	0.00	140.57	259.67	0.00	0.00	0.00	0.00
	LSP/CRP*	0	0	2	4	2	2	0	0	2	14	2	2	0	0.00000	0	0.00000	53	0.00059	105	0.00117	53	0.00059	53	0.00059	0.00	0.00	0.00	0.00	0.45	0.94	0.06	0.13	0.03	0.07	0.04	0.08
	Site Total	**12**	**60**	**18**	**49**	**2**	**7**	**12**	**60**	**18**	**49**	**2**	**7**	**54**	**0.00060**	**271**	**0.00301**	**81**	**0.00090**	**221**	**0.00246**	**9**	**0.00010**	**32**	**0.00035**	**8.28**	**17.07**	**160.32**	**330.36**	**15.81**	**32.57**	**48.73**	**100.42**	**0.01**	**0.01**	**0.23**	**0.48**
RC13.9	MCP*	83	87	77	87	0	23	83	87	77	387	0	23	1553	0.00802	1945	0.00889	1441	0.00744	8651	0.03956	0	0.00000	514	0.00235	8.75	38.92	5.25	24.38	4.87	21.68	4.30	21.58	0.00	0.00	1.92	0.75
	LGR	37	2	73	2	0	0	140	2	128	120	0	0	6437	0.04129	87	0.00053	5886	0.03775	5219	0.03172	0	0.00000	0	0.00000	24.43	87.45	0.10	0.37	18.57	66.48	5.58	21.10	0.00	0.00	0.00	0.00
	HGR	16	8	39	10	0	0	17	10	50	51	0	0	1520	0.01097	847	0.00515	4470	0.03226	4320	0.02625	0	0.00000	0	0.00000	3.39	10.79	12.14	45.87	19.87	63.23	4.48	16.93	0.00	0.00	0.00	0.00
	STR	37	1	60	47	0	0	37	1	60	54	0	0	1418	0.00585	36	0.00020	2299	0.00948	1931	0.01062	0	0.00000	0	0.00000	0.88	4.90	0.01	0.03	12.88	71.70	15.06	62.90	0.00	0.00	0.00	0.00
	Site Total	**173**	**98**	**249**	**536**	**0**	**23**	**277**	**100**	**315**	**612**	**0**	**23**	**2876**	**0.01409**	**1150**	**0.00599**	**3271**	**0.01602**	**7035**	**0.03667**	**0**	**0.00000**	**264**	**0.00138**	**8.52**	**43.92**	**3.47**	**18.87**	**10.44**	**53.81**	**7.21**	**39.19**	**0.00**	**0.00**	**0.07**	**0.39**
SRC0.15	-	not sampled in 2023 or 2024																																			

[1] RBT = Rainbow Trout, BNT = Brown Trout, BRK = Brook Trout

[2] = RC23.9, RC23.4, and RC21.65 were not sampled in 2024.

* These sites were sampled by snorkeling. All other sites were sampled by electrofishing.

This Page Intentionally Left Blan

Table AQ 6-6. Combined Trout Density and Biomass at Sampling Sites in 2023 and 2024

Study Site	Year	Density		Biomass	
		fish/mile	fish/ft²	lbs/acre	lbs/mi
RC23.9	2023	1,374	0.013	32.9	81.7
	2024	--	--	--	--
RC23.4 (Waugh Lakebed)	2023	451	0.001	1.6	12.4
	2024	--	--	--	--
RC21.65	2023	1,198	0.009	26.5	78.4
	2024	--	--	--	--
RC18.55	2023	3,504	0.035	125.3	292.0
	2024	4,126	0.036	149.5	394.5
RC17.55	2023	2,399	0.039	110.6	154.4
	2024	5,625	0.095	111.0	150.8
RC17.05	2023	144	0.002	24.1	49.7
	2024	523	0.006	209.3	431.3
RC13.9	2023	6,147	0.030	19.0	97.7
	2024	8,449	0.044	10.8	58.4
SRC0.15	2023	Dry			
	2024	Dry			

Table AQ 6-7. Historical Comparison of Species Density and Biomass in Rush Creek (Site RC21.65) Below Rush Meadows Dam

Year	Season	Species[1]	Population Estimate	Species Density		Species Biomass	
				fish/mile	fish/ft²	lbs/acre	lbs/mile
1999	Summer	BRK	8	128	0.001	3.57	9.74
		RBT	6	96	0.001	3.57	9.70
	Fall	BRK	41	656	0.009	29.44	48.16
		RBT	8	128	0.002	9.81	14.42
2000	Summer	BRK	17	272	0.002	7.14	32.16
		RBT	6	96	0.001	3.57	9.86
	Fall	BRK	44	704	0.009	34.79	75.34
		RBT	19	304	0.005	23.20	39.28
2001	Summer	BRK	49	784	0.008	30.33	67.50
		RBT	24	384	0.005	28.55	57.02
	Fall	BRK	34	544	0.007	29.44	48.32
		RBT	18	280	0.005	34.79	45.79
2002	Spring	BRK	37	584	0.006	12.49	32.07
		RBT	20	320	0.003	13.38	33.99
2010	Spring	BRK	35	563	0.005	14.90	38.74
		RBT	19	306	0.003	14.63	31.08
	Summer	BRK	21	334	0.003	13.56	27.94
		RBT	9	145	0.001	4.91	13.12
2023	Summer	BRK	53	907	0.007	18.08	53.57
		RBT	17	291	0.002	8.39	24.87

[1] BRK = Brook Trout; RBT = Rainbow Trout.

Table AQ 6-8. Condition Factors by Species Collected by Electrofishing (2023–2024) and Gillnetting (2023)

Site ID	RBT[2]				BNT				BRK			
	2023		2024		2023		2024		2023		2024	
	Average Condition Factor	n[4]	Average Condition Factor	n	Average Condition Factor	n	Average Condition Factor	n	Average Condition Factor	n	Average Condition Factor	n
Stream Segments[3]												
RC23.9	-	0	-		-	-	-		1.07	75	-	
RC23.4 (Waugh Lakebed)	0.84	1	-		-	-	-		1.13	14	-	
RC21.65	1.09	17	-		-	-	-		0.97	38	-	
RC18.55	1.06	21	1.04	22	-	0	-	0	1.02	87	1.00	114
RC17.55	1.02	35	1.01	20	1.05	67	1.07	221	0.97	41	1.10	7
RC17.05[5]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RC13.9	1.13	58	1.05	8	1.08	168	1.11	86	-	0	-	0
SRC0.15[6]	-				-				-			
Reservoirs												
Gem Lake	1.10	18	-		-	observed	-		0.99	6	-	
Agnew Lake	1.01	4	-		-	observed	-		1.06	15	-	

[1] Captured fish under 50mm in fork length were excluded from condition factor analysis.

[2] RBT = Rainbow Trout, BNT = Brook Trout, BRK = Brook Trout

[3] RC23.9, RC23.4, RC21.65, and reservoirs were not sampled in 2024.

[4] 0 indicates no fish of this species were captured at the site.

[5] Snorkel only site. No individual weights were collected to calculate condition factors.

[6] Not sampled in 2023 or 2024.

Table AQ 6-9. Reservoir Gillnetting Catch and Catch Per Unit Effort (CPUE)

Date	Total Nets Deployed	Total Deployment Hours	Average Hours per Net	Reservoir Totals		RBT[1]		BRK	
				Total Fish	Fish per net hour	Total Fish	Fish per net hour	Total Fish	Fish per net hour
Agnew Lake									
8/29-8/30/2023	4	76.7	19.2	19	0.25	4	0.05	15	0.20
Gem Lake									
8/28-8/29/2023	6	132.7	22.1	24	0.18	18	0.14	6	0.05

[1]RBT = Rainbow Trout; BRK = Brook Trout

Table AQ 6-10. Historical Comparison of Reservoir Gillnetting Catch and Catch Per Unit Effort (CPUE)

Year	Total Nets Deployed	Total Deployment Hours	Reservoir Totals		RBT[1]		BRK	
			Total Fish	Fish per net hour	Total Fish	Fish per net hour	Total Fish	Fish per net hour
Agnew Lake								
2023	4	76.7	19	0.25	4	0.05	15	0.20
2002	1	13.4	31	2.31	6	0.45	25	1.87
Gem Lake								
2023	6	132.7	24	0.18	18	0.14	6	0.05
2002	1	8	5	0.63	2	0.25	3	0.38

[1]RBT = Rainbow Trout; BRK = Brook Trout

Table AQ 6-11. Quantitative Measurements of Anthropogenic Passage Barriers

Barrier Name	RM	Barrier Type(s)	Leap Height (inches)	Minimum Depth (inches)	Plunge Pool Depth (inches)	Fish Passage Category
LADWP Gage Weir (Below Silver Lake)	13.67	Leap, Velocity	12	4	12	Potentially Passable
Upper Silver Lake Sediment Delta	16.5	Depth	NA	<6[a]	NA	Critical Riffle (Temporary)
Agnew Gage Wier	18.49	Leap, Depth, Velocity	30	2	36	Potentially Passable[b]
Agnew Dam (Notches)	18.6	Leap, Depth	36	1	12	Not Passable[b]
Upper Agnew Sediment Delta	19.1	Depth	NA	1	NA	Critical Riffle (Temporary)
Gem Dam	19.47	Dam[c]	NA	NA	NA	Not Passable
Rush Meadows Dam	22.25	Dam[c]	NA	NA	NA	Not Passable
Waugh Lakebed	23.5	Depth	NA	2	NA	Critical Riffle (Temporary)

[a] Minimum depths are dependent on lake surface elevation and were not observed in 2023.

[b] Fish access to these infrastructure barriers is restricted by natural barriers downstream.

[c] Primary water release points in Agnew and Waugh Dams are valves that are impassable to fish.

FIGURES

This Page Intentionally Left Blank

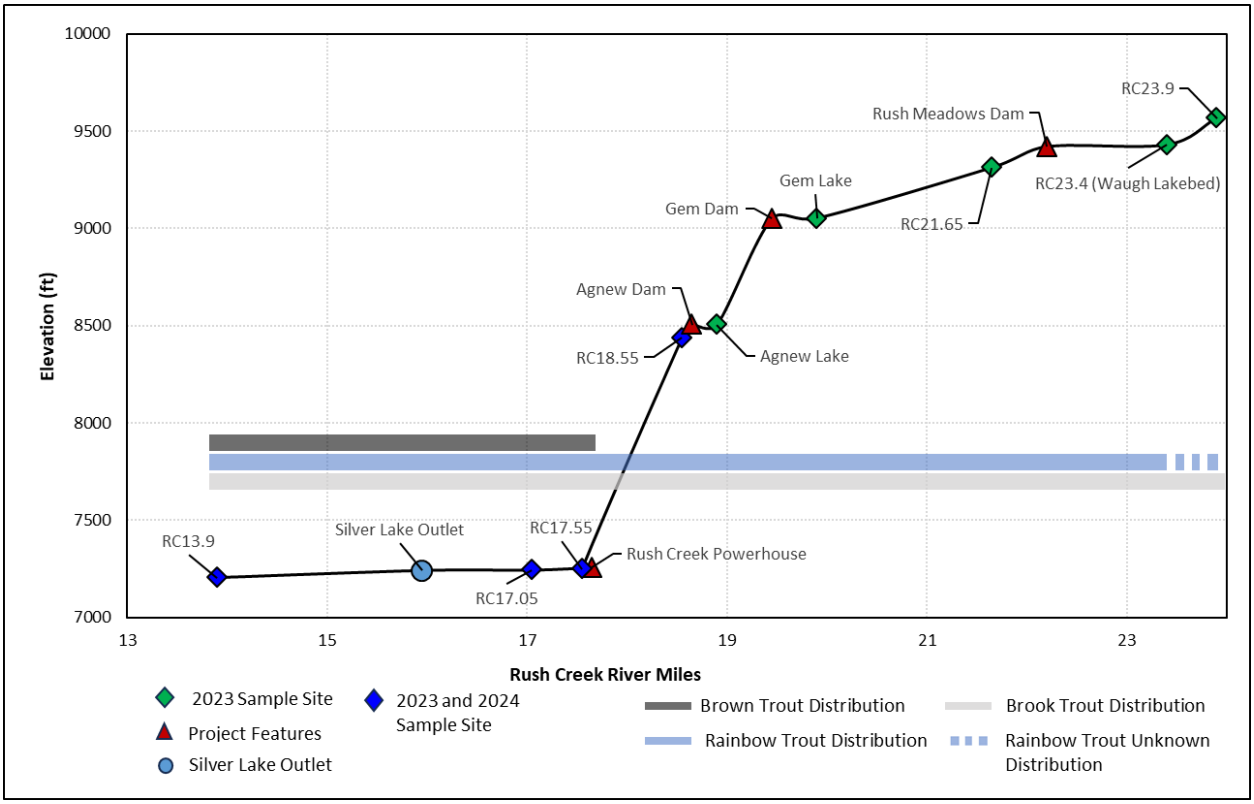


Figure AQ 6-1. Elevations of Sampling Sites on Rush Creek and Fish Species Distribution

