Annual Report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects Authorized under the Department of the Army Regional General Permit No. 12

For the period of January 1, 2025, through December 31, 2025

Prepared by the Pacific States Marine Fisheries Commission for the California Department of Fish and Wildlife

March 1, 2025

Cover photo: Completed Upper Bridge Crossing Little Case Creek Two Barrier Removal Project, tributary to South Fork Eel River, Mendocino County, California. Photo credit Stillwater Sciences 2025.

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Introduction

The San Francisco District of the U.S. Army Corps of Engineers (USACE) re-issued Regional General Permit No. 12 (RGP-12) to the California Department of Fish and Wildlife (CDFW) on May 8, 2023. Pursuant to section 404 of the Clean Water Act, RGP-12 authorizes an array of instream, riparian, and upslope habitat improvement activities. This authorization is within the U.S. Army Corps of Engineers, San Francisco District (Figure 1). The authorization applies to salmonid habitat restoration projects specifically funded under the Fisheries Restoration Grant Program (FRGP).

Special Condition #1 of RGP-12 is to implement Terms and Conditions as stipulated in the National Marine Fisheries Service (NMFS) biological opinion (BO). The BO was issued on May 18, 2022, and is Consultation Number WCRO-2021-03365. The BO Section 1.1.1.3 Project Tracking and Annual Reporting stipulates that CDFW submit an annual report on the previous year's restoration activities by March 1st to NMFS. This report is submitted in compliance with those Terms and Conditions, and this document summarizes data for FRGP projects administered by CDFW that utilized RGP-12 in calendar year 2025.

This report includes analysis of data documenting effects of FRGP activities on listed salmonids and their critical habitat, including effects from exposure to project implementers and monitoring activities by CDFW during the calendar year. Metrics have been compiled and validated. Information is included about each restoration project or monitoring effort conducted during the reporting period. Summaries compare actual activity exposure and mortality data to the maximum activity exposure and mortality anticipated for each species.

A narrative description of any requested variances from the limitations as described in the BO Proposed Action section and their resolution is included.

This report also summarizes implementation assessments provided by CDFW grant managers for restoration projects with activity during 2025. Effectiveness, validation, and Before After Control Impact (BACI) assessments conducted by the Pacific States Marine Fisheries Commission's (PSMFC) Monitoring and Evaluation of Salmonid Habitat Restoration (MESHR) program are also summarized. It also includes a narrative description of how any project-specific information collected during the previous year (such as effectiveness monitoring) was or should be used to assess the effects and benefits of salmonid restoration projects authorized through FRGP.

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Figure 1. USACE Districts. Report activities occurred in the U.S. Army Corps of Engineers, San Francisco District.

Effects of Program Activities on Juvenile Listed Salmonids and their Critical Habitat

Fish Relocation Activities

Restoration construction can require fish exclusion from the project site to minimize harm and mortality to salmonids and other aquatic species. In 2025, eight restoration projects required fish relocation. Project-specific relocation details, including capture totals for salmonids and other aquatic species at each relocation event, are presented in the attached file *Appendix_1_Relocation_RGP12_2025.xlsx*.

The BO (Section 2.8.4) states that injury or mortality from fish relocation is anticipated to be no more than three percent of the affected listed species for each project. Table 1 (below) presents a summary of reported juvenile salmonids captured and relocated prior to dewatering for project implementation, comparing actual mortality to the three percent mortality limit. Numbers of juveniles relocated and killed are reported for the following Evolutionarily Significant Units (ESU) or Distinct Population Segments (DPS):

- Southern Oregon/Northern California Coast (SONCC) Coho Salmon ESU
- Central California Coast (CCC) Coho Salmon ESU
- Coastal California (CC) Chinook Salmon ESU
- Northern California (NC) Steelhead DPS
- CCC Steelhead DPS
- South-Central California Coast (S-CCC) Steelhead DPS

Actual handling mortality was well below 3% for all ESUs and DPSs listed above (Table 1).

Table 1. Annual exposure estimates and anticipated mortality response of juvenile salmonid species resulting from capture and relocation prior to dewatering, as well as crushing and desiccation, compared to reported.

	SONCC Coho Salmon	CCC Coho Salmon	CC Chinook Salmon	NC steelhead	CCC steelhead	S-CCC steelhead
Maximum Number of Juveniles	1,650	425	30	8,850	1,575	1,575
Reported Number of Juveniles	**725**	**10**	**0**	**723**	**4**	**0**
3% Mortality	50	13	1	226	47	47
Reported Number of Mortalities	**2**	**0**	**0**	**2**	**0**	**0**
Reported Mortality	**0.28%**	**0.00%**	**N/A**	**0.28%**	**0.00%**	**N/A**

Monitoring Activities

Limits for handling, capturing, tagging, and mortality of juvenile salmonids during monitoring activities are summarized in Table 2, along with reported results. This summarizes observations and handling across every implementation, effectiveness, and validation monitoring survey conducted in 2025. One juvenile SONCC Coho Salmon was handled and captured during a minnow trapping validation survey (Table 2). There were no injuries or mortalities from monitoring activities, and no fish were tagged.

Table 2. Annual exposure estimates of juvenile salmonids captured, handled, and tagged during project monitoring, and anticipated injury mortality response compared to reported.

ESU/DPS	Maximum Number of Juveniles Captured and Handled	Reported Number of Juveniles Captured and Handled	Reported Number of Juveniles Observed	Maximum Number of Juveniles PIT tagged	Anticipated injury and mortality (3%)
SONCC Coho Salmon	2,500	**1**	**1,576**	25	75
CCC Coho Salmon	500	**0**	**272**	50	15
CC Chinook Salmon	30	**0**	**11**	10	1
NC steelhead	9,000	**0**	**1,477**	900	270
CCC steelhead	1,000	**0**	**0**	100	30
S-CCC steelhead	1,000	**0**	**0**	100	30

Project Locations

Project locations ranged from the California-Oregon border south to Monterey County, and from the Pacific coast east to Siskiyou County. A list of projects for which work occurred in 2025 can be found in *Appendix_2_HUC_RGP12_2025.xlsx* in the attached files, organized by United States Geological Survey (USGS) Fourth Field Hydrologic Unit Code (HUC) 8 and Fifth Field HUC 10. The locations of the 19 projects on the 2025 RGP-12 Project Notification List with work in 2025 and the 25 projects that did not have work in 2025 are presented in Figure 2 (below). Information about the primary benefitted ESU or DPS for each project on the Notification List is provided in the attached file *Appendix_3_ESU_DPS_RGP12_2025.xlsx*.

