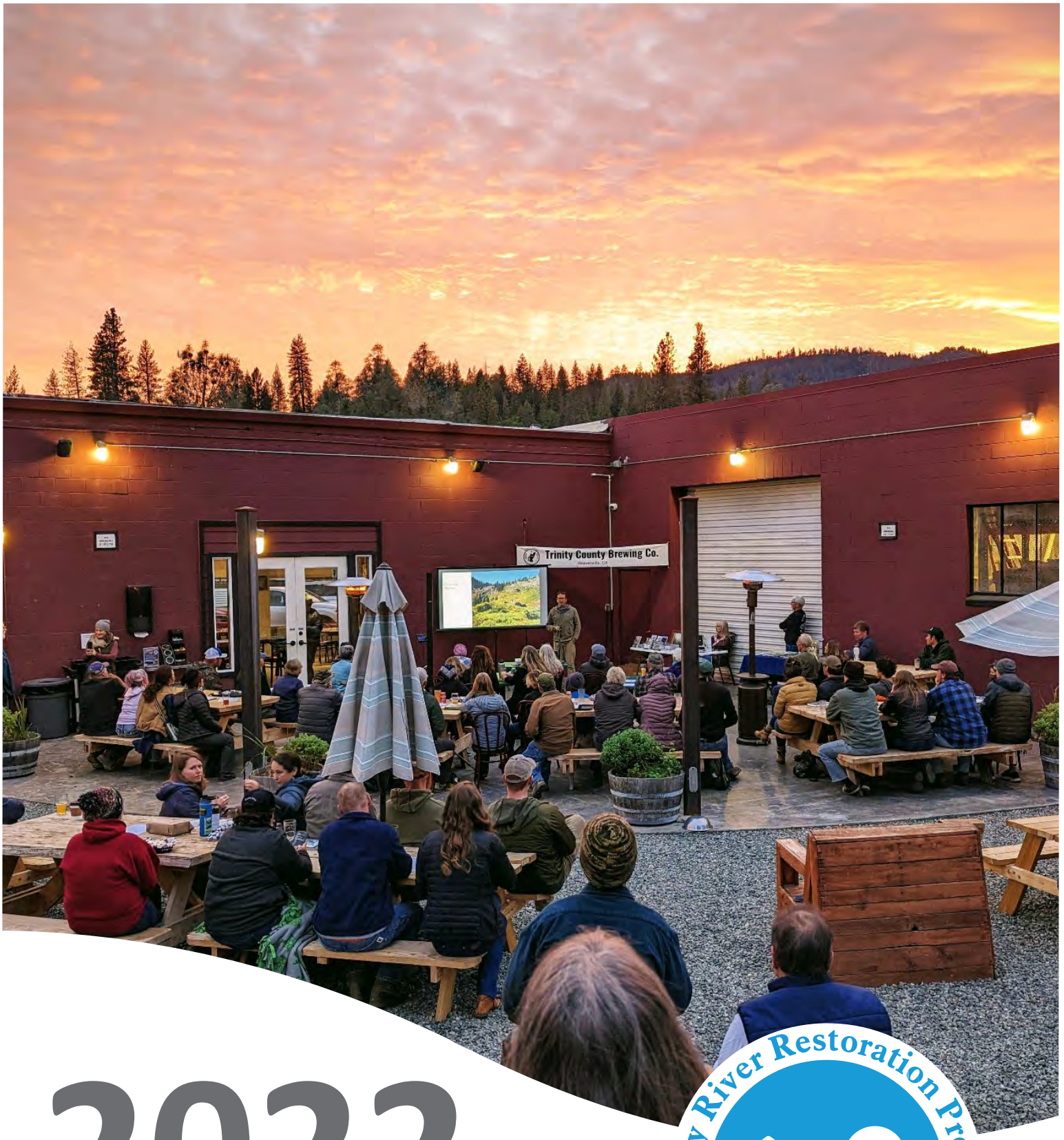

2022
Annual Report

Published: June 2023

Trinity River Restoration Program

Restore • Adapt • Improve

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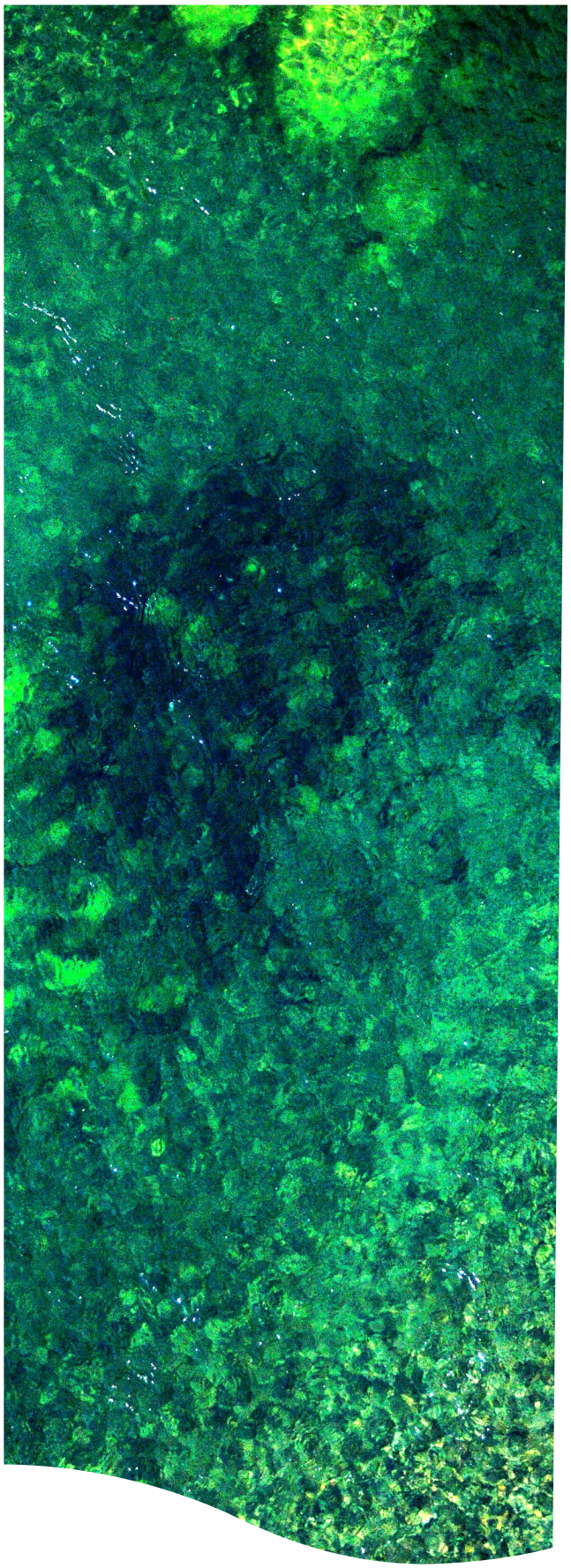


Above: Salmon sit in a cold water pool to rest near Dutch Creek. (TRRP)

On the Cover: The sunset at the November Science on Tap tried to outshine the presenters of the evening. (Andy Johnson)

Contents

Mission Statements

The Department of the Interior (DOI)
conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

The Bureau of Reclamation (Reclamation)
mission is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

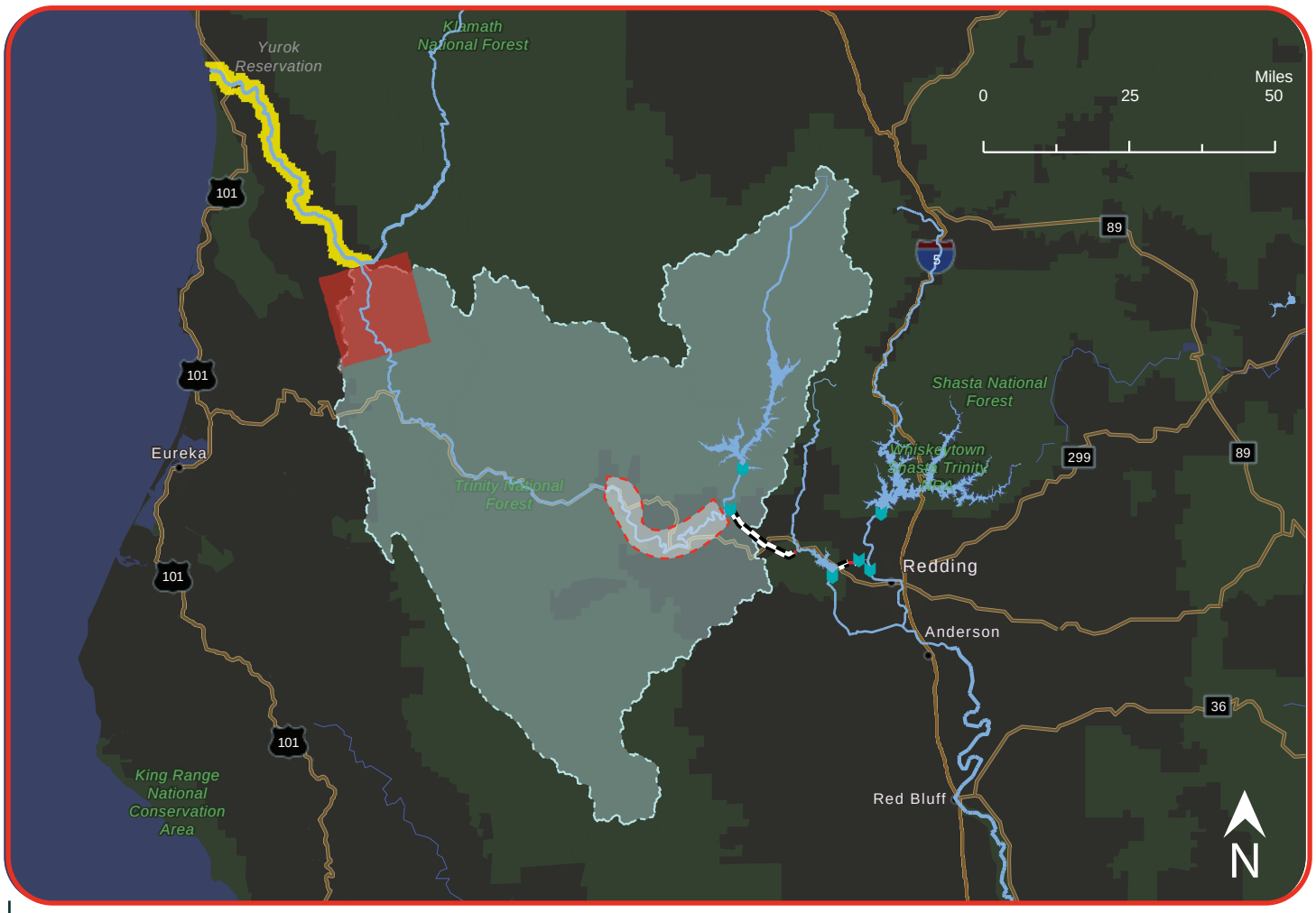
U.S. Fish and Wildlife Service (USFWS)
mission is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people.

The Trinity River Restoration Program (TRRP)
implements the 2000 DOI Record of Decision, which directs DOI to restore the fisheries of the Trinity River impacted by dam construction and related diversions of the Trinity River Division of the Central Valley Project, California.

Acknowledgments

Thank you to all partners and cooperating agencies for their contributions to this report. TRRP partners and stakeholders work diligently, thoughtfully, and effectively to meet the terms of 2000 Record of Decision and recover dynamic river processes that will promote natural-origin salmonid populations. Thank you to partners, stakeholders, and the public for continued involvement and interest in the restoration of the Trinity River. Photo credits are noted on photos, thanks to partners for their use. Note that all rights are reserved.

Greater Trinity Watershed



Area Enlarged

Legend

- Greater Trinity Watershed
- Yurok Reservation
- Hoopa Valley Reservation
- Trinity River Restoration Program 40 Mile Restoration Reach
- Private Lands
- Public Lands
- Bureau of Reclamation Dam Infrastructure
- Bureau of Reclamation Tunnel Infrastructure

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Restoration Strategy

The Trinity River Restoration Program's restoration strategy is to foster a natural, dynamic river system that promotes all life-stages of salmonids. The Program has several restoration tools that help accomplish this task, including;

- Flow Management
- Mechanical Channel Rehabilitation
- Sediment Management
- Watershed Restoration
- Infrastructure Improvements
- Adaptive Management

Yurok Frog

Hoopa Friendship

We would like to thank the Yurok Tribe and Hoopa Valley Tribe for providing symbols used within traditional basket weaving designs for this publication. The Yurok symbol for frog can be found sitting on top of page numbers throughout the document and the Hoopa Friendship Design can be found at the end of each section. We utilize these markings as a way to honor the collaboration with the people and governments of Tribal Nations in restoring the Trinity River.

11,000 cfs near Douglas City. (TRRP)

Flow Management

Restoration flow releases are designed to help establish and maintain complex habitat features in the river. Flow management uses a variable flow regime based on five water year types designated by California Department of Water Resources (CDWR).

Bucktail Restoration site during mechanical channel rehabilitation in 2016. (TRRP)

Mechanical Channel Rehabilitation

Channel rehabilitation projects are designed to reshape the river channel to increase fish habitat across the range of allowable flows. The Flow Study identified 47 project sites along the river below Lewiston Dam for Mechanical Channel Rehabilitation.

Sediment Management

Coarse sediment (spawning-sized gravel) sourced from mine tailings is added back to the river downstream of Lewiston Dam. These sediments replenish gravel-starved reaches of the river and are vitally important for salmon to use in building their nests.

