
AQ 3 – FISH POPULATION INTERIM TECHNICAL MEMORANDUM

**KERN RIVER NO. 1 HYDROELECTRIC PROJECT
*FERC PROJECT NO. 1930***

PREPARED FOR:



February 2025

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List of Acronyms

AQ 2 TM	AQ 2 – Water Quality/Water Temperature Technical Memorandum
AQ 3 ITM	AQ 3 – Fish Population Interim Technical Memorandum
AQ 3 TSP	AQ 3 – Fish Population Technical Study Plan
cm FL	centimeter fork length
E-Cat	cataraft electrofisher
FERC	Federal Energy Regulatory Commission
fish/mi	fish per mile
ITM	Interim Technical Memorandum
KR1	Kern River No.1
mm FL	millimeter fork length
Project	Kern River No. 1 Hydroelectric Project, FERC No. 1930
RSP	Revised Study Plan
SCE	Southern California Edison
SPD	Study Plan Determination

1.0 INTRODUCTION

This AQ 3 – Fish Population Interim Technical Memorandum (AQ 3 ITM) provides the methods and findings of the AQ 3 – Fish Population Technical Study Plan (AQ 3 TSP). The AQ 3 TSP was conducted in support of Southern California Edison’s (SCE) Kern River No. 1 (KR1) Hydroelectric Project (Project) relicensing, Federal Energy Regulatory Commission (FERC) Project No. 1930. The AQ 3 TSP was included in SCE’s Revised Study Plan (RSP) filed on February 13, 2024 (SCE 2024). In its March 14, 2024, Study Plan Determination (SPD), FERC approved the AQ 3 TSP with modifications (FERC 2024).

Data for this memorandum was collected in October 2024 and includes sampling within Democrat Dam Impoundment only. Flows in the Kern River were too high in 2024 to safely sample below Democrat Dam. Field sampling efforts and data analysis completed to date are summarized below. Refer to Section 7, which describes the schedule for completing any outstanding study elements.

2.0 STUDY OBJECTIVES

The objectives of the fish population study, as outlined in the AQ 3 TSP (SCE 2024), include the following:

- Document fish species composition, distribution, and abundance in the Democrat Dam Impoundment and bypass reach.¹
- Characterize fish size, condition factor, and approximate population age structure in the Democrat Dam Impoundment and bypass reach.

3.0 STUDY AREA AND STUDY SITES

The study sites outlined in the AQ 3 TSP include the Democrat Dam Impoundment and sites in the Kern River downstream of Democrat Dam, as follows:

- The locations of study sites for developing fish species composition and abundance estimates are shown in Table 3-1, Figure 3-1, and Map 3-1. The river sampling sites (electrofishing) were not sampled in 2024 due to high flows. They will be sampled in 2025. Sites will be approximately 100 meters long, inclusive of the historical sampling sites (ENTRIX 2009). The Democrat Dam Impoundment electrofishing sampling locations are shown in Map 3-1 and include the full length of the impoundment (approximately 1 mile, 1,609 meters).
- The specific locations of the river sampling sites will be determined in the field and will approximate the historical sampling locations (adjusted for channel changes and input from resource agencies, as appropriate). Mesohabitat characterization will be based on aerial image mapping and will be used to identify representative reach sampling sites with mesohabitat types in approximately similar proportion to the larger geomorphic river segments.

¹ A bypass reach is a segment of a river downstream of a diversion facility where Project operations result in the diversion of a portion of the water from the river.

Table 3-1. Fish Population Sampling Locations.

Study River and Site ID	Sampling Location		Site Length (m)	Sampling Dates	Sampling Method	Type of Reach	
	River Miles	GPS at Downstream Starting Location (Latitude, Longitude)				Bypass Reach	Impoundment
Democrat Dam Impoundment	RM 54.5 – 55.5	35.526145°, 118.674463°	1,609	Electrofishing Late Summer / Fall 2024 Trammel Net Late Summer / Fall 2025	Electrofishing/Trammel Netting		■
Site A – Kern River Bypass Reach	RM 52.8	TBD	100	Late Summer / Fall 2025	Electrofishing/Trammel Netting	■	
Site B – Kern River Bypass Reach	RM 52.0	TBD	100	Late Summer / Fall 2025	Electrofishing/Trammel Netting	■	
Site C – Kern River Bypass Reach	RM 50.9	TBD	100	Late Summer / Fall 2025	Electrofishing/Trammel Netting	■	
Site D – Kern River Bypass Reach	RM 48.9	TBD	100	Late Summer / Fall 2025	Electrofishing/Trammel Netting	■	
Site E – Kern River Bypass Reach	RM 47.4	TBD	100	Late Summer / Fall 2025	Electrofishing/Trammel Netting	■	

KEY: TBD = to be determined in the field

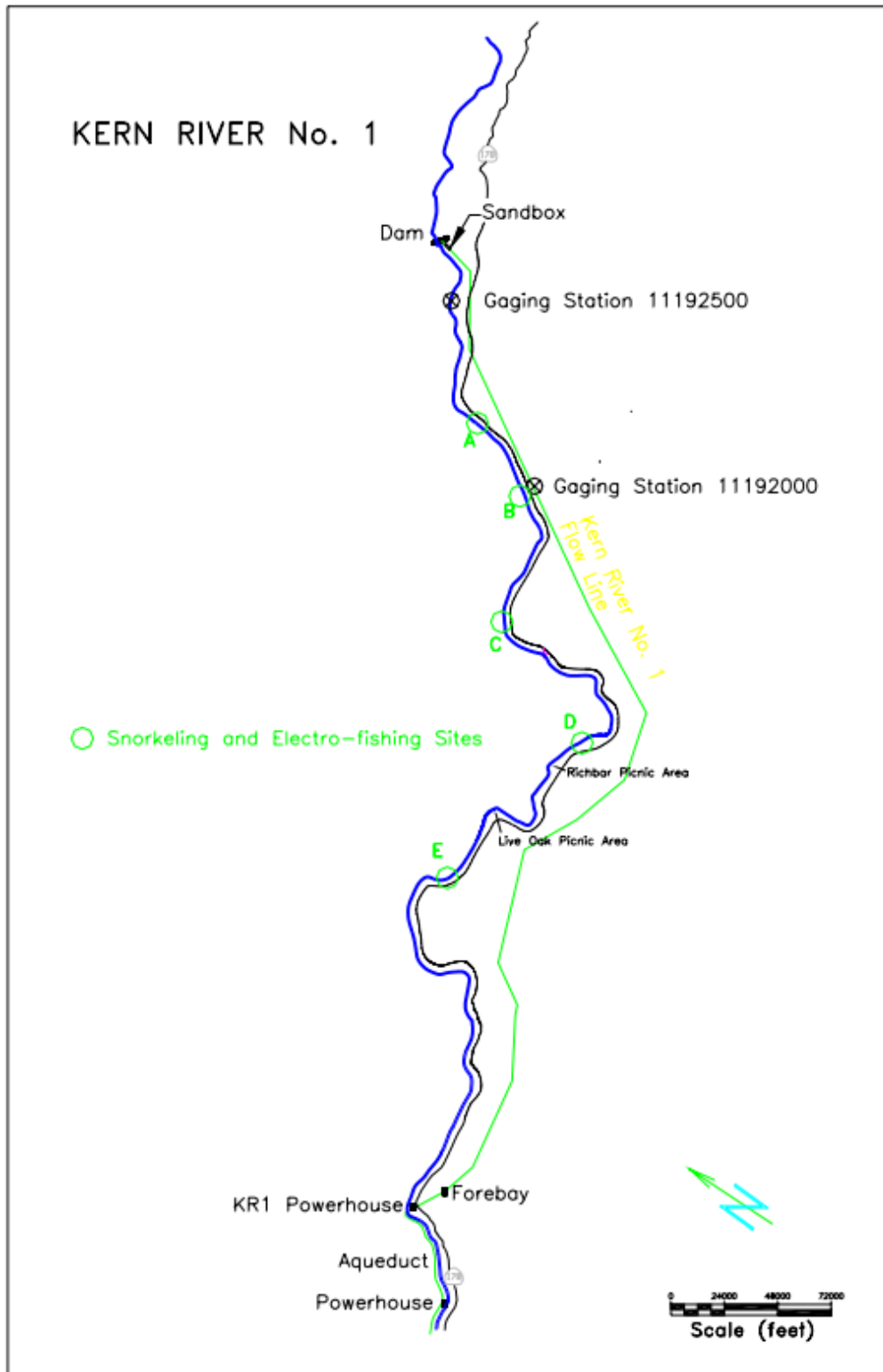
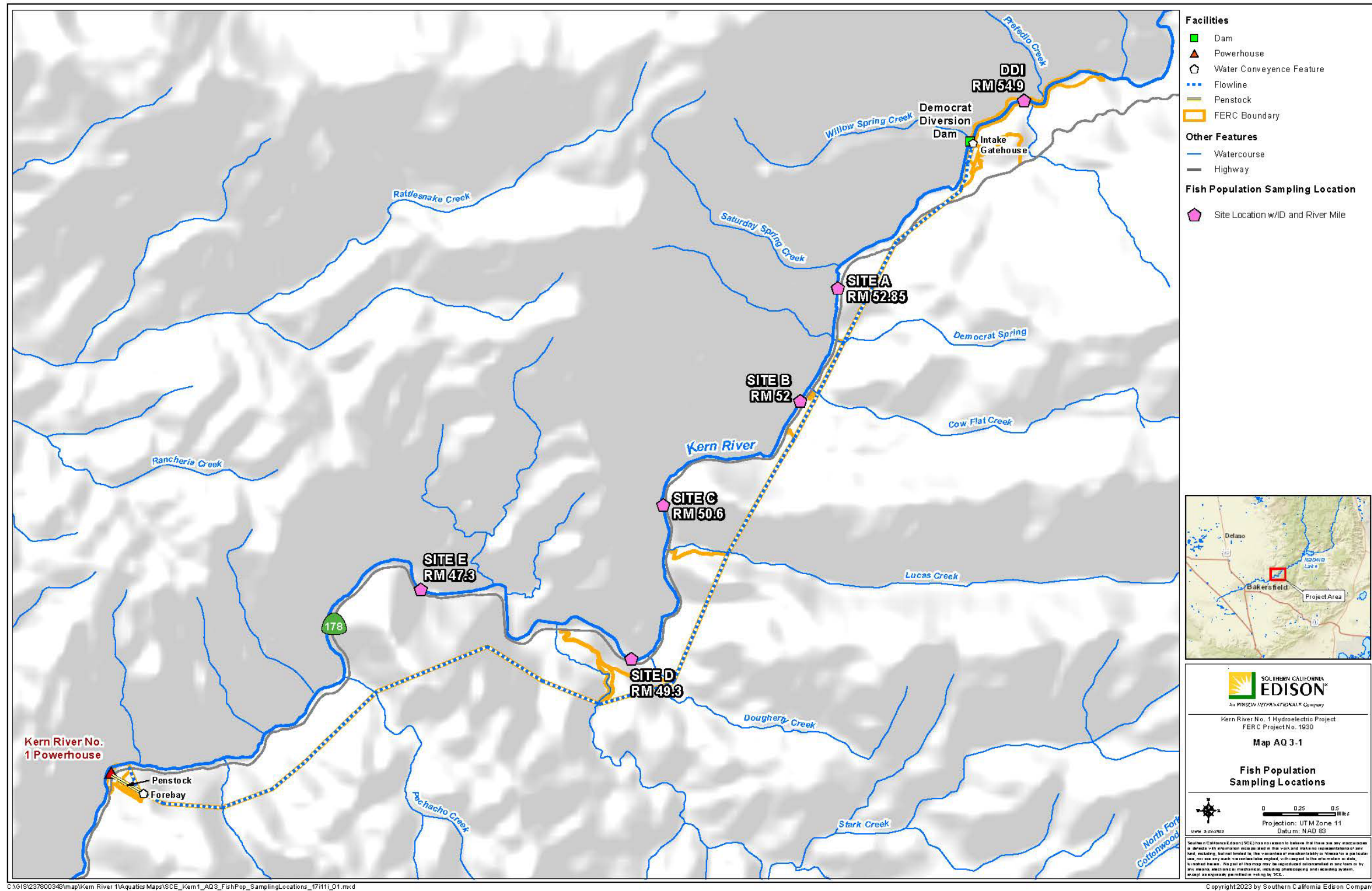