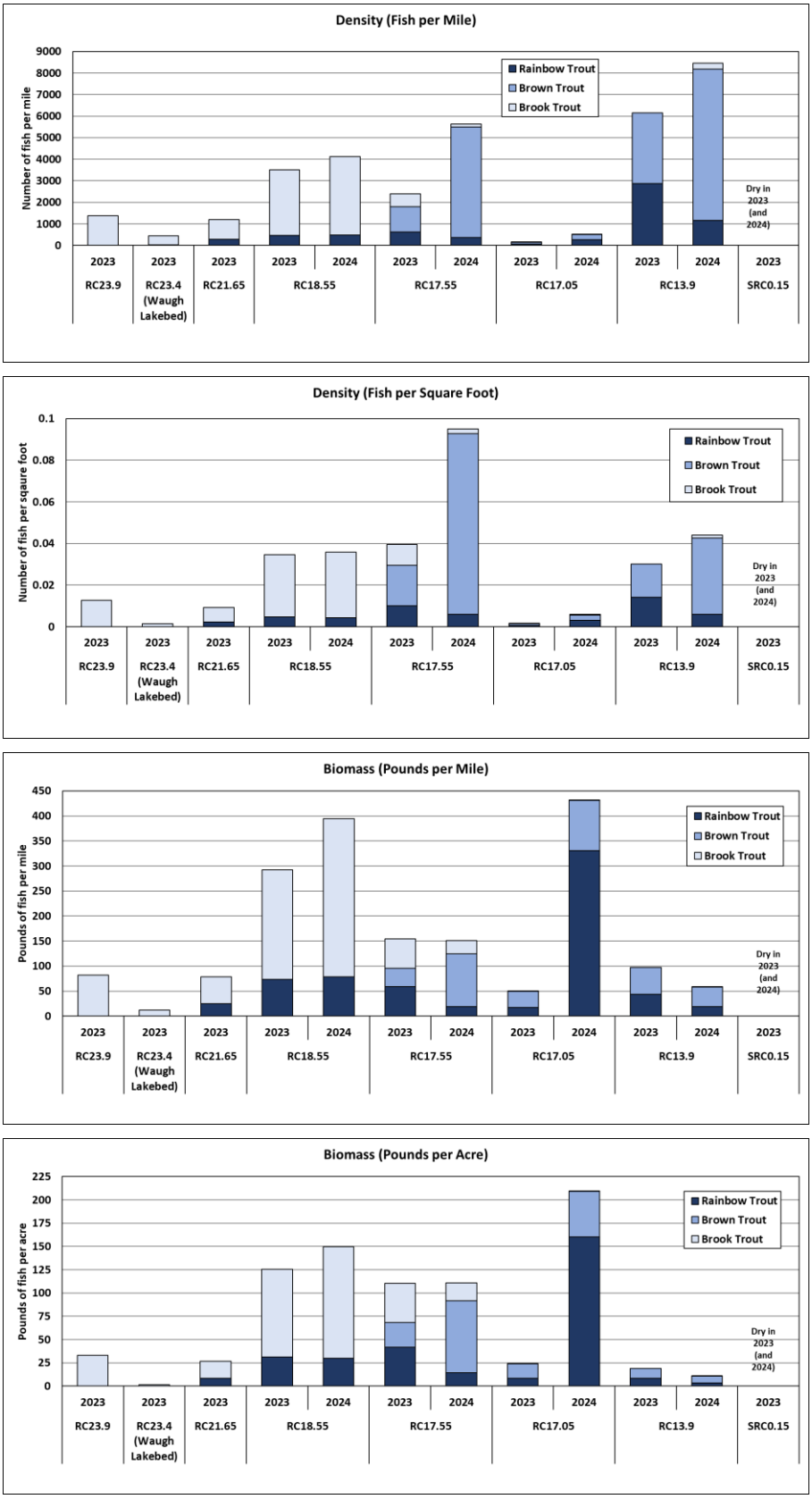


Figure AQ 6-2. Density and Biomass of Fish at Sampling Sites

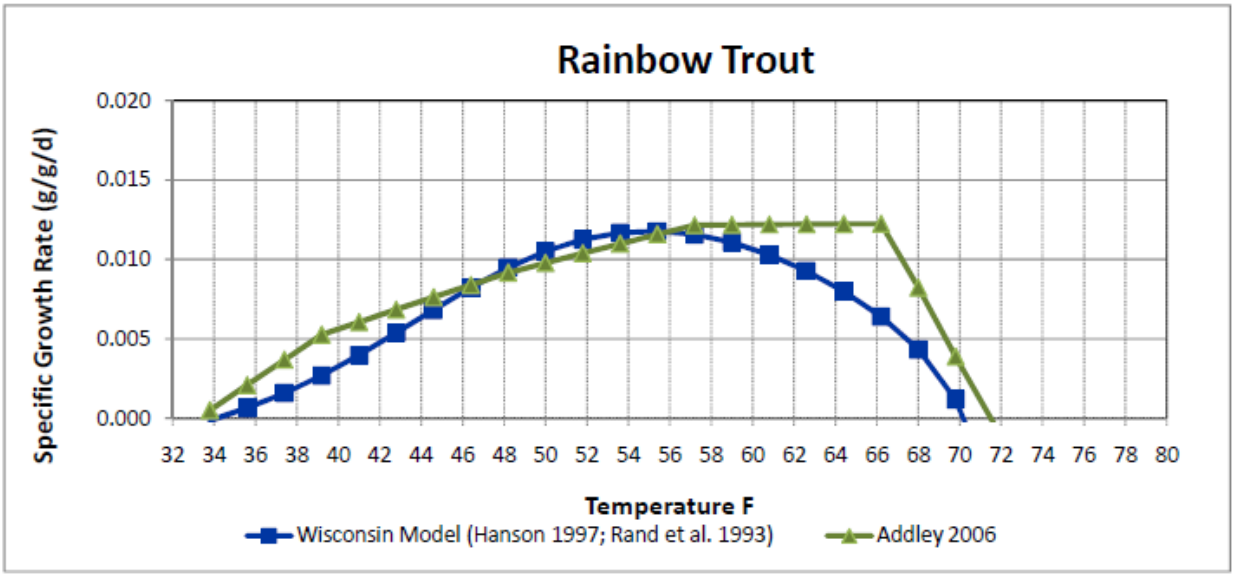
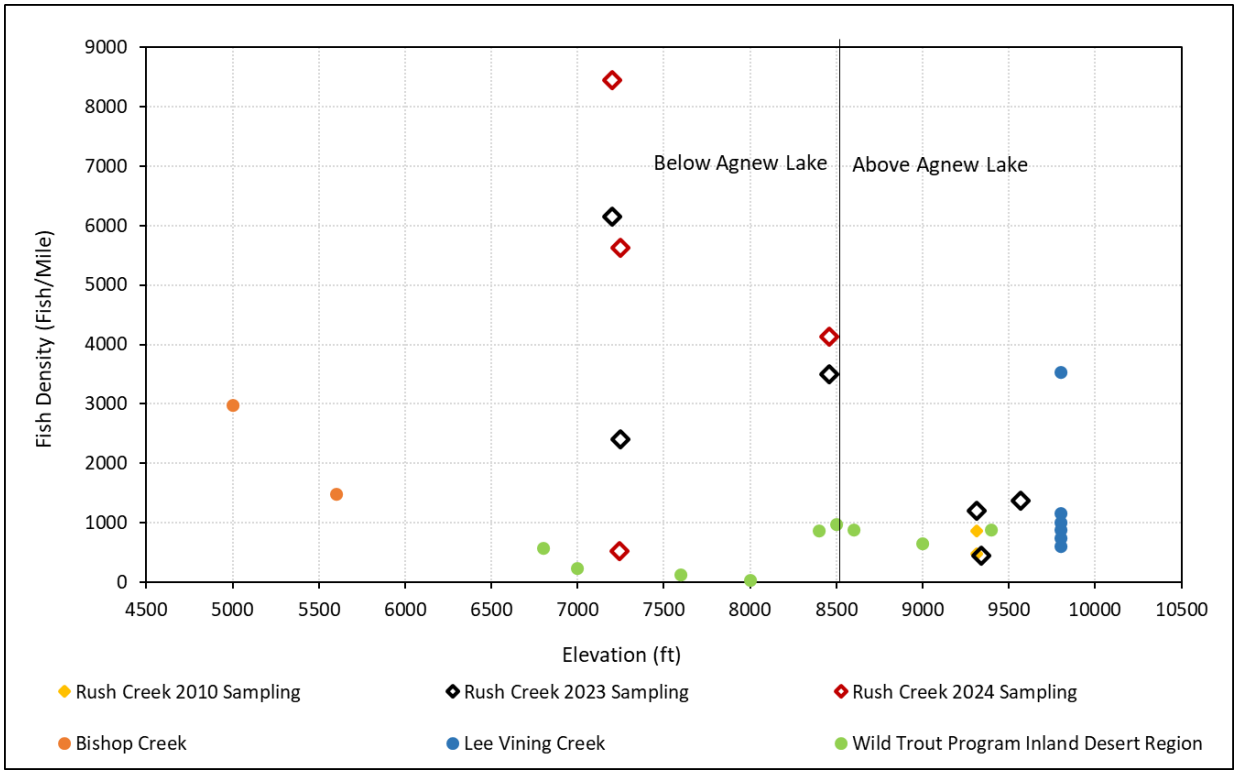


Figure AQ 6-3. Example of the Rainbow Trout Growth Versus Temperature Relationships (g/g/day) for the Wisconsin Model (Hanson 1997) and Addley (2006)



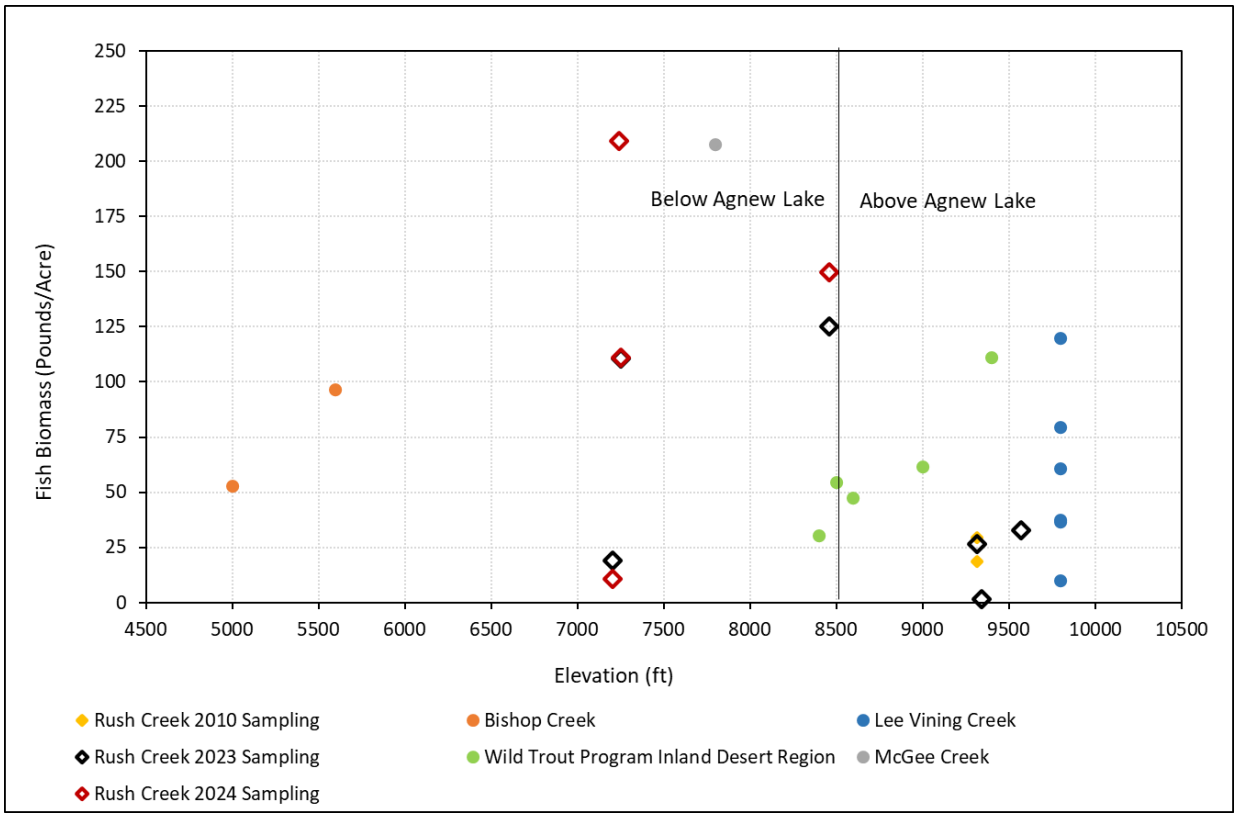
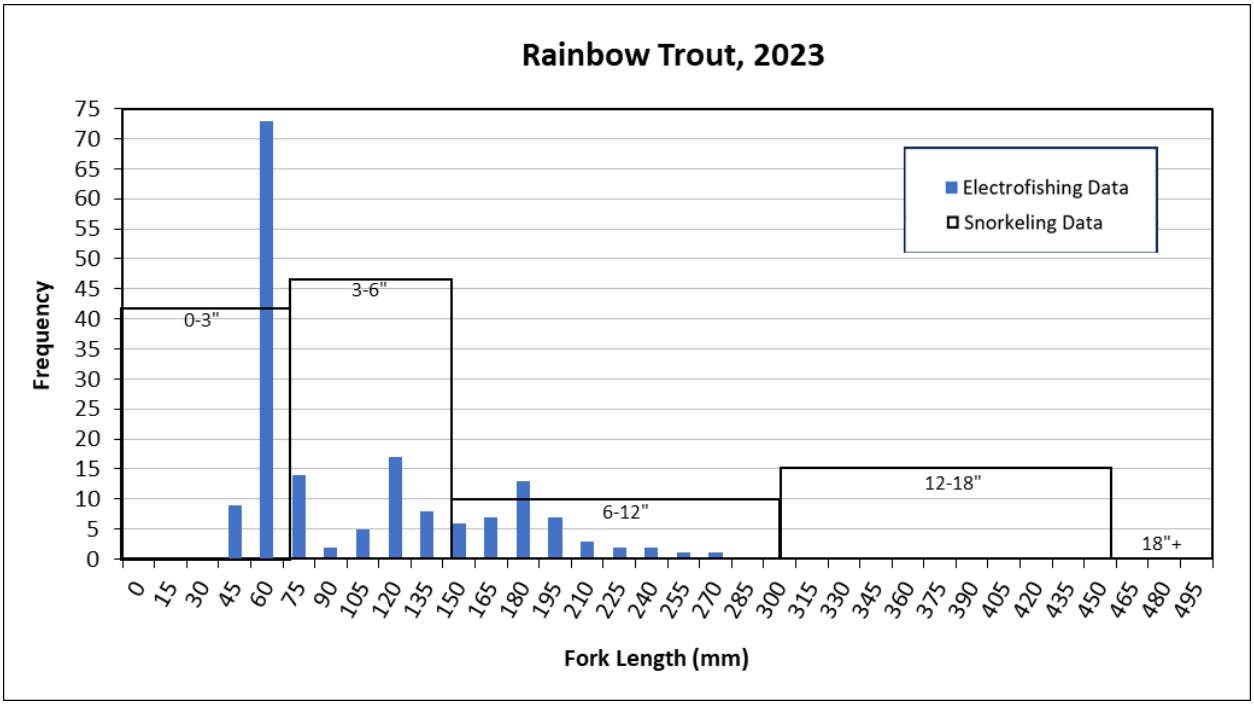


Figure AQ 6-4. Fish per Mile (top) and Pounds per Acre (bottom) Versus Elevation for Historical Eastern Sierra Stream Data Sets and Rush Creek 2023 and 2024 Sampling



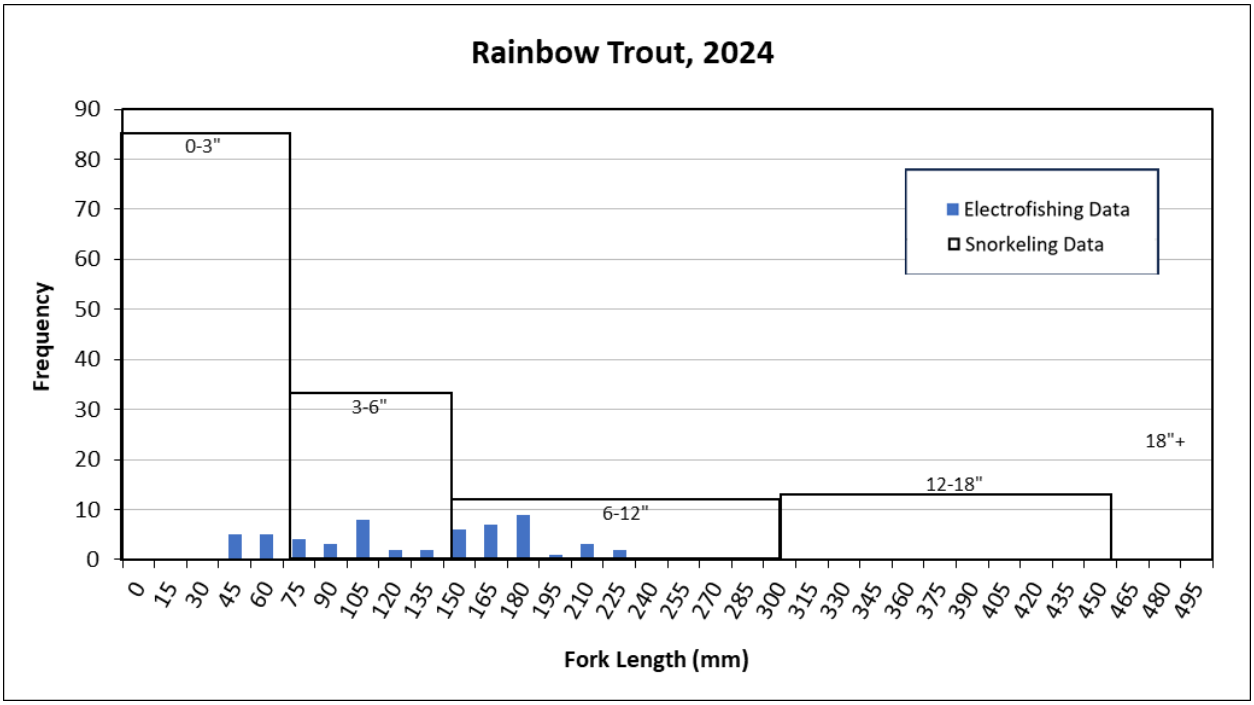


Figure AQ 6-5a. Length-Frequency Histograms for Rainbow Trout Captured During Electrofishing and Snorkeling at All Sites Sampled in 2023 (top) and 2024 (bottom)

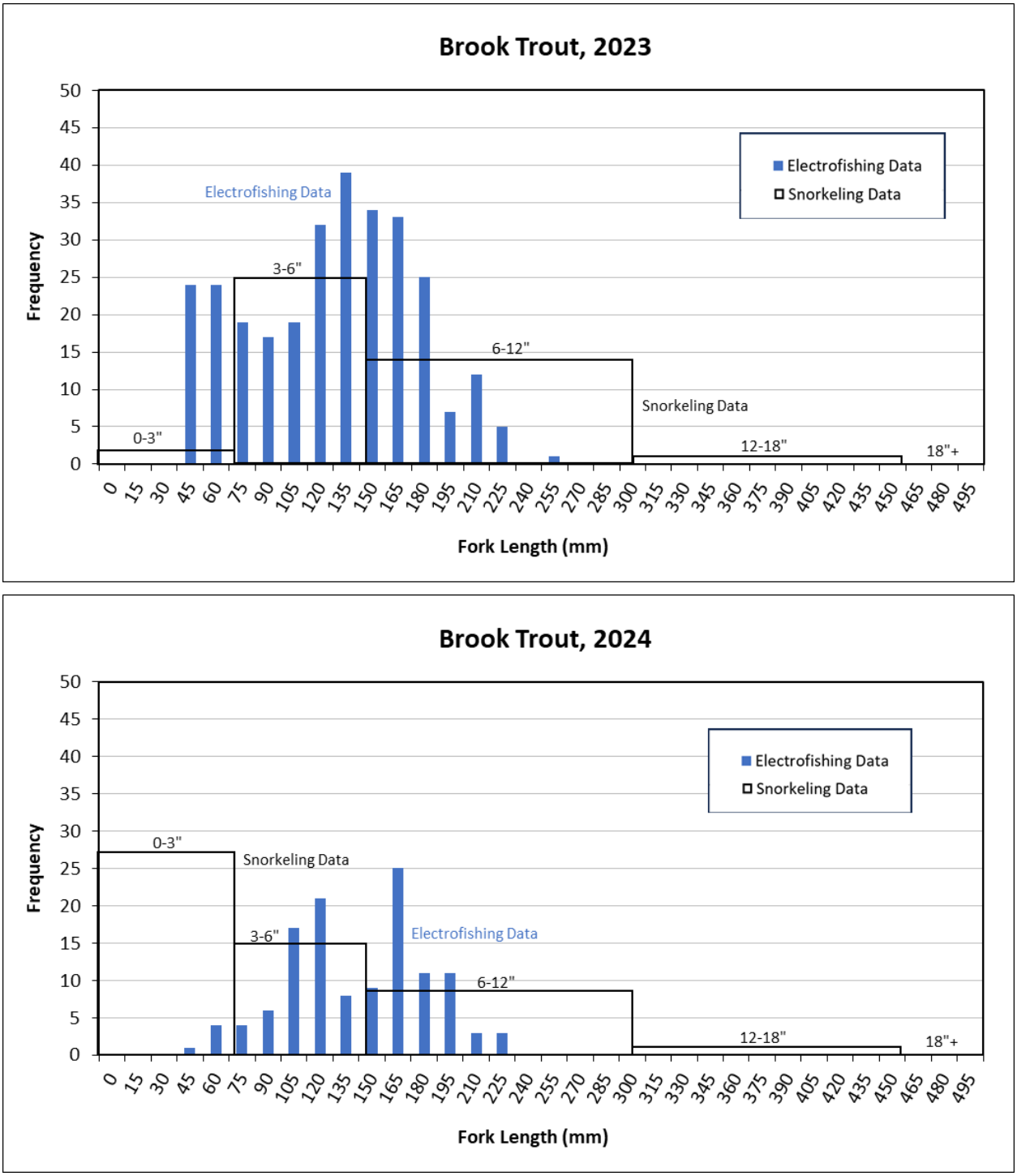
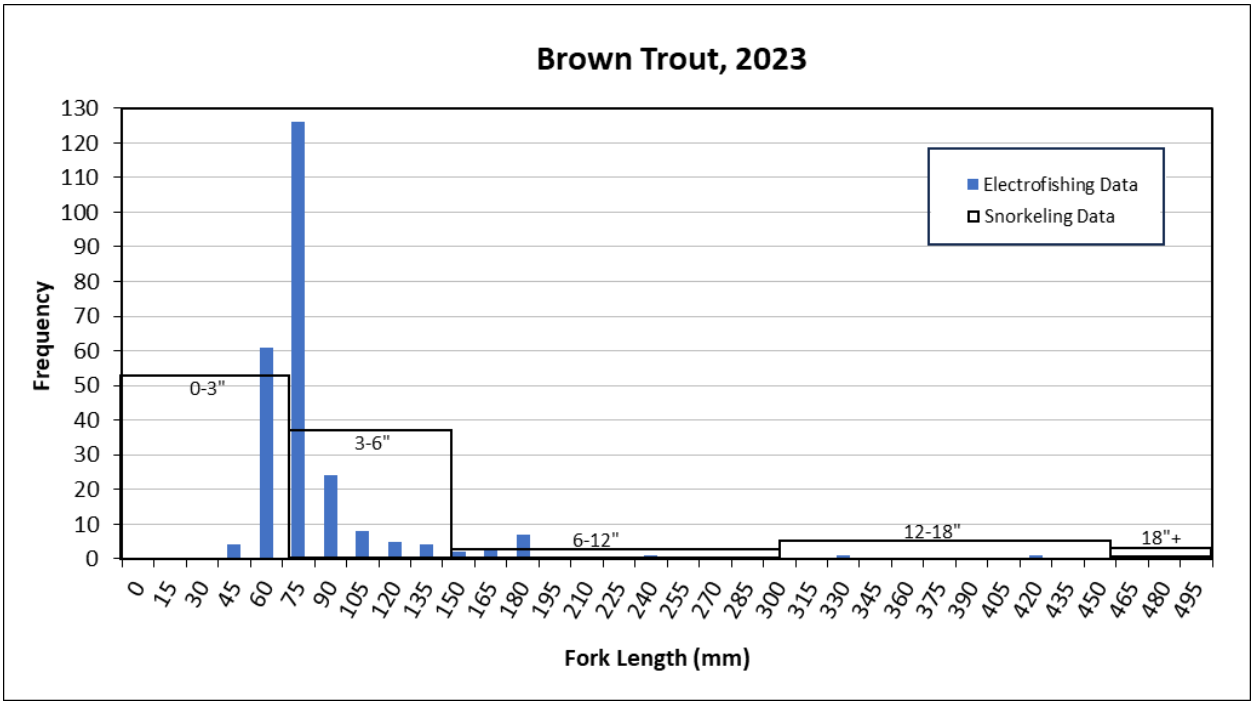