High flow gravel augmentation at the Lewiston Weir, 2017. (TRRP)

Watershed Restoration

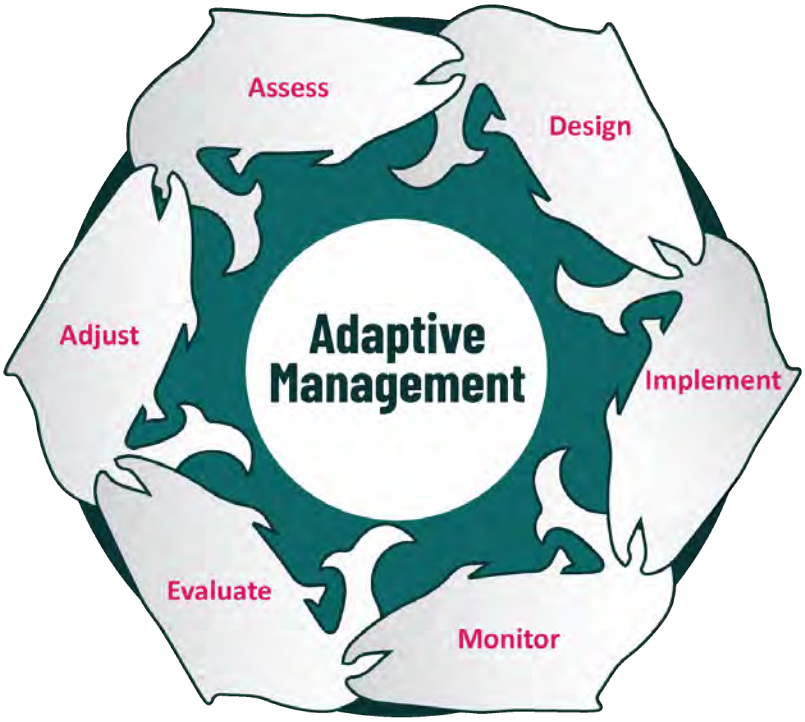
Restoration projects in tributaries reduce fine sediment input to the Trinity River and increase available salmon and steelhead habitat throughout the watershed.

A watershed improvement project completed in 2022 at Supply Creek in Hoopa, CA. (Justin Alvarez, Hoopa Valley Tribal Fisheries)

The Program replaced the bridge to Salt Flat in 2005 to achieve restoration flows over 8500 cfs. (TRRP)

Infrastructure Improvements

Modification of structures in the floodplain allow peak restoration flows released from Lewiston Dam.



Adaptive Management

Adaptive Management is a rigorous monitoring and analysis program to improve restoration activities. The above actions are guided by an adaptive environmental assessment and management process. The first four elements place a priority on physical restoration of the river to create the attributes of an alluvial river system known to enhance habitat for anadromous fish species. Monitoring and evaluation under an adaptive management process show progress toward the expected physical and biological changes from restoration activities.

Restoration Strategy Cover: Chinook caught on camera at Blue Creek. (Ken DeCamp)

Executive Director Report

> *"Our 22nd year broke new ground literally and figuratively."*

In this 22nd year of the Trinity River Restoration Program, we continued to break new ground (literally and figuratively) in our efforts to bring back vibrant fisheries in the river. Among our accomplishments:

- We put the finishing touches on a new Science Plan which will guide how we use research, monitoring, and modeling to inform decision making and changes to how we implement restoration activities.
- Initial construction began on the Oregon Gulch Restoration Project, the largest single site the Program has ever constructed, is estimated to increase the amount of riparian floodplain habitat in the restoration reach by over 30%.

At TRRP's November Science on Tap 115 people were present for a presentation on the Natural History of the Klamath Mountains. (Andy Johnson)

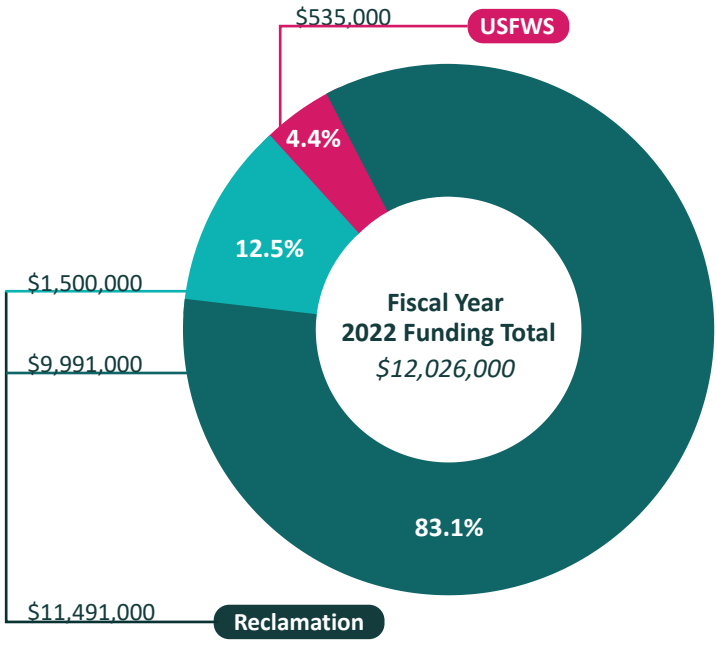
At each event, from March through November, an average of 70 people came to learn about local science.

On the Cover: Looking downriver on Dutch Creek Road. (Kiana Abel, Reclamation)

- For the third consecutive year, restoration releases targeted the objectives of a critically dry year.
- Grants were awarded to recipients who are working to increase dry season stream flows and improve fish passage in key tributaries.
- A new and enormously successful public outreach effort, Science on Tap, began in partnership with the Trinity County Resource Conservation District.

Funding & Expenditures

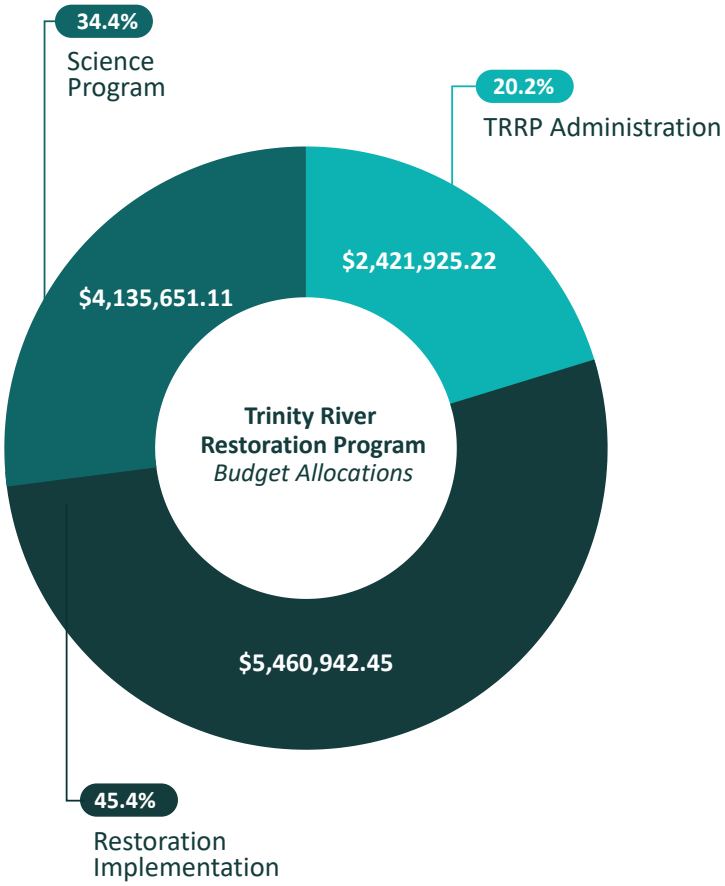
Funding levels have varied between approximately $10 million and $16.7 million per year since the Program's inception. In fiscal year (FY) 2022, we received $12 million, as shown in the figure below:



95.6%	United States Bureau of Reclamation	$11,491,000
12.5%	California Central Valley Project Improvement Act Restoration Fund	$1,500,000
83.1%	Water and Related Resources Account	$9,991,000
4.4%	United States Fish and Wildlife Service	$535,000

Budget Allocations

The FY 2022 went to three primary areas as shown below. It is important to note that individual tasks may, in reality, have components that span different budget areas, and that how those costs are split up may change between years, so totals by budget area should not compared year-to-year.

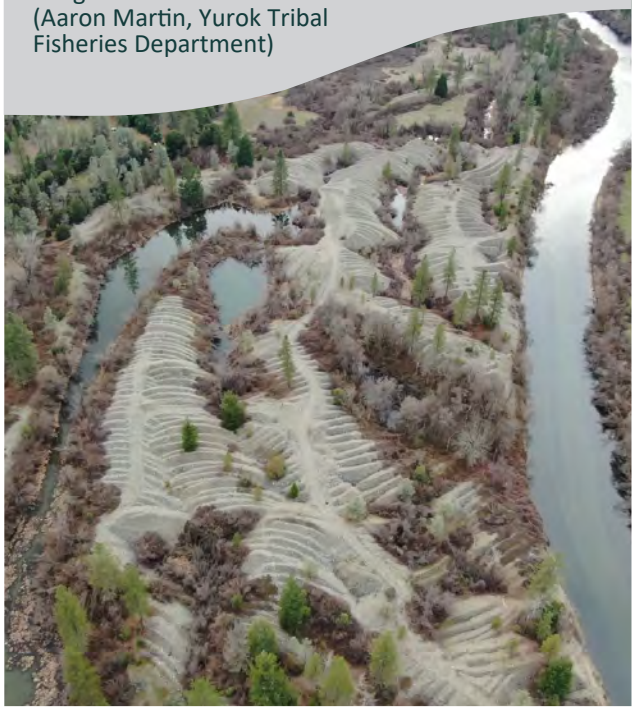


Thank you to all of the staff across our partnership who have made this year so successful. Here's to an even better 2023.

Mike Dixon, TRRP Executive Director

From August to early December 136,812 cubic yards of rock debris was removed from riparian habitat at Oregon Gulch.

Before and after photos of Oregon Gulch Restoration site. (Aaron Martin, Yurok Tribal Fisheries Department)



Program Structure

Administration

The purpose of the Trinity River Restoration Program (TRRP) is to mitigate impacts of the Trinity River Division of the Central Valley Project on anadromous fish populations in the Trinity River by successfully implementing the 2000 United States Department of the Interior (DOI) Record of Decision (ROD). The ROD is administered by two DOI agencies: the Bureau of Reclamation (Reclamation) and the U.S. Fish and Wildlife Service (USFWS).

BUREAU OF RECLAMATION

Additional Accomplishments

Along with the major accomplishments listed in the Executive Director report, the Program and its partners published several noteworthy scientific publications in 2022. Additionally, entities awarded watershed improvement grants in years past hit milestones in restoration activities.Read further for highlighted publications and grantee accomplishments from 2022.

Synthesis Reports

Synthesis reports, also known as summary reports, come from a specific task to provide a cohesive understanding on various restoration topics. The TRRP compiles data and utilizes these reports to inform adaptive management processes across years and topics to address specific scientific and public questions related to Trinity River restoration. Below are the reports published in 2022.

Trinity River Juvenile Salmonid Habitat Synthesis: Physical Habitat Capacity at the Restoration Site and Reach Scale. Report for the Trinity River Restoration Program. Klamath, California.

Cooper-Hertel, E., D. Gaeuman, K. De Juilio, A. Martin, J. Boyce, D. H. Goodman, N. Som, and J. Alvarez.

Available: trrp.net/library/document?id=2570

This report synthesizes data related to flows and juvenile salmonid habitat along the Trinity River between Lewiston Dam and the North Fork Trinity River near Helena. The authors found that the more complex and broader the channel was, the more habitat was available for salmon and Steelhead fry to rear (grow up) in. They found that the low, constant winter releases from Lewiston Dam of 300cfs limited the amount of available habitat for rearing salmon and Steelhead, but that releases above 1,000cfs would increase habitat by at least 18%. The authors made a few recommendations based on their findings: channel rehabilitation projects should prioritize increasing topographic complexity, channel rehabilitation features should increase the wetted width of the channel at flows that occur during the late winter and spring rearing period, and they also recommended evaluating whether releasing more water than 300cfs during the winter and spring would help salmon and Steelhead fry grow and survive better.

Long-Term Analyses of Estimates of Abundance of Juvenile Chinook Salmon on the Trinity River, 1989-2018. Arcata Fisheries Technical Series Report TS 2022-40, report for the Trinity River Restoration Program (TRRP). U.S. Fish and Wildlife Service, Arcata, California.

Pinnix, W. D., S. P. Boyle, T. Wallin, T. Daley, and N. A. Som.

Available: trrp.net/library/document?id=2571

This is a summary of analyses of the number and the sizes of juvenile Chinook salmon sampled from two smolt traps on the Trinity River: one near Helena, and the other near Willow Creek. The young fish are captured as they migrate downstream along the Trinity River to the Pacific Ocean. The analyses show a large increase in the number of outmigrating fish after ROD flows were implemented in 2004, and the authors thought that this increase was due to an increase in habitat in the Trinity River between Lewiston Dam and the North Fork Trinity River. However, the analysis of fish sizes showed that even though more fish were being produced, they were smaller. The authors suggested that this may be due to colder spring and summer water temperatures that followed implementation of the ROD.

Evolution of tributary junctions and their capacity for rearing juvenile Chinook salmon (Oncorhynchus tshawytscha) on a regulated river. Ecohydrology: DOI: 10.1002/eco.2463

Buxton, T. H. and D. N. Bradley.

Available: trrp.net/library/document?id=2569

This study compared how two parts of the Trinity River have changed: one area was just downstream of Rush Creek, and the other was just downstream of Indian Creek. The two creeks supply large amounts of gravel to the Trinity River, and gravel is associated with salmon and Steelhead habitat. The authors found that below Rush Creek, the gravel bars supported willow trees that 'hardened' them and made them less mobile during floods, and over time the habitat quality decreased. At Indian Creek, willows did not grow as densely and the gravel was easily refreshed by frequent floods, so the habitat quality was consistently higher there. The authors attributed the difference to valley confinement - the valley is wider at Rush Creek than Indian Creek, so the flood power of the river is stronger and more focused at Indian Creek. The authors concluded that while wide valley areas of the river have a higher risk in decreasing in quality, they also have more potential for restoration.