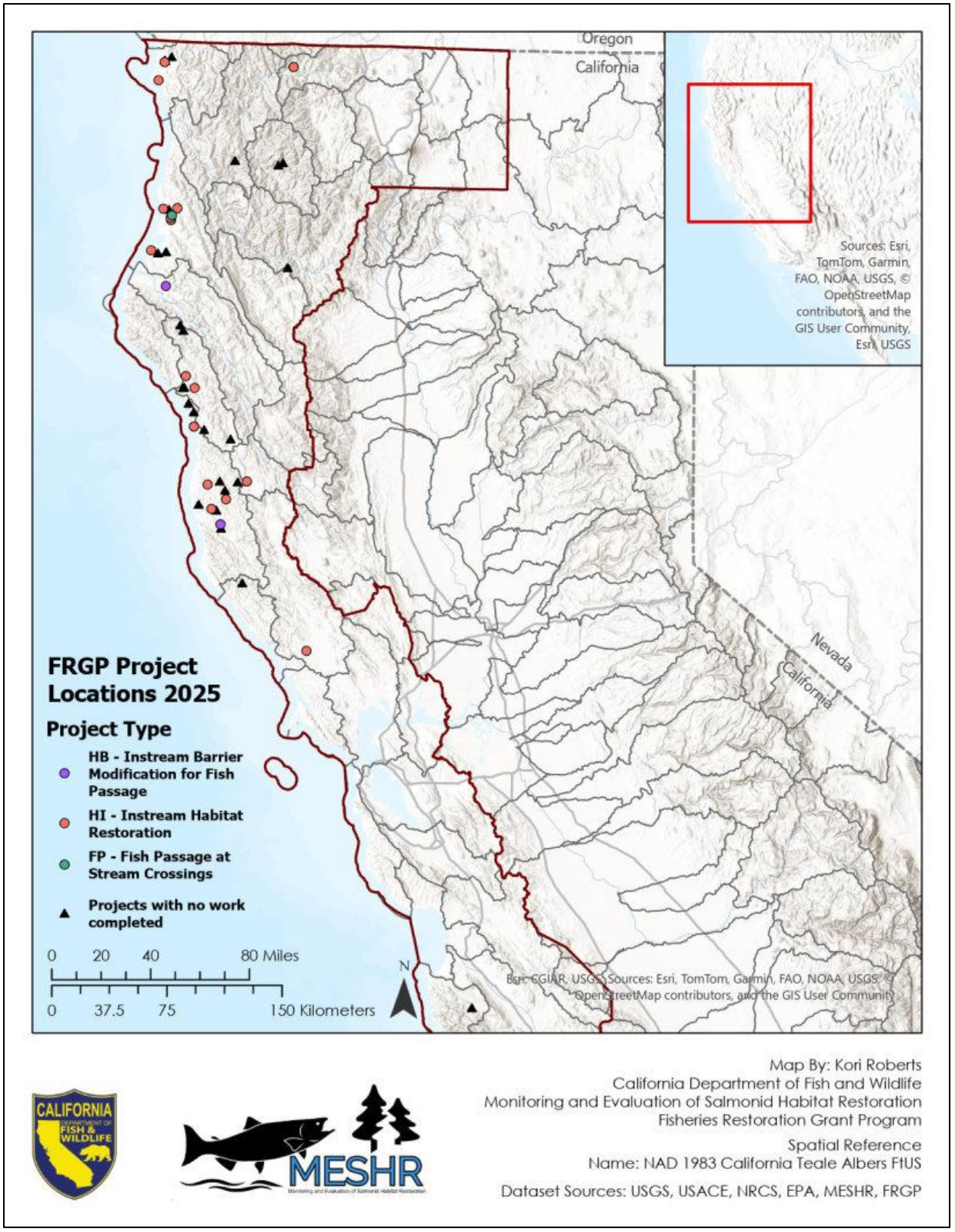

Figure 2. Project locations from the 2025 RGP-12 Notification List for the Fisheries Restoration Grants Program.

Annual Performance Measures

Restoration on any project consists of one or more distinct features. Features are defined as physical elements intended to interact with the environment to improve anadromous salmonid habitat. Annual performance measures of restoration features implemented during 2025 are summarized in annual reports written by grantees and confirmed in the field by CDFW grant managers. Project-specific performance measures of restoration features constructed during 2025 are provided in the attached file *Appendix_4_Annual_Implementation_Measures_RGP12_2025.xlsx*. Table 3 (below) summarizes reported annual performance measures across all restoration projects carried out during the 2025 reporting period.

Table 3. Annual performance measures of projects with features implemented in 2025.

2025 Annual Performance Measures		**Total**
Number of instream structures implemented within the stream channel.		403
Type of instream structures implemented within the stream channel.	Single log structure (digger/cover log) | Multiple log structure (spider logs/cover log complex) | Unanchored large wood | Log, rootwad, and boulder instream habitat restoration combinations | Log/rootwad structures (other) | Boulder structures (other) | Instream improvement (other)	
Length of stream bank (feet) stabilized or planted with riparian species.		12,040
Number of culverts replaced or repaired.		3
The number of miles of restored access to unoccupied salmonid habitat (from culverts replaced or repaired).		1
Distance (miles) of road decommissioned.		0
Distance (feet) of aquatic habitat disturbed at each project site.		9,082
Length of bioengineered streambank (feet) restored.		500
Active channel width at bioengineered streambank (feet) restored.		15

How Project-specific Information Collected was Used to Assess the Effects and Benefits of Salmonid Restoration Projects

Three distinct categories of project-specific monitoring data are collected to assess the effects and benefits of restoration projects: implementation monitoring data, effectiveness monitoring data, and validation monitoring data. Implementation monitoring data are collected by grant managers or grantees immediately post-treatment to assess whether restoration was completed as proposed. Effectiveness monitoring data are collected by MESHR both pre-treatment and three years post-treatment to assess whether restoration resulted in habitat benefits. Validation monitoring data are collected by MESHR both pre-treatment and three years post-treatment to assess whether restoration resulted in benefits for the local salmonid populations themselves. One subcategory of validation monitoring, BACI monitoring, is conducted at a larger timescale, including additional monitoring visits for five years and ten years post-treatment. Together, the information collected from these monitoring types assesses the success and effects of specific restoration projects on salmonid habitat, as well as their benefits to salmonids.

Implementation Monitoring

Methods

The BO (Section 2.8.4) requires that CDFW provide NMFS with a Notification List of projects authorized under RGP-12 to be conducted each year. Work status definitions for the Notification List and Appendix 2 are provided in Table 4.

Table 4. Work status definitions.

Status	Description
Not started	Proposal selected for funding but grant not written yet, or grant written but on-the-ground work has not started.
Ongoing	From the beginning to the end of on-the-ground work.
Completed	From the end of on-the-ground work until the grant is closed.

Work statuses of restoration projects included on the RGP-12 2025 Notification List are in Table 5, broken down by project type.

Table 5. Work statuses of restoration projects included on the RGP-12 2025 Notification List.

Project Type	Not Started	Ongoing	Completed, with Project Maintenance	Completed	Total
Fish Passage at Stream Crossings	0	4	0	2	6
Instream Habitat Restoration	4	19	2	3	28
Instream Barrier Modification for Fish Passage	0	2	0	0	2
Riparian Restoration	0	3	0	0	3
Project Design	0	5	0	0	5
Total	**4**	**33**	**2**	**5**	**44**

FRGP project status definitions for the Notification List and Appendix 2 are provided in Table 6. These track the status of the grant and are similar to but distinct from the work statuses defined in Table 4.

Table 6. FRGP project status definitions.

Status	Description
Field work not started	Grant written, but on-the-ground work has not started.
Field work in progress	From the beginning to the end of on-the-ground work.
Field work completed	From the end of on-the-ground work until the grant closeout.
Closed	Grant has been closed out.

FRGP project statuses for restoration projects on the 2025 RGP-12 2025 Notification List are in Table 7, broken down by project type.

Table 7. FRGP project statuses for restoration projects on the RGP-12 2025 Notification List.

Project Type	Field Work Not Started	Field Work in Progress	Field Work Completed	Closed	Total
Fish Passage at Stream Crossings	3	1	0	2	6
Instream Habitat Restoration	8	14	4	2	28
Instream Barrier Modification for Fish Passage	0	1	1	0	2
Riparian Restoration	0	3	0	0	3
Project Design	0	5	0	0	5
Total	**11**	**24**	**5**	**4**	**44**

All stages of monitoring (pre-treatment, implementation, and post-treatment) evaluate feature construction and effectiveness. Implementation monitoring by CDFW grant managers assesses installation of individual restoration features after construction.

Completed features are rated as excellent, good, fair, poor, or fail, based on the criteria presented in Table 8 (below). Implementation monitoring occurs the same year as feature construction and is done multiple times on the same project if features are constructed over multiple years. For example, if an instream habitat restoration project proposed 20 instream structures but only four were completed during 2025, implementation monitoring for 2025 would only report on the four completed features. The remaining features would receive implementation monitoring during the year of their construction.

Table 8. Implementation feature ratings criteria.