Figure AQ 6-5b. Length-Frequency Histograms for Brook Trout Captured During Electrofishing and Snorkeling at All Sites Sampled in 2023 (top) and 2024 (bottom)



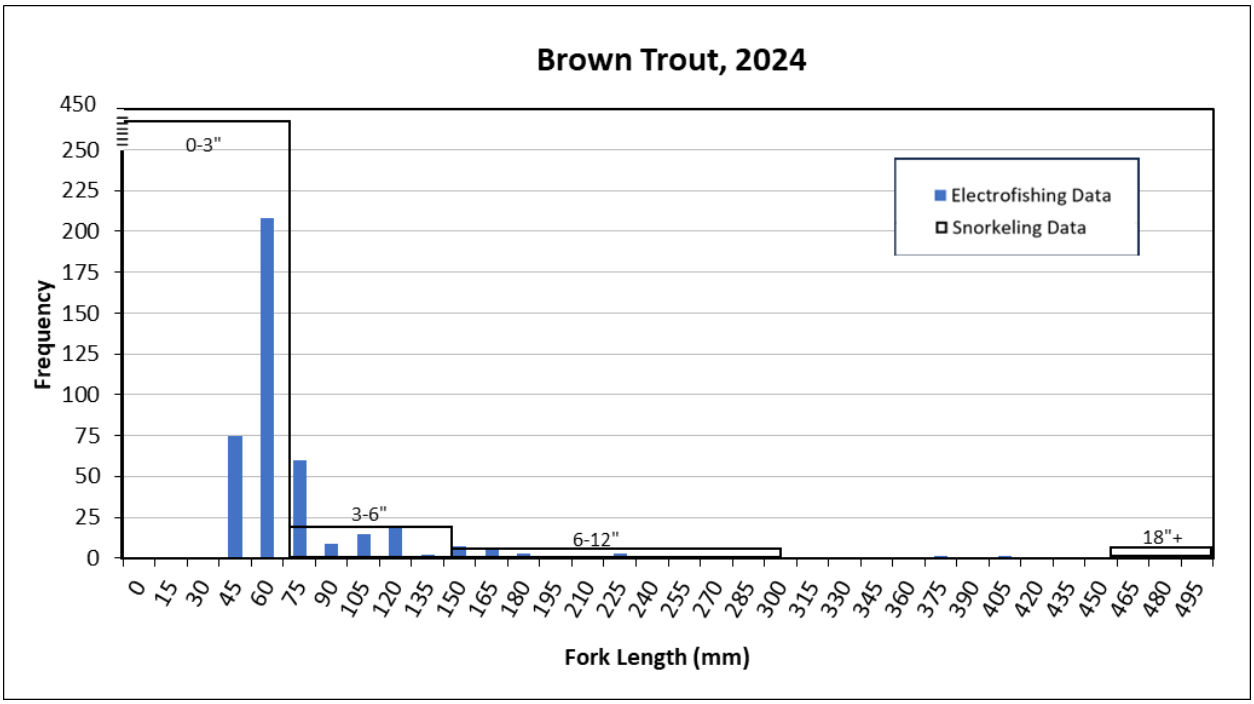


Figure AQ 6-5c. Length-Frequency Histograms for Brown Trout Captured During Electrofishing and Snorkeling at All Sites Sampled in 2023 (top) and 2024 (bottom)

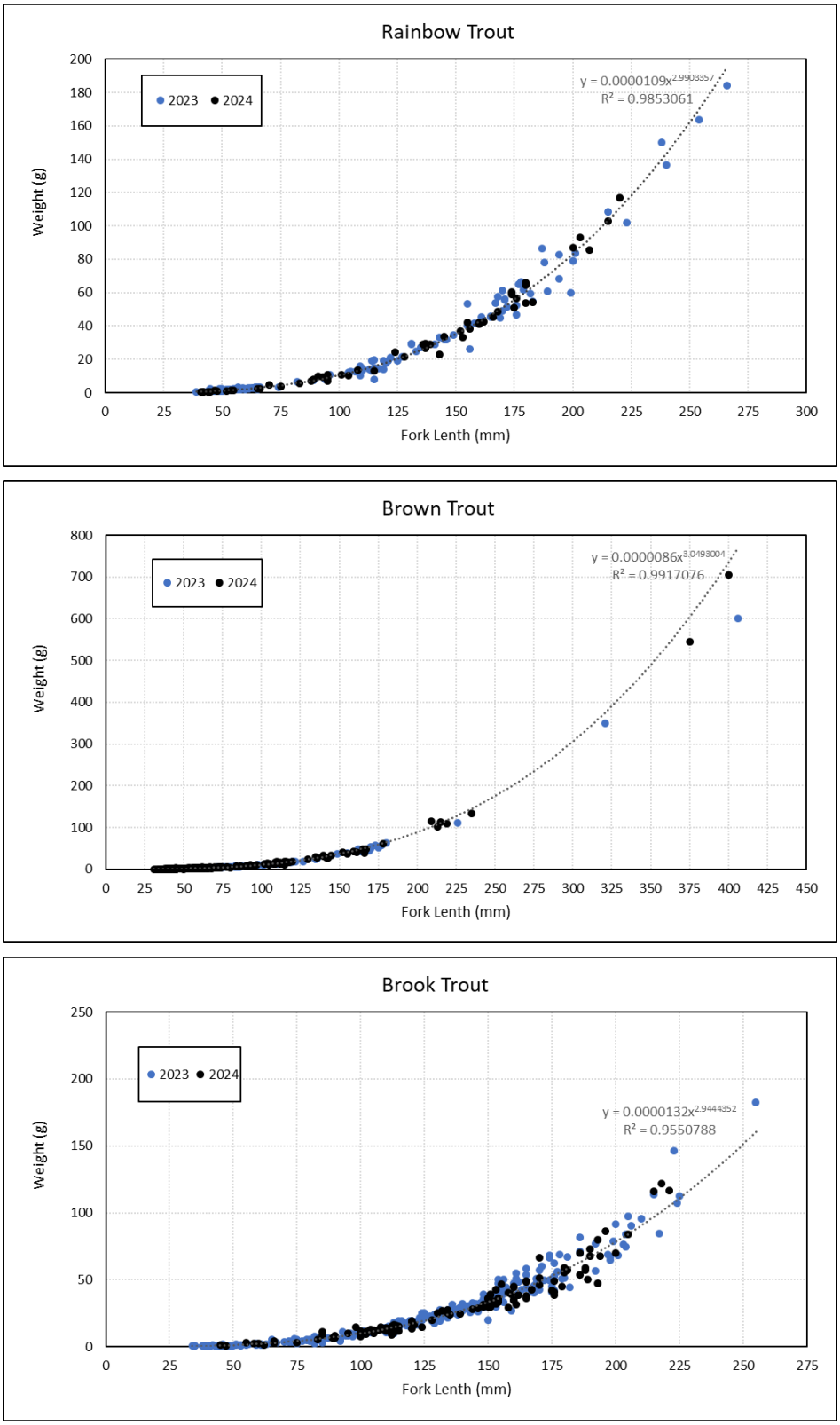


Figure AQ 6-6. Length and Weight Relationship for Each Species at All Sampling Sites Combined

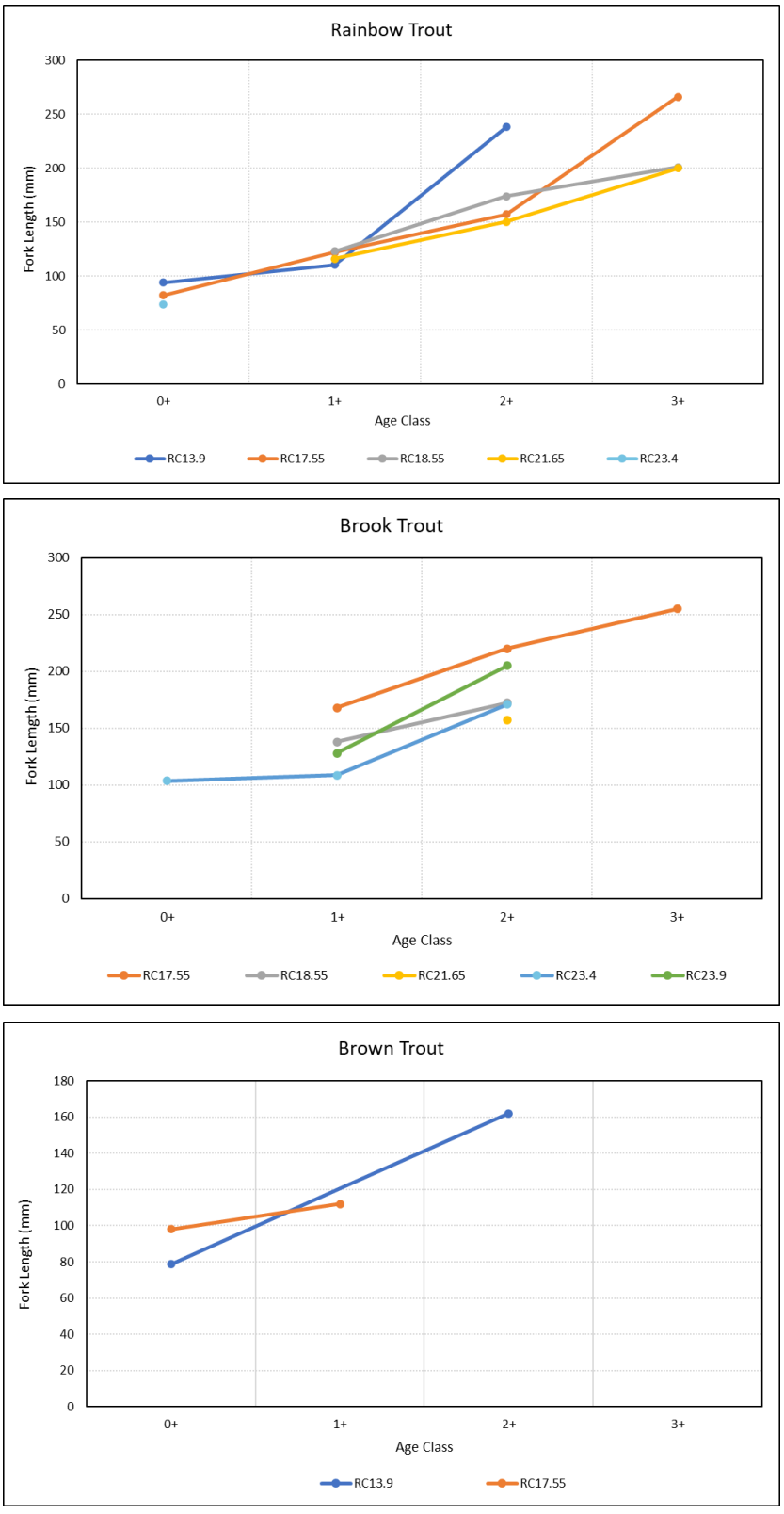
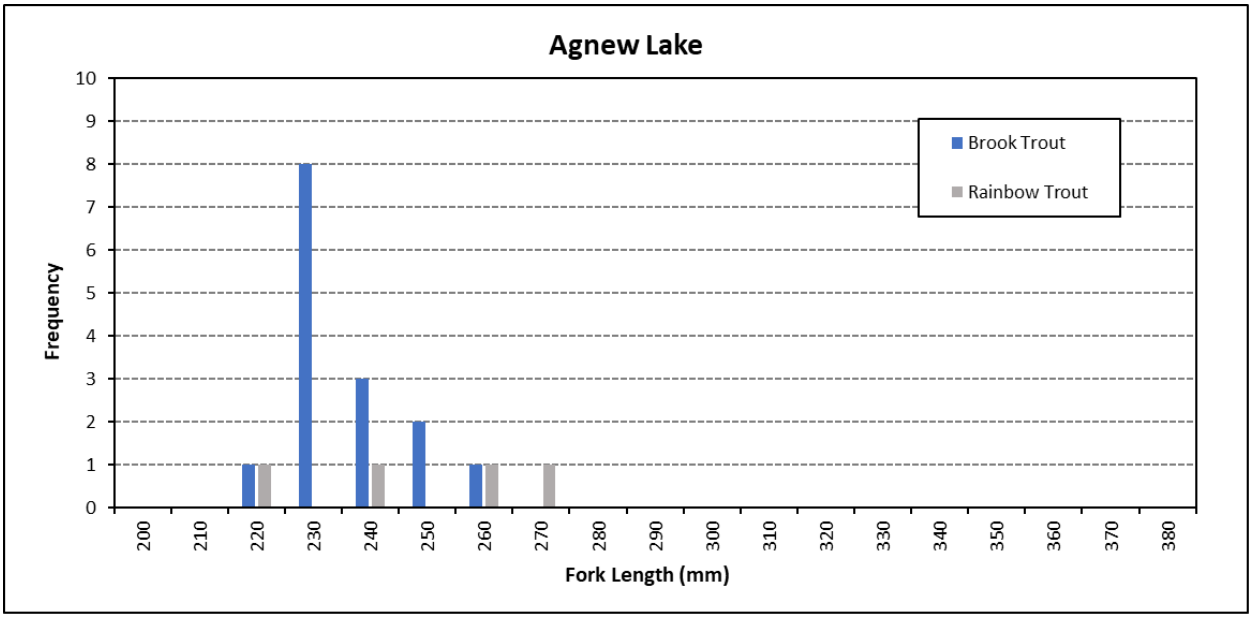


Figure AQ 6-7. Age and Growth Rates of Each Species for All Sampling Sites Combined Based on 2023 Scale Analysis