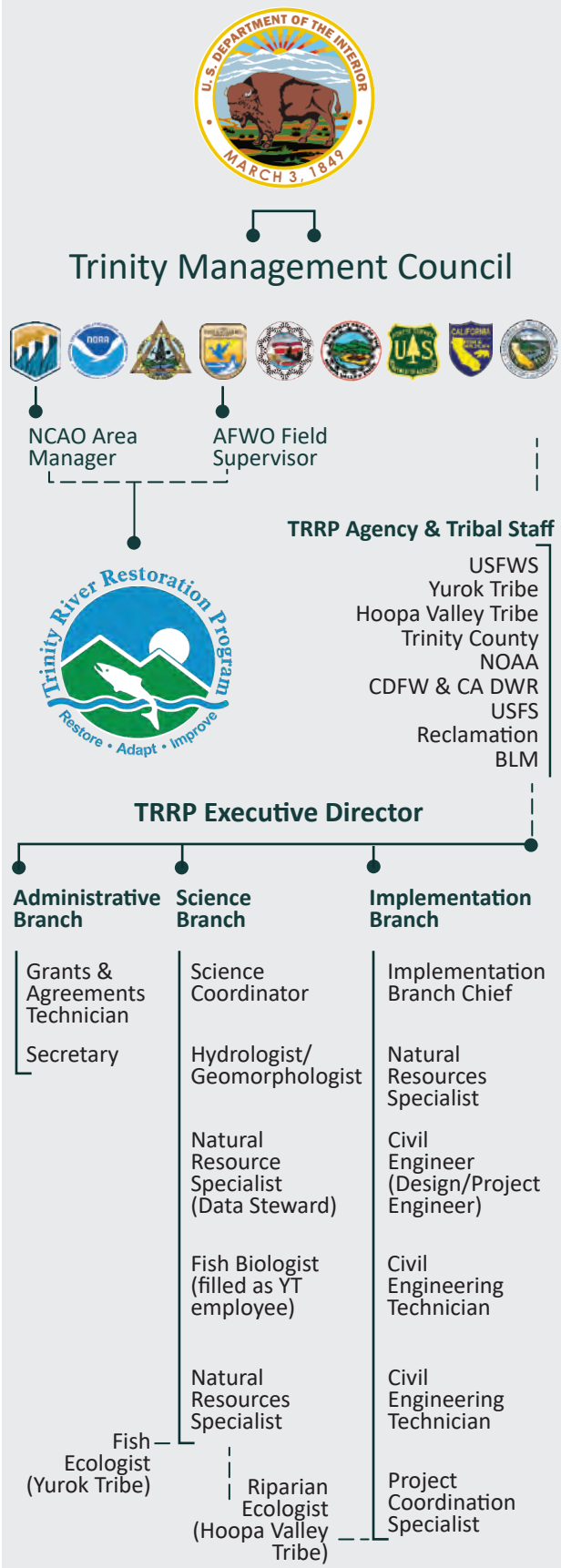
Governing Body

The Program is a partnership comprised of Federal, State, Tribal and Trinity County entities that collaborate to restore a 40 mile stretch of the Trinity River between Lewiston Dam and the confluence of the North Fork Trinity, California.

The governing body shares the decision making process through their participation on the Trinity Management Council (TMC). The TMC functions as a board of directors that sets priorities and schedules for strategic implementation by the Program's Executive Director. Partners on the TMC include:

- Hoopa Valley Tribe (HVT)
- Yurok Tribe (YT)
- Trinity County, CA
- California Natural Resources Agency
  - California's Department of Water Resources (CDWR)
  - Department of Fish and Wildlife CDFW)
- U.S. Forest Service (USFS)
- National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries)

...Program Structure



Publications

The Program and its partners publish scientific reports each year in study of the Trinity River. Below are the reports published in 2022.

The mechanics of diurnal thermal stratification in river pools: Implications for water management and species conservation.

Buxton, T. H., Y. G. Lai, N. A. Som, E. Peterson, and B. Abban.

Available: trrp.net/library/document?id=2577

Program scientists saw evidence that high summer baseflows in the Trinity River caused pools to exhibit uniformly cold temperatures and high velocities compared to what would exist under natural baseflow conditions. High summer flows provide the cold temperatures adult salmon require, but do they also harm juvenile salmon and reduce future adult returns?

Program scientists began studying this question in 2020 to see if data supported this hypothesis. The study included measurements of water temperatures, flow velocities, and depths in two pools on the Trinity River. One pool is located upstream of the reservoir above Coffee Creek and the other pool is located well below the dam near Pear Tree, close to the confluence with the North Fork Trinity River.

Results indicate that summer flows below Lewiston Dam provide the water temperatures and depths in pools that adult salmon need, but temperatures are uniformly cold and flow velocities are too high for the salmon to passively rest. The lack of thermal diversity also prevents juvenile salmon from accessing the different temperatures they need to maximize growth. In contrast, the Trinity River pool above the dam exhibited a temperature difference of almost 15°F from the warm surface water to the cold water in the bottom depths of the pool. Such temperature differences occur naturally on undammed rivers in California and other locations where river flows are naturally low and air temperatures high in summer.

Second only to river flows themselves, water temperatures are the most important driver of biological populations in the river. For this reason, as we consider how to provide conditions in the river that support multiple species and all life stages of salmon, we cannot overlook water temperature. How summer flow management should change to provide a better range of temperature conditions in the Trinity River continues to be explored.

Research & Development

Assessing temperature regimes and juvenile Chinook Salmon growth in Trinity River off-channel and mainstem habitats. Report for the Trinity River Restoration Program (TRRP). Yurok Tribe Fisheries Department, Klamath, California.

Cooper-Hertel, E. J., K. T. Lindke, T. Daley, K. De Juilio, and K. Hopkins.

Available: trrp.net/library/document?id=2567

The Trinity River Restoration Program has made efforts to improve juvenile salmonid rearing habitat degraded by legacy hydraulic mining and dam operations through habitat restoration and adaptive flow management. Program scientists assessed how restored off-channel habitats benefit the growth of juvenile Chinook Salmon compared to mainstem habitats in locations just downstream of Lewiston Dam and locations farther downstream affected by accretionary flows near Junction City. Several of the enclosures that they used to monitor fish growth were damaged, allowing the fish to escape. As a result, this project has been considered a trial study with the intention to repeat it in the future.

Trinity River winter flow project. Report for the TRRP. TRRP, Weaverville, California.

Abel, C. E., K. De Juilio, K. T. Lindke, S. Naman, and E. E. Thorn.

Available: trrp.net/library/document?id=2566

The Winter Flow Project proposes to shift a portion of the ROD water volume used for restoration releases in the spring to the winter period to improve anadromous fish habitat conditions along the TRRP's restoration reach, which is the approximately 40-mile length of the Trinity River downstream of Lewiston Dam to the confluence of the North Fork Trinity River in Trinity County, California.

This report has been prepared to summarize and provide the history, scientific rationale, and anticipated outcomes of the Winter Flow Project proposed by the TRRP. The Winter Flow Project activities described in this report are designed to support the TRRP's goal of restoring fish populations to pre-dam levels and restoring dependent fisheries, including those held in trust by the federal government for the Hoopa Valley and the Yurok Tribes.

Work Groups

The TRRP has a number of collaborative work groups for addressing technical issues. Work group meetings are open to the public and are posted on the TRRP calendar, viewable on the calendar page. Agendas and summaries are available through each workgroup's page.

Design Team *(Channel Rehabilitation Work Group)*
2022 Coordinator: Oliver Rogers (TRRP)
trrp.net/design-team/

Fish Workgroup
2022 Coordinator: Bill Pinnix (USFWS)
trrp.net/calendar/fish-workgroup/

Flow/Temperature Workgroup
2022 Coordinator: Seth Naman (NMFS)
trrp.net/flow-temperature-workgroup/

Gravel Augmentation/Physical Workgroup
2022 Coordinator: Todd Buxton (TRRP)
trrp.net/gravel-physical-workgroups/

Interdisciplinary Team (IDT)
2022 Coordinator: James Lee/Chad Abel (TRRP)
trrp.net/inter-disciplinary-team-idt/

Watershed Workgroup
2022 Coordinator: Chad Abel (TRRP)
trrp.net/watershed-workgroup/

Riparian & Aquatic Ecology Workgroup
2022 Coordinator: Chris Laskodi (YTFD)
trrp.net/riparian-aquatic-ecology-workgroup/

Committees

Science Advisory Board

Members of the SAB provided scientific peer review of proposed hypotheses associated with monitoring and restoration management approaches, proposed annual flow schedules, short- and long-term monitoring and investigation plans developed by technical work groups, technical recommendations, and research reports.

Five scientists, recognized as experts in the disciplines of fisheries biology, fluvial geomorphology, hydraulic engineering, hydrology, riparian ecology, wildlife biology, or aquatic ecology, form a Scientific Advisory Board (SAB). Each member is appointed by the Executive Director and serves a four-year rotating term.

SAB Members

John Buffington, Ph.D.
USDA Forest Service
jbuffington@fs.fed.us

John Buffington (Ph.D. Geological Sciences) is a Research Geomorphologist with the U.S. Forest Service, Rocky Mountain Research Station. His research focuses on fluvial geomorphology of mountain basins, biophysical interactions, and the effects of natural and anthropogenic disturbances on salmonid habitat.

Andrew J. Paul, Ph.D.
Alberta Environment and Parks
andrew.paul@gov.ab.ca

Andrew Paul (Ph.D. Population Ecologist) is the Provincial Environmental Flow Specialist for Fish and Wildlife Habitat Policy with the Alberta Government.

Tracking coarse sediment augmentations with RFID tracers in the Trinity River, CA.
Gaeuman, D. and K. De Juilio.
Available: trrp.net/library/document/?id=2585

This report describes how gravel that is deliberately added to the river moves in response to flows. The authors placed passive integrated transponders in 1,000 pieces of gravel, and mixed these tracers with gravel supplied to the river by TRRP. They then relocated the tracers after spring floods in 2016, 2017, and 2019. They found that the shape of the channel had a strong affect on where the gravel ended up, and that the gravel didn't move as far as anticipated. Nearly all of the gravel was deposited within half a mile of where it was introduced.

Trinity River water year 2019 system wide riparian mapping, Lewiston Dam to the North Fork Trinity River.
Hoopa Valley Tribal Fisheries Department and McBain Associates.
Available: trrp.net/library/document/?id=2545

Every five years, the Trinity River Restoration Program maps the riparian vegetation associated with the mainstem Trinity River. This map and the associated report represent the fourth iteration of systemic mapping on the Trinity River since 2003, and was based on aerial imagery that was collected in 2019. The authors made some comparisons to the maps created in previous years and found that narrowleaf-dusky willow and cottonwood cover is increasing, while white alder cover is becoming more fragmented. There was also a net gain in riparian vegetation at channel rehabilitation sites. These changes are consistent with predicted results of increasing streamflows and implementing channel rehabilitation projects.

A first year of periphyton monitoring in the Trinity River, California.
E.B. Peterson.
Available: trrp.net/library/document/?id=2549

Observations of algae in the Trinity River have concerned many people, including people who fish, raft, and people who use the Trinity River as their domestic water source. On the other hand, we also know that algae is the foundation of the aquatic food chain. These concerns have led many of us to ask, "what kinds of algae live in the Trinity River, and what causes their blooms?" This report identifies algae and characterizes its abundance. The author found 35 different taxa, including *Didymosphenia* germinate "rock snot" and blue-green algae. He also found some interesting patterns that laid the basis for several hypotheses that he intends to test in the future.

Watershed Grantee Funding

The TRRP awarded $809,307 in FY22 to three projects within the Trinity watershed. The grantees put forward $264,870 in matching funds for a total conservation impact of $1,074,177. Read further for a description of those awarded projects.

5 storage and withdrawal projects have been completed with 2 on deck. (Watershed Research and Training Center)

$439,542.39

Watershed Research and Training Center

Resiliency in the Greater Trinity River Watershed

Watershed Research and Training Center was funded $439,542.39 for "Resiliency in the Greater Trinity River Watershed". The organization is tasked to plan and implement four storage tank arrays and establish long-term forbearance agreements to reduce annual water withdrawals from key tributaries to the Trinity River during the summer low-flow period. The project will increase the quality and quantity of natural temporal habitats crucial to the survival of anadromous fishes and aquatic organisms in the Trinity River Watershed.

The Yurok Tribe has been awarded funding to design and work through compliance for replacement of the Sky Ranch Road culvert on Oregon Gulch. (Elliot Sarnacki, Reclamation)

$104,182.67

Yurok Tribal Fisheries Department

Oregon Gulch Culvert Replacement

The Yurok Tribe was funded $104,182.67 for "Oregon Gulch Culvert Replacement". The Yurok Tribe will complete 90% design plans and obtain environmental approvals to replace the Oregon Gulch culvert under Sky Ranch Road in Junction City. The project will open over five miles of suitable salmonid spawning and rearing habitat. The grantee will collect existing conditions data, complete technical modeling and draft design, and complete a design report. The grantee will coordinate with other regulatory and conservation agencies and organizations in the Trinity River Basin including the Trinity County Department of Transportation (TCDOT).

The culvert that will be replaced with an arched culvert at a USFS campground in Weaverville. (5 Counties Salmonid Conservation Program)

$265,582.08

Northwest California Resource Conservation & Development

East Branch East Weaver Creek Migration Barrier Removal

Northwest California Resource Conservation & Development Council funded $265,582.08 for "East Branch East Weaver Creek Migration Barrier Removal". The project will replace a road crossing with an arch culvert near a USFS campground and community trail system in order to open a migration pathway for anadromous fish. The project will restore access to 1.2 miles of habitat to all life stages of salmonid species.