Figure 3-1. Historical Kern River No. 1 Hydroelectric Project Fish Populations Sampling Site Locations.



Map 3-1. Fish Population Sampling Locations

4.0 METHODS

Study implementation followed the methods described in the AQ 3 TSP (SCE 2024).

4.1 STUDY PLAN VARIANCES

Sampling planned for 2024 had to be deferred due to high flows and will be completed in 2025.

4.2 DEMOCRAT DAM IMPOUNDMENT SAMPLING

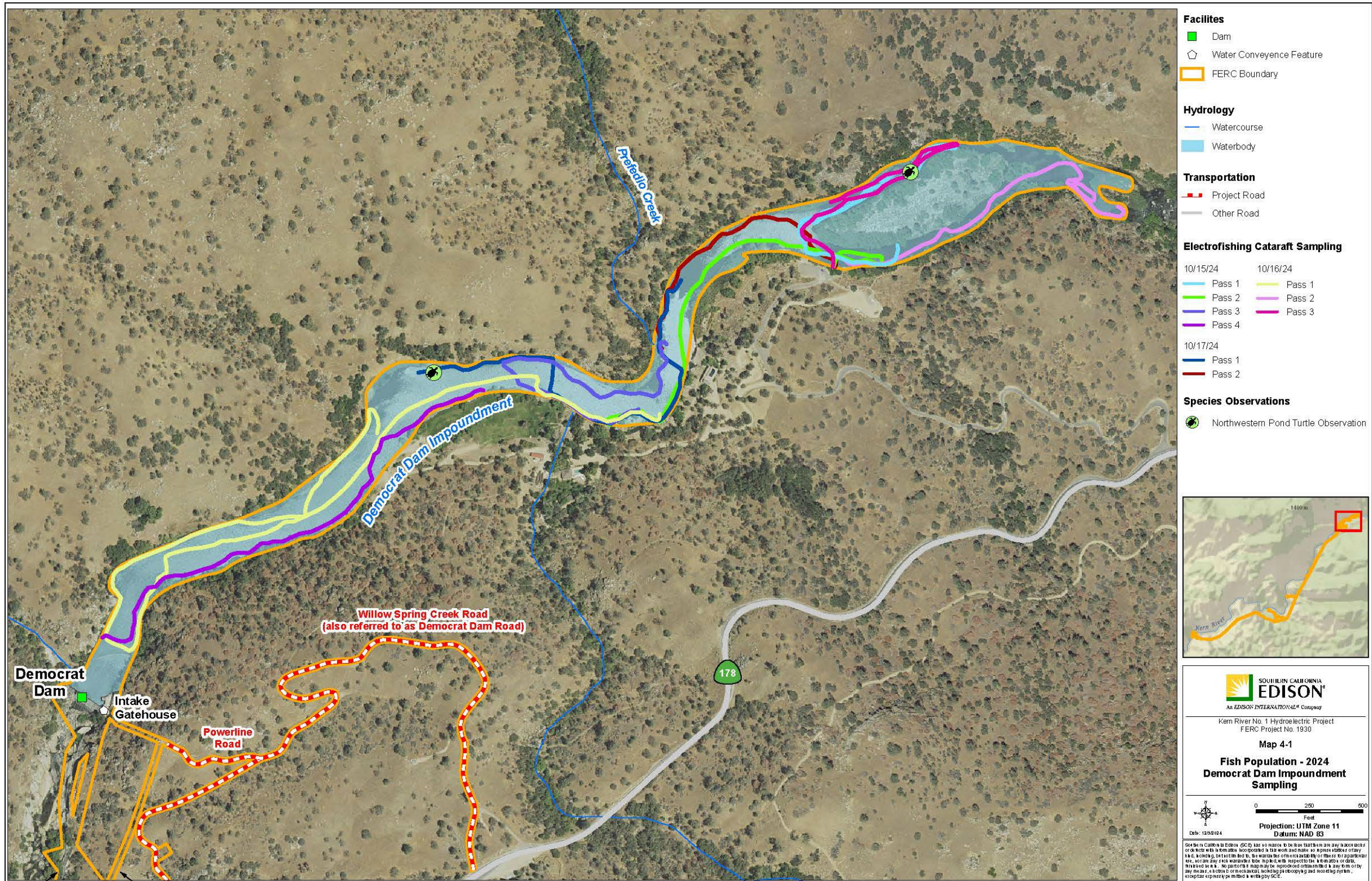
The impoundment sampling methods include electrofishing and trammel netting (Table 3-1) (poor water clarity precludes snorkeling at this site).

- Between October 15 and 17, 2024, approximately 4.65 miles (7,483 meters) of electrofishing passes were sampled in Democrat Dam Impoundment using a Smith-Root™ “E-Cat” light-duty cataraft electrofisher (E-Cat) with oars and a small outboard motor. Biologists sampled most of the 1-mile-long impoundment, including shoreline margins and open waters up to six feet deep. Sampling routes (passes) of the E-Cat are shown in Map 4-1.
- Three days of sampling electrofishing were conducted to capture, if possible, up to 10 of each edible-sized sport fish species for the AQ 2 – Water Quality and Water Temperature Technical Study Plan (AQ 2 TSP) total mercury and methylmercury fish tissue testing,
- During the late summer/early fall of 2025, trammel nets will be used to sample deep water portions of the impoundment. Sampling will include setting 2 trammel nets for 4 hours (daylight) in deeper portions of the impoundment.

4.3 BYPASS REACH (RIVER) SAMPLING

The bypass reach (river) sites were not sampled in 2024. Flows in the Kern River were too high to safely sample below Democrat Dam. SCE anticipates conducting river sampling in the bypass reach late summer/early fall of 2025.

- The bypass reach study sites will be sampled using electrofishing and trammel netting (Table 3-1) (low water clarity precludes snorkeling at these sites).
 - Where possible, due to natural river features or the river being amendable to blocknetting, multi-pass electrofishing (e.g., Reynolds 1996; Van Deventer and Platts 1989; Rexstad and Burnham 1992) will be used to sample and estimate fish populations in shallow stream habitats (<1.5 m) at each study site.
 - Captured fish from each pass will be kept in separate live wells or buckets. Where possible, the sampling sites will be partitioned into mesohabitat types for sampling.



C:\Users\stclare\OneDrive - Stantec\Documents\CON01Data\gis_projects\23780034303_data\gis_cad\map\Kern River 1\Aquatics\Map\SCE_Kern1_AQ3_FishPop_2024_171111_01.mxd

Map 4-1. 2024 Democrat Dam Impoundment Sampling

- In deeper portions of the sampling site, an e-cat electrofisher cataraft will be used to obtain abundance estimates based on the length/area sampled provided the e-cat cataraft can be transported to the sampling site.
- If pool habitat exists that is deeper than the e-cat can effectively electrofish, 1 to 2 trammel nets will be set in the river for 4 hours (daylight), if possible.