Rating	Implementation	Action
Excellent	Meets all specifications and exceeds expectations.	No remedial action required.
Good	Meets all specifications and expectations.	No remedial action required.
Fair	Does not meet some specifications and expectations but implemented adequately.	Probably not serious enough to require remedial action.
Poor	Does not meet most specifications and expectations, implemented inadequately.	Serious enough to require remedial action.
Fail	Fails to meet specifications, implemented incorrectly, or not implemented.	Serious enough to require remedial action.

Results

Nineteen projects had work in 2025, and all received implementation monitoring by grant managers. Of the 392 features implemented, 388 (99%) were monitored (Table 9). Grant managers were unable to complete implementation monitoring for four project features. One large wood (LW) instream feature in the SF Cottaneva Watershed Habitat Enhancement project was not monitored because the grant manager did not have access behind a locked gate. Two LW instream features in the Upper South Fork Little River Instream Habitat Improvement Project were not monitored because they were difficult to access and set apart from other features. One revegetation treatment site in the Lower Green Valley Creek Off-Channel Habitat Enhancement Project was not monitored because the grant manager ran out of time for implementation monitoring.

Good or excellent ratings were given to 371 (95.6%) of the features monitored (56 excellent and 315 good (Table 9). Of the remaining 17 features, 14 (3.6%) were given a

fair rating and only 3 (0.8%) were rated poor. One LW feature in the WF Sproul Snip and Grip Wood Loading Project was rated poor because it was missing an anchor and was not placed well. Two LW features in the Upper South Fork Little River Instream Habitat Improvement Project were given poor ratings because logs were not or barely within bankfull, and one was missing an anchor. No features were given a rating of fail. Project-specific implementation monitoring ratings for restoration features constructed during 2025 are provided in *Appendix_5_Feature_Ratings_RGP12_2025.xlsx*.

Table 9. Feature implementation ratings assigned in 2025 by project type.

Project Type	Total Number of Project Features	Number of Features Monitored	Excellent	Good	Fair	Poor	Fail
Fish Passage at Stream Crossings	5	5	2	3	0	0	0
Instream Barrier Modification for Fish Passage	35	35	0	32	3	0	0
Instream Habitat Restoration	352	348	54	280	11	3	0
Total Feature Ratings	**392**	**388**	**56**	**315**	**14**	**3**	**0**
% Of Total Monitored			**14.4%**	**81.2%**	**3.6%**	**0.8%**	**0%**

Table 10. Project rating criteria based on cumulative percentage of feature ratings.

	Excellent Feature Ratings	Good Feature Ratings	Fair Feature Ratings	Poor Feature Ratings	Fail Feature Ratings
Excellent Project Rating	≥ 80%			0%	0%
Good Project Rating	≥ 80%	≥ 80%		≤ 10%	0%
Fair Project Rating	≥ 80%	≥ 80%	≥ 80%		<10%
Poor Project Rating	≥ 50%	≥ 50%	≥ 50%		<25%
Failed Project Rating	<50%	<50%	<50%	≥ 50%	≥ 50%

An overall implementation rating is assigned to the project based on the criteria presented in Table 10. The following are narrative descriptions of the same criteria:

- A project is rated **excellent** if 80% or more of its features were rated excellent and no features were rated either poor or fail.
- A project is rated **good** if 80% or more of its features were rated either good or excellent, no more than 10% of features were poor, and no features were rated fail.
- A project is rated **fair** if 80% or more of its features were rated either excellent, good, or fair, and no more than 10% of its features were rated fail.
- A project is rated **poor** if 50% or more of its features were rated either excellent, good, or fair, and no more than 25% of its features were rated fail.
- A project is rated **fail** if 50% or more of its features were rated either poor or fail.

Grant managers work with grantees to remedy features rated as poor or fail. After remediation, the final feature rating is reported as excellent, good, or fair.

Discussion

One of 19 projects monitored at implementation received an overall project rating of excellent, 17 of 19 received a project rating of good, and 1 of 19 received a project rating of fair (Table 11). No projects received a rating of poor or fail (Table 11).

Table 11. Project ratings by project type for implementation monitoring in 2025.

Project Type	Projects Monitored	Excellent	Good	Fair	Poor	Fail
Fish Passage at Stream Crossings	1	0	1	0	0	0
Instream Habitat Restoration	16	1	14	1	0	0
Instream Barrier Modification for Fish Passage	2	0	2	0	0	0
Total Project Ratings	**19**	**1**	**17**	**1**	**0**	**0**
% Of Total		**5.3%**	**89.4%**	**5.3%**	**0%**	**0%**

Effectiveness Monitoring

Methods

Effectiveness monitoring by MESHR is conducted on a stratified random selection of 10% of each project type in each USACE watershed (i.e., North Coast, North Central Coast, and San Francisco Bay) funded each year, with a minimum of three projects selected in each USACE watershed. Effectiveness monitoring has two phases: pre-treatment monitoring and post-treatment monitoring. Pre-treatment monitoring documents baseline data on habitat conditions before on-the-ground restoration treatments begin, providing a benchmark to evaluate restoration activity effectiveness. Pre-treatment monitoring is generally conducted before construction the same year as project implementation.

Post-treatment monitoring is usually conducted three years after project completion to ensure projects experience multiple winter high-flow periods. Post-treatment monitoring may be deferred to other years, or additional monitoring may be added if appropriate and resources are available.

Table 12. Projects that received effectiveness monitoring in 2025.

Grant Number	Project Type	Grant Name	Monitoring Type
Q2210513	Instream Habitat Restoration	Upper South Fork Little River Instream Habitat Improvement Project	Pre-treatment
Q2310503	Instream Barrier Modification for Fish Passage	Cooper Mill Creek Fish Passage & Instream Habitat Improvement Project	Pre-treatment
Q2310507	Fish Passage at Stream Crossings	Duffy Gulch Fish Passage Improvement	Pre-treatment
Q2310509	Instream Habitat Restoration	Elk Creek Beaver Dam Analogue (BDA) and Wetland Habitat Enhancement Project	Pre-treatment
Q2310511	Instream Habitat Restoration	Freshwater Off-Channel Habitat: Phase 2 Implementation (Orchard Pond)	Pre-treatment
Q2010526	Instream Habitat Restoration	Bear Gulch Coho Stream Habitat Enhancement Project	Post-treatment

Results

Pre-treatment effectiveness monitoring was conducted on five restoration projects in 2025 (Table 12, Table 13), and 110 out of 112 features were evaluated. Two LW instream features were not monitored for Upper South Fork Little River Instream Habitat Improvement Project because they were difficult to access and set apart from other features.

Table 13. Number of pre-treatment projects monitored during 2025 by project type.

Project Type	Total
Fish Passage at Stream Crossings	1
Instream Habitat Restoration	3
Instream Barrier Modification for Fish Passage	1
Total	***5***

Post-treatment effectiveness monitoring evaluates structural integrity and function of completed restoration features three years after implementation. Each feature is rated as excellent, good, fair, poor, or fail, based on the criteria presented in Table 14.

Table 14. Post-treatment effectiveness feature rating criteria.

Rating	Goals	Targets	Unintended effects	Structural condition
Excellent	Achieved all stated goals.	Met or exceeded targeted values.	No negative unintended effects. Unintended positive effects may outweigh failure to achieve a targeted value.	Excellent to Good.
Good	Achieved most stated goals.	Did not quite meet targeted values. If no targets were specified, maximum rating is Good.	No negative unintended effects.	Excellent to Fair.
Fair	Partially achieved most goals, or goals not achieved were outside the control of the feature.	Did not meet targeted values, but the feature still has some functional value.	May have minor unintended negative effects that partially offset goals.	Excellent to Fair.
Poor	Achieved at least one goal; goals not achieved were the fault of the feature.	Did not meet targeted values, feature has little functional value.	May have minor or major unintended negative effects that offset or negate a targeted gain.	Excellent to Poor.
Fail	Achieved no goals; feature has no functional value.	Did not meet targeted values.	May have unintended negative effects that are degrading the habitat and outweigh achieved goals.	Excellent to Fail (may be completely gone).