A Hoopa employee looks over a large wood installation at Supply Creek. (Justin Alvarez, Hoopa Valley Tribe)

24 rolling dips were installed to provide drainage. (Five Counties Salmonid Conservation Program)

After construction on 30N16B. (Trinity County Resource Conservation District)

Watershed Grantee Accomplishments

The TRRP awarded grant funds to three projects that were completed in 2022. Read below for each project's accomplishments and updates.

Supply Creek Berm Removal - Hoopa, CA

Hoopa Valley Tribe
2020 TRRP Watershed Grant
2021-22 Construction and Riparian Planting

The Supply Creek berm removal project is located in downtown Hoopa, CA near the elementary school. The project intention was to increase tributary habitat for Chinook and Steelhead salmon. Construction crews removed an 8,000 cubic foot man-made berm that sat in the center of the creek's floodplain. Additionally, crews used engineered plans from McBain and Associates to cut 70 meters of new channel and split the creek's flow. Rock and log-jam wood features were then placed to encourage 35% of the flow to move into the side channel.

After construction revegetation crews went out to plant 17 cluster plantings of native species such as, Arroyo Willow, Red Willow and Cottonwood.

Carr Fire Recovery & Sediment Reduction Project Deadwood, CA

Five Counties Salmonid Conservation Program

Within the Tunnel Gulch Watershed, Five Counties Salmonid Conservation Program identified a sediment reduction area within the Carr Fire footprint near Deadwood Creek. Crews rocked 9 stream crossings and critical dips within the road and installed an additional 24 rolling dips which provide adequate drainage for the road length.

South Fork & Mainstem Trinity River Road Decommissioning - Hyampom, CA

Trinity County Resource Conservation District

Roads have long been identified as the greatest source of controllable fine sediment delivery to river systems affecting anadromous fisheries of the Trinity watershed. This project conducted by TCRCD included decommissioning of two roads, botany and wildlife surveys, and post implementation revegetation of trees and riparian vegetation.

Restoration Flow Management

> *2022 was critically dry for a record 3rd year.*

Each water year (WY), the TRRP's Flow Work Group and the Trinity Management Council recommend a schedule for releasing restoration flows on the Trinity River. The WY22 hydrograph was designed to:

- Vary discharges at the beginning of the release to disperse Steelhead smolt released from Trinity Hatchery;
- Dislodge macroinvertebrates from the streambed for drift feeding by salmonids;
- Provide a fluctuating water table in off-channel wetlands;

11,000 cfs high flow near Douglas City, 2011. (TRRP)

A critically dry WY allocates the Program 369,000 AF of water for restoration releases.

- Elevate discharge to recruit leaf litter from floodplains;
- Mobilize sediment and scour riparian plants from the channel margins;
- Inundate side channels for juvenile salmon rearing; and
- Provide elevated flows to survey the depths and shapes of underwater terrain between the North Fork (NF) Trinity River and Lewiston Dam with multibeam sonar.

The water volume for the restoration flow release to the Trinity River below Lewiston Dam is based on the California Department of Water Resources (CDWR) April 1 forecast of the total annual inflow to Trinity and Lewiston Reservoirs, grouped into five water year types. Forecasts are used because the actual water year type is not known when the annual release schedules are developed. The CDWR forecast that the water year type for 2022 was "Critically Dry". The approved daily average flow schedule for the Critically Dry WY was a modification of the hydrograph prescribed for this water year type in the ROD (Figure 1).

On the Cover: Winter base flow releases from the Lewiston Dam, 2022. (Kiana Abel, Reclamation)

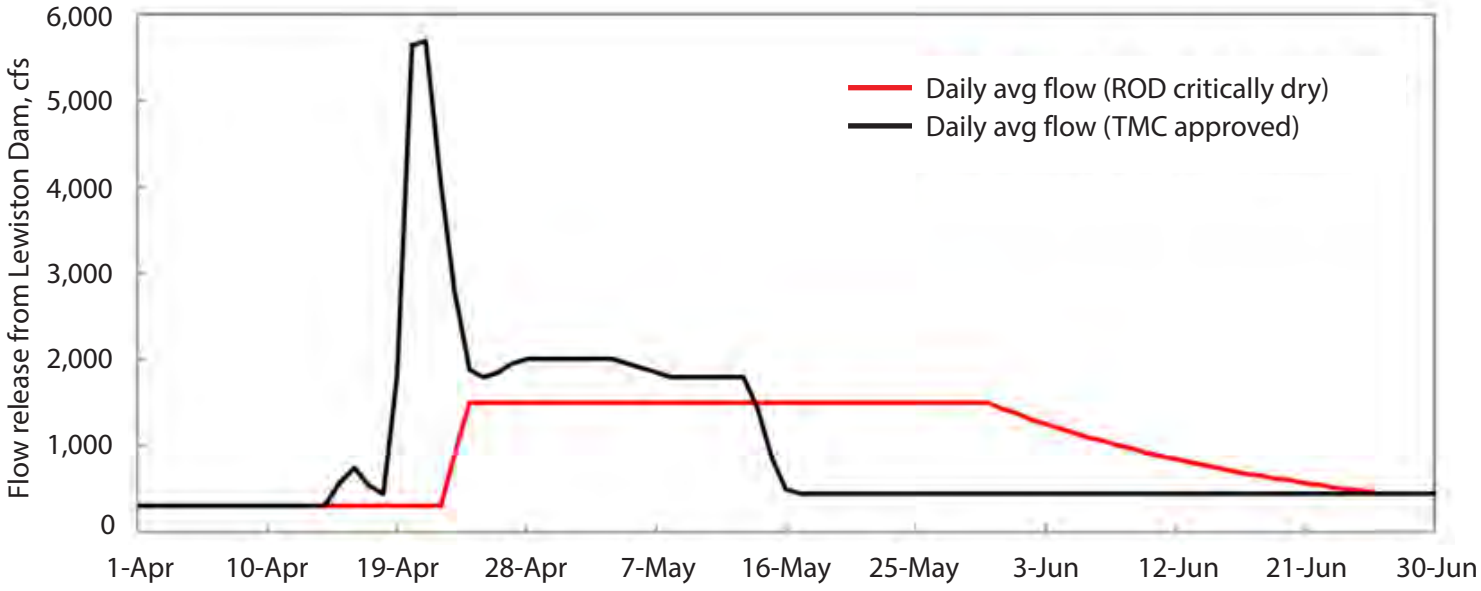


Figure 1. The approved hydrograph (black line) for WY 2022. The ROD hydrograph (red line) is also shown for comparison.

Flow Release from Lewiston Dam

Daily average flows released from Lewiston Dam closely followed the flows scheduled release in WY22. There was one exception when discharge was increased from the summer baseflow to a peak of 1,160 cfs to release 27,431 AF of water to aid Chinook salmon in the lower Klamath River (Figure 2). This water is separate from water allocated for restoration of the Trinity River.

The total volume of water released from Lewiston Dam to the Trinity River in WY 2022 was 392,420 acre feet (AF) according to the US Geological Service (USGS). According to US Bureau of Reclamation (Reclamation), water was released to the river via the Lewiston power turbine (50,394 AF), fish hatchery and other outlets (120,869 AF), and radial gates at Lewiston Dam (226,921 AF), for a total of 398,184 AF. The 1.4% discrepancy between the USGS volume and Reclamation volume reflects error in these respective measurements.

Lewiston Dam at winter base flow, 2022. (Kiana Abel, Reclamation)

27,431 AF was released to aide Chinook salmon in the lower Klamath River.

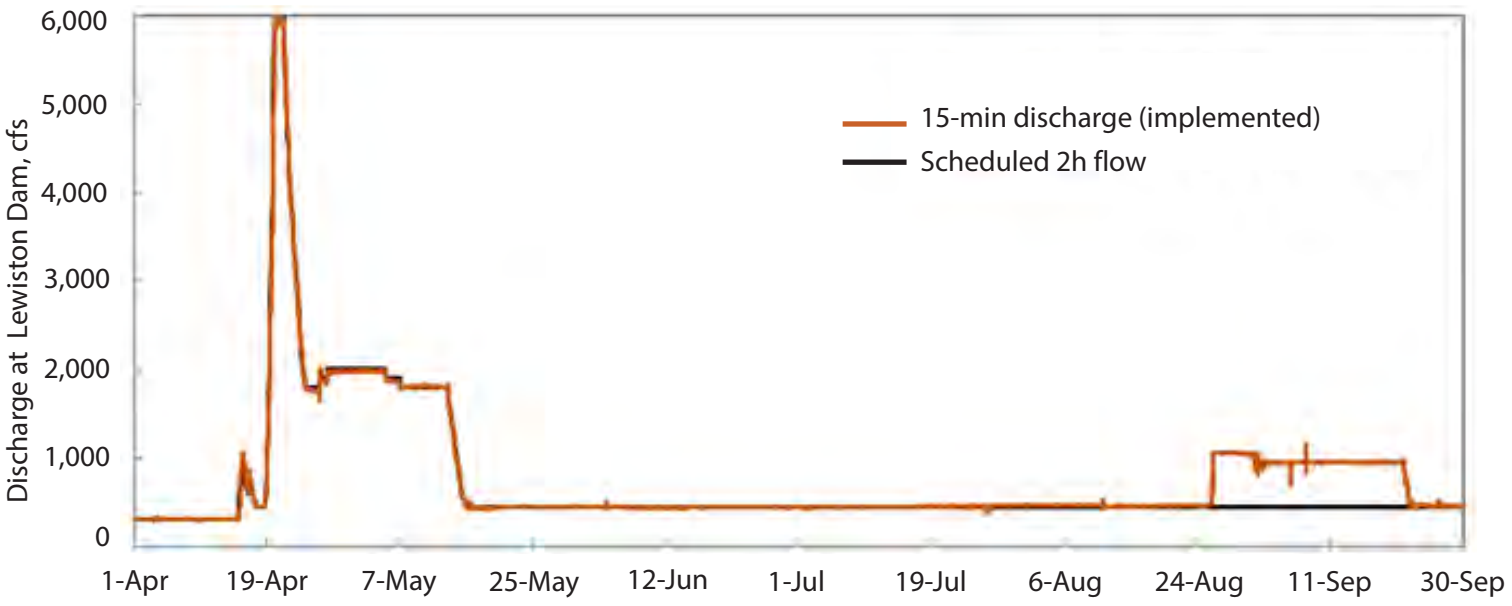
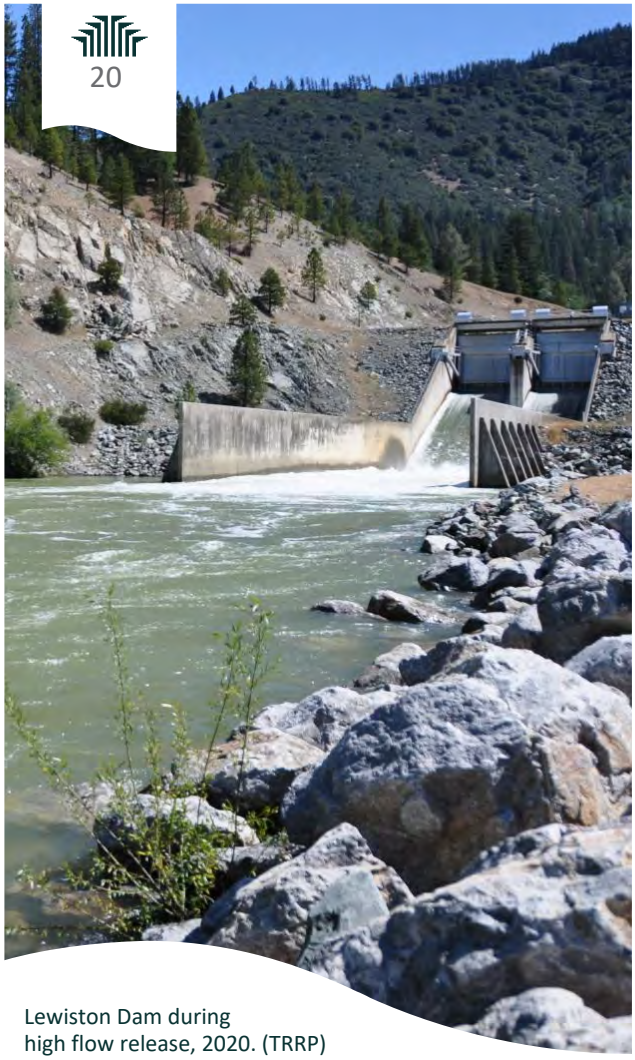


Figure 2. Scheduled and implemented flow releases from Lewiston Dam in WY22.



Lewiston Dam during high flow release, 2020. (TRRP)

Restoration Flow Schedule

Hydrograph Implementation

In addition to showing actual water releases, Figure 3 compares the releases from Lewiston Dam to the TMC approved release schedule, as measured at the Lewiston gage (USGS #11525500). Central Valley Operations implemented the allocated flow volume closely. The difference between the implemented restoration volume and the scheduled volume for restoration (369,000 AF) was -4,012 AF, or -1.1%, which is within the assumed error in the flow gaging. The full water and temperature report is available on the TRRP website.

Trinity River water allocation, temperatures, and model results for implemented flows and approved hydrographs for water year 2022.

Buxton, T. H.