4.4 FISH PROCESSING

- Fish were anesthetized (CO₂) as needed, enumerated, identified to species, and measured (fork length and weight).
- Fish were returned to the study site when the sampling was completed.
- Sampling protocols and field data forms were consistent with those in 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 the stream sampled.
 - Captured fish from each pass were kept in separate live wells or buckets. Where possible, the sampling sites were partitioned into mesohabitat types for sampling.
- If fish mortalities occur, they were recorded and the fish were properly placed back into the river system for organic decomposition in deep pools by puncturing their air bladders.

4.5 WESTERN POND TURTLE AND INCIDENTAL SPECIES OBSERVATIONS

Incidental observations of northwestern pond turtle (*Actinemys marmorata*) and other aquatic species were recorded during E-Cat sampling at the Democrat Dam Impoundment. A two-person inflatable kayak was also used to access portions of the reservoir inaccessible with the E-Cat and to conduct surveys without the noise disturbance of the E-Cat to improve detection probability.

4.6 REPORTING

- Fish abundance was reported by species and depending on the sampling method used by either catch-per-unit-effort (CPUE) (fish per length/area of stream sampled or by net-hour) in the case of trammel netting or e-cat electrofishing and by (fish per mile, fish per acre) for multi-pass electrofishing.
- Fish abundance at the bypass river sampling sites will be compared to historical data sets in the Kern River No. 1 bypass reach and recent sampling in the upstream Borel Project river reach (ENTRIX 2009; Cardno 2021).

- A distribution map for each species in the Project study area will be developed using the quantitative abundance estimates and qualitative sampling data.
- A fish life stage periodicity chart (or life history chronology chart by month) will be developed for each species based on available literature, consultation with qualified fisheries biologists, and the fish population sampling data.
- Length frequency histograms of sampled fish were developed to determine the age structure of fish populations using scale data.
- Fish condition factors were calculated using measured weight and length data.
- Upon request, an electronic database (Excel spreadsheet) will be provided of all fish sampling data (date, location, fish species, fish size, sampling pass, etc.) to resource agencies and interested stakeholders.

5.0 RESULTS SUMMARY

5.1 DEMOCRAT DAM IMPOUNDMENT SAMPLING

5.1.1 Species Captured, Density, and Catch per Unit Effort

Approximately 4.65 miles (7,483 meters) of habitat was sampled using the E-Cat in the Democrat Dam Impoundment between October 15 and 17, 2024, (Map 4-1). A total of 329 fish were collected, consisting of brown bullhead (*Ameiurus nebulosus*), channel catfish (*Ictalurus punctatus*), white catfish (*A. catus*), common carp (*Cyprinus carpio*), hardhead minnow (*Mylopharodon conocephalus*), black crappie (*Pomoxis nigromaculatus*), bluegill sunfish (*Lepomis macrochirus*), largemouth bass (*Micropterus nigricans*), Sacramento sucker (*Catostomus occidentalis*), and threadfin shad (*Dorosoma petenense*). The numbers of each fish species captured and their length ranges are shown in Table 5-1. Native species include hardhead and Sacramento sucker. Introduced species include brown bullhead, channel catfish, white catfish, common carp, black crappie, bluegill sunfish, largemouth bass, and threadfin shad. These species are not currently stocked and are apparently self-sustaining populations. Threadfin shad are likely present in the Democrat Dam Impoundment as a result of spill events from Lake Isabella. No smallmouth bass (*M. dolomieu*) were captured.

Table 5-1. Species and Fork Length Range (mm) collected from Democrat Dam Impoundment, 2024.

Species	Total Fish (n)	Length Range (mm)
Brown Bullhead	15	159–251
Black Crappie	7	104–223
Bluegill Sunfish	8	44–169
Common Carp	13	475–610
Channel Catfish	1	545
Hardhead Minnow	2	86–360
Largemouth Bass	131	44–520
Sacramento Sucker	50	81–525
Threadfin Shad	96	43–103
White Catfish	6	150–172

Key: mm = millimeter

Largemouth bass, threadfin shad, and Sacramento sucker were the most numerous species observed during the 2024 sampling in the Democrat Dam Impoundment (Figure 5-1). By weight, Sacramento sucker and common carp made up the majority of biomass, followed by largemouth bass, during the sampling effort (Figure 5-1).

Linear catch rates ranged from 31 to 125 fish per mile (fish/mi) per pass (Table 5-2 and Figure 5-2). The lowest species-specific catch rates were found in channel catfish (0.2 fish/mi), hardhead minnow (0.4 fish/mi), and white catfish (0.5 fish/mi). The highest species-specific catch rates were for largemouth bass (28.2 fish/mi) and Sacramento sucker (10.8 fish/mi) (Table 5-2 and Figure 5-2).

A total of 29 edible-sized sport fish were collected for total mercury and methylmercury fish tissue sampling, including 10 largemouth bass three black crappie, five bluegill sunfish, one channel catfish, one white catfish, and nine brown bullhead, Fish ranged in size from 15.5- to 247-centimeter fork length (cm FL). Additional detail on fish collected for methylmercury laboratory analysis will be provided in the AQ 2 TM.

Catch composition from 2024 sampling in the Democrat Dam Impoundment was compared to data from sampling conducted in 1994 (Figure 5-3, FERC 1998). Overall, more fish were collected in 2024, however, the sampling effort was different. The sampling effort in 1994 is unknown but included beach seining, gill netting, and electroshocking. In a relative sense, there were greater numbers of brown bullhead, common carp, and largemouth bass observed than in 1994. Smallmouth bass, white crappie (*Pomoxis annularis*), mosquitofish (*Gambusia affinis*), and hitch (*Lavinia exilicauda*) were collected in 1994 but were not observed in 2024. Black crappie, bluegill sunfish, hardhead minnow, Sacramento sucker, and white catfish were observed in 2024 but not in 1994.

Table 5-2. Catch Rates by Sampling Pass (Fish per Mile Sampled) from E-Cat Electrofishing in Democrat Dam Impoundment, 2024.

Date	Pass	Length of Pass (mi)	Total Fish (n)	Fish/mi	Species																			
					Black Crappie		Bluegill Sunfish		Brown Bullhead		Common Carp		Channel Catfish		Hardhead Minnow		Largemouth Bass		Sacramento Sucker		Threadfin Shad		White Catfish	
					n	Fish/mi	n	Fish/mi	n	Fish/mi	n	Fish/mi	n	Fish/mi	n	Fish/mi	n	Fish/mi	n	Fish/mi	n	Fish/mi	n	Fish/mi
10/15/2024	1	0.48	15	31	-	-	-	-	1	2.1	-	-	-	-	-	-	-	9	18.8	4	8.3	1	2.1	
	2	0.48	60	125	3	6.3	3	6.3	2	4.2	-	-	-	-	1	2.1	10	20.8	5	10.4	33	68.8	3	6.3
	3	0.41	45	110	2	4.9	-	-	-	-	2	4.9	-	-	1	2.4	17	41.5	3	7.3	20	48.8	-	-
	4	0.47	31	66	-	-	-	-	-	-	2	4.3	-	-	-	-	22	46.8	7	14.9	-	-	-	-
10/16/2024	1	1.09	62	57	1	0.9	2	1.8	5	4.6	2	1.8	1	0.9	-	-	30	27.5	4	3.7	16	14.7	1	0.9
	2	0.37	6	16	-	-	1	2.7	-	-	-	-	-	-	-	-	5	13.5	-	-	-	-	-	-
	3	0.62	25	40	-	-	-	-	2	3.2	4	6.5	-	-	-	-	6	9.7	13	21.0	-	-	-	-
10/17/2024	1	0.46	57	124	-	-	2	4.3	2	4.3	2	4.3	-	-	-	-	29	63.0	6	13.0	14	30.4	1	2.2
	2	0.27	28	104	-	-	-	-	3	11.1	1	3.7	-	-	-	-	12	44.4	3	11.1	9	33.3	-	-
Totals		4.65	329	-	6	1.3	8	1.7	15	3.2	13	2.8	1	0.2	2	0.4	131	28.2	50	10.8	96	2.3	6	0.5