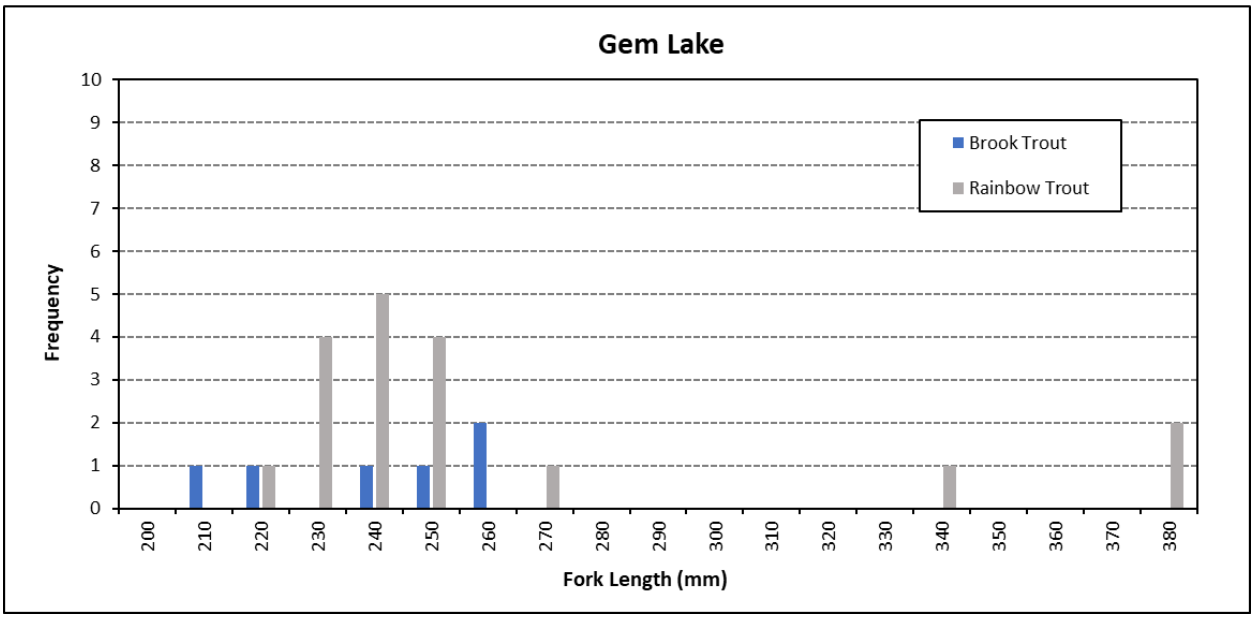
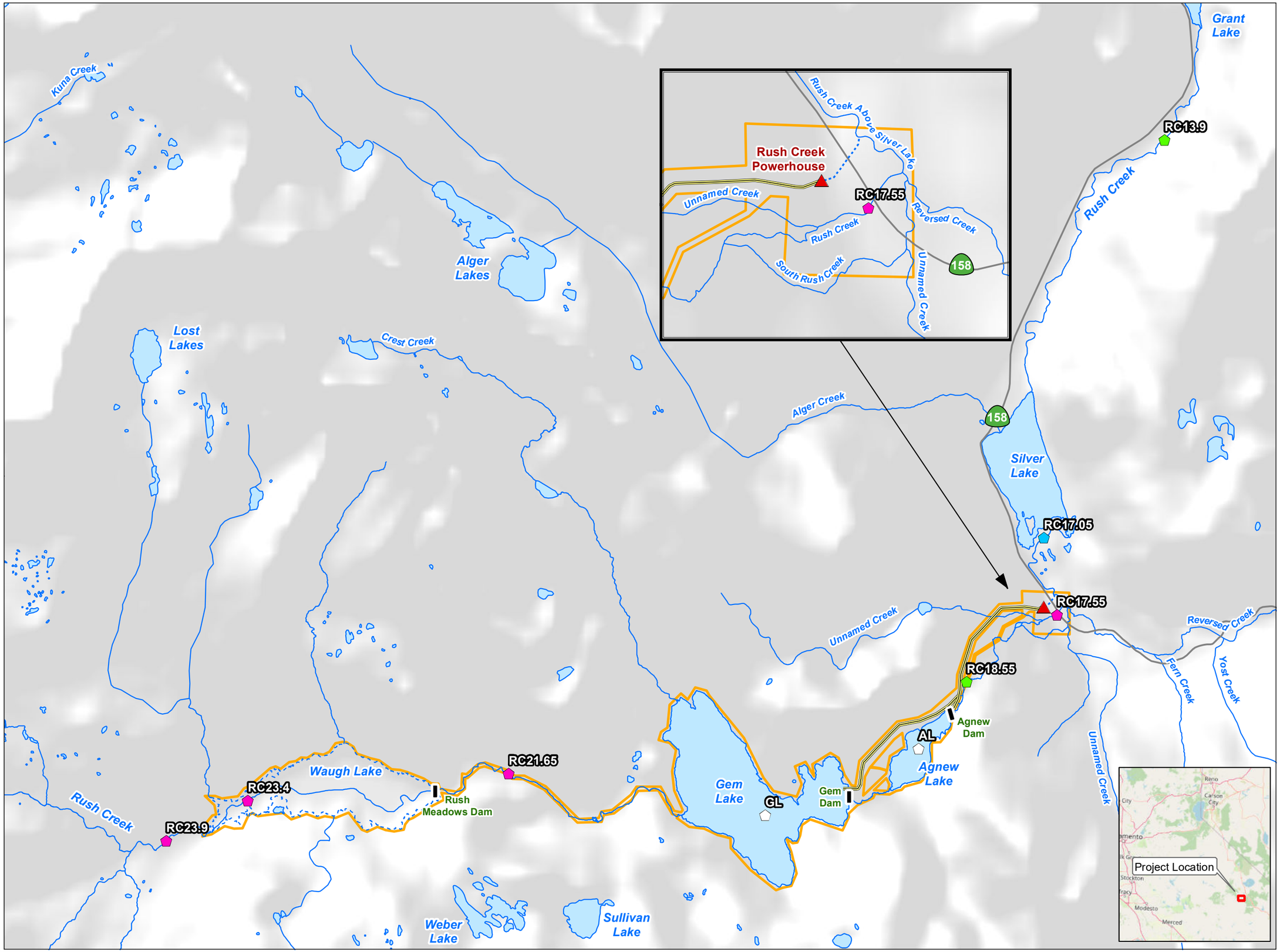


Figure AQ 6-8. Length-Frequency Histogram of Fish Captured in Gem Lake and Agnew Lake during Gillnet Sampling

MAPS

This Page Intentionally Left Blank



SCE Facilities
- Dam
- Powerhouse
- Flowline / Penstock
- Tailrace

Other Features
- Highway
- River/Stream
- Lake/Reservoir
- Dry Lake/Reservoir
- FERC Boundary

Sampling Locations
- Gill Net
- Electrofishing
- Electrofishing/Snorkeling
- Snorkeling

SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

Rush Creek Project (FERC 1389)

Map AQ 6-1

Sampling Locations

0 0.25 0.5 Miles

Projection: UTM Zone 11
Datum: NAD 83

Date: 12/1/2023

C:\GIS\237800343\map\Rush Creek\AquaticMaps\SCE_RUSH_CREEK_AQ6_SamplingLocations_17i11i_03.mxd

This Page Intentionally Left Blank

APPENDIX A
Fish Population Sampling Site Descriptions

This Page Intentionally Left Blank

Table of Contents

RUSH CREEK DOWNSTREAM OF SILVER LAKE

RC 13.9

2023 Sampled Mesohabitat Units

Unit Number	Unit Type[1]	Sampling Method[2]	Length (ft)	Width (ft)	Unit Area (ft^2)	Mean Depth (ft)	Max Depth (ft)	% of Total Survey Length	% of Total Survey Area
1	MCP	S	85.3	23.0	1961.9	2.5	4.3	14.4%	9.1%
4	MCP	S	196.9	42.7	8407.6	2.4	3.9	33.2%	38.9%
Total			**282.2**	**--**	**10369.5**	**--**	**--**	**47.6%**	**48.0%**
Average			*141.1*	*32.9*	*5184.8*	*2.5*	*4.1*	--	--
2	LGR	E	114.8	29.5	3386.6	1.0	1.4	19.3%	15.7%
Total			**114.8**	**--**	**3386.6**	**--**	**--**	**19.3%**	**15.7%**
3	HGR	E	59.1	26.2	1548.4	1.7	2.8	9.9%	7.1%
Total			**59.1**	**--**	**1548.4**	**--**	**--**	**9.9%**	**7.1%**
5	STR	E	137.7	45.9	6320.4	0.7	2.0	23.2%	29.2%
Total			**137.7**	**--**	**6320.4**	**--**	**--**	**23.2%**	**29.2%**
Grand Total			**593.8**	**--**	**21624.9**	**--**	**--**	**100.0%**	**100.0%**

[1]MCP= Mid-Channel Pool; LGR = Low Gradient Riffle; HGR = High Gradient Riffle; STR=Step Run

[2]S = Snorkeling; E=Electrofishing

2024 Sampled Mesohabitat Units

Unit Number	Unit Type[1]	Sampling Method[2]	Length (ft)	Width (ft)	Unit Area (ft^2)	Mean Depth (ft)	Max Depth (ft)	% of Total Survey Length	% of Total Survey Area
1	MCP	S	108.3	36.1	3909.6	1.8	3.7	19.1%	19.0%
4	MCP	S	128.0	45.9	5875.2	1.4	3.7	22.6%	28.5%
Total			**236.2**	**--**	**9784.8**	**--**	**--**	**41.6%**	**47.5%**
Average			*118.1*	*41.0*	*4892.4*	*1.6*	*3.7*	--	--
2	LGR	E	121.4	31.2	3787.7	0.8	1.4	21.4%	18.4%
Total			**121.4**	**--**	**3787.7**	**--**	**--**	**21.4%**	**18.4%**
3	HGR	E	62.3	31.2	1943.8	1.6	2.7	11.0%	9.4%
Total			**62.3**	**--**	**1943.8**	**--**	**--**	**11.0%**	**9.4%**
5	STR	E	147.6	34.4	5077.4	0.4	1.7	26.0%	24.7%
Total			**147.6**	**--**	**5077.4**	**--**	**--**	**26.0%**	**24.7%**
Grand Total			**567.5**	**--**	**20593.7**	**--**	**--**	**100.0%**	**100.0%**

Photos of Representative Habitat Units

MCP

LGR

HGR

STR

RUSH CREEK UPSTREAM OF SILVER LAKE

RC 17.05

2023 Sampled Mesohabitat Units

Unit Number	Unit Type[1]	Sampling Method[2]	Length (ft)	Width (ft)	Unit Area (ft^2)	Mean Depth (ft)	Max Depth (ft)	% of Total Survey Length	% of Total Survey Area
1	MCP	S	168.0	17.0	2856.0	5.0	7.0	14.3%	14.3%
Total			**168.0**	**--**	**2856.0**	**--**	**--**	**14.3%**	**14.3%**
2	Run	S	181.0	17.0	3077.0	5.0	7.0	15.5%	15.5%
Total			**181.0**	**--**	**3077.0**	**--**	**--**	**15.5%**	**15.5%**
3	CRP	S	377.0	17.0	6409.0	5.0	7.0	32.2%	32.2%
Total			**377.0**	**--**	**6409.0**	**--**	**--**	**32.2%**	**32.2%**
4	CRP/Run	S	244.0	17.0	4148.0	5.0	7.0	20.8%	20.8%
Total			**244.0**	**--**	**4148.0**	**--**	**--**	**20.8%**	**20.8%**
5	LSP/CRP	S	201.0	17.0	3417.0	5.0	7.0	17.2%	17.2%
Total			**201.0**	**--**	**3417.0**	**--**	**--**	**17.2%**	**17.2%**
Grand Total			**1171.0**	**--**	**19907.0**	**--**	**--**	**100.0%**	**100.0%**

[1] MCP=Mid-channel Pool; CRP=Corner Pool; LSP=Lateral Scour Pool
[2] S = Snorkeling

2024 Sampled Mesohabitat Units

Unit Number	Unit Type[1]	Sampling Method[2]	Length (ft)	Width (ft)	Unit Area (ft^2)	Mean Depth (ft)	Max Depth (ft)	% of Total Survey Length	% of Total Survey Area
1	MCP	S	168.0	17.0	2856.0	3.0	6.0	14.3%	14.3%
Total			**168.0**	**--**	**2856.0**	**--**	**--**	**14.3%**	**14.3%**
2	Run	S	181.0	17.0	3077.0	2.0	3.0	15.5%	15.5%
Total			**181.0**	**--**	**3077.0**	**--**	**--**	**15.5%**	**15.5%**
3	CRP/Pool	S	377.0	17.0	6409.0	3.0	6.0	32.2%	32.2%
Total			**377.0**	**--**	**6409.0**	**--**	**--**	**32.2%**	**32.2%**
4	CRP/Pool	S	244.0	17.0	4148.0	3.0	6.0	20.8%	20.8%
Total			**244.0**	**--**	**4148.0**	**--**	**--**	**20.8%**	**20.8%**
5	Run	S	201.0	17.0	3417.0	2.0	3.0	17.2%	17.2%
Total			**201.0**	**--**	**3417.0**	**--**	**--**	**17.2%**	**17.2%**
Grand Total			**1171.0**	**--**	**19907.0**	**--**	**--**	**100.0%**	**100.0%**

Photos of Representative Habitat Units

CRP/Run

Run

RUSH CREEK ABOVE SILVER LAKE NEAR POWERHOUSE AND US HWY 158

RC 17.55

2023 Sampled Mesohabitat Units

Unit Number	Unit Type[1]	Sampling Method[2]	Length (ft)	Width (ft)	Unit Area (ft^2)	Mean Depth (ft)	Max Depth (ft)	% of Total Survey Length	% of Total Survey Area
1	HGR	E	59.1	10.5	620.6	0.4	1.1	16.7%	15.2%
5	HGR	E	82.0	13.1	1074.2	0.8	1.7	23.2%	26.3%
Total			**141.1**	**--**	**1694.8**	**--**	**--**	**39.9%**	**41.5%**
Average			*70.6*	*11.8*	*847.4*	*0.6*	*1.4*	--	--
3	LGR	E	91.9	11.5	1056.9	0.8	1.8	25.9%	25.9%
Total			**91.9**	**--**	**1056.9**	**--**	**--**	**25.9%**	**25.9%**
2	Run/MCP	E	82.0	11.5	943.0	1.0	3.5	23.1%	23.1%
Total			**82.0**	**--**	**943.0**	**--**	**--**	**23.1%**	**23.1%**
4	STP	E	39.4	9.8	386.1	1.0	1.7	11.1%	9.5%
Total			**39.4**	**--**	**386.1**	**--**	**--**	**11.1%**	**9.5%**
Grand Total			**354.4**	**--**	**4080.8**	**--**	**--**	**100%**	**100%**

[1] HGR = High Gradient Riffle; LGR=Low Gradient Riffle; Run/MCP=Run and Mid-channel Pool; STP= Step Pool
[2] E= Electrofishing

2024 Sampled Mesohabitat Units

Unit Number	Unit Type[1]	Sampling Method[2]	Length (ft)	Width (ft)	Unit Area (ft^2)	Mean Depth (ft)	Max Depth (ft)	% of Total Survey Length	% of Total Survey Area
1	HGR	E	59.0	8.5	501.5	0.6	1.0	16.7%	12.5%
5	HGR	E	82.0	9.8	803.6	0.5	3.0	23.2%	20.0%
Total			**278.9**	**--**	**1305.1**	**--**	**--**	**39.9%**	**32.5%**
Average			*139.5*	*9.2*	*652.6*	*0.6*	*2.0*	--	--
3	LGR	E	91.9	13.1	1203.9	0.7	1.9	25.9%	30.0%
Total			**91.9**	**--**	**1203.9**	**--**	**--**	**25.9%**	**30.0%**
2	Run/MCP	E	82.0	14.1	1156.2	1.9	3.1	23.1%	28.8%
Total			**82.0**	**--**	**1156.2**	**--**	**--**	**23.1%**	**28.8%**
4	STP	E	42.7	8.2	350.1	0.8	1.4	11.1%	8.7%
Total			**42.7**	**--**	**350.1**	**--**	**--**	**11.1%**	**8.7%**
Grand Total			**495.5**	**--**	**4015.3**	**--**	**--**	**100%**	**100%**

Photos of Representative Habitat Units

HGR

LGR

STP

Run/MCP

RUSH CREEK BELOW AGNEW DAM

RC 18.55

2023 Sampled Mesohabitat Units

Unit Number	Unit Type[1]	Sampling Method[2]	Length (ft)	Width (ft)	Unit Area (ft^2)	Mean Depth (ft)	Max Depth (ft)	% of Total Survey Length	% of Total Survey Area
1	PLP	S	59.1	45.9	2712.7	5.5	7.6	15.9%	38.0%
4	PLP	S	55.8	17.4	970.9	4.0	6.2	15.1%	13.6%
Total			**114.9**	**--**	**3683.6**	**--**	**--**	**31.0%**	**51.6%**
Average			*57.5*	*31.7*	*1841.8*	*4.75*	*10.7*	--	--
2	LGR	E	101.7	11.5	1169.6	0.5	0.8	27.4%	16.4%
Total			**101.7**	**--**	**1169.6**	**--**	**--**	**27.4%**	**16.4%**
3	Run	E	154.2	14.8	2282.2	0.5	1.0	41.6%	32.0%
Total			**154.2**	**--**	**2282.2**	**--**	**--**	**41.6%**	**32.0%**
Grand Total			**370.8**	**--**	**7135.4**	**--**	**--**	**100.0%**	**100.0%**

[1] PLP=Plunge Pool; LGR =Low Gradient Riffle
[2] S = Snorkeling; E = Electrofishing

2024 Sampled Mesohabitat Units

Unit Number	Unit Type[1]	Sampling Method[2]	Length (ft)	Width (ft)	Unit Area (ft^2)	Mean Depth (ft)	Max Depth (ft)	% of Total Survey Length	% of Total Survey Area
1	PLP	S	55.8	36.1	2012.2	5.0	8.0	15.5%	25.6%
4	PLP	S	52.5	19.7	1033.0	1.8	3.6	14.6%	13.2%
Total			**108.3**	**--**	**3045.2**	**--**	**--**	**30.0%**	**38.8%**
Average			*54.1*	*27.9*	*1522.6*	*3.4*	*5.8*	--	--
2	LGR	E	98.4	18.0	1771.2	0.3	1.0	27.3%	22.6%
Total			**98.4**	**--**	**1771.2**	**--**	**--**	**27.3%**	**22.6%**
3	Run	E	154.2	19.7	3037.7	0.8	1.8	42.7%	38.7%
Total			**154.2**	**--**	**3037.7**	**--**	**--**	**42.7%**	**38.7%**
Grand Total			**360.9**	**--**	**7854.1**	**--**	**--**	**100.0%**	**100.0%**