Available: trrp.net/library/document?id=2601

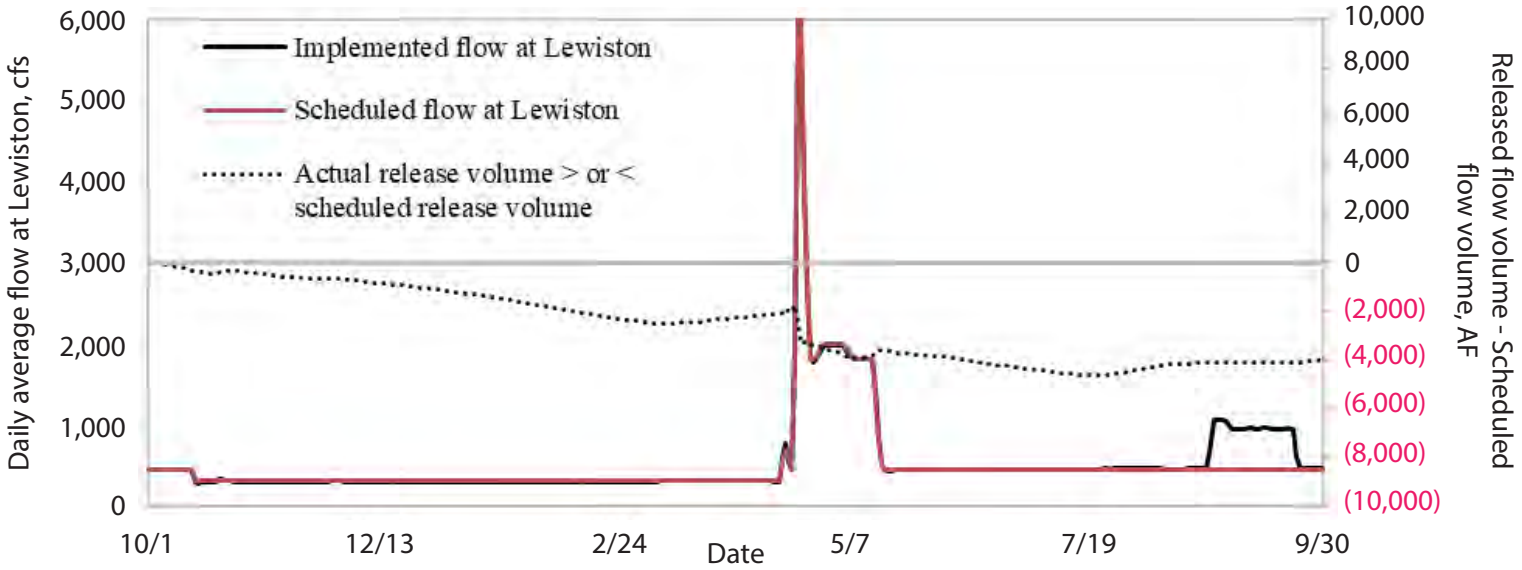


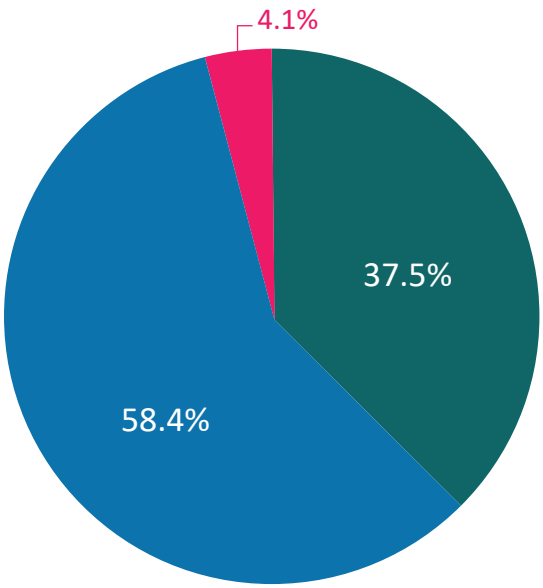
Figure 3. Daily average flows scheduled and implemented at Lewiston and the volume that implemented flows were above or below the ROD water volume allocated for a critically dry water year. The gray horizontal line indicates agreement between the scheduled and released water volume.

Water Exported from the Trinity River

Water exported from the Trinity River basin to the Central Valley via the Clear Creek tunnel totaled 252,151 AF in WY 2022. This is the lowest diversion volume since passage of the ROD (2000) and 36% less water than was released to the Trinity River (392,420 AF) in WY 2022. An additional 21,854 AF and 2,348 AF of water evaporation was respectively estimated for Trinity and Lewiston reservoirs, making the volumetric expense of impounding Trinity River water 24,202 AF. This value is 5% of the full natural flow in WY 2022 at Trinity Lake (488,148 AF) and 7% of the flow volume allocated for Trinity River restoration in WY 2022 (369,000 AF).

Figure 4. WY22 Flow allocations in acre feet.

2022 Flow Release



Total volume of water released
672,002 AF

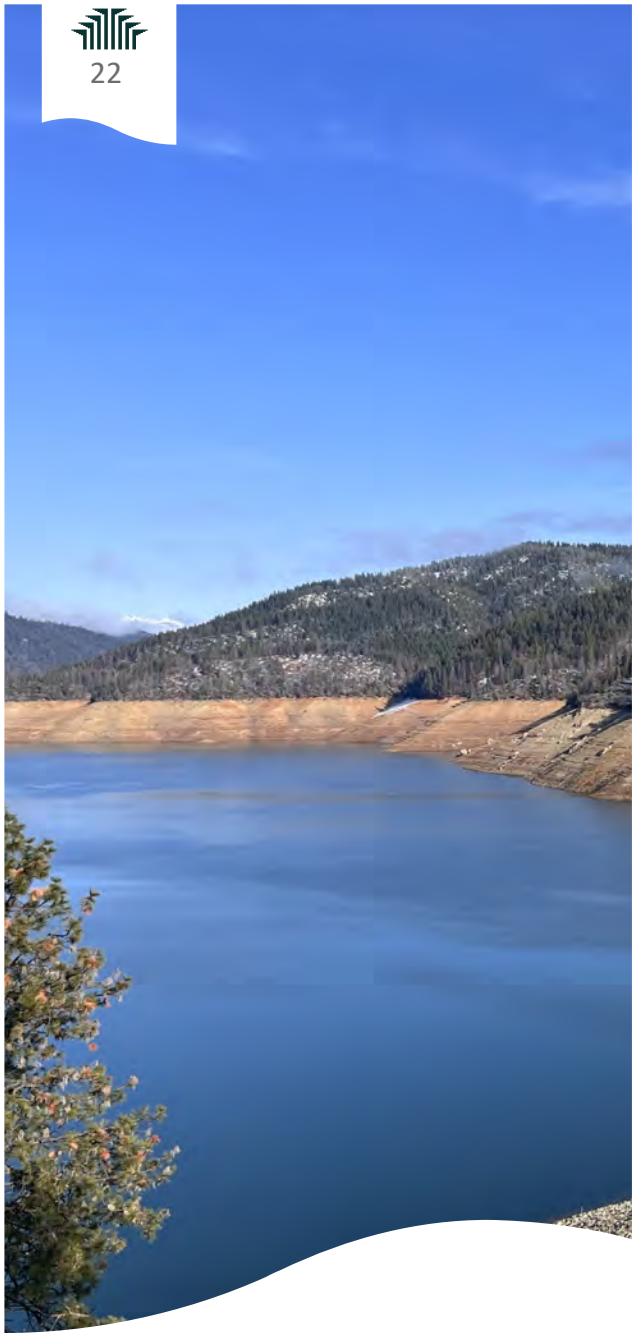
252,151 AF — Water exported from the Trinity River basin via Clear Creek Tunnel

392,420 AF — Water released to the Trinity River for restoration purposes

27,431 AF — Water released for lower river augmentation purposes

Clear Creek Tunnel. (Reclamation)

Water exported from the Trinity River basin to the Central Valley via the Clear Creek tunnel was the lowest diversion volume since passage of the ROD [2000].



Trinity Reservoir taken in December 2022.
(Kiana Abel, Reclamation)

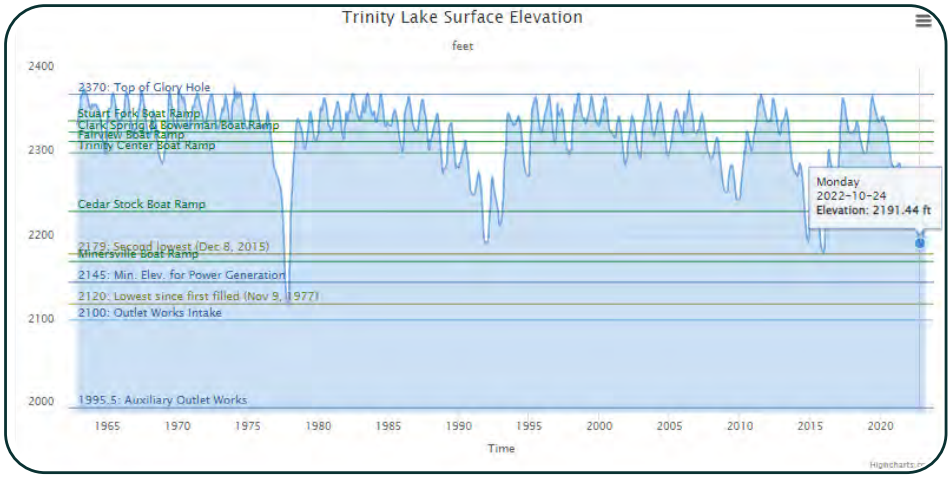
Trinity Reservoir Operations

The volume of water in Trinity reservoir decreased from 706,800 AF at the start of the water year (10/1/2021) to 553,200 AF at the end of the water year (9/30/2022). These volumes are respectively 29% and 23% of reservoir capacity (2,448,000 AF). The decrease in storage volume lowered the reservoir water surface 24 ft and caused the Cedar Stock, Trinity Center, Fairview, Clark Spring, and Stuart Fork boat ramps to remain dry this water year.

Current elevations of the water reservoir at Trinity Lake are available on the TRRP DataPort: trrp.net/dataport/

Temperature Targets & Compliance

Water temperature targets are specified for two locations on the Trinity River to help provide adult salmon suitable conditions for upstream migration and holding. The compliance target locations are at Douglas City and above the confluence with the North Fork (NF) Trinity River (SWRCB, 1990; NCWQCB, 1991). The temperature targets are daily average values and vary with time of year and location on the river (Table 1). Success meeting the temperature targets and criteria in WY 2022 varied between stations as described below.



Screenshot of current and past lake levels can be found on our website: https://www.trrp.net/dataport/

Table 1. Trinity River Temperature Targets by Reach and Date.

Source	Target Reach	Dates	Target
Basin Plan for the North Coast Region (North Coast RWQBC 2011)	Lewiston to Douglas City	July 1 - September 14	≤60 °F (15.5 °C)
		September 15 - 30	≤56 °F (13.3 °C)
NMFS (2000) and WR 90-5 (SWRCB 1990)	Lewiston to North Fork Trinity River	October 1 - December 31	≤56 °F (13.3 °C)

River temperatures at Douglas City during the target period are influenced by the release temperatures at Lewiston Dam and local weather. Given the extremely hot summer that was experienced, water temperatures remained above the historic daily average values until fall. Water temperatures targets at Douglas City were not met for 70 (days) of the 92-day compliance period in WY 2022. The peak daily exceedance and total exceedance at this station were respectively 3°C and 132°C, respectively (Figure 5).

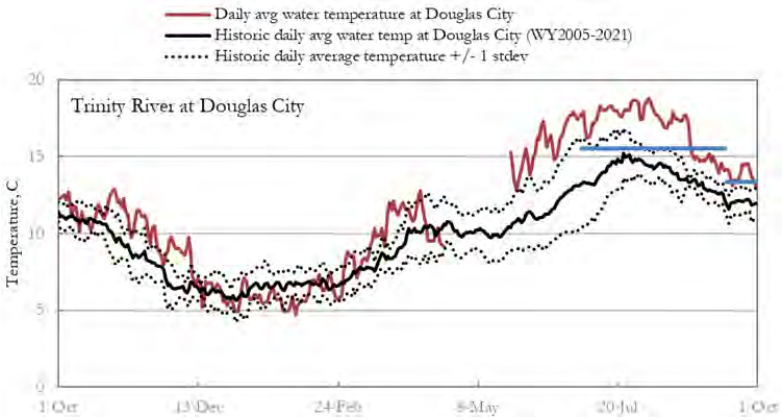


Figure 5. Daily average water temperatures at the Douglas City compliance point in WY 2022. Observed water temperatures are plotted with compliance targets and the average and range (+/- 1 standard deviation) of daily temperatures for the period of record (WY 2005-2021). The period of missing data (red line) is due to a malfunction of the temperature gauge.

Water temperatures above the NF Trinity River were below the targeted values in all except 7 days of the 92-day compliance period in WY 2022 (Figure 6).

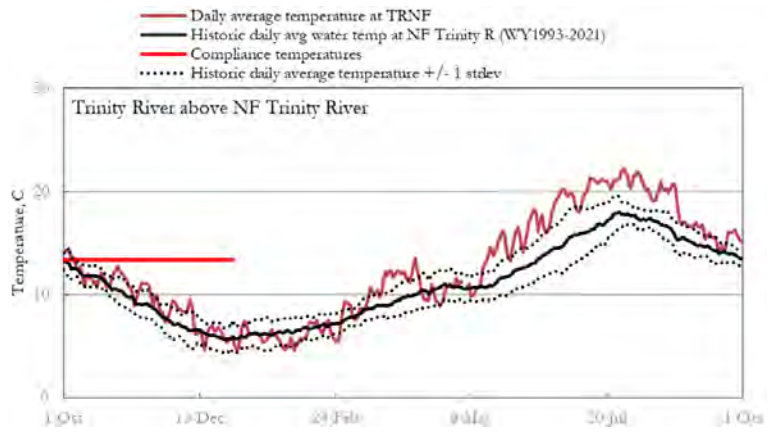


Figure 6. Daily average water temperatures for the Trinity River above NF Trinity River in WY 2022. Also shown are the historic daily average and range (+/- 1 standard deviation) of daily temperatures for the period of record (WY 1993-2021) at this station.

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Mechanical Channel Rehab

“Before 1940, Oregon Gulch was one of the largest sources of floodplain habitat on the Trinity River.”

Phase 1 Oregon Gulch Rehabilitation Project had the following goals set for 2022.