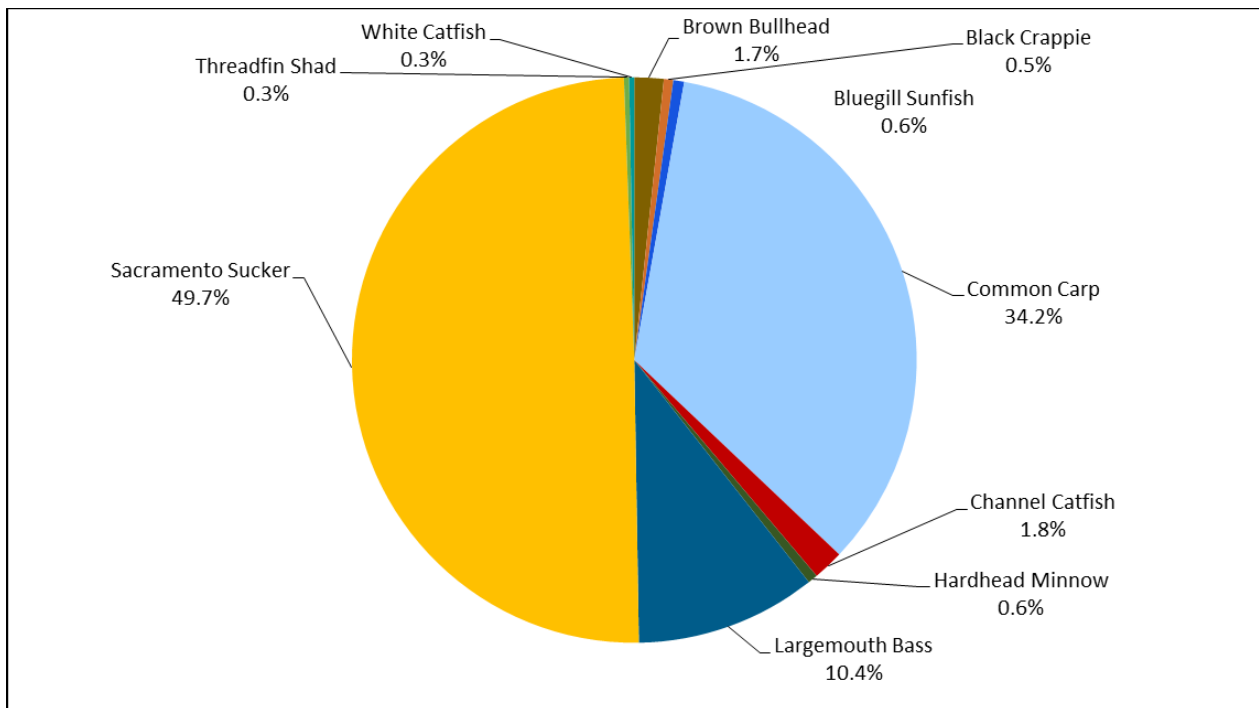
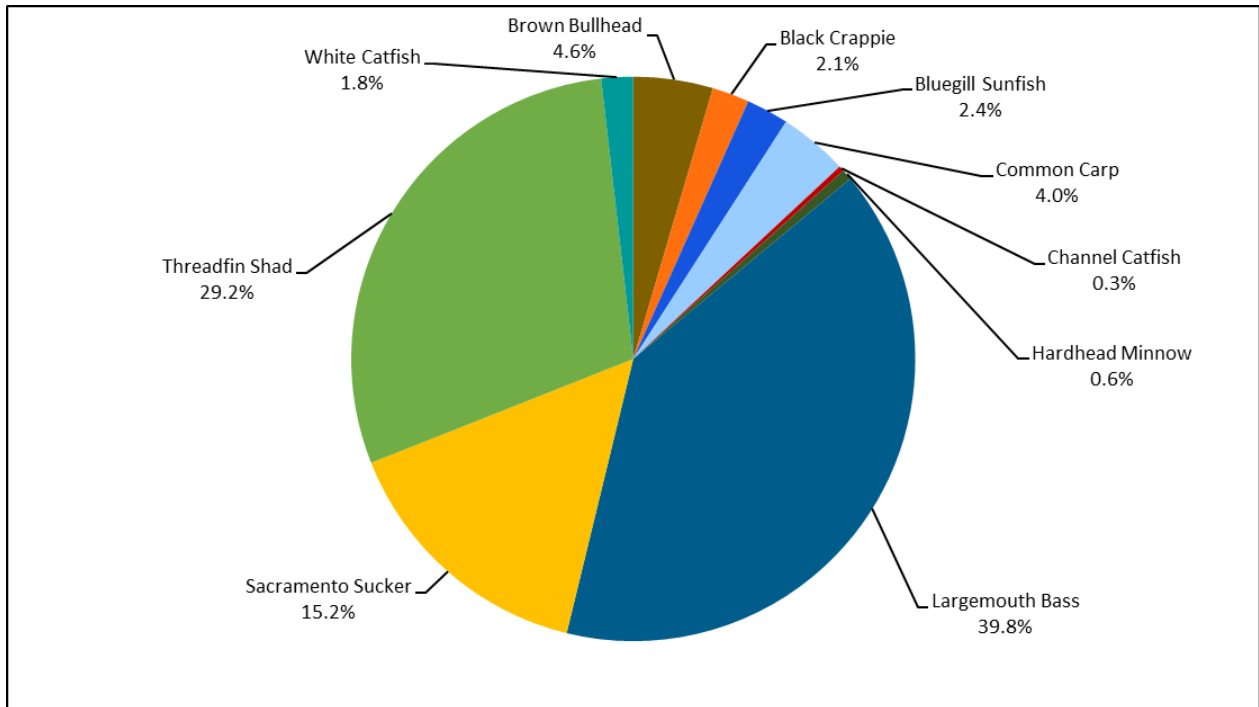


Figure 5-1. Democrat Dam Impoundment Species Composition, by Number Captured (top) and Biomass (bottom).

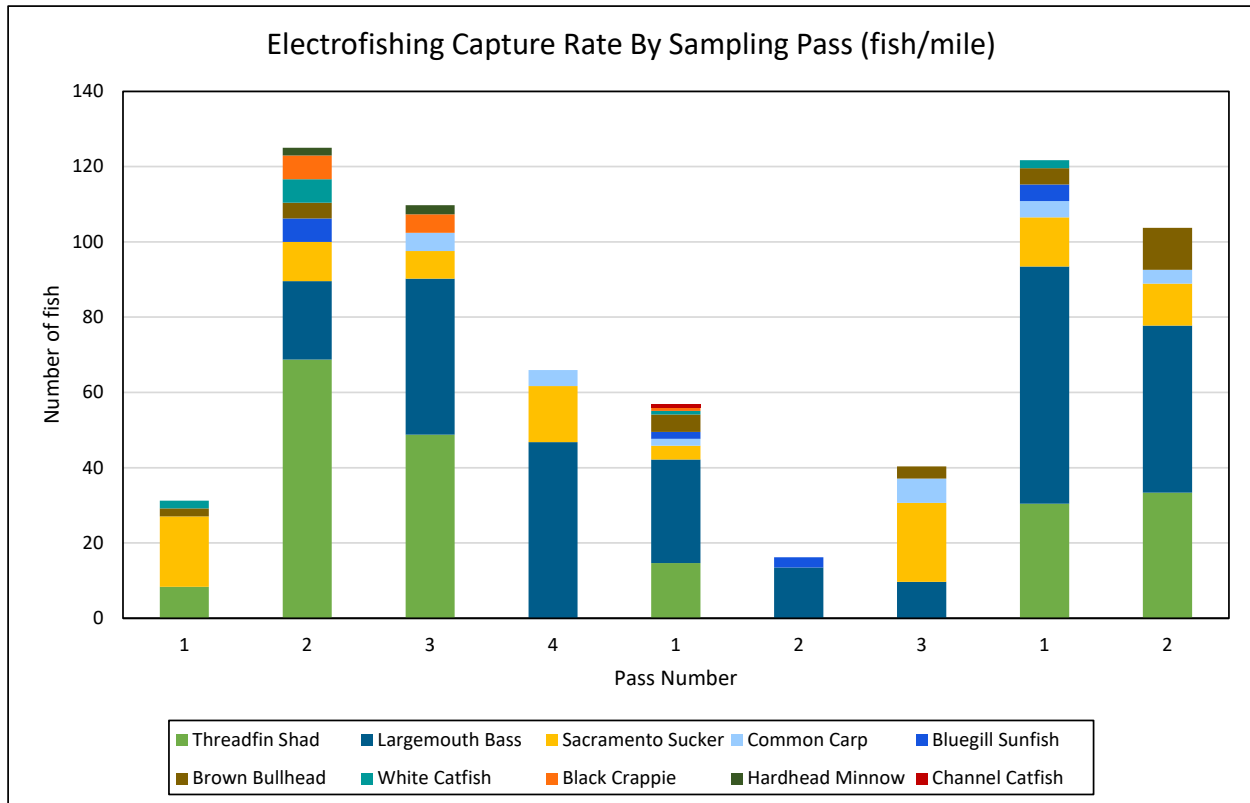


Figure 5-2. Species Capture Rate by Sampling Pass (fish per mile) in Democrat Dam Impoundment, 2024.

5.1.2 Length-Frequency

At the Democrat Dam Impoundment, length frequency histograms were created for species collected during sampling and are shown in Figure 5-4 and Appendix A. Fish between 50- and 150-millimeter fork length² (mm FL) were the most frequently collected, consisting primarily of threadfin shad and largemouth bass. Low to moderate numbers of fish between 150- and 400-mm FL were observed, consisting of largemouth bass, bluegill sunfish, black crappie, brown bullhead, white catfish, and hardhead. Sacramento sucker and common carp had the most fish of larger size from 400- to over 600-mm FL collected.

² Fork length is the length of a fish as measured from the tip of its snout to the fork of the tail.