Photos of Representative Habitat Units:

Plunge Pool

Run

RUSH CREEK BELOW RUSH MEADOWS DAM

RC 21.65

2023 Sampled Mesohabitat Units

Unit Number	Unit Type[1]	Sampling Method[2]	Length (ft)	Width (ft)	Unit Area (ft^2)	Mean Depth (ft)	Max Depth (ft)	% of Total Survey Length	% of Total Survey Area
1	HGR	E	114.8	29.5	3386.6	0.8	1.7	37.2%	44.9%
3	HGR	E	72.2	24.0	1732.8	1.6	2.6	23.4%	23.0%
Total			**187.0**	**--**	**5119.4**	**--**	**--**	**60.6%**	**67.9%**
Average			*93.5*	*26.8*	*2559.7*	*1.2*	*2.2*	--	--
2	MCP	E	65.6	20.7	1357.9	2.6	3.5	21.3%	18.0%
Total			**65.6**	**--**	**1357.9**	**--**	**--**	**21.3%**	**18.0%**
4	STP	E	55.8	19.0	1060.2	2.3	2.9	18.1%	14.1%
Total			**55.8**	**--**	**1060.2**	**--**	**--**	**18.1%**	**14.1%**
Grand Total			**308.4**	**--**	**7537.5**	**--**	**--**	**100.0%**	**100.0%**

[1] HGR = High Gradient Riffle; MCP= Mid-channel Pool; STP= Step Pool
[2] E = Electrofishing

Photos of Representative Habitat Units

HGR

MCP

STP

RUSH CREEK WAUGH LAKEBED

RC23.0

2023 Sampled Mesohabitat Units

Unit Number	Unit Type[1]	Sampling Method[2]	Length (ft)	Width (ft)	Unit Area (ft^2)	Mean Depth (ft)	Max Depth (ft)	% of Total Survey Length	% of Total Survey Area
1	LGR	E	328.1	64.6	21195.3	0.3	2.0	100%	100 %
Grand Total			**328.1**	**--**	**21195.3**	**--**	**--**	**100.0%**	**100.0%**

[1] LGR = Low Gradient Riffle
[2] E = Electrofishing

Photos of Representative Habitat Units

LGR

RUSH CREEK ABOVE WAUGH LAKE

RC 23.9

2023 Sampled Mesohabitat Units

Unit Number	Unit Type[1]	Sampling Method[2]	Length (ft)	Width (ft)	Unit Area (ft^2)	Mean Depth (ft)	Max Depth (ft)	% of Total Survey Length	% of Total Survey Area
1	MCP	E	65.6	19.7	1292.3	1.5	4.5	21.5%	20.6%
Total			**65.6**	**--**	**1292.3**	**--**	**--**	**21.5%**	**20.6%**
2	STP	E	65.6	21.3	1397.3	1.2	2.0	21.5%	22.3%
Total			**65.6**	**--**	**1397.3**	**--**	**--**	**21.5%**	**22.3%**
3	LGR	E	88.6	21.3	1887.2	0.4	2.0	29.0%	30.2%
Total			**88.6**	**--**	**1887.2**	**--**	**--**	**29.0%**	**30.2%**
4	HGR	E	85.3	19.7	1680.4	0.5	2.0	28.0%	26.9%
Total			**85.3**	**--**	**1680.4**	**--**	**--**	**28.0%**	**26.9%**
Grand Total			**305.1**	**--**	**6257.2**	**--**	**--**	**100.0%**	**100.0%**

[1] MCP=Mid-channel Pool; STP=Step Pool; LGR = Low Gradient Riffle; HGR = High Gradient Riffle
[2] E = Electrofishing

Photos of Representative Habitat Units

MCP

STP

LGR

HGR

SOUTH RUSH CREEK

SOUTH RUSH CREEK WAS DRY IN SEPTEMBER 2023 AND AUGUST 2024 AND NOT SAMPLED.

Photos of Representative Habitat Units:

Dry Riverbed

Dry Riverbed

This Page Intentionally Left Blank

APPENDIX B
Reservoir Gillnet Sampling Details

This Page Intentionally Left Blank

Table B-1. Fish Population Reservoir Study Site Locations and Gillnet Deployment Details.

Study Site	Net Deployment Location (UTM)[1]		Deployment		Retrieval		Net Type	Net Depth (ft)	Total Deployment Time (hrs)
	Easting	Northing	Date	Time	Date	Time			
Agnew Lake									
AL-1H[2]	311926	4180960	8/29/2023	2:40 PM	8/30/2023	9:55 AM	Horizontal	0-16	19.25
AL-1V	311904	4180916	8/29/2023	3:10 PM	8/30/2023	9:40 AM	Vertical	0-80	18.50
AL-2H	311779	4180768	8/29/2023	3:30 PM	8/30/2023	11:20 AM	Horizontal	0-20	19.83
AL-2V	311914	4180745	8/29/2023	4:00 PM	8/30/2023	11:05 AM	Vertical	0-65	19.08
Gem Lake									
GL-1H	311249	4180598	8/28/2023	11:20 AM	8/29/2023	10:03 AM	Horizontal	0-40	22.72
GL-1V	311126	4180548	8/28/2023	11:59 AM	8/29/2023	9:48 AM	Vertical	0-125	21.82
GL-2H	310652	4180377	8/28/2023	12:40 PM	8/29/2023	11:10 AM	Horizontal	0-12	22.50
GL-2V	310566	4180344	8/28/2023	1:23 PM	8/29/2023	10:59 AM	Vertical	0-185	21.60
GL-3H	309976	4180339	8/28/2023	1:45 PM	8/29/2023	12:05 PM	Horizontal	0-35	22.33
GL-3V	309960	4180412	8/28/2023	2:10 PM	8/29/2023	11:55 AM	Vertical	0-110	21.75

[1] Universal Transverse Mercator Zone 11 South, North American Datum 1983
[2] See Appendix B, Map B-1 and B-2.

This Page Intentionally Left Blank

SCE Facilities

- Dam
- Flowline / Penstock
- Stream Gage
- Reservoir Gage
- Tramway
- FERC Boundary

Other Features

- River/Stream
- Lake

Gill Net Locations

- Horizontal Nets
- Vertical Nets

SOUTHERN CALIFORNIA EDISON®
An *EDISON INTERNATIONAL*® Company

Rush Creek Project (FERC 1389)

Map B-1

Fish Population Study Gill Net Locations
Gem Lake

0 125 250 500 Feet

Projection: UTM Zone 11
Datum: NAD 83

Date: 11/28/2023

C:\GIS\237800343\map\Rush Creek\AquaticMaps\SCE_RUSH_CREEK_AQ6_GillNetLocs_17i11i_01.mxd

This Page Intentionally Left Blank

SCE Facilities

- Dam
- Flowline / Penstock
- Stream Gage
- Reservoir Gage
- Tramway
- FERC Boundary

Other Features

- River/Stream
- Lake

Gill Net Locations

- Horizontal Nets
- Vertical Nets

SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

Rush Creek Project (FERC 1389)

Map B-2

Fish Population Study Gill Net Locations
Agnew Lake

0 125 250 Feet

Projection: UTM Zone 11
Datum: NAD 83

Date: 11/28/2023

C:\GIS\237800343\map\Rush Creek\AquaticMaps\SCE_RUSH_CREEK_AQ6_GillNetLocs_17i11i_01.mxd

This Page Intentionally Left Blank

Table B-2. Summary of Fish Species Captured During Reservoir Gillnetting.

Date	Study Site	Total Soaking Time (hrs.)	Number of Fish[1] Captured	
			RBT	BRK
Agnew Lake				
8/30/2023	AL-1H	19.25	2	10
	AL-1V	18.50	-	-
	AL-2H	19.83	2	5
	AL-2V	19.08	-	-
	Total	**76.66**	**4**	**15**
Gem Lake				
8/29/2023	GL-1H	22.72	7	-
	GL-1V	21.82	-	-
	GL-2H	22.50	4	1
	GL-2V	21.60	-	-
	GL-3H	22.33	6	4
	GL-3V	21.75	1	1
	Total	**132.72**	**18**	**6**

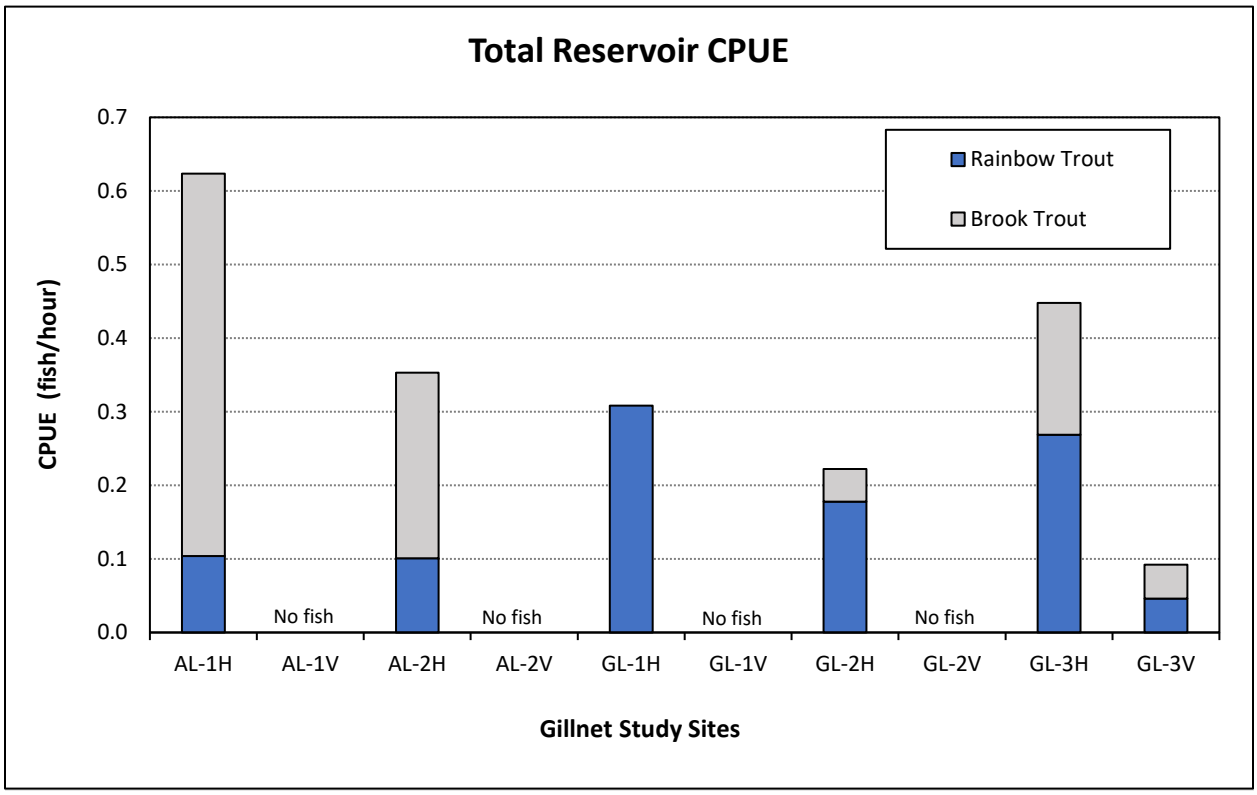
[1] RBT = Rainbow Trout, BRK = Brook Trout

Table B-3. Catch per Unit Effort for Reservoir Gillnetting.

Date	Study Site	Total Soaking Time (hrs.)	Number of Fish[1] Captured / Net Hour	
			RBT	BRK
Agnew Lake				
8/30/2023	AL-1H	19.25	0.10	0.52
	AL-1V	18.50	-	-
	AL-2H	19.83	0.10	0.25
	AL-2V	19.08	-	-
	Total	76.66	0.05	0.20
Gem Lake				
8/29/2023	GL-1H	22.72	0.31	-
	GL-1V	21.82	-	-
	GL-2H	22.50	0.18	0.04
	GL-2V	21.60	-	-
	GL-3H	22.33	0.27	0.18
	GL-3V	21.75	0.05	0.05
	Total	132.72	0.14	0.05

[1] RBT = Rainbow Trout, BRK = Brook Trout

Figure B-1. Gillnetting Catch Per Unit Effort (CPUE) (Fish per Hour) for Fish Species in Gem Lake and Agnew Lake.



This Page Intentionally Left Blank

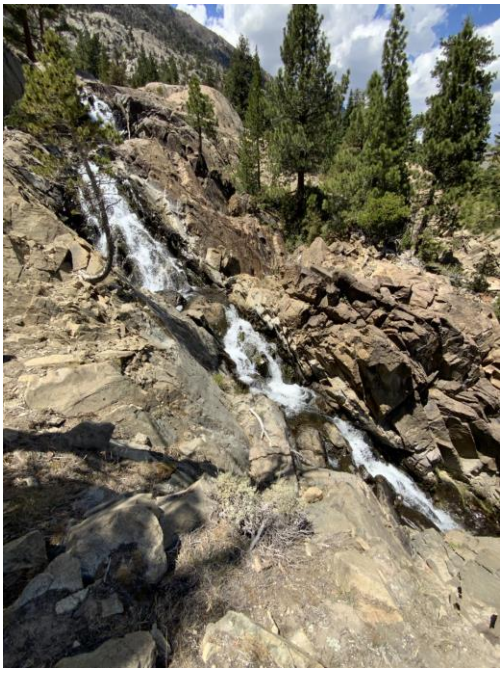
APPENDIX C
Fish Barriers and Migration

This Page Intentionally Left Blank

FP1 (Gage Weir Downstream of Silver Lake) – This is a compound barrier consisting of a cascade (top left, bottom left) and a flat weir spillway (top right, bottom right). A combination of velocity, depth, and vertical leap barriers limits passage of some fish species and life stages under some flow conditions. Stadia rod is shown for scale. The weir spillway consists of an approximately 1-foot drop over a flat crest into a concrete apron with approximately 1-foot water depth at the pictured flow (bottom right). Water depth immediately above the weir is approximately 0.5 feet (top right).

FP2 (Silver Lake Inflow Sediment Delta) – The sediment delta occurring where Rush Creek enters Silver Lake may present a depth barrier when low lake levels combine with low creek flows. A depth barrier is most likely to occur when lake surface elevation approaches 7,220.5 feet. The aerial image above shows the sediment delta and bathymetry points measured using high-precision global positioning system (GPS) survey equipment.

Highway 158 Crossing – Analysis indicates this culvert crossing does not present a barrier to fish movement.



FP3 (Horsetail Falls Barrier Reach) – The downstream end of this barrier reach occurs at a log jam in Rush Creek near the Rush Creek Powerhouse with a waterfall a short distance upstream (left photo). The reach is dominated by cascades, chutes, and waterfalls (right photo). The largest waterfall in the reach is Horsetail Falls. This barrier reach extends upstream to just below the Agnew Gage Weir.

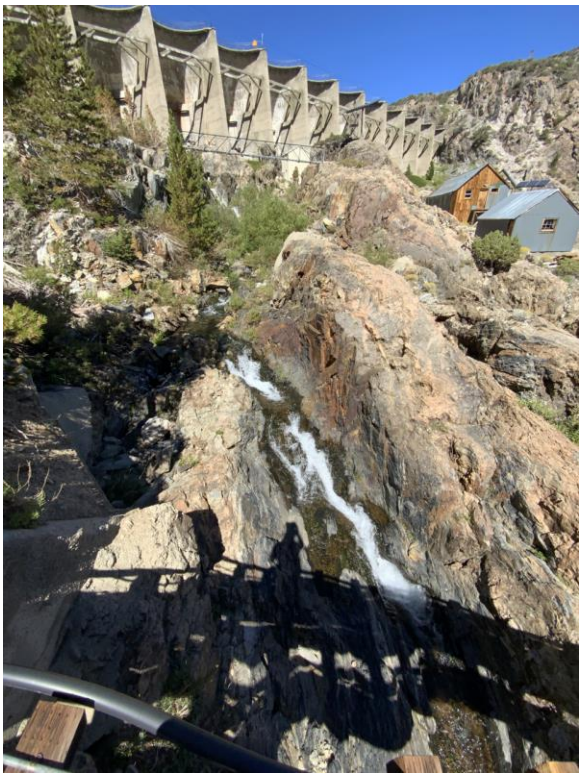
FP4 (Agnew Gauge Weir) – Similar to the gauge below Silver Lake, this is a compound barrier consisting of a concrete spillway with multiple flat spill edges. A combination of velocity, depth, and vertical leap barriers limits passage of some fish species and life stages under some flow conditions. Analysis indicates the drop height (2.5 feet with 2- to 3-foot-deep plunge pool) is within the leap abilities of only adult trout, and the shallow (approximately 2 inches), high-velocity spillway lip prevents passage of adult trout under low-flow conditions and juvenile trout under all conditions. This barrier is potentially passable for adult trout only under certain flow conditions. The presence of natural barriers a short distance below this barrier may prevent trout from accessing the Agnew Gage Weir from downstream.

FP5A (Cascade below Agnew Dam Outlets) – An approximately 13-foot-high cascade barrier, shown with 25-foot rod for size reference, occurs immediately below Agnew Dam. This cascade prevents fish from reaching the base of Agnew Dam. Brook trout were observed in the field attempting, and failing, to ascend this barrier.

FP5B (Agnew Dam Outlets) – The two outlets created in 2017 consist of a 2.5-foot drop over a square edge into an approximately 1-foot-deep plunge pool at the flow pictured. Depth of flow through the outlets is approximately 1 inch. The outlets could present potential depth and vertical leap barriers to fish. However, access to the outlets is blocked by a cascade barrier downstream.