One project received post-treatment monitoring in 2025: Bear Gulch Coho Stream Habitat Enhancement Project. There were 33 project features evaluated, of which 31 (94%) were monitored. Two features were not monitored at post-treatment because the features were added at implementation and were not monitored at pre-treatment so no comparison could occur.

At post-treatment monitoring all 31 features received a good feature (Table 15). Feature and project ratings for completed projects monitored in 2025 are in an attached Excel file *Appendix_6_Effectiveness_RGP12_2025.xlsx*.

Table 15. Feature ratings and overall project rating from post-treatment effectiveness monitoring for Q2010526 Bear Gulch Coho Stream Habitat Enhancement Project.

Project Type	Excellent	Good	Fair	Poor	Fail	Overall Project Rating
Instream Habitat Restoration	0	31	0	0	0	Good

An effectiveness rating for the whole project is calculated from the individual feature ratings using criteria in Table 10 above. Project proposals do not always list specific numeric targets for habitat improvements, which are required for an excellent rating. In 2025, one project received an effectiveness project rating (Table 15).

Discussion

Pre-treatment effectiveness monitoring documents existing habitat conditions prior to implementation. This serves as a baseline to assess restoration effectiveness during post-treatment monitoring three years later. Five restoration projects received pre-treatment effectiveness monitoring in 2025 and will be revisited in three years, at which time this data will help determine the overall success of the project.

Post-treatment effectiveness monitoring records data on restoration outcomes relative to pre-treatment benchmarks and assigns a rating of the overall success of a project. Depending on the project type, this may include documenting erosion, plant growth, scouring or substrate deposition at instream structures, or successful fish passage at a former barrier.

The only project monitored for post-treatment effectiveness in 2025 received an overall rating of good, indicating it continued to meet proposed project objectives after several years of high-flow events.

Effectiveness of restoration projects is typically assessed three years after implementation. While short-term monitoring can provide immediate data, it has limitations in detecting

long term trends and can have misleading results, so years-long gaps between pre- and post-treatment monitoring can help to document lasting restoration impacts. The recovery period of some highly channelized streams may be as long as 4 to 8 years (Muotka et al. 2002), suggesting that even longer gaps than 3 years may be appropriate in certain cases.

Validation Monitoring

Methods

Four project types receiving effectiveness monitoring also receive validation monitoring: instream habitat improvement, fish passage at stream crossings, instream barrier modification for fish passage, and project design. An upslope watershed restoration (HU) project can also include validation monitoring if it has an instream component. As of 2014, a subset of instream habitat improvement projects with validation monitoring also receive BACI monitoring to evaluate habitat metrics, fish response, and effectiveness of LW treatments.

Validation monitoring consists of three distinct efforts: 1) juvenile snorkel surveys, 2) winter adult spawner surveys, and 3) minnow trapping. All validation project types receive snorkel surveys three years after implementation. For BACI monitoring, additional snorkel surveys are conducted at 1, 5, and 10 years after implementation. Adult spawner surveys are limited to fish passage projects. Spawner surveys can be completed the first winter after implementation and continue until fish or redd presence is documented above the former barriers. Minnow trapping is conducted when snorkel surveys are not a suitable option due to poor water quality or visibility, or to document for winter non-natal rearing.

Juvenile Snorkel Validation Surveys

Snorkel surveys are used to determine juvenile salmonid presence/absence and density in stream reaches directly associated with instream features (often LW), or upstream of migration barrier removal locations. Snorkel surveys are typically performed during the same site visits as effectiveness monitoring, both immediately prior to project implementation (pre-treatment) and three years after implementation (post-treatment). Snorkeling protocols were adapted from Duffy (2005) and Garwood and Ricker (2017).

For fish passage projects, up to five pool units are randomly selected immediately upstream and downstream of a migration barrier removal location. For instream habitat improvement projects, up to five randomly selected pool and/or run habitat units adjacent to proposed LW structure locations are selected for snorkeling at pre-treatment and revisited following three winters. Selected pool units must exceed minimum qualifications to snorkel, including maximum residual depth ≥ 0.8 feet (ft), average wetted width ≤ 16.4 ft, and visibility ≥ 4 ft. If the average wetted width of a pool is ≥ 16.5 ft, maximum depth must be ≥ 1.5 ft.

Each unit is surveyed from downstream to upstream by one diver in a single pass (to minimize fish and sediment disturbance) during daylight hours. A waterproof flashlight is used to view undercut banks and other dimly lit areas. Fish are identified to species, grouped by age class, and enumerated. Age class designation is assigned according to visually estimated lengths: 0-3 inches (in) = young-of-year (YOY); 3-6 in = 1+ years of age; > 6 in = 2+ years of age. Physical dimension measurements (average width, maximum length, and maximum residual water depth) for each unit are recorded. Fish densities are reported as number of individuals per 100 square feet (n/100 ft^2) and are calculated by dividing fish numbers by area (length x width) of the pool, then multiplying by 100. Air and water temperatures are recorded at each site prior to entering the water, and again if water temperatures increase to potentially stressful levels (> 68° F).

Coho Salmon *Oncorhynchus kisutch* and steelhead trout *Oncorhynchus mykiss* are the primary targeted species for validation monitoring; however, Chinook Salmon *Oncorhynchus tshawytscha* and Coastal Cutthroat Trout *Oncorhynchus clarkii clarkii* are also recorded. Chinook Salmon may be underrepresented because surveys are often conducted after most juveniles have begun migrating to the ocean.

BACI Surveys

The BACI monitoring protocol used by MESHR was adapted from the Washington State Salmon Recovery Funding Board (Crawford 2011) and the U.S. Environmental Protection Agency (Kaufmann et al. 1999). The intent of BACI is to determine whether the addition of LW structures improves stream habitat over time based on analysis of standardized, repeatable measurements such as LW volume, channel substrate composition, residual pool depth, and juvenile fish relative abundance in the treated reach, using a designated control reach with similar pre-treatment conditions as a basis for comparison.

To determine LW volume, surveyors measure the diameter and length of the first 10 pieces of LW between transects in the survey reach. Based on these measurements, pieces are binned into one of four diameter classes from small to extra-large, and one of five length classes from small to extra-large. Volume for each piece is calculated based on the following formula, which overestimates volume to account for unmeasured pieces:

$$V = \pi * \left(1.33 * \left(\frac{cmd}{2}\right)^2\right) * (1.33 * cml)$$

In this formula, V = volume, cmd = class minimum diameter, and cml = class minimum length. Class minimum diameter refers to the lower bound of the piece's diameter class (4 in for small, 12 in for medium, 24 in for large, and 32 in for extra-large). Class minimum length refers to the lower bound of the piece's length class (5 ft for small; 10 ft for medium; 20 ft for large; 30 ft for very large, and 50 ft for extra-large). Calculated volumes are summed across an entire survey to obtain a single LW volume value for each reach in each BACI year.

Projects are monitored more intensively and for a longer period than effectiveness assessments, with habitat and fish parameters measured prior to treatment (year 0) and after treatment at year 1, year 3, year 5 and year 10. Impact and control reaches are selected during pre-treatment. Physical habitat parameters are recorded, and juvenile salmonids are enumerated during snorkel surveys during all monitoring visits. All qualifying pool and run habitat units in both the control reach and impact reach are snorkeled from downstream to upstream following the same methods described above for juvenile snorkel validation monitoring.

Minnow Trapping Surveys

The goal of minnow trapping surveys is to determine juvenile salmonid presence and density in stream reaches directly associated with migration barrier removal locations or instream features when snorkeling is not a viable option. Up to five minnow traps are baited with sterilized salmon roe and left in low-flow water with cover. Individual traps are deployed for approximately two hours and all fish captured are documented and released. Salmonid lengths are also recorded.