- Mobilize and establish the construction site.
- Near completion of rock material processing equaling 13,130 cubic yards of clean gravel and cobbles and 13,000 cubic yards of small boulders.
- Establish safe and efficient hauling/trucking operation from the project site to the quarry at Eagle Rock, Inc.

Oregon Gulch Rehabilitation

Phase I & II

Phase I of the Oregon Gulch Rehabilitation project was a highlight for the Trinity River Restoration Program (TRRP) implementation branch in 2022. The project is situated between Weaverville and Junction City two miles upstream from the Dutch Creek Bridge. A massive effort is underway to restore salmonid habitat on the scenic Trinity River at this location. The Oregon Gulch Rehabilitation site was chosen for several reasons. Prior to hydraulic gold mining and dam construction on the upper river, the area was the largest source of floodplain habitat upriver of the Hoopa Valley and downriver from the (now flooded) Lewiston Reservoir. During the gold mining era, large dredge boats raked the river bottom of rock and piled leftover materials in large mountain like “tailings piles”. These piles are still evident in many riparian areas along streams and rivers in Trinity County. At Oregon Gulch specifically, large-scale hydraulic and dredge operations piled rock tailings 25 to 35 feet above the river’s bank and flood plain. The piles ended up occupying up to 75% of the valley’s width and through time have eliminated the river's ability to push waters into most of the low-lying topography during high flows. Additionally, static water releases from Trinity and Lewiston Dams during the winter and summer months (350 and 450 cfs, respectively) allowed riverbanks to become crowded with vegetation and built-up sediment further contributing to the creation of a channelized river.

In an effort to create floodplain habitat for wildlife, The TRRP and its partners have engineered a design to remove the leftover piles of rocky debris and encourage the river to access the floodplain via mechanical rehabilitation. The design calls for upwards of 500,000 cubic yards of excavated material to be removed which would fill 208 Olympic size swimming pools! Eagle Rock Inc., a local company about 4 miles from Oregon Gulch are accepting, and plan to use, most of the excavated materials in future road and building projects. In past TRRP excavation projects the options to place materials were limited to the site itself and were generally placed higher up along the river corridor. Disposal at Eagle Rock reduces the need to place excavated materials in local upland areas and allows the site to reclaim more

Left: Dredge mining machines methodically dropped tailings piles along the Trinity River during the gold mining period. Piles sit 25-35ft above the rivers bank. (Aaron Martin, YTFD)

On the Cover: Oregon Gulch restoration project phase 1 focuses on tailings pile removal. (Aaron Martin, YTFD)

floodplain for the river to use during high flow.

Project excavation began in August 2022 with the Yurok Tribe, Hoopa Valley Tribe and several sub-contractors who have been steadily working 5 days a week. By the end of 2022, nearly 50% of the total off-haul from the site had been completed. Not only is stone being removed to Eagle Rock, Inc, but it's also being screened and sorted to create materials which will be used to construct in-channel habitat features on-site. In December, removal crews endured adverse weather conditions with several atmospheric river events that passed through California. Phase 1 of the design is expected to finish on time and reach completion in summer of 2023. The program is continually appreciative of local residents, who are an important on-the-ground presence during all phases of work. Phase 2 of the Oregon Gulch project will commence in-river work that will create river meanders and lower targeted areas to floodplain elevations. Overall, the project proposes to create up to 1,000 times the amount of rearing habitat for small salmon at the site than presently exists. This large-scale addition of nursery habitat will help increase the size and number of young salmon and Steelhead that leave Trinity River on their way to the ocean, which in turn will help promote an increase in salmonid spawning.

Power screen processing machines sort tailings for building materials and other TRRP project features. (Elliot Sarnacki, Reclamation)

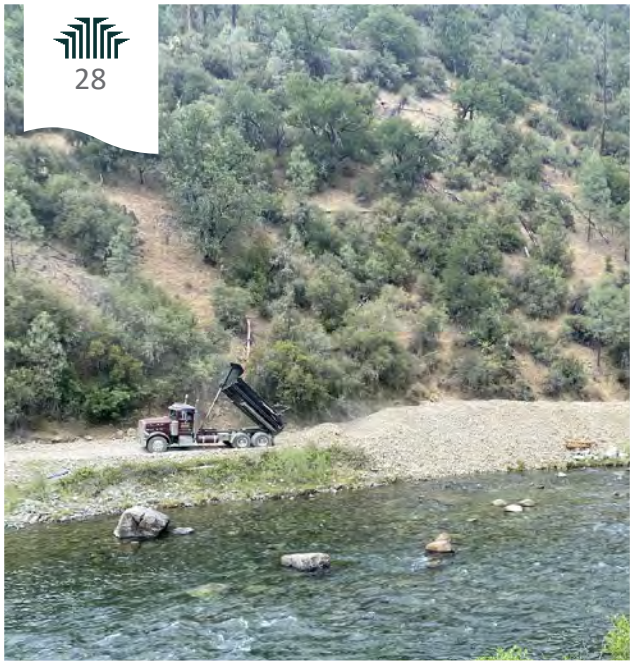
Environmental Assessments

Much of the effort spent by the implementation branch in 2022 was focused on creating foundations for future design and construction. The TRRP is proposing the addition of four new gravel augmentation sites at Dark Gulch, Vitzthum Gulch, Steel Bridge Day Use Area, and Trinity House Gulch.

These projects are bolstered by a foundational Gravel [Sediment] Augmentation Environmental Assessment which finished the public comment and scoping period in the Spring of 2022. The final Gravel [Sediment] Augmentation Environmental Assessment will clear the path to allow the TRRP to create additional fish habit through gravel augmentation in reaches devoid of the natural sediments that attract salmonids spawning.

Also working its way through the NEPA process is the Trinity River Watershed Programmatic Environmental Assessment (PEA). Prepared by the Bureau of Reclamation (TRRP) along

Articulating trucks staging material for haul off to Eagle Rock, Inc. (Elliot Sarnacki, Reclamation)



Gravel Augmentation Goals & Objectives

- Provide material to the river that is otherwise blocked from upstream.
- Create bars and pools in the river channel by encouraging the scour and fill processes that form them.
- Provide additional juvenile rearing habitat in the river channel as opposed to floodplain rearing habitat that is only made available during high flows.
- Create and maintain spawning beds for redd formation by adult salmon.
- Improve the overall elements of channel complexity.

with the US Forest Service and the Bureau of Land Management, the PEA will streamline restoration projects that fall outside of the Trinity mainstem by creating an overarching environmental document. Activities covered by the PEA include instream habitat restoration, native riparian and wetland revegetation, fish passage restoration, instream flow restoration, road decommissioning, maintenance, and rehabilitation activities. The PEA was publicly scoped in November of 2022.

Sky Ranch and Upper Conner Creek represent the next two large scale rehabilitation projects in the implementation schedule. Sky Ranch, is at the 60% design phase and is working through the NEPA process. Upper Conner Creek is not far behind, currently at a 30% design level and through the Value Engineering process. These upcoming projects represent large-scale, innovative floodplain lowering for the Trinity River in the Junction City area and will yield wide-reaching improvements for river complexity and fish habitat.

Gravel Augmentation

Due to the critically dry water year in 2022, no in-river gravel augmentation occurred. Instead of gravel placements, coarse gravel was processed for future use at the Sawmill Rehabilitation site, southwest of Lewiston. Starting in late September, four weeks of machine work yielded thousands of cubic yards of sorted coarse sediment for augmentation.

Photo Left/Above: A dump truck drops a load of gravel at TRRP's 2021 gravel augmentation site near Lewiston Dam. (TRRP)

Photo Left/Below: Chinook over spawning gravel. (Thomas Dunklin).

Riparian & Aquatic Ecology

"The riparian area is the transitional zone between river and land."

The Program's restoration ecologists had a busy year in 2022. Read below to learn of some highlights.

- TRRP riparian ecologists worked with partner groups to eradicate newly identified populations of invasive noxious weeds.
- While designing and planning the re-vegetation effort at Oregon Gulch, ecologists cared for and maintained plantings at previously re-vegetated sites.
- Participation with several outreach events got ecologists out into the community raising awareness about native plants and the importance of biodiversity.

There are several different species of willow in the Trinity Basin, and they have different ecological niches. Tree willows, as pictured above, deposit higher on the riverbank and hence do not contribute to river edge encroachment as significantly as narrow-leaf willow. (Veronica Yates, Hoopa Tribal Fisheries Department)

The pacific chorus frog, native to Northern California, is mostly a ground-dweller, living among shrubs and grass typically near water. (Jamie Battaso, USFS)

On the Cover: An egg mass of foothill yellow legged frogs rest on willow branches in a shallow riparian zone. (TRRP)

The riparian area – the transitional zone between aquatic (river) and terrestrial (land) – is a critical area of study for the Program. Riparian vegetation, such as willows, cottonwoods, alders, and other water-loving species, provide important habitat structure for salmonids by increasing cover, shade, and food. Healthy riparian vegetation also benefits songbirds, amphibians, mammals, and other wildlife.

Each channel rehabilitation project is accompanied by a significant native re-vegetation effort. To mitigate for any plants that are removed during construction, the Program has a commitment to replace all removed riparian vegetation at a minimum ratio of 1:1. This is monitored via the Riparian Revegetation Monitoring Plan (RRMP). Program staff are continuously employing adaptive management strategies and working with partners to determine the best methods for re-establishing native species.

Riparian Species & Flow Regulation

Throughout the seasons, an undammed river naturally fluctuates in flow in a somewhat predictable pattern. Riparian trees are adapted to take advantage of these flow fluctuations, timing their seed dispersal to correlate with their specific habitat needs. Black cottonwoods release relatively few seeds while the river is high with snow melt (from mid-April to mid-June), taking advantage of being deposited higher on the banks with less competition from other riparian species. Then, as flows recede later in the year, other riparian species, like narrow leaf willow, release a profuse abundance of seeds (June – August). Many narrow leaf willow seedlings will germinate lower in the river corridor, but most of them are naturally scoured with the next winter flows. This scouring effect is critical to maintain the ecological balance and ensure that there is the physical space for other riparian species to thrive, which is why this species' strategy is to produce such a high quantity of seed.

In contrast, on a regulated river such as the Trinity River below the Lewiston Dam, the loss of large floods, coupled with stable summer flows, has disturbed this harmonious balance between species and resulted in continuous bands of unnaturally dense vegetation (i.e., low-establishing species like narrow leaf willows) along the summer water line (Table 1). This vegetation shapes bars and banks into areas that are unfavorable for rearing salmonids and can hasten the development of steep berms along the banks (known as channelization). TRRP uses restoration flows to discourage woody plant encroachment, a primary objective

identified in the Trinity River Flow Evaluation Report (TRFER) (USFWS HVT 1999).

Table 1: The surviving cohorts of narrow-leaf willow in each water year. To date, there are 7 surviving cohorts since 1993.

Water Year	Instantaneous Maximum Lewiston Discharge (cfs)	Cohorts Scoured	Surviving Cohorts	Established Cohorts
2005	7,600	2004	None	1993, 1998, 2000 2002
2006	10,400	2003, 2004 2005	No Data	1993, 1998, 2000 2002
2007	4,810	None	2006	1993, 1998, 2000 2002, 2006
2008	6,890	2007	2006	1993, 1998, 2000 2002, 2006
2009	4,630	None	2006, 2008	1993, 1998, 2000 2002, 2006, 2008
2010	7,480	2009	2006, 2008	1993, 1998, 2000 2002, 2006, 2008
2011	12,300	2008, 2009 2010	2006	1993, 1998, 2000 2002, 2006
2012	6,180	2011	2006	1993, 1998, 2000 2002, 2006
2013	4,590	None	2006, 2012	1993, 1998, 2000 2002, 2006, 2012
2014	3,460*	None	2006, 2012 2013	1993, 1998, 2000, 2002, 2006, 2012, 2013
2015	8,830	2013, 2014	2006, 2012	1993, 1998, 2000 2002, 2006, 2012
2016	9,600	2014, 2015	2006, 2012	1993, 1998, 2000 2002, 2006
2017	12,000	2015, 2016	2006	1993, 1998, 2000 2002, 2006
2018	2,400	None	2006, 2017	1993, 1998, 2000 2002, 2006, 2017
2019	10,800	2017, 2018	2006	1993, 1998, 2000 2002, 2006
2020	3,970	None	2006, 2019	1993, 1998, 2000 2002, 2006, 2019
2021	4,070	None	2006, 2019 2020	1993, 1998, 2000, 2002, 2006, 2019, 2020
2022	6,030	2021	2006, 2019 2020	1993, 1998, 2000, 2002, 2006, 2019, 2020

*The peak discharge of 2014 was not associated with spring ROD flows, rather it occurred on September 22, 2013, and was associated with Lower Klamath temperature and health flows.

A hummingbird moth shown pollinating this showy milkweed (*Asclepias speciosa*). The milkweed flowers produce an aromatic compound, which attracts clear wing moths. The moths buzz over and try to land on the flower to imbibe in delectable nectar, but since the flowers of milkweeds are rather slippery, their bug legs and other body parts may slip into convenient little slots that lie along the stigma (female flower parts). These "stigmatic slits" have bristles and grooves that prevent the insect from moving anywhere but upwards. At the top of this uni-directional entrapment device is a "translator arm", which bears pollinia (pollen bearing packages found in milkweeds and orchids) on either side. Imagine two suitcases with a strap connecting them, where the strap is the translator arm and the suitcases are pollinia. If the insect is strong enough, it will break off the translator arm, thus freeing the paired pollinia, which attach to the insect for a ride onto the next milkweed flower. This symbiotic relationship is one of the many reasons that planting and seeding with native species is crucial to overall ecosystem health. (Veronica Yates, Hoopa Tribal Fisheries Department)

Volunteers show-off native wetland plants that were planted at a volunteer planting event located at Chapman Ranch restoration site. The event was co-hosted with Trinity County Resource Conservation District. (TCRCD)

Riparian ecologists analyze a previously re-vegetated site in 2022. Program staff are continuously employing adaptive management strategies and working with partners to determine the best methods for re-establishing native species.
(Veronica Yates, Hoopa Tribal Fisheries Department)

A riparian encroachment synthesis report (HVT and McBain Associates 2021) documented extensive vegetation monitoring, which indicated that managed flow releases have successfully discouraged woody plant encroachment.