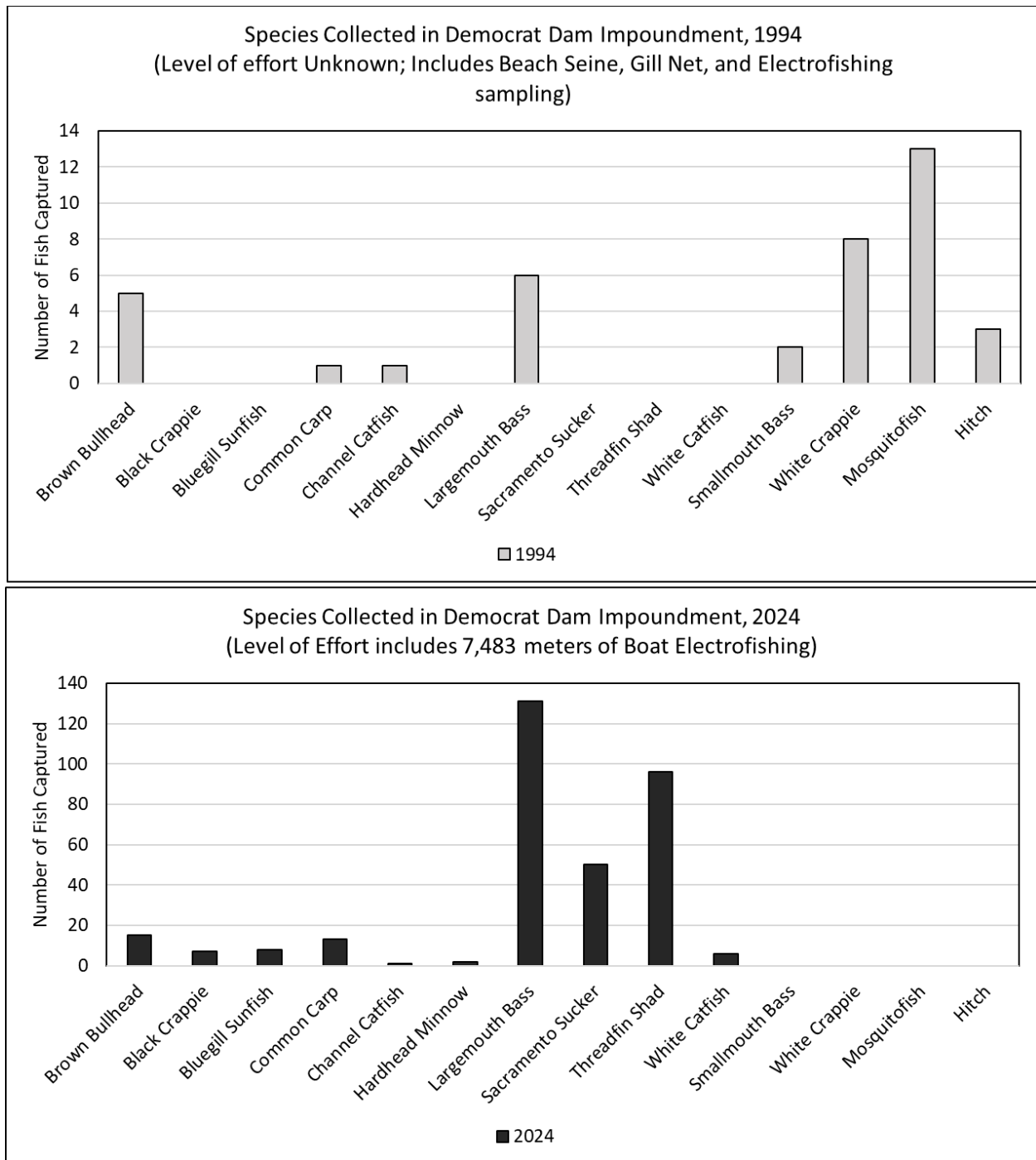


Figure 5-3. Comparison of Species Collected in Democrat Dam Impoundment in 1994 (top) and 2024 (bottom) (note that the level of effort is different between years and unknown for 1994).

5.1.3 Condition Factor and Fish Health

The average condition factors of all species observed in the Democrat Dam Impoundment ranged from 1.10 to 2.35, representing fish in good condition (Table 5-3). Diseases or parasites were encountered incidentally in some fish but were not widespread. A large hardhead was captured in poor health with an unidentified wound (Figure 5-5). The wound was not consistent with an external parasite or electrofishing injury and may have been due to internal infection or injury from catch by recreational fishers.

Table 5-3. Average Condition Factors by Species Collected in Democrat Dam Impoundment, 2024.

Species	Average Condition Factor	Total Fish (n) ¹
Brown Bullhead	1.30	15
Black Crappie	1.49	7
Bluegill Sunfish	2.35	8
Common Carp	2.02	13
Channel Catfish	1.24	1
Hardhead Minnow	1.10	2
Largemouth Bass	1.29	131
Sacramento Sucker	1.35	50
Threadfin Shad	1.16	96
White Catfish	1.32	6

¹ Captured fish under 50 millimeter in fork length were excluded from condition factor analysis.

5.2 BYPASS REACH (RIVER) SAMPLING

The bypass reach (river) sites were not sampled in 2024. Flows in the Kern River were too high in 2024 to safely sample. SCE anticipates conducting river sampling in the bypass reach late summer/early fall of 2025.

5.3 WESTERN POND TURTLE AND INCIDENTAL SPECIES OBSERVATIONS

One juvenile northwestern pond turtle estimated at 2–3 years old was observed along the northern shoreline of the Democrat Dam Impoundment during E-Cat sampling on October 16, 2024. The turtle appeared to be healthy and in good condition. Additionally, one adult male northwestern pond turtle was observed basking in the northeast portion of the impoundment on October 16, 2024, and one red-eared slider was seen foraging underwater.

No other incidental aquatic species were observed.

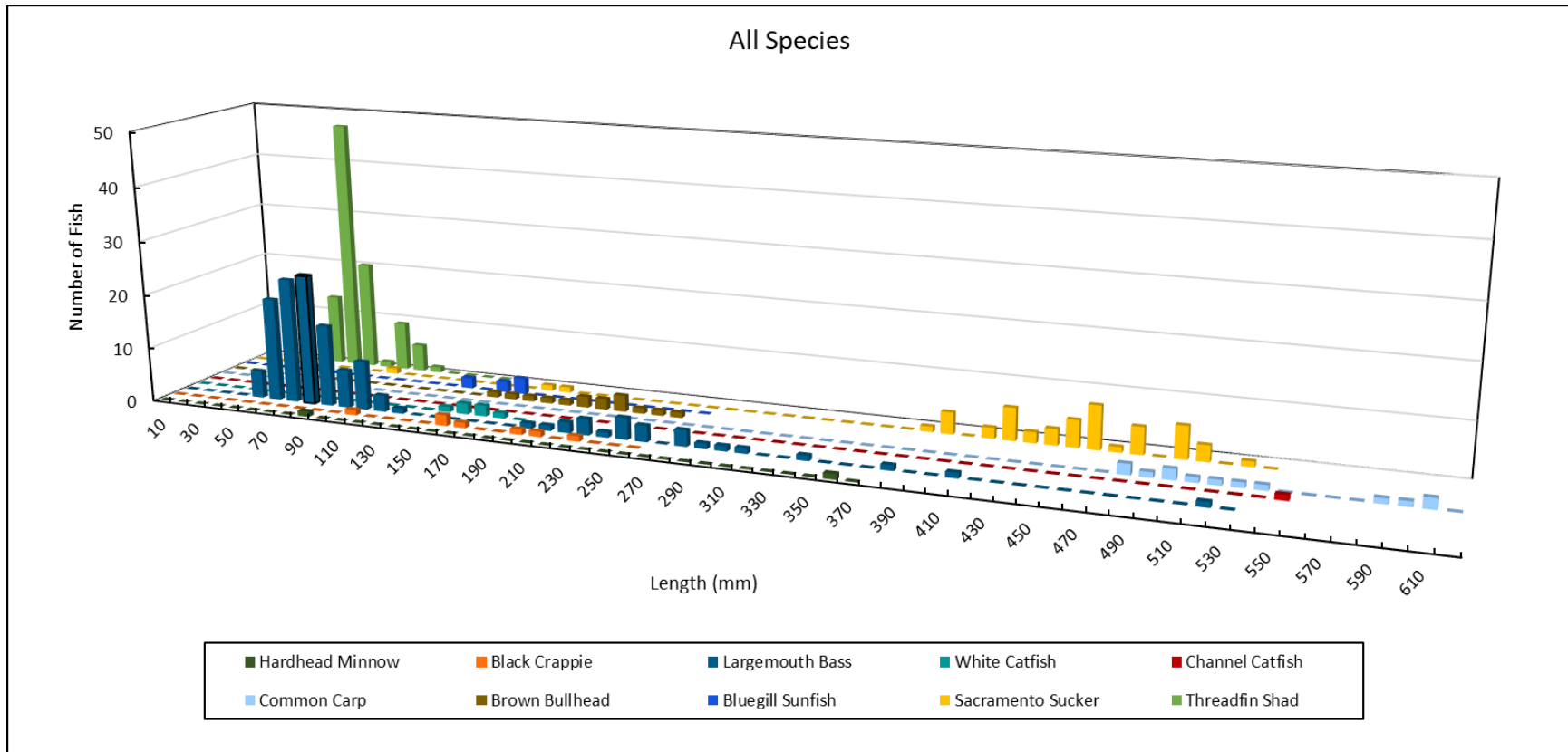


Figure 5-4. Length Frequency Histogram for all Species Captured during E-Cat Sampling in Democrat Dam Impoundment, 2024.



Figure 5-5. Adult hardhead captured in Democrat impoundment with unknown wound or infection.

6.0 STUDY-SPECIFIC CONSULTATION

The following study-specific consultation has been conducted:

- **August 8, 2024:** A Technical Working Group meeting for Aquatic Resources was held to obtain stakeholder and resource agency input on the implementation of the hydrology and fish populations studies. Details of field studies were covered, including specific locations of the fish sampling sites.

7.0 OUTSTANDING STUDY PLAN ELEMENTS

Field activities for the AQ 3 TSP were initially planned as a one-year study to be conducted in 2024. However, flows in the bypass reach remained elevated above levels suitable for river sampling throughout 2024 precluding safe and effective sampling. Only electrofish sampling in the Democrat Dam Impoundment was completed in 2024. SCE anticipates conducting trammel net sampling in Democrat Dam Impoundment and river sampling in the bypass reach late summer/early fall of 2025.