Adult Spawner Validation Surveys

Adult spawner surveys record counts of redds, live fish, and carcasses in reaches immediately upstream and downstream of a barrier removal location. Live fish and carcasses are identified by species and sex, if possible. If multiple surveys within the season are planned (especially for complete barrier projects), identified redds are marked with flagging indicating the date and redd number to avoid re-counting redds in later surveys.

Habitat parameters are recorded along standard reach lengths of approximately 20 bankfull channel widths tracked using a Garmin™ GPS 60CSx unit or Avenza Maps. Stream flows can also be tracked using a USGS proxy gauge from a nearby stream. If a surveyed reach does not contain suitable spawning habitat, landowner permission may be pursued for surveys further upstream of the standard 20 bankfull channel widths.

Validation Monitoring Project Selection

Four projects received pre-treatment validation monitoring and are summarized in Table 16. The Upper Lawrence Coho Habitat Design Project is listed on Table 16 but was not included in MESHR's effectiveness monitoring selection. Validation monitoring for this project was assisted by CDFW staff on the project partner and grantee's request to inform the design process.

The 2025 effectiveness monitoring selection by MESHR designated six new projects to receive pre-treatment validation monitoring, but all these projects were postponed until 2026 or later. An additional project that had been previously selected and postponed was eligible for validation monitoring in 2025 but was postponed again until 2026 or later.

Table 16. Restoration projects that received validation monitoring in 2025.

Grant Number	Project Title	Project Type	Monitoring Type(s)
Q2310503	Cooper Mill Creek Fish Passage & Instream Habitat Improvement Project	Instream Barrier Modification for Fish Passage	Pre-snorkel, Post-spawner
Q2210513	Upper South Fork Little River Instream Habitat Restoration Project	Instream Habitat Restoration	Pre-snorkel
Q2310507	Duffy Gulch Fish Passage Improvement	Fish Passage at Stream Crossings	Pre-snorkel
Q2410513	Upper Lawrence Coho Habitat Design Project	Project Design	Pre-snorkel
Q2310509	Elk Creek Beaver Dam Analogue (BDA) and Wetland Habitat Enhancement Project	Instream Habitat Restoration	Pre-minnow trapping
Q2210524	Little Case Two Barrier Removal Project	Instream Barrier Modification for Fish Passage	Post-snorkel, Post-spawner
Q2010526	Bear Gulch Coho Stream Habitat Enhancement Project	Instream Habitat Restoration	Post-snorkel
P1310504	Little River Coho Habitat Enhancement Project	Instream Habitat Restoration	Post-BACI snorkel
P1610504	James Creek Coho Stream Habitat Enhancement Project	Instream Habitat Restoration	Post-BACI snorkel

Results

Three pre-treatment projects, two post-treatment projects, two BACI monitoring projects and one project design received juvenile snorkel validation monitoring (Table 16). Minnow trapping was conducted on one pre-treatment project due to grassy marsh-like conditions that would have made snorkeling difficult. Two projects received spawner surveys to document possible fish passage above previous barriers. One project received post-treatment snorkel validation monitoring (Table 16). This 2025 validation monitoring report includes data collected from January 1 to December 31, 2025.

Young-of-year trout can be progeny of steelhead trout, resident Rainbow Trout, Coastal Cutthroat Trout, or Rainbow Trout and Cutthroat Trout hybrids. Although steelhead trout are often the most abundant trout at restoration sites, juvenile trout identification to species at this size can be inaccurate. Unless otherwise specified, we will identify all observations of juvenile trout simply as trout.
Q2310503 Cooper Mill Creek Fish Passage & Instream Habitat Improvement Project

Q2310503 Cooper Mill Creek Fish Passage & Instream Habitat Improvement Project

The goal of this project was to improve fish passage, increase stream habitat complexity, pool frequency, pool depth, and over-summer and winter rearing habitat benefiting SONCC Coho Salmon, CC Chinook Salmon, and NC steelhead trout in Cooper Mill Creek within the Eel River watershed in Humboldt County. The two barriers removed included a boulder weir array at the confluence with Yager Creek and a concrete sill associated with an abandoned fish hatchery owned by Pacific Lumber Company that operated from 1976-2002. Additional restoration activities included installation of a series of nonengineered LW features to enhance instream habitat. Construction of an alcove feature to provide winter habitat refugia during high flows. Last, the realignment of the channel with the confluence of Yager Creek, which involved the installation of rock weirs, log steps, and a roughened channel.

Snorkel validation monitoring was conducted May 28, 2025, before implementation. Five pools were snorkeled, four pools below the concrete sill barrier and one above. Twenty-seven juvenile Coho Salmon and 33 trout were observed in the pools below the concrete sill, with mean densities of 1.31 ± 1.14 (mean ± SE) and 2.67 ± 1.43 n/100 ft^2 of pool respectively. No Coho Salmon and thirteen trout were observed above the barrier. Habitat measurements were taken during the survey. The mean pool surface area surveyed was 472.2 ± 108.6 ft^2, and mean pool depth was 1.9 ± 0.2 ft (Table 17, Table 18).

One post-treatment spawner survey was conducted on December 31, 2025. The survey started at the confluence of Cooper Mill Creek and Yager Creek and continued upstream a total of 3,000 feet, ending approximately 650 feet upstream of the former barrier. Twenty-one adult Chinook Salmon were observed throughout the reach, including fifteen above the former barrier (Table 19). The visibility was poor (<0.4 feet), and therefore redds were not visible, but digging behavior was observed.

Table 17. Snorkel survey validation habitat data for all projects snorkeled in 2025, excluding BACI projects.

Grant No.	Project Title	Monitoring Period	No. Units Surveyed	Mean Unit Area (ft^2)	Standard Error (SE)	Mean Maximum Residual Depth (ft)	SE
Q2310503	Cooper Mill Creek Fish Passage & Instream Habitat Improvement Project	Pre	5	472.2	108.6	1.9	0.2
Q2210513	Upper South Fork Little River Instream Habitat Restoration Project	Pre	5	535.3	74.4	2.2	0.3
Q2310507	Duffy Gulch Fish Passage Improvement	Pre	5	432.9	283.3	2.2	0.4
Q2410513	Upper Lawrence Coho Habitat Design Project	Pre	21	1,527.6	137.7	3.3	0.3
Q2210524	Little Case Two Barrier Removal Project	Post	2	189.8	60.3	2.2	0.4
Q2010526	Bear Gulch Stream Habitat Enhancement Project	Post	5	221.0	20.9	1.6	0.2

Table 18. Snorkel survey validation fish count data for all projects snorkeled in 2025, excluding BACI projects.

Grant No.	Monitoring Period	No. Coho	Mean Density (n/100 ft^2)	SE	No. Chinook	Mean Density (n/100 ft^2)	SE	No. Trout	Mean Density (n/100 ft^2)	SE
Q2310503	Pre	27	1.32	1.14	0	0	0	46	2.67	1.43
Q2210513	Pre	19	0.47	0.47	0	0	0	36	1.35	0.41
Q2310507	Pre	4	0.33	0.19	0	0	0	46	3.97	1.03
Q2410513	Pre	918	2.63	0.23	0	0	0	910	2.75	0.40
Q2210524	Post	41	10.62	0.58	2	0.40	0.40	2	0.77	0.77
Q2010526	Post	89	8.78	2.54	0	0	0	0	0	0

Table 19. Spawner survey validation data for both projects that received spawner surveys in 2025.