The WY22 hydrograph (Figure 1) was reflective of a critically dry year. No woody plant recruitment or seedling scour objectives are associated with a Critically Dry Year (USDI 2000). Past results of annual riparian band transect and exposed bar monitoring showed that, in most years, riparian hardwoods will be scoured from the low water edge by winter storms (tributary-generated floods) and spring ROD releases.

Seedlings become established after four growing seasons, after which their root systems are too extensive to be scoured by ROD flow releases alone. Since 2000 at least one cohort (WY 2006) has been documented to have survived to establishment, and is therefore beyond the ability of ROD releases to remove via scour. Allowing 2 out of every 13 cohorts to survive to establishment could rapidly lead to further encroachment along the low water channel, especially at newly created habitat within rehabilitation sites.

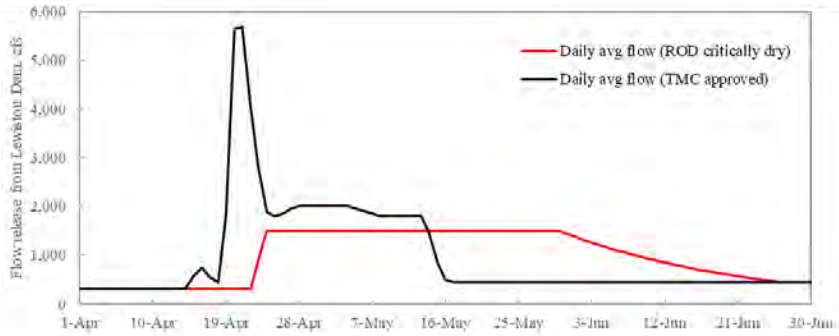


Figure 1: WY22 Hydrograph developed by TRRP scientists and approved by the Trinity Management Council.

Fisheries Monitoring

> *“Anadromous fish are the central focus on the Trinity River for both fishing and science.”*

Anadromous fish are the central focus on the Trinity River for both fishing and science. Numerous studies on winter and spring run Chinook salmon, Coho salmon, and steelhead are conducted regularly to evaluate the outcomes of restoration actions and provide feedback for Adaptive Management.

Juvenile Chinook swim in search of food near Indian Creek. (Thomas Dunklin)

Above: An example of a large wood instillation from the Dutch Creek Restoration Site, completed in 2020. (TRRP)

On the Cover: A Yurok Tribal fisheries technician shows off a large steelhead that found its way into the weir for counting. (Mike Dixon, Reclamation)

Juvenile Salmon Habitat Assessment

The Habitat Assessment Team collaborates with the Science Program and the Implementation Branch team to monitor the effectiveness of channel rehabilitation for increasing juvenile habitat availability. Goals in 2022 included updating the hydraulic model for the 40-mile restoration reach and cataloging large wood installations at rehabilitation sites.

Hydraulic Model Update for the Restoration Reach

A 2-Dimensional hydraulic model of the restoration reach is completed every 5 years in order to assess changes to salmonid habitat as a result of constructed in-stream habitat improvements (Bradley, et al 2016). In 2022, the habitat assessment team (Yurok, Hoopa and USFWS) collected calibration and validation data to help build the hydraulic model at three discharges. These data included water surface elevations, wetted edge locations, water velocities and depth information. The salmonid habitat predictions from this model will be compared to previous habitat predictions to assess changes across the restoration reach.

In 2022, the Habitat Assessment Team assisted the Rehabilitation Site Design Team with collection of hydraulic model calibration data. This primary calibration data will be used in the creation of an SRH2D 2-Dimensional hydraulic model that will predict the quantity of salmonid habitat in the restoration reach for a given flow and life stage. In addition to the primary calibration data, the Habitat Assessment Team, with assistance from management collaborators, collected independent calibration data for a validation model intended to assess the accuracy of the SRH2D model. This consisted of water surface elevation, bathymetry, velocity, and wetted edge locations at two flows in the restoration reach. Assessing the accuracy of the primary SRH2D model is important for understanding the extent of variability that may occur in habitat area estimates for salmonids in the restoration reach.

Large Wood Survey and In-Stream Cover Mapping

Large wood surveys at the newly completed Chapman Rehabilitation Site and the Dutch Creek Site were completed

in 2022 and added to a long-term large wood monitoring dataset of rehabilitation sites throughout the restoration reach. The large wood database is used to track changes to large wood installation structures over time, potentially identifying types of structures that withstand disturbances. The long-term dataset represents 15 years of large wood inventories at rehabilitation sites and is also used to assess long term trends in large wood distribution across the restoration reach.

Juvenile salmonid habitat selection is influenced by the availability of cover habitat that provides shelter from high water velocities that can hinder growth and wetted structures that provide protection from predation as a source of mortality. The Habitat Assessment Team used mapping grade GPS tools to map and quantify the amount of cover habitat at the newly completed Chapman Ranch Rehabilitation Site. These data will update the cover map created in 2021 by the Habitat Assessment team.

Monitoring of Juvenile Chinook Salmon

Monitoring of juvenile Chinook salmon on the Trinity River in 2022 was conducted by the Hoopa Valley Tribal Fisheries Department at the Pear Tree Gulch Monitoring Site, and Yurok Tribal Fisheries Program at the Willow Creek Monitoring Site. Monitoring at the Pear Tree Site began on January 10th, 2022, and ended on August 27th, 2022. Monitoring at the Willow Creek Site began on March 8th, 2022, after spring high flows receded and continued through August 2nd, 2022. Trapping operations at the Willow Creek Site were suspended when water temperature surpassed temperature thresholds at USGS gaging station 11530000 in Hoopa to protect fish health and limit handling stress. The 2022 season was overall a successful season allowing for both season wide and weekly population estimates to be calculated. The 2022 estimates of naturally produced juvenile Chinook salmon are expected to be released at the end of 2023.

A restoration design engineer watches as fish scatter into the beds of aquatic plants (macrophytes) in a side channel constructed at the 2010 Lowden restoration site. These macrophyte beds are fish food factories and provide tons of cover from predators. (TRRP)

Salmon Redd Distribution and Abundance

Since 2002 the USFWS, CDFW, HVT, YTFP, and USFS have conducted annual salmon spawning surveys on the mainstem Trinity River to evaluate the distribution and abundance of Chinook salmon spawning activity.

Fall spawning numbers were impressive at the 2021 gravel augmentation site near Lewiston Dam in the fall of 2022. (TRRP)

Female Chinook salmon dig redds as males compete for a spawning opportunity at the crest of a side channel in the Trinity River. (M. Bradford, CDFW)

Surveyors located 4,082 salmon redds and examined 1,142 fresh salmon carcasses during the 2022 survey season. Of the fresh carcasses, 1,121 were Chinook salmon and 21 were Coho salmon. Natural-origin Chinook salmon built an estimated 3,725 redds, hatchery-origin Chinook salmon built 357 redds, and Coho salmon built the remaining 121 redds (Table 8). The number of Chinook salmon redds observed in 2022 was above the median (3,642) and mean (3,722) counts since the survey, in its current iteration, was initiated in 2002 (Table 1).

Table 1: Estimated numbers of Chinook and Coho salmon redds observed in the mainstem Trinity River in 2022.

Species	Origin	2022
Chinook Salmon	All	4,082[b]
	Natural	3,725[b] (3,535-3,876)
	Hatchery	357 (206-546)
Coho Salmon[a]	All	121[b]
	Natural	NA[c]
	Hatchery	NA[c]

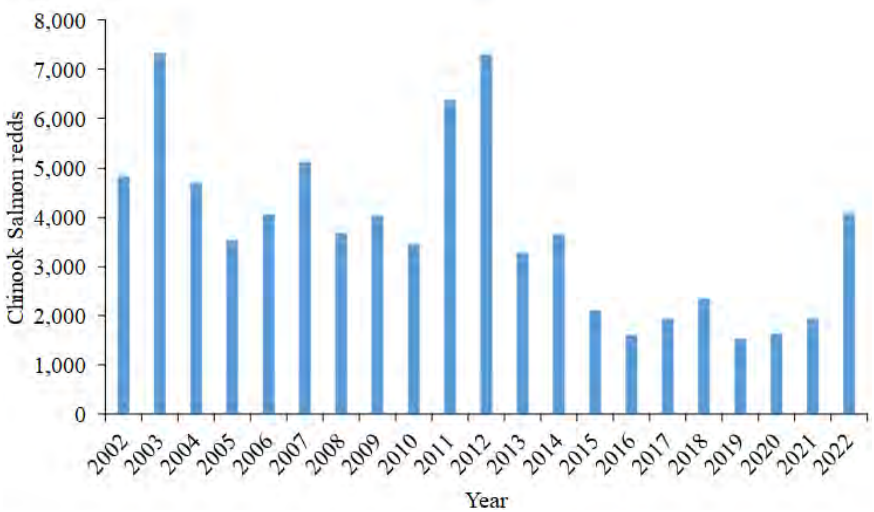
Bootstrap-generated 95% confidence intervals are in parentheses.

[a] The survey season only partially covers the Coho salmon spawning period.

[b] Confidence intervals are generated with both Chinook and Coho salmon data. Not enough female Coho salmon carcasses were found in 2022 to calculate a confidence interval.

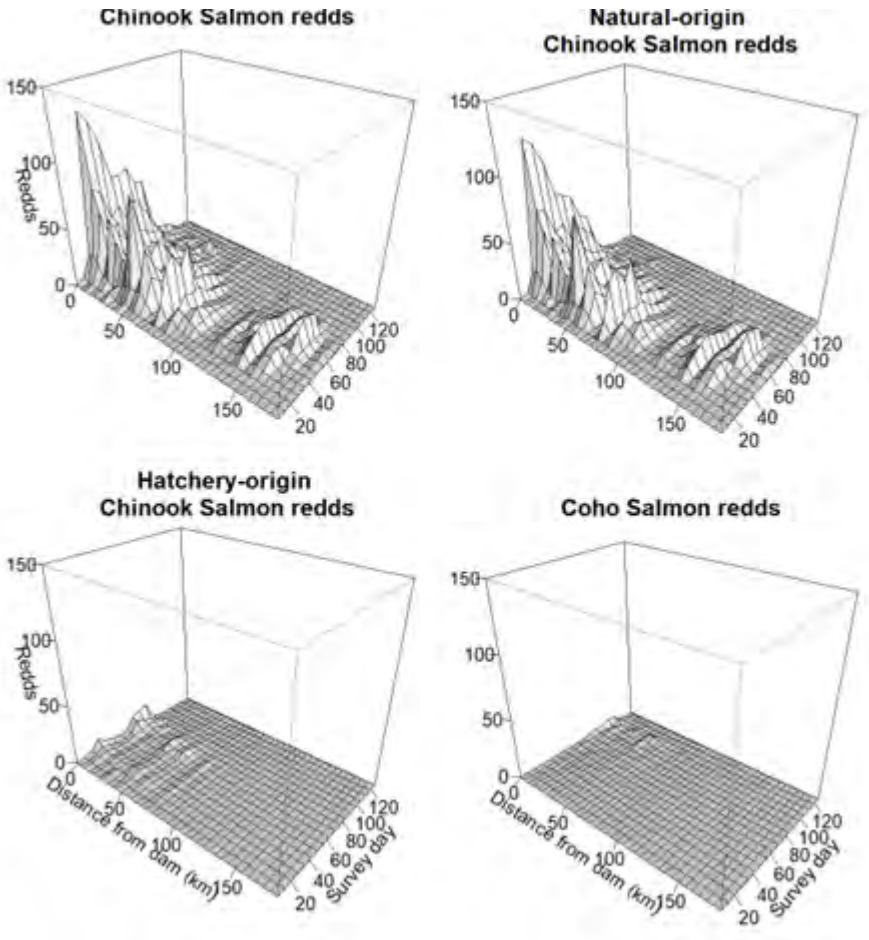
[c] Not enough fresh female Coho salmon carcasses were found in 2022 to calculate separate estimates for natural- and hatchery-origin Coho salmon redds.

Figure 1: Estimated numbers of Chinook salmon redds in the mainstem Trinity River, California, from 2002 to 2022.



Most redds were counted during the earlier portion of the spawning season indicating that they were presumably constructed by spring-run Chinook salmon (Figure 2). Hatchery-origin Chinook Salmon tended to spawn relatively close to the Trinity River Hatchery located at the base of Lewiston Dam. A large proportion of natural-origin Chinook Salmon spawned in the area just below the dam as well; however, their redds were more distributed downstream, mainly throughout the restoration reach.

Figure 2: Spatiotemporal distribution of salmon redds observed in the mainstem Trinity River, California in 2022. Pigeon Point and Burnt Ranch whitewater reaches were not surveyed. Survey Day l = September 1.



A fisheries technician collects data as salmonids migrate back from the sea to their natal home. (Mike Dixon, Reclamation)

The Yurok Tribal Fisheries Program survey crew looks for salmon redds and carcasses on a cold and foggy morning on the Trinity River. (Photo by M. Bradford, CDFW)

Salmonid Spawning Escapement and Harvest

Each year, TRRP supports monitoring for run-size, escapement, and harvest of natural-origin and Trinity River Hatchery-produced spring and fall run Chinook and Coho salmon, as well as adult fall steelhead.

The estimated escapement of adult fall Chinook salmon to natural spawning grounds in the Trinity River basin (above

After guarding their redds (nests) for as long as they can, the adult salmon will expire leaving one last gift to their offspring, marine-derived nutrients to help fuel the ecosystem and help their young fry grow. (Mike Dixon, Reclamation)

Willow Creek Weir) in 2022 was 14,179 fish. Estimates for 2022 indicate that 8,932 natural-origin fall Chinook salmon and 4,938 hatchery-origin fall Chinook salmon returned to natural river areas or the Trinity River Hatchery (including age-2 jacks). Details on the 2022 escapement monitoring for Trinity River salmonids are provided in Table 2.