FP6 (Agnew Lake Inflow Sediment Delta) – At low flows, occurring during the late summer and autumn, the sediment delta at the upper end of Agnew Lake may contain depth barriers. A critical riffle with 1 inch of water depth is pictured in August. This seasonal depth barrier is more likely to impact autumn spawners such as brook trout.

FP6–FP7 (Agnew–Gem Barrier Reach) – The reach upstream of the Agnew Lake sediment delta is dominated by cascades, chutes, and waterfalls upstream to the foot of Gem Dam. Fish occur in plunge pools, but numerous barriers prevent upstream migration.



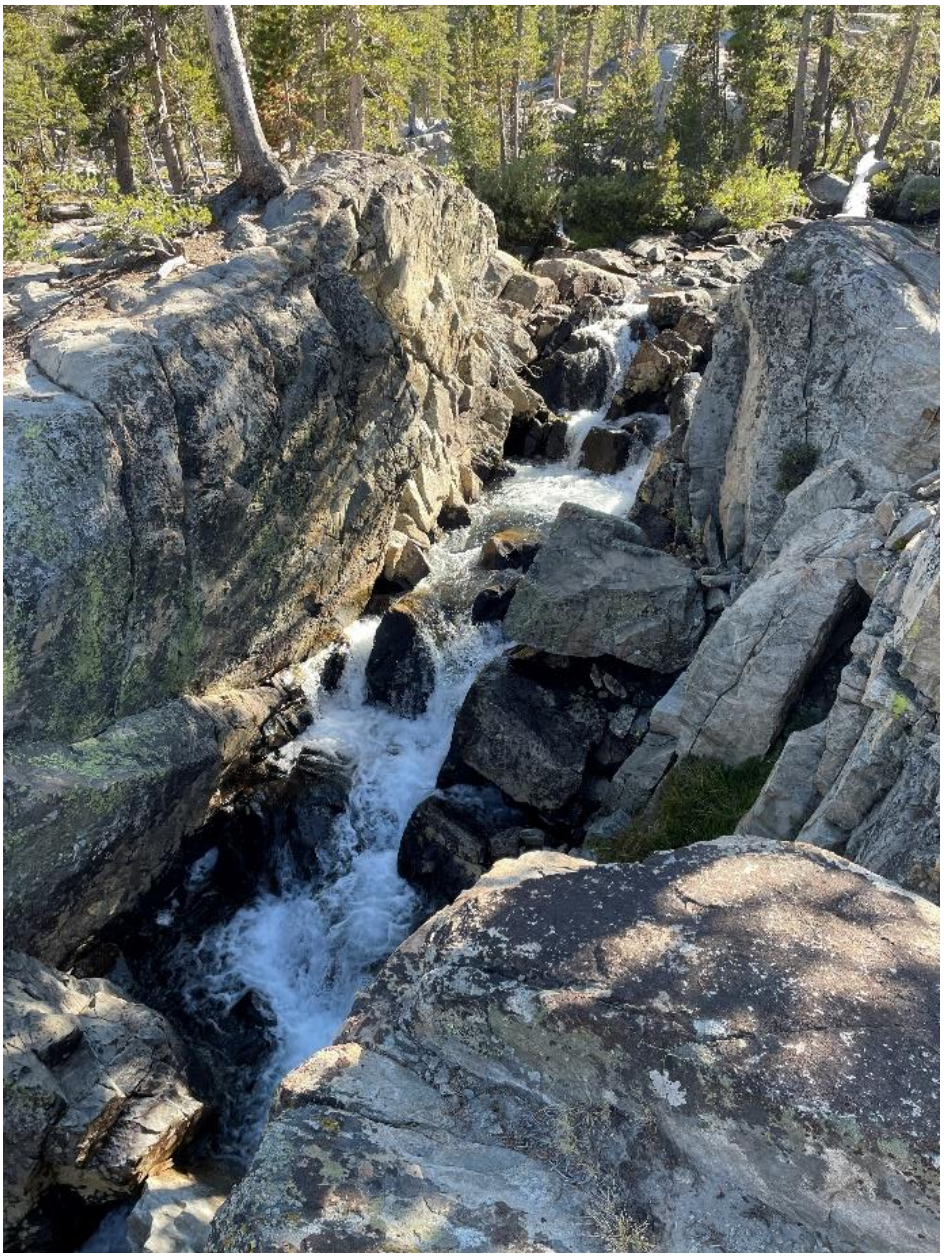
FP7 (Gem Dam) – Gem Dam represents a complete barrier to migration. Low-level release valves in the dam are not passable. However, numerous barriers in the high-gradient reach downstream of the dam prevent fish from accessing the downstream side of the dam.

FP8 (Cascade/Waterfall at Gem Lake Inflow) – A steep cascade/waterfall feature occurs at the upper end of Gem Lake where Rush Creek enters the lake. The size of the falls is dependent on the lake level, but generally the falls encompass over 100 feet of stream, with some near-vertical sections.

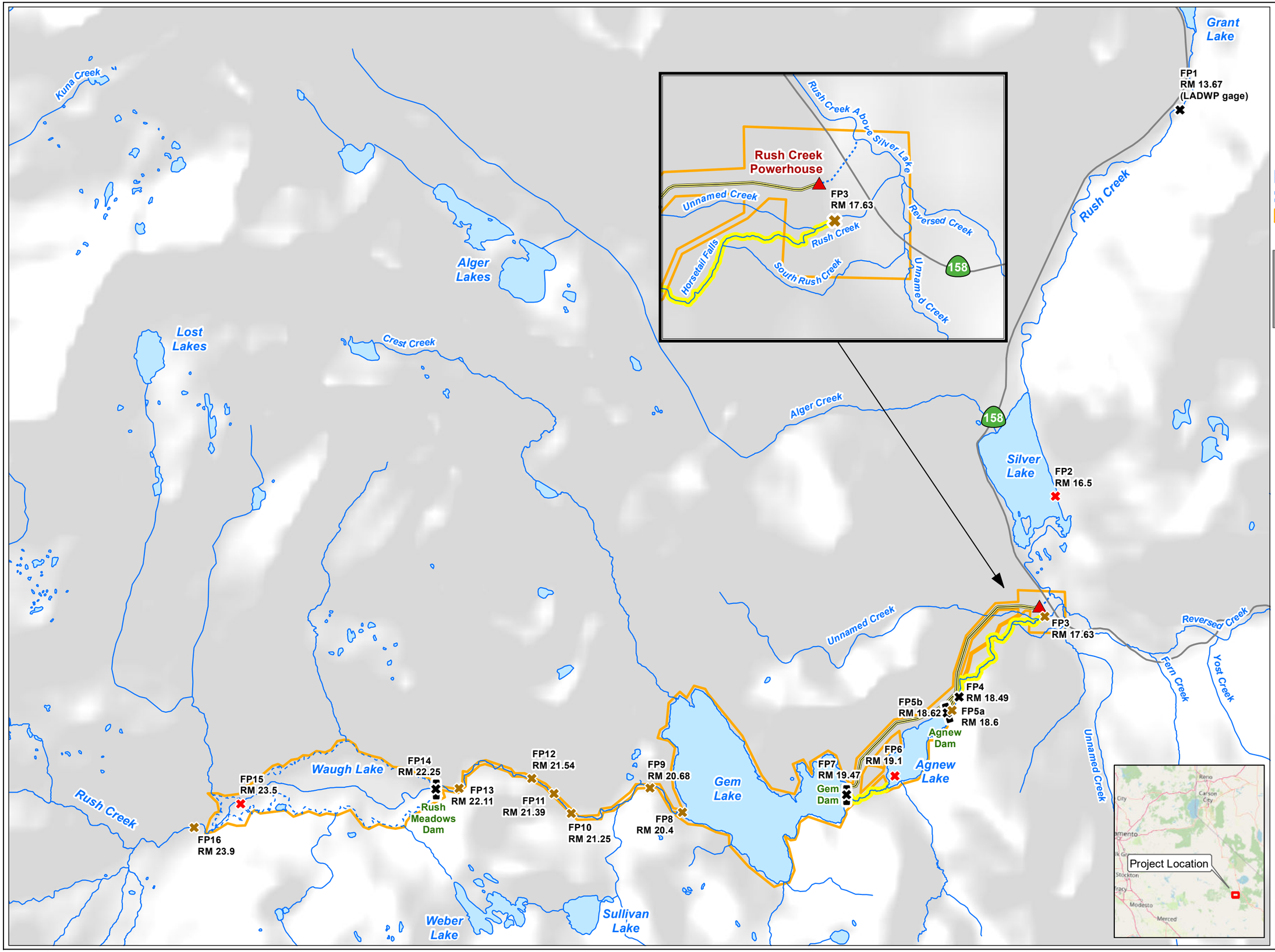
FP9–FP13 (Barriers in Rush Meadows Reach) – Multiple naturally occurring barriers, including cascades, chutes, and waterfalls, exist in the reach between Rush Meadows Dam and Gem Lake. Five barriers were mapped from FP9 (top left) to FP13 (bottom right), but other smaller partial barriers also exist within the reach.

FP14 (Waugh Dam) – Waugh Dam represents a complete barrier to migration.

FP15 (Waugh Lakebed Critical Riffles) – Rush Creek meanders through the Waugh Lakebed in sinuous, braided channels. In some locations, these channels form wide, shallow riffles that may represent depth barriers at low flows. The critical riffle pictured is approximately 2 inches deep. Critical riffles occurring in the late summer or autumn are more likely to present barriers to autumn-spawning species such a brook trout.



FP16 (Cascades Upstream of Waugh Lake) – High-gradient cascade reaches occur upstream of Waugh Lake, above the reservoir's influence. These high-gradient reaches prevent or limit migration.



SCE Facilities

- Dam
- Powerhouse
- Flowline / Penstock
- Tailrace

Other Features

- Highway
- River/Stream
- Lake/Reservoir
- Dry Lake/Reservoir
- FERC Boundary

Fish Passage Barrier Assessment*

- Infrastructure Barrier
- Natural Barrier
- Critical Riffle
- Barrier Reaches

*Includes barriers quantified as impassable and potentially impassable.

SOUTHERN CALIFORNIA EDISON®
Energy for What's Ahead™

Rush Creek Project (FERC 1389)

Map C-1

Fish Passage Barrier Locations

0 0.25 0.5 Miles

Projection: UTM Zone 11
Datum: NAD 83

Date: 7/8/2024

C:\GIS\237800343\map\Rush Creek\AquaticMaps\SCE_RUSH_CREEK_AQ6_FishBarriers_17i11i_02.mxd

This Page Intentionally Left Blank

APPENDIX D
Fish Population Sampling Data

This Page Intentionally Left Blank

Table D-1. Summary of Fish Sampled at Stream Sampling Sites in 2023 and 2024

Study Site	Date	Sample Type[1]	Species[2]		
			RBT	BNT	BRK
RC23.9[3]	09/26/2023	E	0	-	77
RC23.4 (Waugh Lakebed)	09/26/2023	E	1	-	25
RC21.65	09/25/2023, 09/27/2023	E	17	-	38
RC18.55	09/27/2023	E	23	-	110
		S	9	-	40
	08/21/2024	E	22	-	115
		S	11	-	57
RC17.55	09/29/2023	E	39	75	41
	08/19/2024	E	24	262	8
RC17.05	09/29/2023	S	12	18	2
	08/22/2024	S	103	114	7
RC13.9	09/28/2023	E	0	172	0
		S	83	77	0
	08/20/2024	E	11	149	0
		S	87	387	23
SRC0.15	NA[4]	-	-	-	-

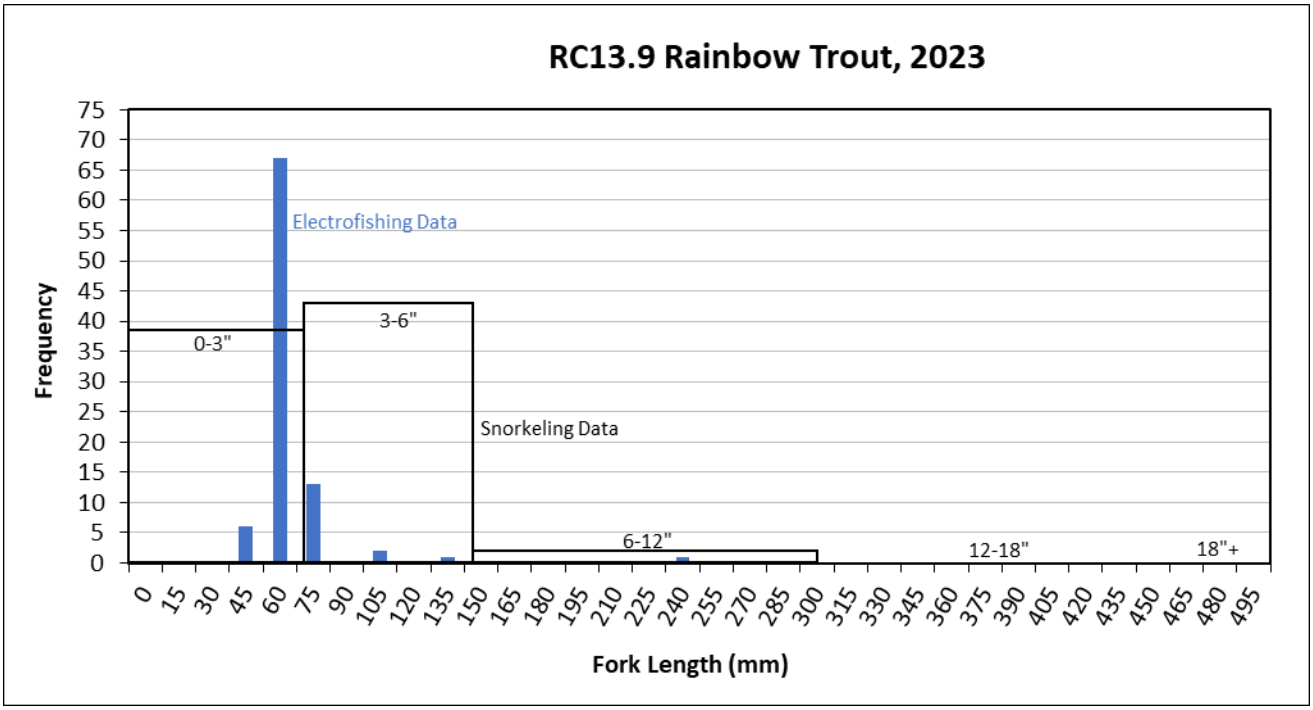
[1] E = Electrofishing, S = Snorkeling
[2] RBT = Rainbow Trout, BNT = Brown Trout, BRK = Brook Trout
[3] Not sampled in 2023 or 2024.
[4] Sites RC23.9, RC23.4, and RC21.65 were not sampled in 2024.

Table D-2. Average Length and Number of Scale Aged Trout at Stream Sampling Sites

Study Site	Average Length in Millimeters at Age (sample size)											
	Rainbow Trout				Brown Trout				Brook Trout			
	0+	1+	2+	3+	0+	1+	2+	3+	0+	1+	2+	3+
RC23.9	0	0	0	0	-	-	-	-	0	128 (9)	205 (1)	0
RC23.4 (Waugh Lakebed)	74 (1)	0	0	0	-	-	-	-	104 (3)	109 (4)	171 (3)	0
RC21.65	0	116 (7)	150 (6)	200 (2)	-	-	-	-	0	122 (6)	157 (4)	0
RC18.55	0	123 (3)	174 (2)	201 (2)	-	-	-	-	0	138 (2)	172 (3)	0
RC17.55	82 (1)	122 (3)	157 (2)	266 (1)	98 (2)	112 (4)	0	0	98 (2)	112 (4)	0	0
RC13.9	94 (1)	111 (2)	238 (1)	0	79 (9)	0	162 (1)	0	-	-	-	-

APPENDIX E
Length-Frequency Histograms

This Page Intentionally Left Blank



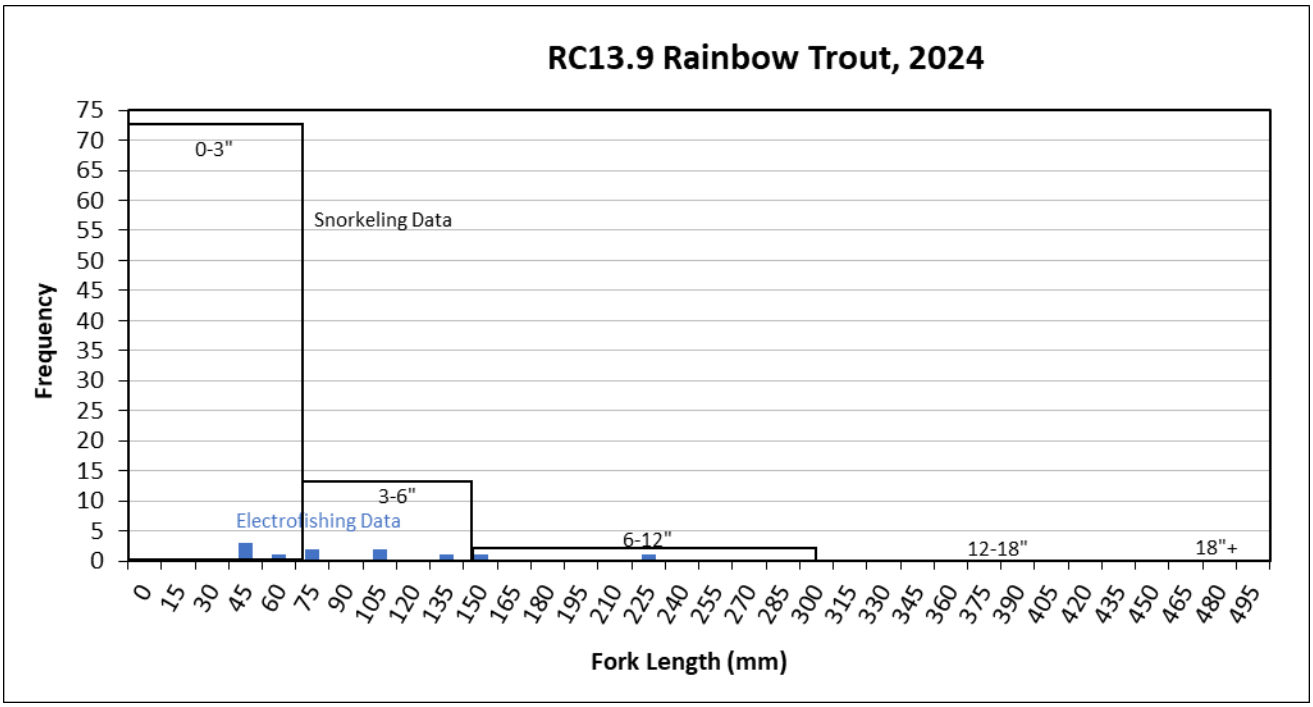


Figure E-1a. Length-Frequency Histograms for Rainbow Trout observed during Electrofishing and Snorkel Sampling at RC13.9, below Silver Lake, in 2023 (top) and 2024 (bottom)