Grant Number	Monitoring Period	Reach Length (ft)	No. Live *O. tshawytscha*	No. Carcasses	No. Redds
Q2310503	Post	3,000	21	0	0
Q2210524	Post	2,575	0	0	1
Q2210524	Post	1,520	0	0	0

Q2210513 Upper South Fork Little River Instream Habitat Restoration Project

The goal of this project was to improve salmonid habitat by installing LW in the Upper South Fork Little River. The Upper South Fork Little River is a tributary to the Little River, which drains into the Pacific Ocean near Trinidad. This watershed is privately owned with a history of timber harvest and LW removal resulting in channel simplification. The project addresses this by installing 43 new wood structures along 1.8 miles of stream, aiming to develop more pools, offer more cover, and promote better rearing habitat for NC steelhead, SONCC Coho Salmon, and CC Chinook Salmon. Construction for this project was carried out in the summer of 2025.

A pre-treatment snorkel survey was conducted on June 10, 2025. Five pools throughout the project reach were surveyed, with an overall mean pool surface area of 535.5 ± 74.4 ft^2 (mean ± SE) and a mean depth of 2.2 ± 0.3 ft (Table 17). During this survey, a total of 19 juvenile Coho Salmon and 36 trout were observed, with mean densities of 0.47 ± 0.47 and 1.35 ± 0.41 individuals per 100 ft^2 of pool respectively (Table 18). No Chinook Salmon were observed during the survey.

Q2310507 Duffy Gulch Fish Passage Improvement

This project will remove a fish passage barrier on the Mendocino Railway, at Duffy Gulch, a tributary to the Noyo River in Mendocino County. The existing crossing is an 8 ft by 8 ft concrete box culvert that extends 38 ft in length at 2.3% slope. The drop from the culvert outlet to the downstream pool is six feet over a 16-foot-long concrete apron sloped at 33%. The project will replace the crossing with a structure that will meet fish passage requirements, as defined by CDFW and NMFS, and that will convey the 100-year flood.

This project will directly benefit CCC Coho Salmon and NC steelhead trout by increasing access to over two and a half miles of high-quality spawning and rearing habitat in the Noyo River watershed. Implementation was scheduled for the summer of 2025 and pre-treatment effectiveness and validation monitoring were completed, but construction has been postponed to 2026.

Snorkel validation monitoring was conducted on July 2, 2025. Five pools were snorkeled – three below the crossing and two above the crossing. The mean pool surface area surveyed was 432.9 ± 283.3 ft^2 (mean ± SE) with mean depth of 2.2 ± 0.4 ft (Table 17). Three juvenile Coho Salmon and 36 trout were observed below the crossing and one juvenile Coho Salmon and 10 steelhead trout were observed above the crossing, totaling four Coho Salmon and 46 trout with mean

densities of 0.33 ± 0.19 and 3.97 ± 1.03 individuals per 100 ft^2 of pool respectively (Table 18).

Q2410513 Upper Lawrence Coho Habitat Design Project

This project is the planning and design of an LW project on two miles of Lawrence Creek, a tributary to Yager Creek, tributary to the Van Duzen River in the Eel River watershed. The reach will be assessed to plan LW structures for the benefit of SONCC Coho Salmon. Implementation of the design plans will increase habitat complexity for salmonids in Lawrence Creek.

On August 26, 2025, project partners with Eel River Watershed Improvement Group and the California Conservation Corps conducted a snorkel survey with CDFW staff as part of a biological assessment for the Upper Lawrence Coho Habitat Project design. Survey methods differed from MESHR snorkel surveys; every other pool was snorkeled within the entire two-mile proposed project area. A total of twenty-one pools were surveyed, with a mean pool surface area of 1,527.6 ± 137.7 ft^2 (mean ± SE) and a mean depth of 3.3 ± 0.3 ft (Table 17). A total of 918 juvenile Coho Salmon and 910 trout were observed, with mean densities of 2.63 ± 0.23 and 2.75 ± 0.4 individuals per 100 ft^2 of pool respectively (Table 18). No Chinook Salmon were observed during the survey.

Q2210524 Little Case Two Barrier Removal Project

The goal of this project is to address two culverted stream crossings in Little Case Creek which were total barriers to juvenile salmonids and partial barriers to adults. Little Case Creek is a tributary to Tenmile Creek, which drains into the South Fork Eel River. The Little Case Creek culverts were replaced with two bridges to allow fish passage for all life stages at all flows. The project treated 0.08 miles of stream and restored access to one mile of previously inaccessible upstream spawning and rearing habitat for SONCC Coho Salmon, CC Chinook Salmon, and NC steelhead. Additionally, six log and boulder habitat features were installed to provide complex habitat and channel stability.

A post-treatment validation snorkel survey was conducted on August 12, 2025. Most of the pools surveyed pre-treatment were dry post-treatment, so only the first pool above the upper crossing was surveyed both times. This pool was 18% deeper and covered a 39% larger area post-treatment.

Three pools were surveyed post-treatment, but due to some missing data only two are reported here. These two pools had a mean area of 189.8 ± 60.3 ft^2 (mean ± SE) and a mean maximum residual depth of 2.2 ± 0.4(Table 17). Forty-one Coho Salmon, 2 Chinook Salmon, and 2 trout were observed using this habitat, with densities of 10.62 ± 0.58, 0.4 ± 0.4, and 0.77 ± 0.77 individuals per

100ft^2 (Table 18). Compared to pre-treatment, fewer trout and more salmon (both Coho Salmon and Chinook Salmon) were observed.

Two post-treatment validation spawner surveys were conducted on Little Case Creek in 2025, each moving upstream from a pool below the lower bridge. A survey covering 2,575 ft of stream channel was conducted on January 1, 2025 (Table 19). Visibility was excellent, but no live fish or carcasses were observed. One salmonid redd was found between the two bridges (i.e. above one former barrier). A second survey covering 1,520 ft of stream was conducted on November 20, 2025. This survey started at the same location but did not extend as far upstream. Despite excellent visibility and indications of favorable spawning habitat, no live fish, carcasses, or redds were observed on this survey.

Q2010526 Bear Gulch Stream Habitat Enhancement Project

This project improved instream habitat for CCC Coho Salmon and NC steelhead by installing 33 LW structures using 89 pieces of LW within 3,315 feet (0.63 miles) of Bear Gulch, a tributary to the South Fork Noyo River in Mendocino County. The LW features aimed to improve geomorphic function by capturing spawning gravels, improving winter and summer instream refugia, creating back flooding off-channel habitat and improving access to floodplains.

Instream work was completed in the summer of 2022. During construction, project feature designs were modified with approval from the CDFW Grant Manager. Original plans proposed 35 LW features and 33 were built. Four features were deleted, and two features were added to the project reach.

Validation monitoring was conducted via snorkel surveys during pre- and post-treatment surveys. No salmonids were observed in 2021 during pre-treatment monitoring. Post-treatment validation monitoring was completed on July 9th, 2025. Five pools were surveyed with an overall mean surface area of 221 ± 20.9 ft^2 (mean ± SE) and a mean residual depth of 1.6 ± 0.2 ft (Table 17). Eighty-nine Coho Salmon were observed throughout the reach with mean densities of 8.78 ± 2.54 individuals per 100 ft^2 (Table 18).

P1310504 Little River Coho Habitat Enhancement Project

This project aimed to increase channel complexity and improve pool and edge habitats by constructing 11 woven log jam features along approximately 0.2 miles of the Little River. The goal was to enhance spawning and rearing habitat for SONCC Coho Salmon through LW augmentation. The Little River is a coastal stream with an entirely privately owned watershed primarily used for timber production. Legacy logging impacts and LW removal resulted in a simplified channel, but it still supports a resilient Coho Salmon population. Project construction concluded in October of 2025.

BACI monitoring for this project began with year 0 pre-treatment monitoring in August of 2015 before the end of construction. The selected control reach is located approximately 0.1 miles upstream of the treatment reach. Year 1, year 3, and year 5 post-treatment monitoring occurred in 2016, 2018, and 2020 respectively.

Year 10 post-treatment monitoring of the control reach was conducted on August 21, 2025. Four pools were surveyed, with a mean pool surface area of 4,322.3 ± 1,530.5 ft^2 and a mean maximum residual depth of 3 ± 0.6 ft (Table 20). Totals of 357 Coho Salmon and 359 trout were observed on this survey, with densities of 2.96 ± 1.11 and 2.69 ± 1.19 individuals per 100 ft^2 respectively (Table 21). No Chinook Salmon were observed in the control reach.