The anticipated schedule to complete the outstanding study plan elements is outlined in Table 7-1.

Table 7-1. Schedule for Completion of Outstanding Study Plan Elements

Date	Activity
February 2025	Distribute ITM to the stakeholders.
March–May 2025	Stakeholders review and provide comments on the ITM (90 days)
June 2025–July 2025	Resolve stakeholder comments
August–October 2025	Conduct trammel net sampling in Democrat Dam Impoundment, bypass reach sampling, and prepare Final Technical Memorandum.
December 2025	Distribute Final Technical Memorandum in Draft License Application

8.0 REFERENCES

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APPENDIX A

Length Frequency Histograms by Species

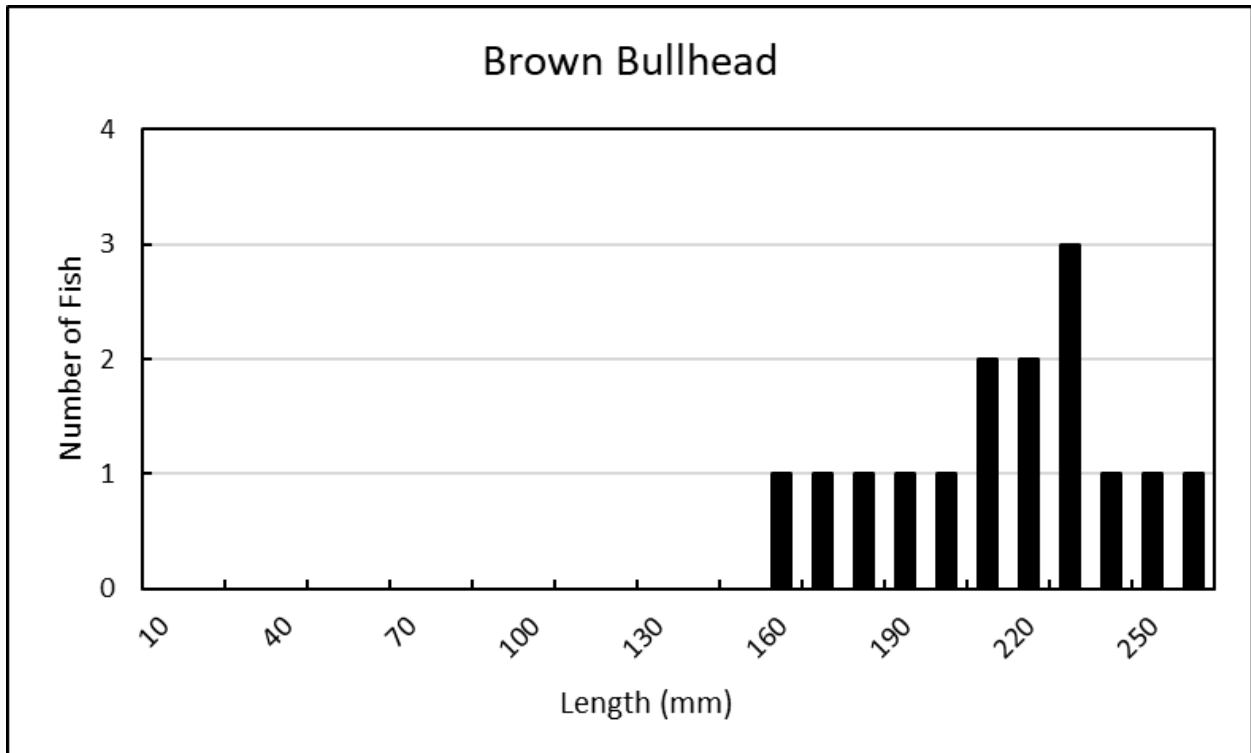


Figure A-1. Length-Frequency Histogram for Brown Bullhead collected in Democrat Dam Impoundment, 2024.

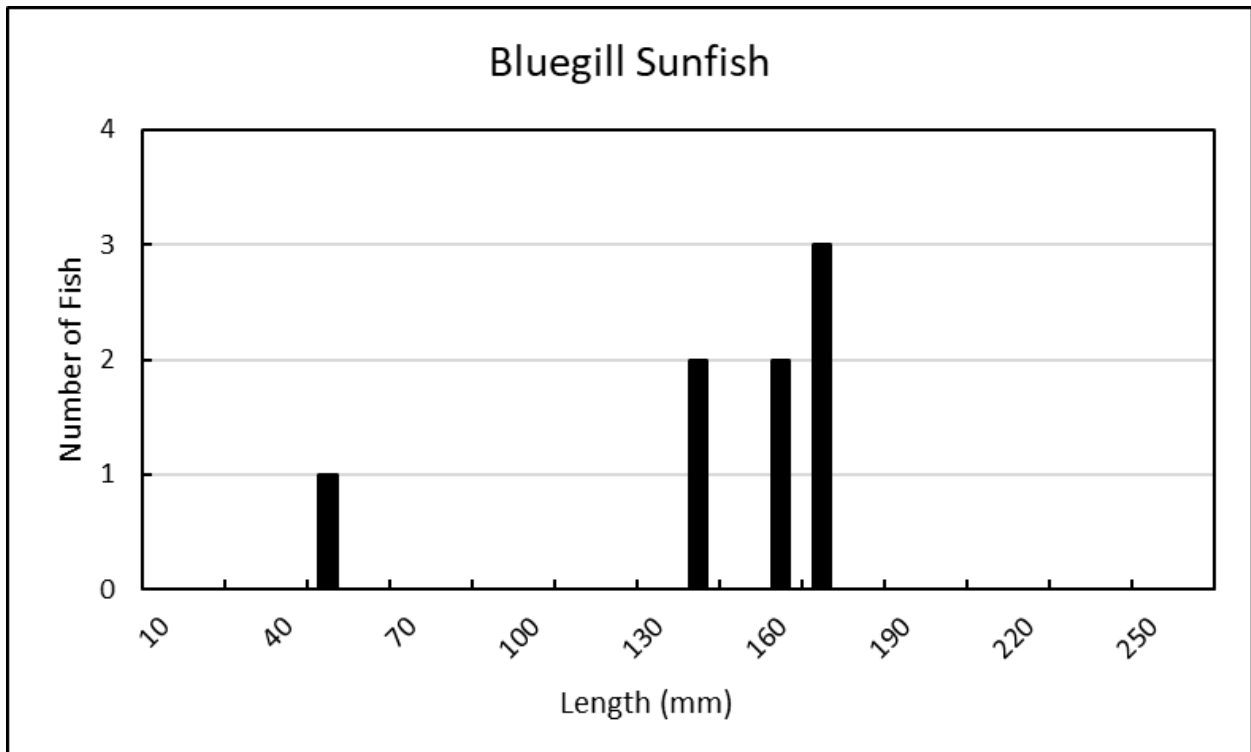


Figure A-2. Length-Frequency Histogram for Bluegill Sunfish collected in Democrat Dam Impoundment, 2024.

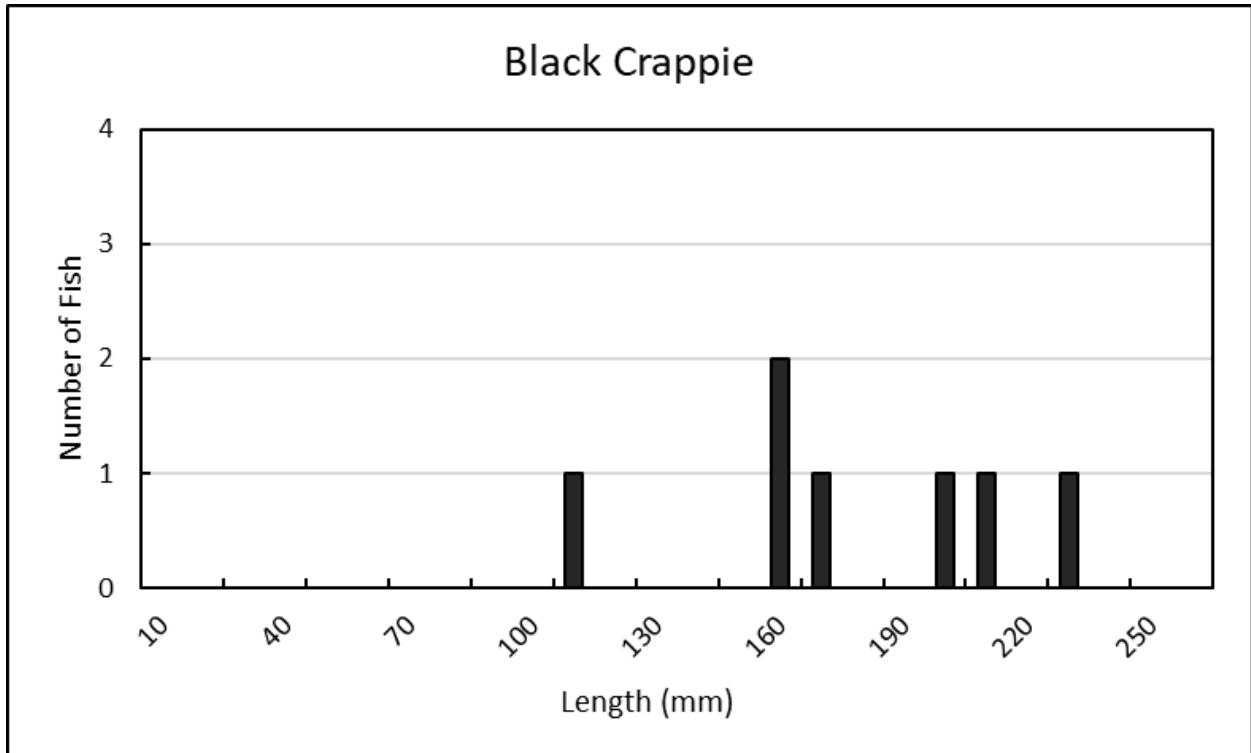


Figure A-3. Length-Frequency Histogram for Black Crappie collected in Democrat Dam Impoundment, 2024.