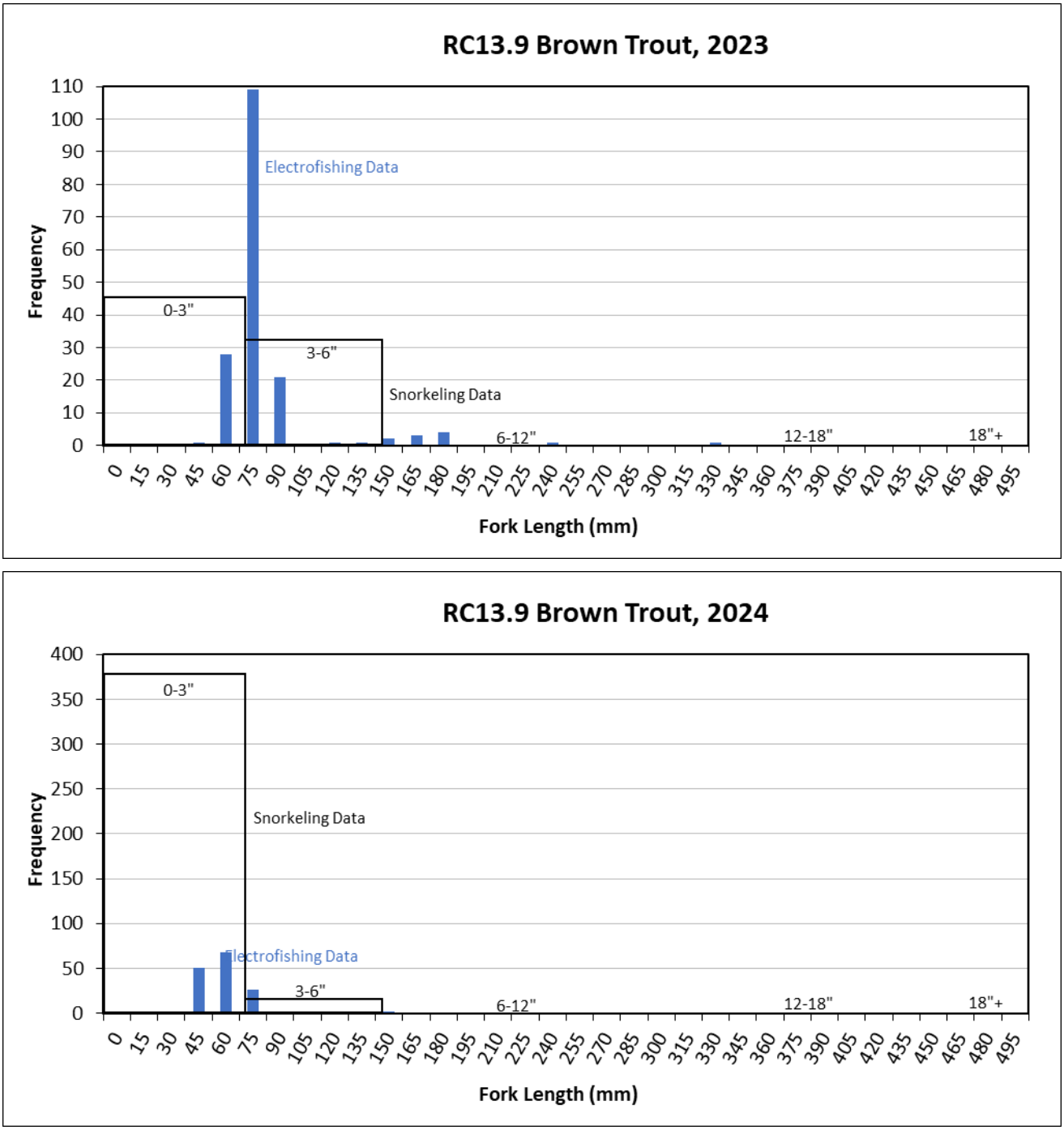


Figure E-1b. Length-Frequency Histograms for Brown Trout observed during Electrofishing and Snorkel Sampling at RC13.9, below Silver Lake, in 2023 (top) and 2024 (bottom)

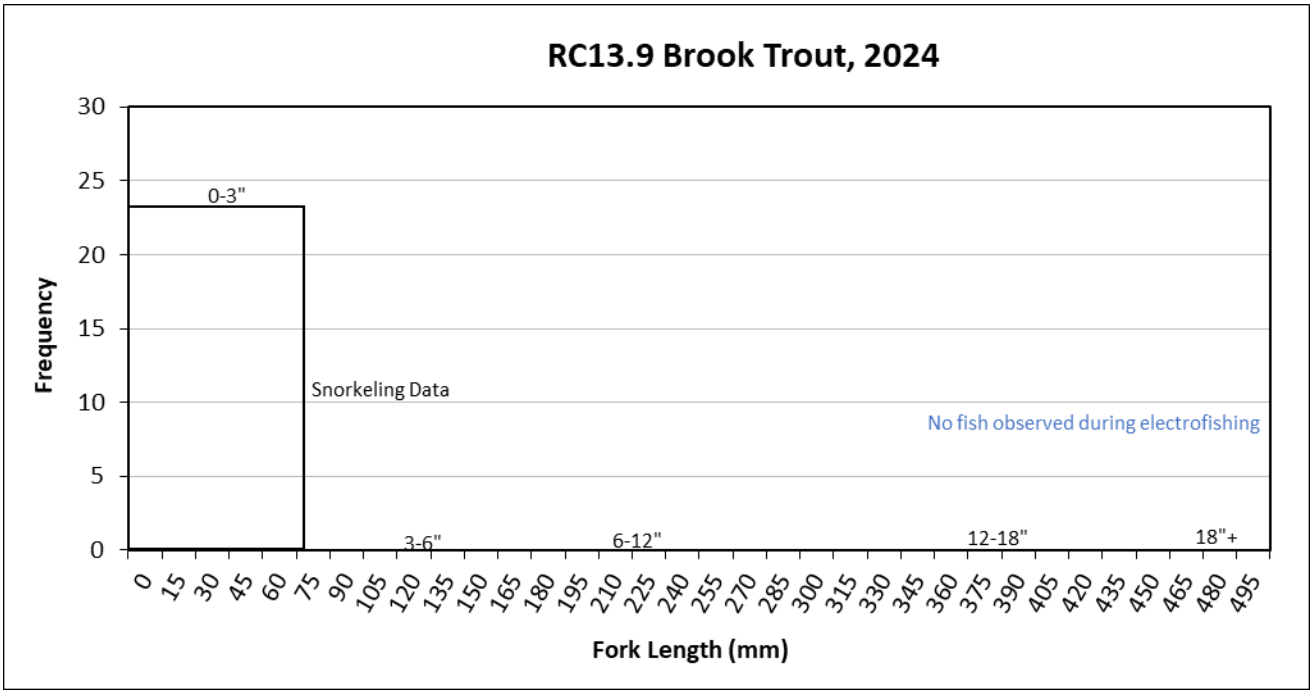
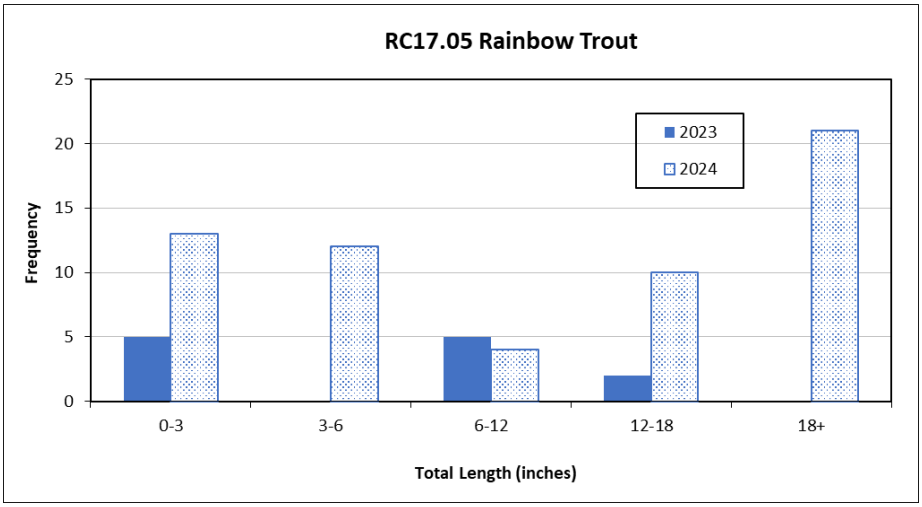
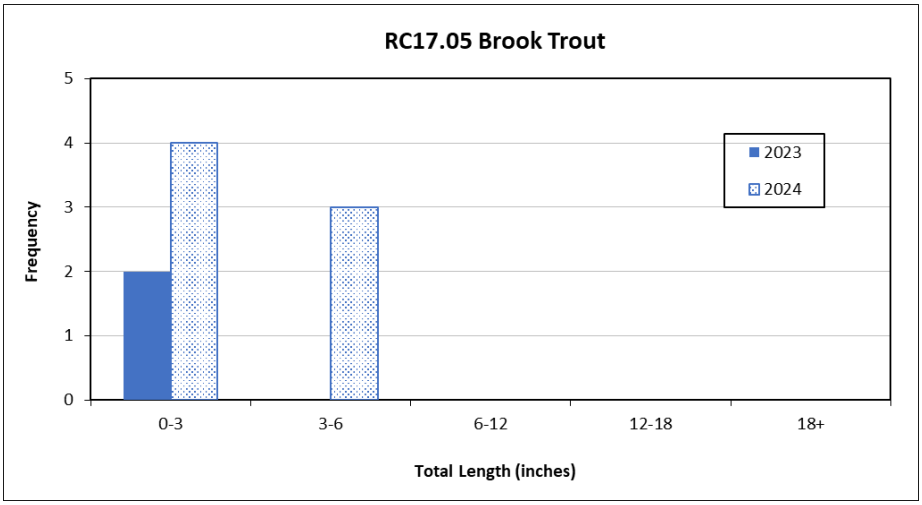


Figure E-1c. Length-Frequency Histograms for Brook Trout observed during Electrofishing and Snorkel Sampling at RC13.9, below Silver Lake, in 2024





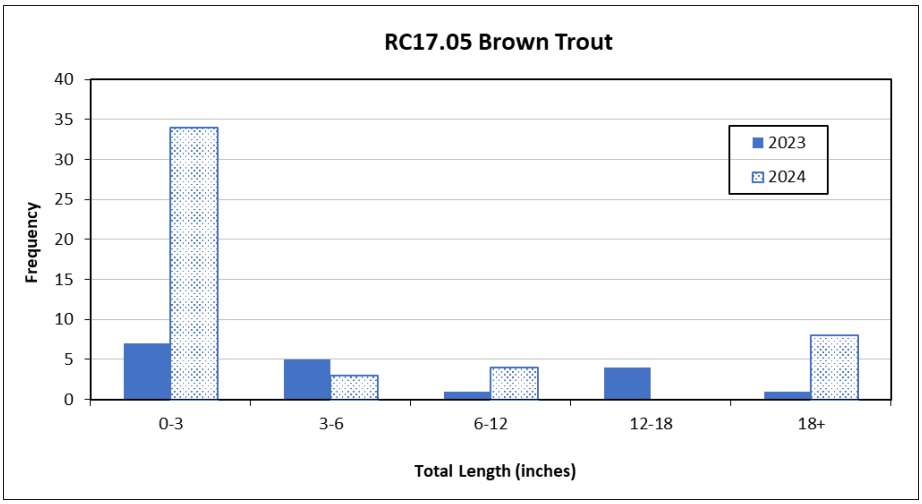


Figure E-2. Length-Frequency Histograms for Rainbow Trout, Brook Trout, and Brown Trout observed during Snorkel Sampling at RC17.05, above Silver Lake, in 2023 and 2024

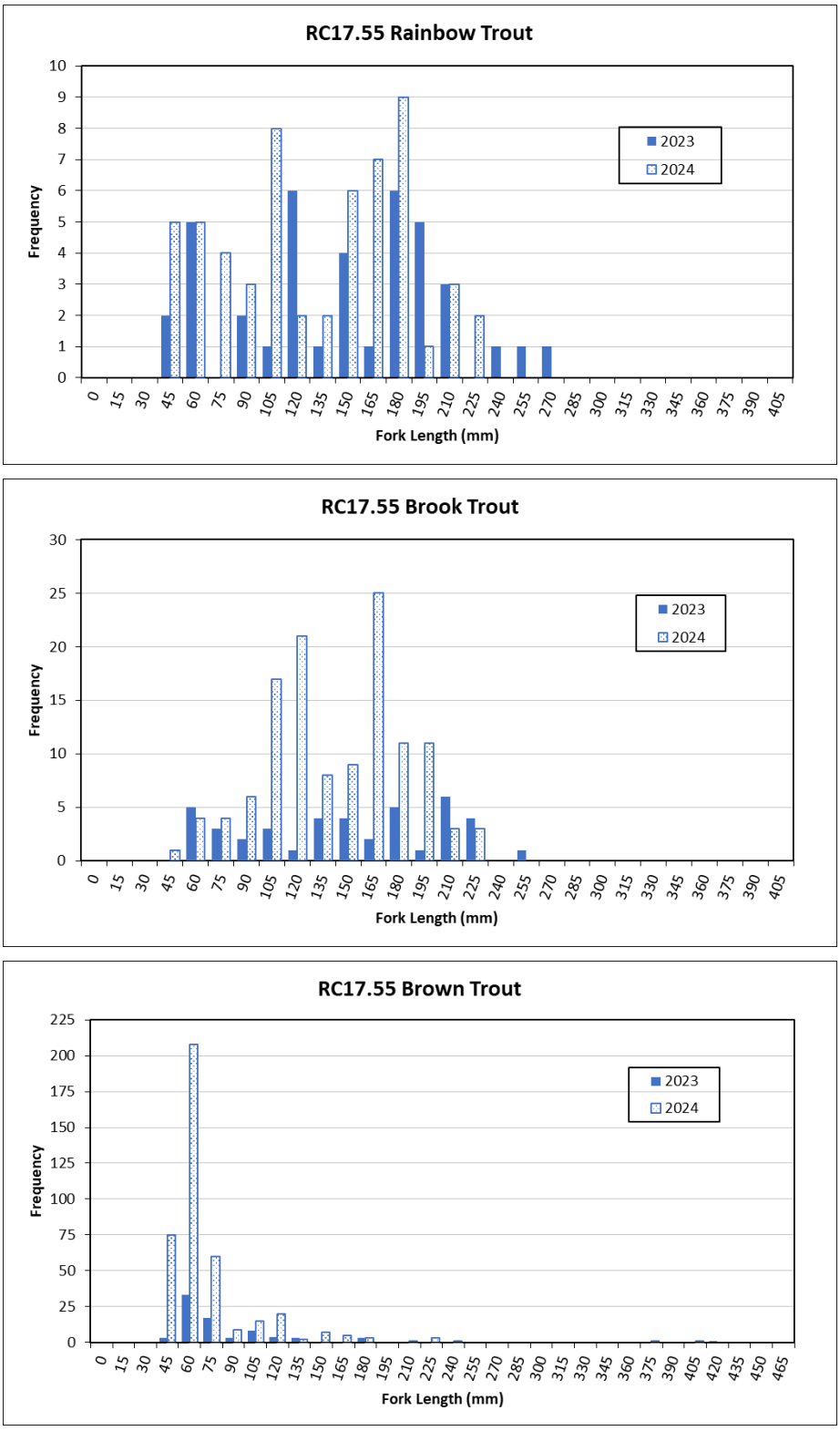


Figure E-3. Length-Frequency Histograms for Rainbow Trout, Brook Trout, and Brown Trout observed during Electrofishing Sampling at RC17.55, above Silver Lake, in 2023 and 2024