Year 10 post-treatment monitoring for the treatment reach was conducted on August 26, 2025. Five pools were surveyed, with an overall mean pool surface area of 7,762.1 ± 3,282.4 ft^2 and a mean maximum residual depth of 3.7 ± 0.7 ft (Table 20). Totals of 1,325 Coho Salmon, 13 Chinook Salmon, and 887 trout were observed on this survey, with densities of 6.31 ± 2.09, 0.04 ± 0.02, and 4.45 ± 1.38 individuals per 100 ft^2 respectively (Table 21). Compared to the control reach, the treatment reach had larger and deeper pools with greater densities of Coho Salmon, Chinook Salmon, and trout.

Ten years of repeated visits to the impact reach revealed a significant loss of the installed LW structures, beginning in the year following construction. The LW in the treatment reach was not originally anchored, which allowed many pieces to move downstream. There has been an overall 61% decrease in calculated LW volume in the treatment reach between years 3 and 10 (from 14,954 ft^3 in year 1 to 5,894 ft^3 in year 10). By contrast, the control reach showed only a 9% decrease. However, there is still greater LW volume in the treatment reach than there was pre-treatment in year 0 (2,340 ft^3).

Table 20. Snorkel survey habitat data for all BACI projects snorkeled in 2025.

Grant No.	Project Title	BACI Year	Reach	No. Units Surveyed	Mean Unit Area (ft^2)	SE	Mean Maximum Residual Depth (ft)	SE
P1310504	Little River Coho Habitat Enhancement Project	10	Control	4	4,322.3	1,530.5	3.0	0.6
P1310504	Little River Coho Habitat Enhancement Project	10	Treatment	5	7,762.1	3,282.4	3.7	0.7
P1610504	James Creek Coho Stream Habitat Enhancement Project	5	Control	4	1,155.3	295.5	2.3	1.0
P1610504	James Creek Coho Stream Habitat Enhancement Project	5	Treatment	6	924.1	169.2	2.6	0.7

Table 21. Snorkel survey fish count data for all BACI projects snorkeled in 2025.

Grant No.	BACI Year	Reach	No. Coho	Mean Density (n/100 ft^2)	SE	No. Chinook	Mean Density (n/100 ft^2)	SE	No. Trout	Mean Density (n/100 ft^2)	SE
P1310504	10	Control	357	2.96	1.11	0	0	0	359	2.69	1.19
P1310504	10	Treatment	1,325	6.31	2.09	13	0.04	0.02	887	4.45	1.38
P1610504	5	Control	25	0.51	0.13	1	0.03	0.03	10	0.16	0.08
P1610504	5	Treatment	173	3.34	0.03	3	0.06	0.03	31	0.53	0.11

P1610504 James Creek Coho Stream Habitat Enhancement Project

This project aimed to improve the quality and quantity of spawning and rearing habitat for CCC Coho Salmon and NC steelhead trout via installation of 28 instream features using 93 pieces of LW. The features were constructed along a total of 4,646 feet (0.88 miles) of James Creek, a tributary to North Fork Big River in Mendocino County. The site is located on Jackson Demonstration State Forest land and is primarily managed for timber production composed of mixed conifers. LW features were constructed in the summer of 2020. The goal of the structures was to improve habitat complexity, frequency, and depth of pools to provide refugia for migrating salmonids.

The project was selected for BACI monitoring in 2017. Treatment and control reaches were chosen, each 500 feet in length. The control reach is located approximately 1,000 feet upstream from the treatment reach, outside of the restoration area. Construction of the project was postponed for three years resulting in three pre-treatment monitoring visits in 2017, 2018 and 2019. Post-treatment monitoring was completed one year, three- and five-years post construction in 2021, 2023 and 2025.

On October 7, 2025, validation monitoring was completed as a part of year-5 post treatment BACI monitoring. Six pools with LW structures within the treatment project reach were surveyed, with an overall mean pool surface area of 924.1 ± 169.2 ft^2 (mean ± SE) and a mean maximum residual depth of 2.6 ± 0.7 ft (Table 20). A total of 173 juvenile Coho Salmon, 3 juvenile Chinook Salmon and 31 trout were observed, with mean densities of 3.34 ± 0.03, 0.06 ± 0.03, and 0.53 ± 0.11 individuals per 100 ft^2 of pool respectively (Table 21).

Four pools within the control reach were surveyed, with an overall mean pool surface area of 1,155.3 ± 295.5 ft^2 (mean ± SE) and a mean maximum residual depth of 2.3 ± 1.0 ft (Table 20). A total of 25 juvenile Coho Salmon, one juvenile Chinook Salmon and 10 trout were observed, with mean densities of 0.51 ± 0.13, 0.03 ± 0.03, and 0.16 ± 0.08 individuals per 100 ft^2 of pool respectively (Table 21).

Q2310509 Elk Creek Beaver Dam Analogue (BDA) and Wetland Habitat Enhancement Project

The goal of this project is to restore low-gradient instream and off-channel habitat on Elk Creek using beaver dam analogues. Elk Creek is a small coastal stream near Crescent City. Ditching, straightening, and other developments have simplified its channel and reduced the availability of off-channel habitat. Eight beaver dam analogues are planned to be installed along 400 feet of stream, restoring connection to 5 acres of off-channel habitat for the benefit of the Elk River population of SONCC Coho Salmon. Additional riparian restoration

plans include exclusion fencing and willow plantings to restore native vegetation and combat invasive reed canary grass.

Construction began on September 29, 2025, and concluded the following week. However, due to restrictive conditions at the project site, only four of the beaver dam analogues were installed in 2025. Future assessments will determine whether additional beaver dam analogues will be installed in September 2026.

A pre-treatment minnow trapping survey was conducted at the project site on May 13, 2025. Minnow traps were used in place of snorkeling due to site conditions. A total of six minnow traps were set in five locations along the project reach (Table 22). Soak times ranged from 1 hour and 20 minutes to three hours. Only one Coho Salmon was caught in a trap. Four additional Coho Salmon were observed in the project area but not trapped. The other fish caught in the traps included one Coastal Cutthroat Trout *Oncorhynchus clarkii*, one unidentified sculpin *Cottus* sp., and 11 Three-Spined Sticklebacks *Gasterosteus aculeatus*.

Table 22. Minnow trapping validation data for the single project that was surveyed with minnow traps in 2025.

Grant No.	Monitoring Period	No. Traps Set	No. *O. kisutch*	No. *O. mykiss*	No. *O. clarkii*	No. *G. aculeatus*	No. *Cottus* sp.
Q2310509	Pre	6	1	0	1	11	1

Discussion

Pre-treatment validation monitoring is essential to document baseline salmonid presence and density prior to restoration to compare it to post-treatment data. However, small changes in fish density from individual surveys can be due to daily, seasonal, or annual variability in fish relative abundance in a particular stream or stream reach. Larger sample sizes over a longer period are necessary for statistical analyses to determine if variability in fish densities is significant. Using available resources, MESHR conducts pre- and post-treatment surveys under similar conditions (e.g., flow, temperature, visibility, or seasonal re-distribution of salmonids) to reduce variability in fish densities. However, this was not always possible due to timing constraints. For example, the post-treatment survey on Little Case Creek was conducted at a different time of year than the pre-treatment survey (August 2025 vs. May 2024), resulting in several units that were surveyed pre-treatment being dry during the post-treatment survey. Additionally, the BACI survey on James Creek was conducted after the first rain in late September likely triggered juvenile salmon to move downstream, possibly affecting overall fish densities.