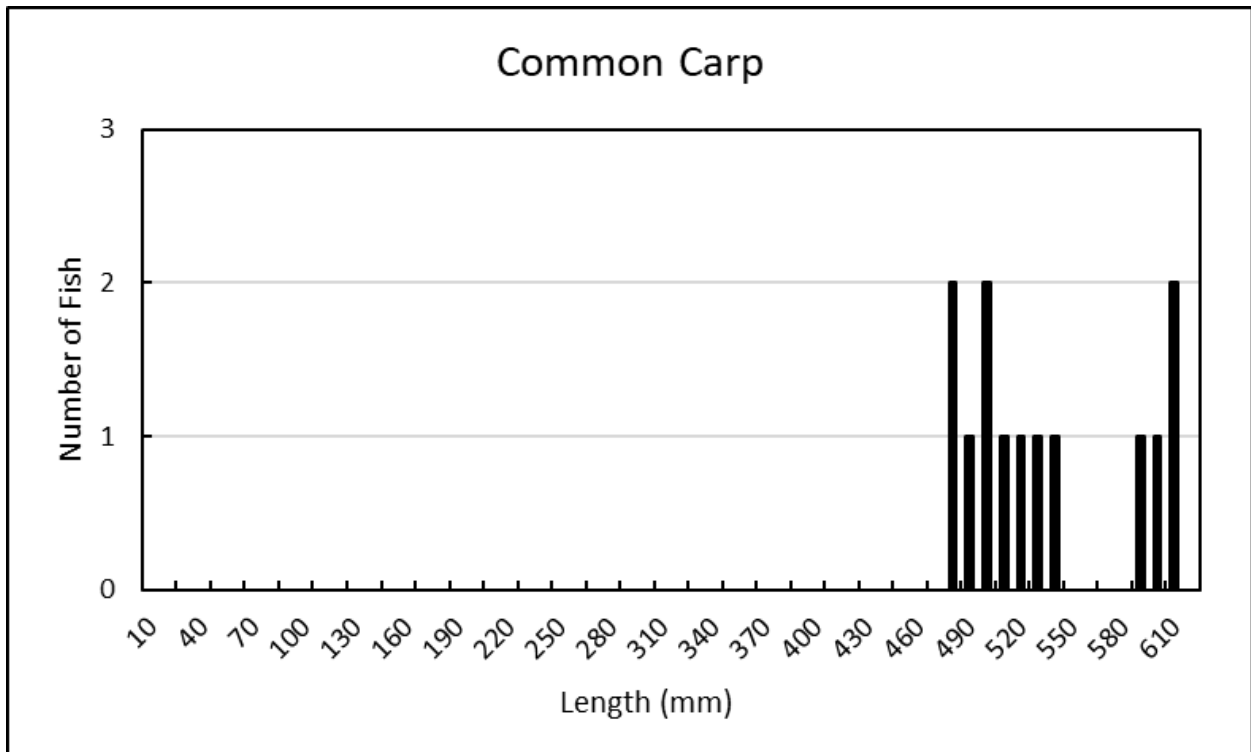


Figure A-4. Length-Frequency Histogram for Common Carp collected in Democrat Dam Impoundment, 2024.

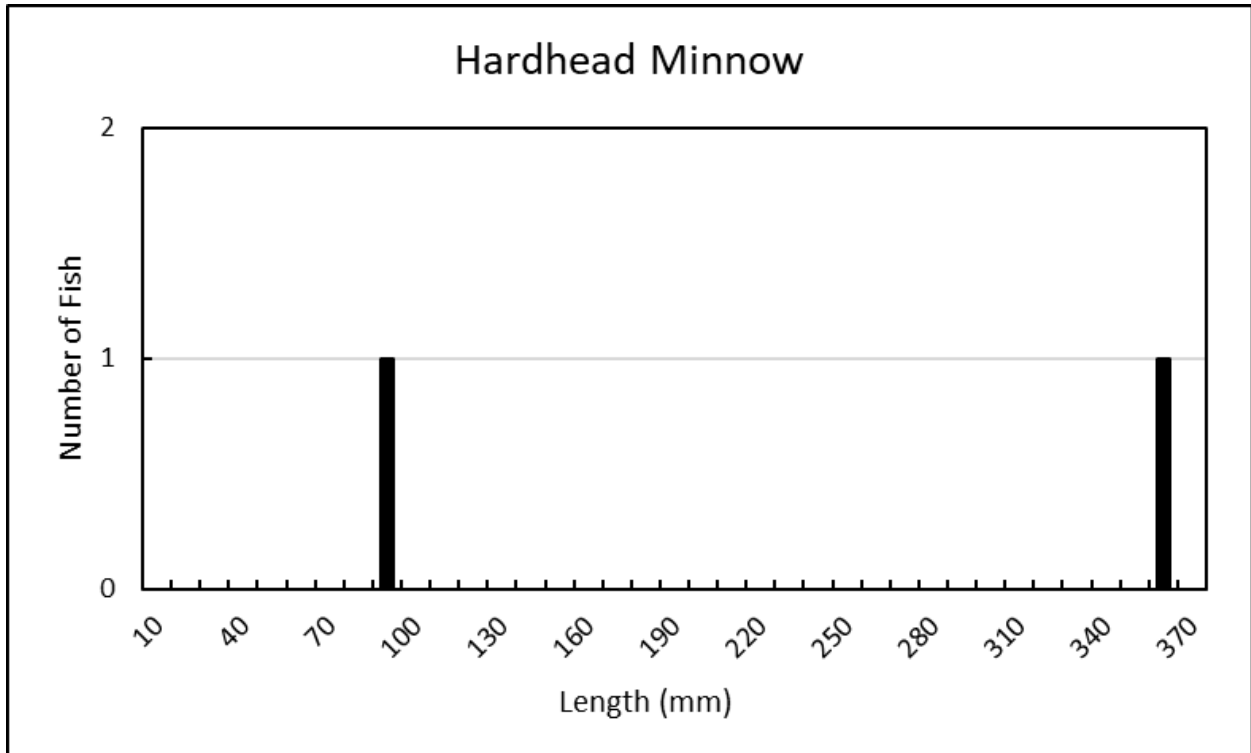


Figure A-5. Length-Frequency Histogram for Hardhead Minnow collected in Democrat Dam Impoundment, 2024.

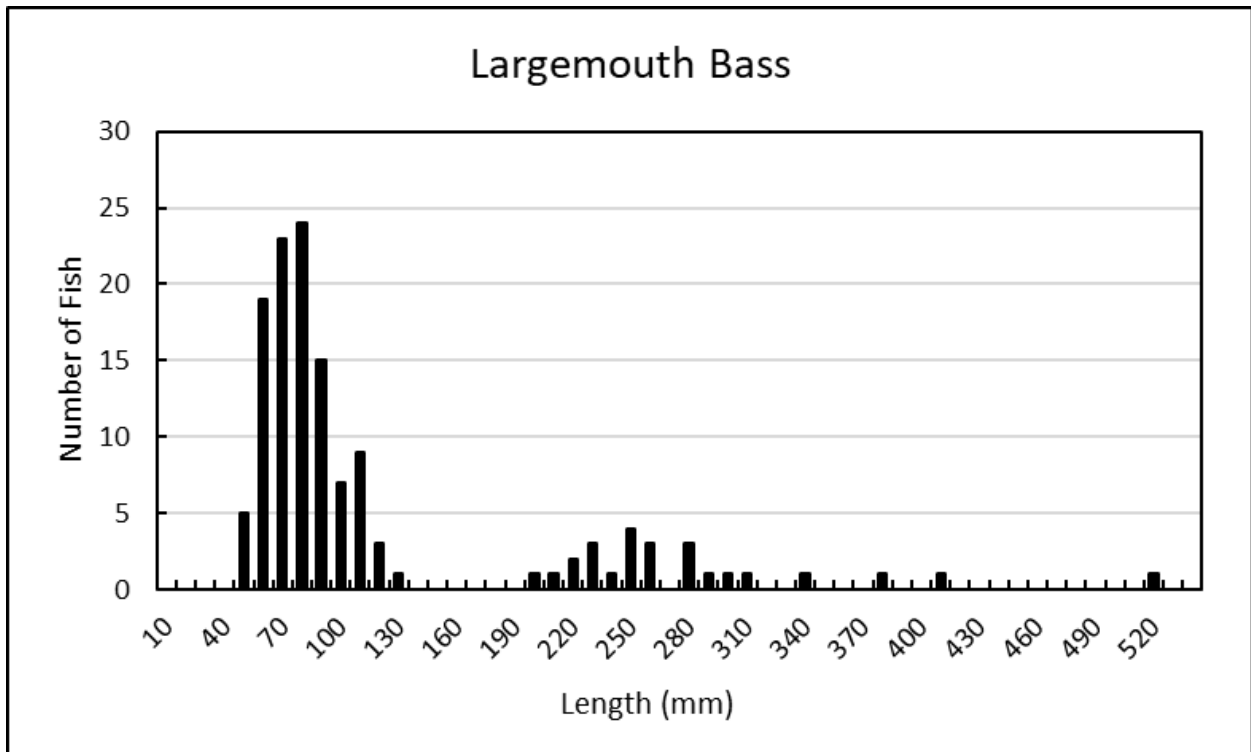


Figure A-6. Length-Frequency Histogram for Largemouth Bass collected in Democrat Dam Impoundment, 2024.