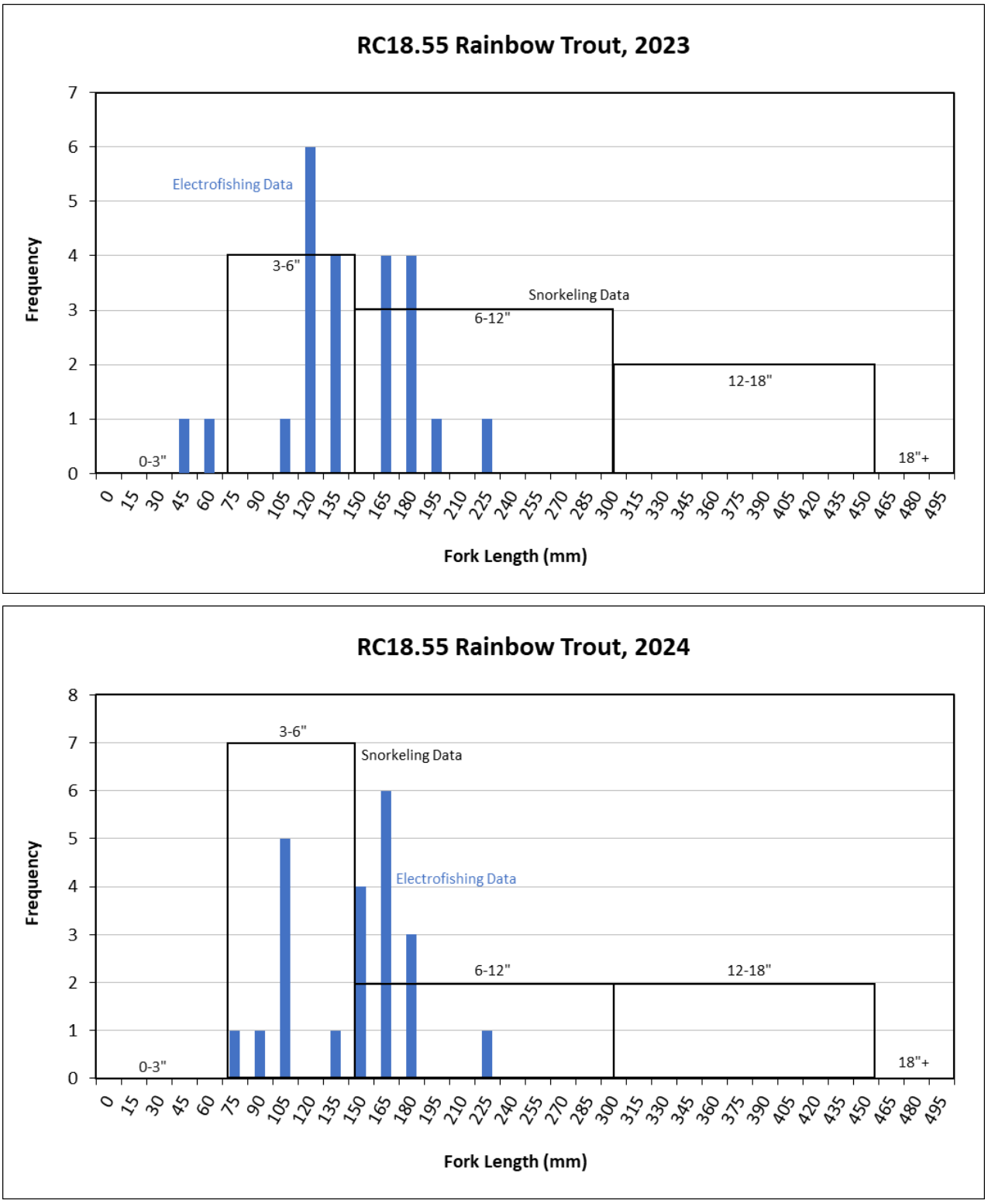


Figure E-4a. Length-Frequency Histograms for Rainbow Trout observed during Electrofishing and Snorkel Sampling at RC18.55, below Agnew Dam, in 2023 (top) and 2024 (bottom)

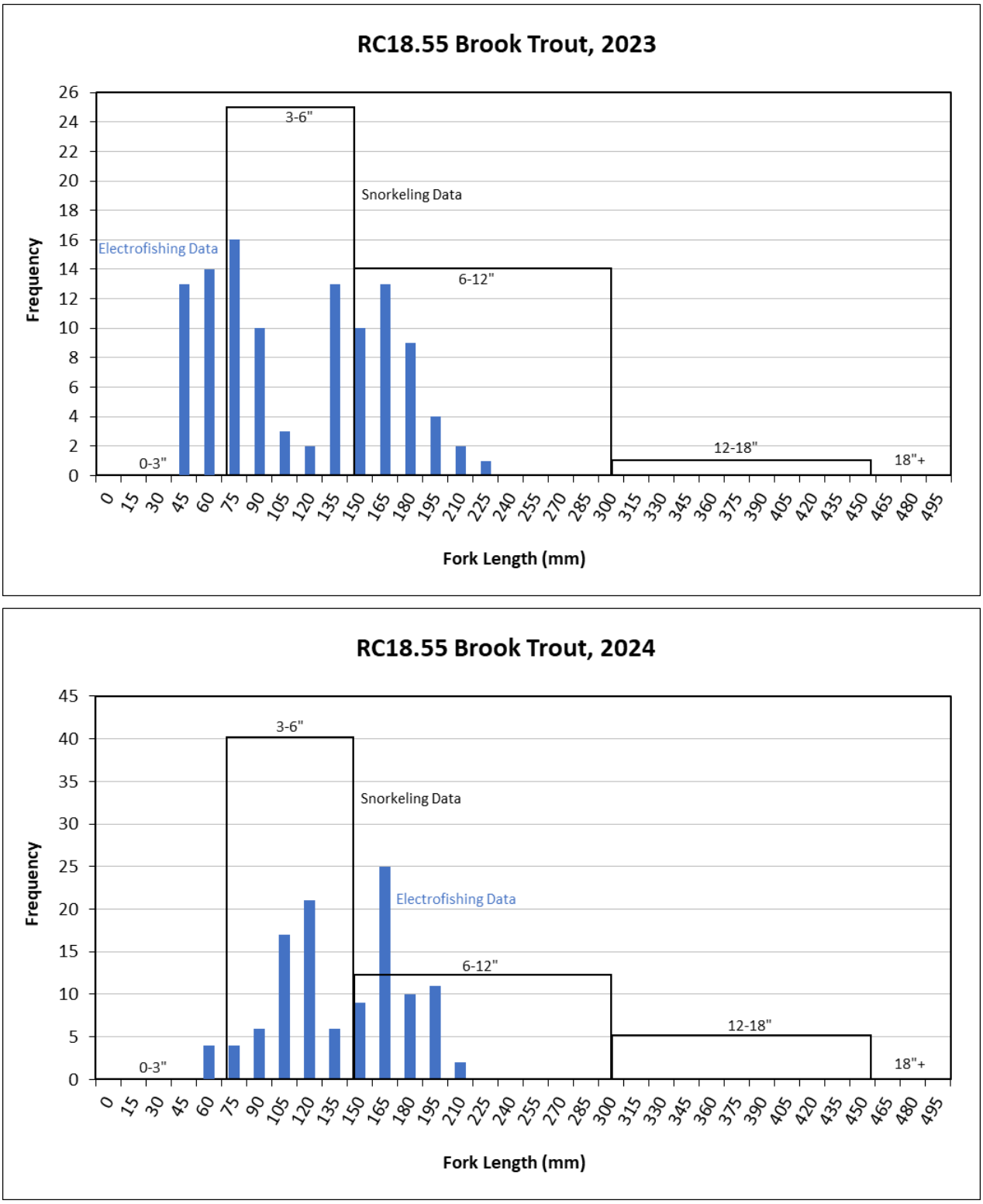


Figure E-4b. Length-Frequency Histograms for Brook Trout observed during Electrofishing and Snorkel Sampling at RC18.55, below Agnew Dam, in 2023 (top) and 2024 (bottom)

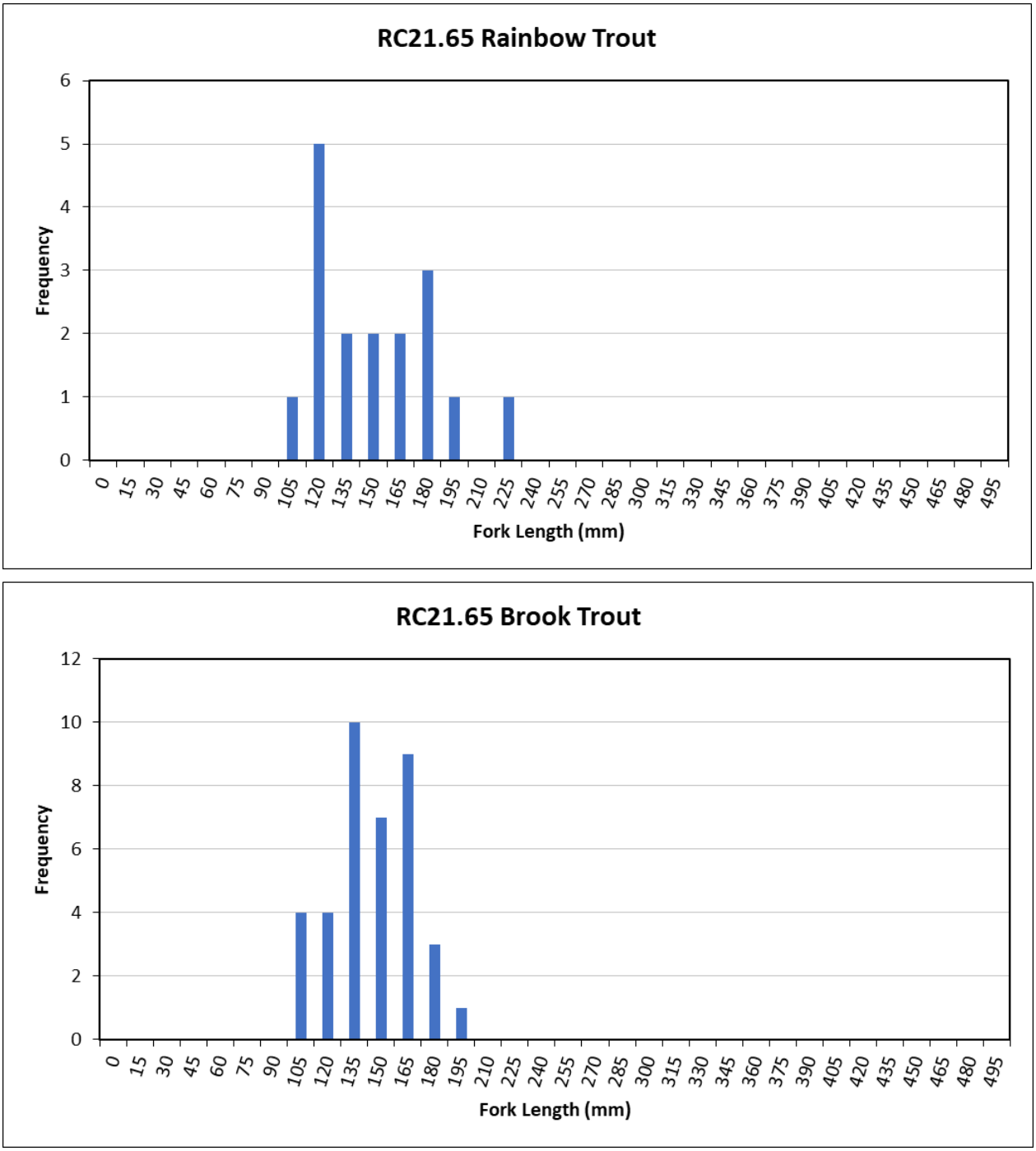


Figure E-5. Length-Frequency Histograms for Rainbow Trout and Brook Trout observed during Electrofishing Sampling at RC21.65, below Rush Meadows Dam

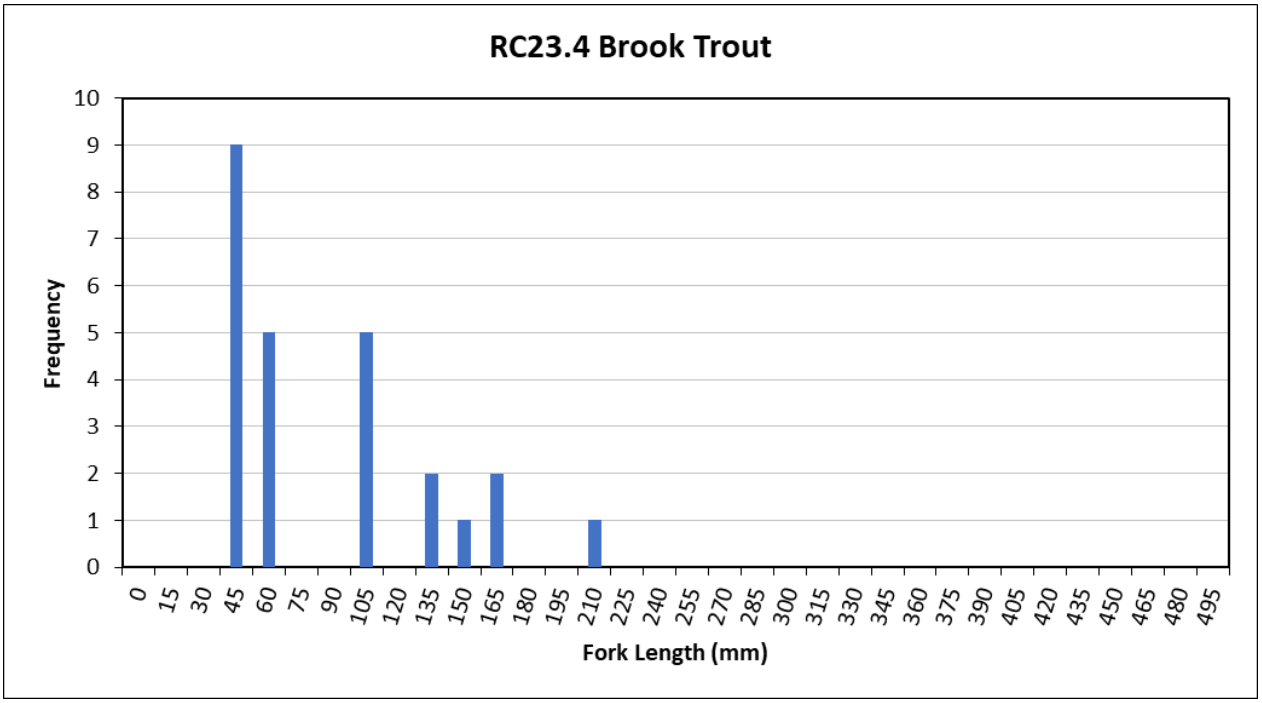


Figure E-6. Length-Frequency Histograms for Brook Trout observed during Electrofishing Sampling at RC23.4, in Waugh Lakebed[9]

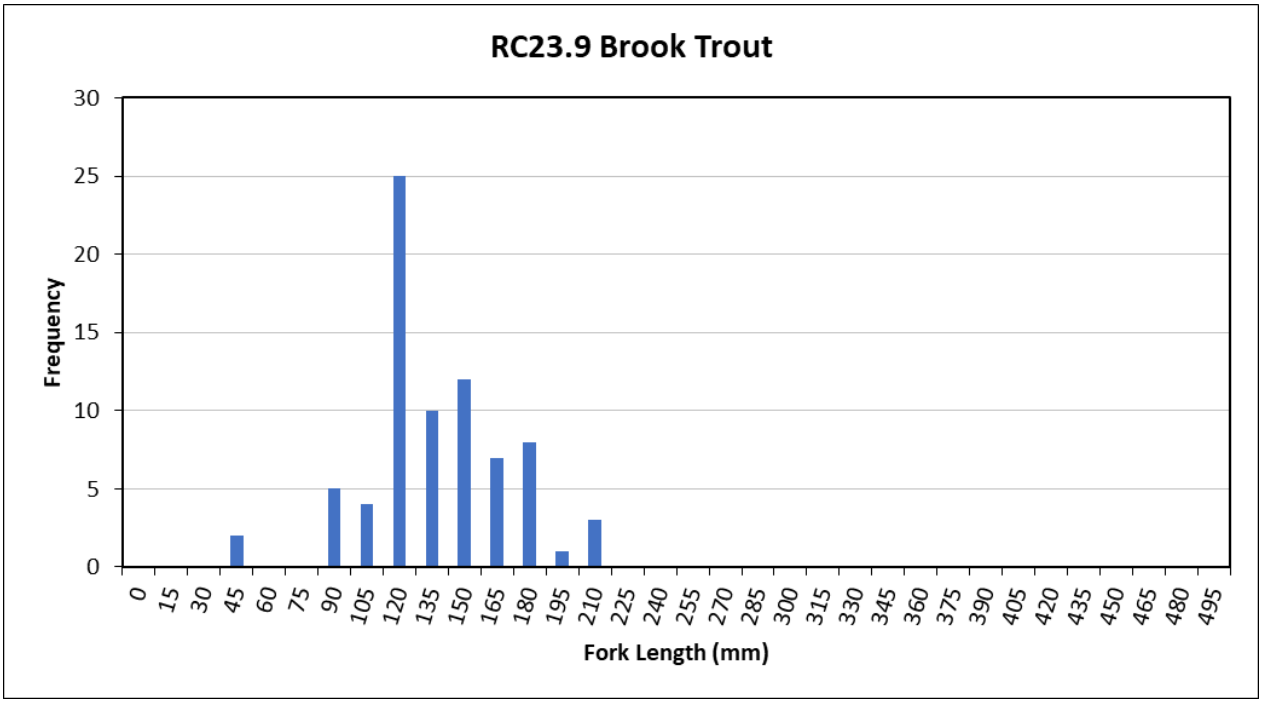


Figure E-7. Length-Frequency Histograms for Brook Trout observed during Electrofishing Sampling at RC23.9, above Waugh Lake

[9] Only one rainbow trout was observed at this site, so no histogram was created.

This Page Intentionally Left Blank