Juvenile Snorkel Validation and BACI Surveys (Pre- and Post-Treatment)

Four projects received pre-treatment snorkel validation monitoring in 2025, as seven projects scheduled for validation monitoring were postponed, and one was monitored by minnow trap due to inadequate water depth for snorkeling.

Bear Gulch Coho Stream Habitat Enhancement Project was an instream habitat restoration project that received post-treatment snorkel validation monitoring in 2026. No juvenile salmonids were observed during pre-treatment monitoring, and eighty-nine Coho Salmon were observed throughout the reach at post-treatment monitoring, with mean densities of 8.78 individuals per 100 ft^2. The presence/absence of Coho Salmon in a particular stream may be the result of many contributing factors including survey timing, cohort strength, and presence of non-natal rearing. Pre-treatment validation monitoring took place in early April 2021, while post was in early July 2025. Juvenile Coho Salmon born in natal streams frequently emigrate to non-natal rearing habitats, including tributaries and other freshwater reaches, during their first summer (Gorman 2016). This redistribution may have affected survey results.

The Little Case Creek Two Barrier Removal Project was monitored via snorkel survey one year after construction in the summer of 2025. Most snorkel validation monitoring is completed by MESHR three years after construction so the site can experience multiple winter flows and give time for fish response. But fish passage projects can show immediate fish response once the barrier is removed. During the survey juvenile Coho Salmon, Chinook Salmon and trout were observed for the first time above the newly constructed crossings.

Minnow Trapping Surveys

The Elk Creek Beaver Dam Analogue Project was monitored by minnow trapping in 2025 due to the water being too shallow to snorkel. One trap was deployed for a 3-hour soak, and the other traps had shorter soak times. This was sufficient to detect the presence of Coho Salmon at the site. However, more Coho Salmon were observed from shore than were caught in the traps. This suggests that in this case the traps were unnecessary to detect presence and less effective than informal bankside observations at quantifying abundance. One way to increase the efficacy of minnow trapping efforts could be to deploy traps with longer soak times. Although 2-hour soaks are generally considered sufficient and the rate of catch is not affected by soak time, the size of catch *is* affected by soak time (Peltola 2024, Swales 1987). The positive effect of longer soaks on catch size is particularly strong when fish density is low, which we may expect to be the case at many sites pre-treatment (Swales 1987). Current protocol defined in the BO (Section 1.1.5.2) specifies that soak time should be up to 180 minutes. These surveys would be more effective if all traps were

consistently deployed for this maximum soak time. In the future, we may also recommend increasing the maximum soak time stated in the protocol. Provided that a site has sufficient dissolved oxygen to not suffocate fish that are held overnight (>2 mg/L), overnight soaks could improve the results of MESHR's minnow trapping efforts.

Adult Spawner Validation Surveys (Post-Treatment)

Documenting fish response to barrier removal or modification using spawner surveys is more informative for complete barrier removals than for partial or temporal barrier modifications or LW addition projects.

Re-colonization of habitat above former barriers by adult anadromous salmonids typically occurs within one to five years after barrier removal (Anderson and Quinn 2007, Kiffney et al. 2008, and Pess 2009). Success of validation spawner surveys depend on 1) availability of suitable spawning habitat above a former barrier, 2) discovery of this habitat by spawners, 3) overlap of run timing with time of spawner surveys, and 4) annual variability of run size and spawner distribution. All are important considerations when evaluating spawner survey data, particularly when sample sizes remain low in the first years after treatment. No evidence of fish above a barrier at pre-treatment followed by observed fish upstream after barrier removal suggests new habitat was opened by the project. However, confidence in re-occupation above the barrier would increase with more surveys during both pre- and post-treatment monitoring.

Two fish passage improvement projects were monitored with on the ground adult spawner surveys in 2025. Little Case Creek Two Barrier Removal project was surveyed on February 9, 2025. One redd was observed above the first newly constructed bridge. There were no live fish on the redd so a species could not be determined. It is worth noting that video footage of an adult Chinook Salmon just downstream of the first bridge, around the same time, was captured and shared by a landowner on Little Case Creek. This could suggest the species that built the redd but cannot be definitive.

The Cooper Mill Creek Fish Passage & Instream Habitat Improvement project proved successful for adult fish passage immediately after removal. Fifteen adult Chinook Salmon were observed above the former barrier in late December 2025. MESHR will continue spawner surveys on Cooper Mill Creek with the goal of documenting increased adult Coho Salmon passage as well.

Effects and Benefits Discussion

Fish relocation activities were conducted on eight implementation projects in 2025. A total of 1,465 salmonids were captured, including 725 SONCC Coho Salmon, ten CCC Coho Salmon, 723 NC steelhead, four CCC steelhead and one Rainbow Trout. Mortalities were limited to two SONCC Coho Salmon and two NC steelhead (0.27% of captured). One juvenile SONCC Coho Salmon was captured and handled during project monitoring activities. Across all projects, 9,082 feet of aquatic habitat were disturbed by construction activities.

These short-term impacts will result in long-term benefits. For example, 403 instream structures were constructed across all project sites. Three culverts were replaced or repaired, restoring access to one mile of previously unoccupied salmonid habitat. During a 2025 spawner survey on Little Case Creek, which was the location of two culvert replacements the previous year, the MESHR team observed a salmon redd above the first the former barrier (Table 19). This evinces the ability of salmon to quickly colonize and make use of spawning habitat made newly available to them by these restoration actions. Similarly, 1 dam was removed on Cooper Mill Creek in 2025, restoring access to 1.7 miles of habitat previously unavailable to anadromous species. Post-treatment validation surveys revealed anadromous salmonids are already making use of this newly available habitat. This use of previously inaccessible habitat is a clear indication of project efficacy for barrier removal efforts.

Validation and BACI surveys provided data to guide future restoration. A total of 5,326 juvenile salmonids were observed during validation and BACI snorkel surveys, and no negative fish response was observed. Both sites that received post-treatment snorkel surveys (Little Case Creek and Bear Gulch) showed increased densities of Coho Salmon and Chinook Salmon compared to their respective pre-treatment surveys. Additionally, both BACI projects monitored in 2025 (Little River and James Creek) showed greater densities of Coho Salmon, Chinook Salmon, and trout in their treatment reaches than in their control reaches. Despite potential confounding factors in the timing of the Little Case Creek and James Creek surveys, these overall increased densities indicate that the instream habitat improvements at these sites are successfully attracting salmonids.

Though this is encouraging anecdotal validation of benefits to salmonids, and aligns with the expected response to habitat restoration, this evidence should be interpreted judiciously. The signal of restoration is not clear around instream restoration, particularly when relying on density snapshots, due to noise factors including the timing of the survey and interannual variability (Polivka 2022). Additionally, mounting evidence suggests that the benefits of restoration may manifest more than 5 years following implementation (Lamperth et al. 2026), which would be beyond the temporal scope of all post-treatment monitoring surveys except for the BACI projects.

Brief case study reports that summarize project objectives and outcomes following post-treatment effectiveness and validation monitoring are made annually. Case studies for 2025 are presented in a separate file titled *Appendix_7_Case_Studies_RGP12_2025.pdf* submitted with this report and will be added to past projects on the CalFish website.

Bioengineering

The BO (section 2.5.6.1.8) requires CDFW to report to NMFS on all projects that use bioengineered bank stabilization methods. For each project that includes the application of bioengineering, the length of bio-engineered streambank restored per project must be less than three times the active channel width of that project. One project reported using bioengineering methods in 2025. Upper Tryon Creek Restoration Project, Phase 2 reported 500 feet in length of bioengineered streambank restored and an active channel width of 15 feet at bioengineered streambank restored. The length of bioengineered streambank exceeds three times the active channel width. In this case, bioengineered streambank restoration was a preferable treatment to more hardened bank stabilization methods.

Variances

The BO (section 1.1.1.4) requires CDFW to provide NMFS with a narrative description of any requested variances from the limitations described in the Proposed Action and their resolution. No projects requested for variance in 2025.

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