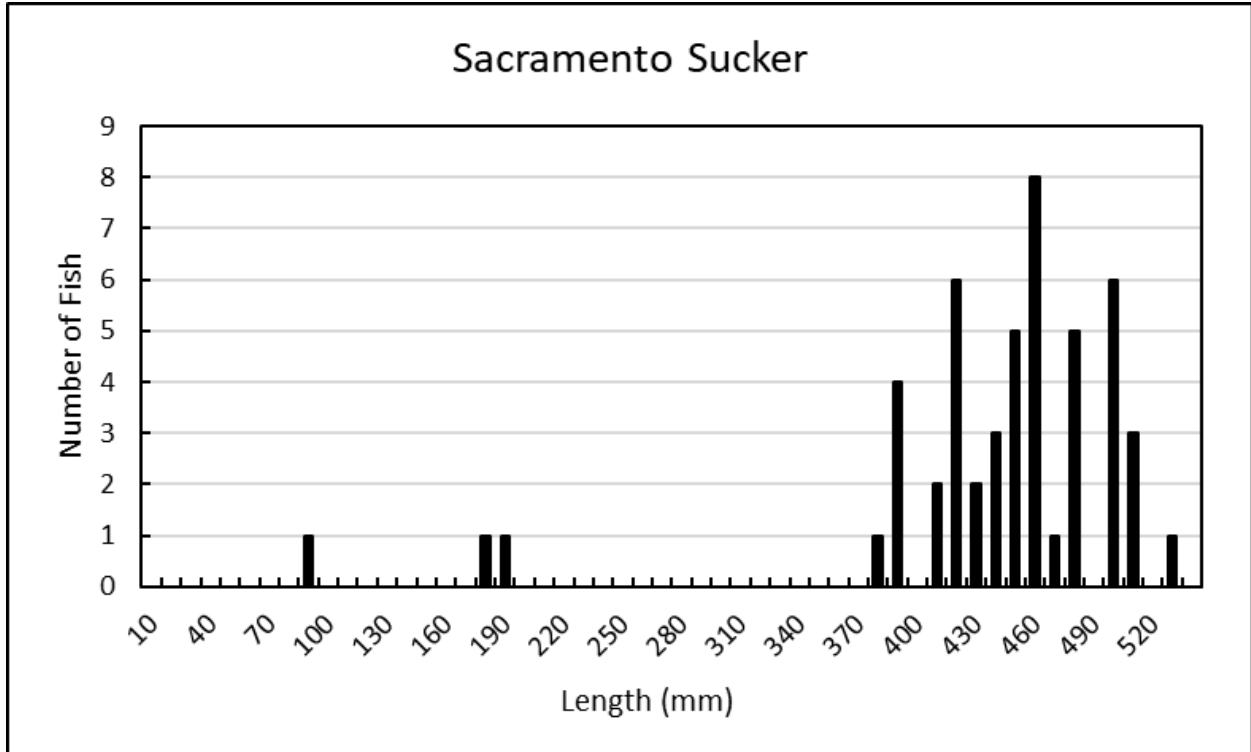


Figure A-7. Length-Frequency Histogram for Sacramento Sucker collected in Democrat Dam Impoundment, 2024.

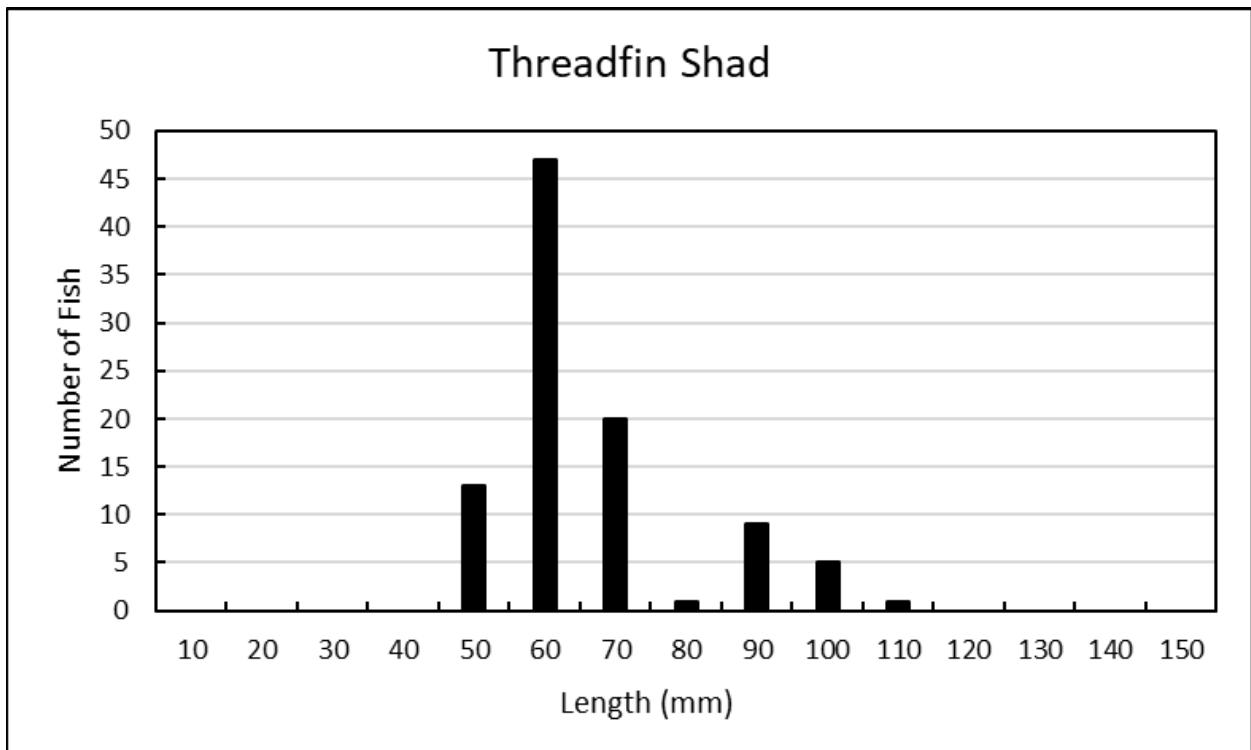


Figure A-8. Length-Frequency Histogram for Threadfin Shad collected in Democrat Dam Impoundment, 2024.

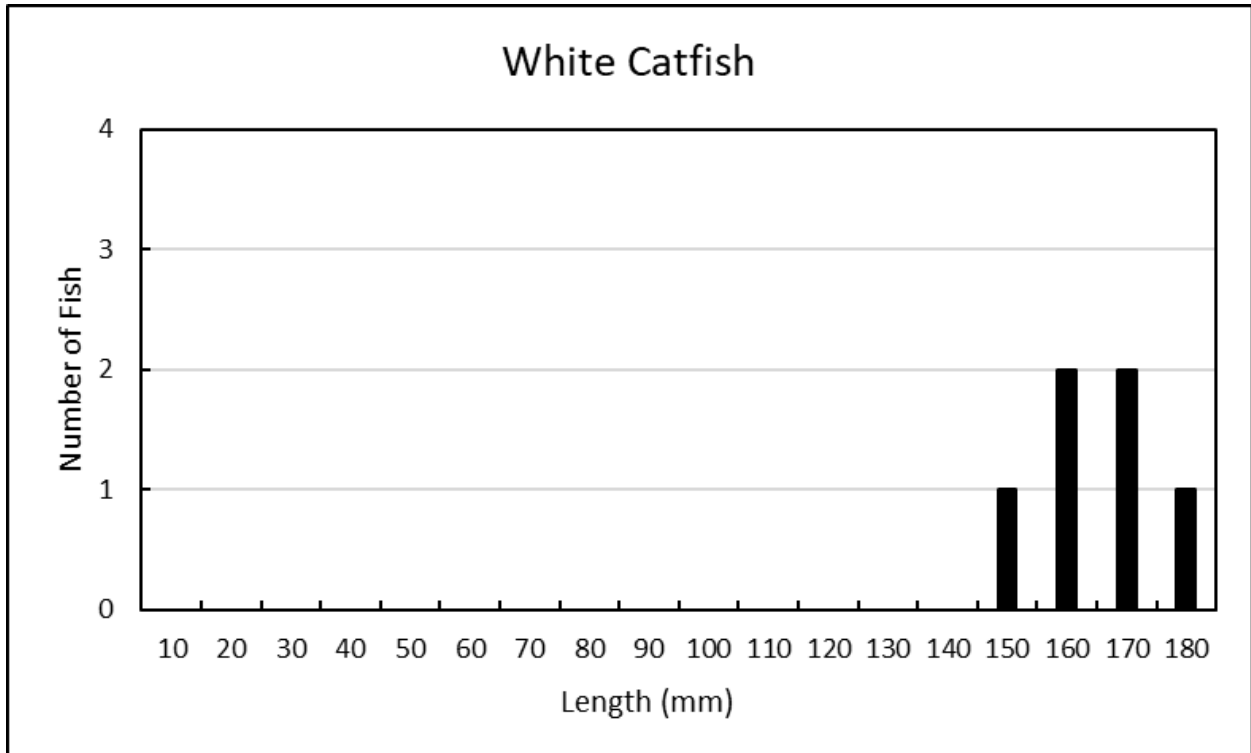


Figure A-9. Length-Frequency Histogram for Threadfin Shad collected in Democrat Dam Impoundment, 2024.