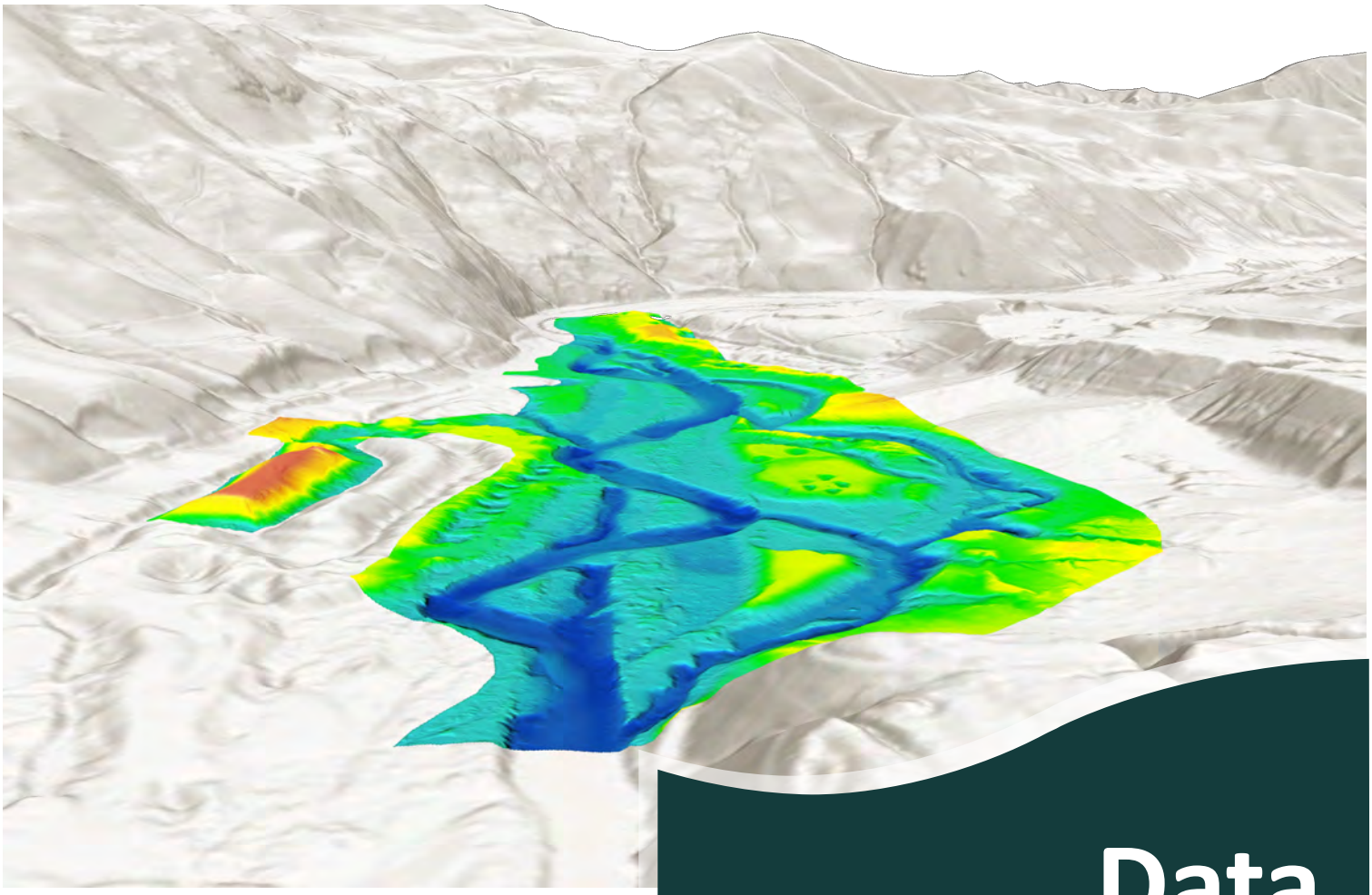
Table 2: 2022 adult escapement estimates for Trinity River salmonids upstream of Willow Creek Weir or Junction City Weir (spring Chinook salmon only).

Species	Natural-origin escapement		Hatchery-origin escapement	
	2022	Program Goal	2022	Program Goal
Spring Chinook Salmon	8,926	6,000	4,151	3,000
Fall Chinook Salmon	8,932	62,000	4,938	9,000
Coho Salmon	3,044	1,400	3,507	2,100
Adult Steelhead Salmon	9,225[1]	40,000	1,051	10,000

[1] This number only represents fish that passed through the WC weir and does not account for fish that passed when the weirs were not in the river.

TRRP supports dependent ocean fisheries, as well as in-river recreational and tribal fisheries as part of the Program's goal to restore anadromous fish populations. Natural and hatchery-origin fall Chinook salmon from the Trinity River support the recreational fishery and the Hoopa Valley Tribal fishery on the Trinity River and contribute to the recreational fishery and the Yurok Tribal fishery in the lower Klamath River below its confluence with the Trinity River.

In 2022, an estimated 309 adult fall Chinook salmon were harvested in the recreational fishery on the Trinity River. These estimates include both natural origin and hatchery origin fish. The estimated tribal harvest and Klamath River harvest of adult fall Chinook salmon are still under assessment and will me amended into the document when available.



Data Management

Data forms the basis for assessing restoration performance, measuring progress towards goals and objectives, and designing channel rehabilitation projects and hydrographs. Effective data management ensures that TRRP has the resources needed to analyze past actions and plan for future actions, yielding better adaptive management and decision support.

Data stewardship practices encompass quality assurance and quality control, information security, public and partner accessibility, and usable documentation to preserve data's value through time. The Program's primary outlet for data is our DataPort, which fosters the usability of data and information across the partnership by making it accessible to restoration professionals and to the public.

> *"Over 1,700 reports & 125 data packages are downloadable from the TRRP website DataPort library."*

Data Resources

Current River Flows: trrp.net/

A growing number of data resources are managed through the DataPort, many of which are integrated into other portions of the website. For example, the TRRP.net home page itself has a table of current river flows and multiple graphs that are resourced from the DataPort.

The Restoration Action Database

trrp.net/dataport/rad/

The Restoration Action Database (RAD) is comprised of a collection of tabular data on completed projects within the TRRP focal reach and includes watershed improvement projects and previous non-TRRP efforts.

Mapping Application

trrp.net/DataPort/map.php

A mapping application provides access to aerial photography, restoration designs and as-builts, modeled flow extents, and a variety of other geospatial data.

Riverview Application

trrp.net/dataport/riverview-launch

The RiverView application provides an oblique point-of-view for the restoration reach and can provide the public with a virtual float down the river. A new set of imagery was collected during the summer of 2022, which is expected to be available in the RiverView application before summer of 2023.

On the Cover: Chapman B as-built topography (color) placed in context of more generalized topography from USGS (gray-scale).

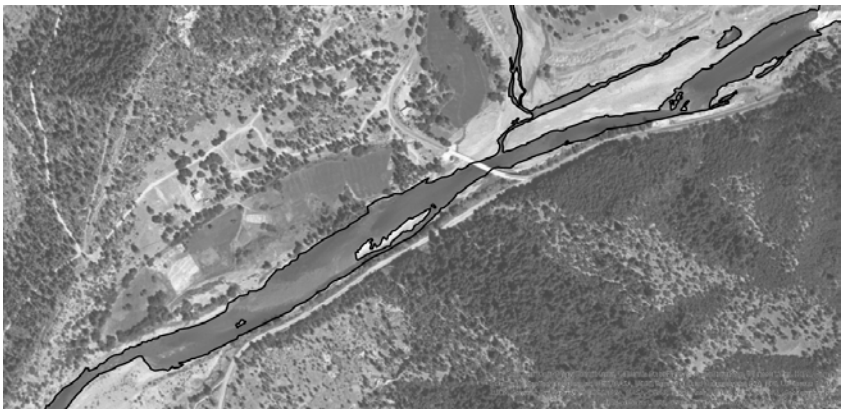
Over 1,700 reports and other documents, and over 125 data packages, including reports and documents dating back to 1900, can be searched and downloaded from the TRRP: DataPort library: trrp.net/library/

Aerial Photography

High-resolution aerial photography may be TRRP's most widely used type of data since it provides the context for documenting changes in the river channel, designing restoration actions, planning scientific investigations, and communicating both within the TRRP and with the public. Aerial photography data sets going as far back as 1944 allow the public and TRRP partners to view changes on the river over time and are available in TRRP DataPort maps. New aerial photography for the restoration reach was collected June 24, 2022. The use of aerial photography for change detection, including narrowing of the river after dam construction, is demonstrated in Figures 1 and 2 below.

Figure 1 (above): The Trinity River at Douglas City in August of 1944. River flow in Lewiston (upstream) was measured this day at 190 cfs. The water's edge is marked with black lines.

Figure 2 (below): The Trinity River at Douglas City in June of 2022. River flow in Lewiston (upstream) was measured this day at 443 cfs. The water's edge from 1944 is marked with black lines, revealing a much narrower river despite more than twice the flow.



A New Topographic Dataset

In addition to aerial photographs, detailed topographic models from data collected by aerial LiDAR (light detection and ranging), photogrammetry from unmanned aerial systems (UAS, a.k.a. “drones”), and boat-based bathymetric sonar are often completed to document changes at rehabilitation sites or other locations along the river. An as-built topography for phase B of the Chapman Ranch channel rehabilitation site was completed using UAS and boat-based sonar early in FY2022.

Reach-wide data collection occurs on a roughly 5-year cycle due to the cost of data collection. A reach-wide topography dataset was collected in 2016 and collection of sonar data for a new topography was completed in 2022, along with LiDAR early in FY2023.

Chapman Ranch phase B as-built survey technical report. Data Package for the Trinity River Restoration Program.

Pryor, C.

Available: trrp.net/library/data/?id=149

The Yurok Tribe’s Fisheries Department Design Construction Program (YTFD) was tasked by the USBR Trinity River Restoration Program (TRRP) to document as-built conditions at the Chapman Ranch Phase B Rehabilitation site, on the Trinity River. As-built documentation consisted of detailed topographic surveys of the river channel and channel margins as well as constructed side channels, gravel bars, backwaters and floodplains. Data were collected for the purpose of developing a detailed digital terrain model (DTM) to document and support project monitoring.

Surveying a pool near mouth of Browns Creek in 2022. (Jeanne McSloy, Reclamation)

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Outreach

In 2022 we saw the lifting of many Covid restrictions. With vaccinations available people began gathering and showing support for in-person events. Below are a few highlights of outreach efforts from the year. Read on to learn of additional activities that the Program produces for the community.

- In order to reach the local community, the Program started a TRRP Facebook page. The page garnered over 600 followers by the end of the year.
- In collaboration with Trinity County Resource Conservation District, the Program launched Science on Tap. The event saw an average of 70 people in attendance each month.
- School based programs such as Weaverville Summer Day Camp, Day at the Wetlands and Indian Days were brought back post-Covid.

"TRRP works with the Trinity County Resource Conservation District to produce outreach events for the community."

The star of the show, Salmon, took photos with fans at the Salmon Festival. (TCRCD)

TRRP staff launched boaters on a tour of the Trinity River during the annual Public Float. (TRRP)

TRRP staff showed the difference between Steelhead and Chinook at the Salmon Fest in Weaverville. (TCRCD)

Public Events

The Program funds and partners with TCRCD to produce outreach events. Some events are in conjunction with additional federal, tribal and local agencies such as the Bureau of Land Management, US Forest Service and the Yurok Tribe. The TRRP hosted 17 public events in 2022 from February to November in close collaboration with these and other agencies. Each event is unique and is structured to meet outreach and education targets pertaining to program departments.

Throughout the year, the Program hosts events that teach about and encourage participants to mix with local ecology. First, we kicked off the year with our citizen science initiative, The Great Backyard Bird Count. TRRP participated in two counting events with local birding experts. Sightings are registered into a national registry that help scientists better understand global populations and annual migration patterns. Other events throughout the year were an inventive and fun spring wildflower scavenger hunt; a highly successful invasive species plant pulling event held at Bucktail Restoration site that focused on removing scotch broom; and a fall native planting event held at our 2021 restoration site.

The Program encourages folks to get out on the river by hosting a yearly public float during the summer. Staff from the Program float river sections with those interested in learning about river ecology and restoration activities. Additionally, the Program hosted two river clean up days in 2022. The first, held in July, volunteers floated the river and gathered trash via water craft. People brought in tires, construction materials, plastic floats, fishing lures, and all sorts of trash. The second event was a road-side clean up in the fall. Those in attendance deserve extra thanks due to the chilly, wet weather that day!

In March of 2022, the Program added a new monthly event hosted at Trinity County Brewing Company in Weaverville called Science on Tap. This wildly popular presentation style event focuses on local science topics delivered by the local scientists who work so diligently on those issues. Each event ran on the 4th Wednesday from March through November and reached an average audience of 70 people each event!

In October, collaborators were able to bring the Trinity River

Salmon Festival back to Weaverville. The event was a huge success. Highlights from the day long event were a blessing from the Nor Rel Muk Wintu Nation who also served traditionally cooked salmon and had a drum circle bringing cultural education to those in attendance. The Turtle Bay Exploration Park brought their live animal show back to Weaverville showcasing animal education in a touch and feel environment. Throughout the day attendees were entertained by three local bands, a wildly energetic salmon plus many booths with games, art projects for children and food, drink and local wares for the adults. At the TRRP booth, visitors found our fish tank full of Steelhead and Chinook salmon. We pointed out unique characteristics of each fish, played games and took questions about current and past Program projects.

Educational Outreach

One of the highlights of the outreach program is bringing science to local youth. We participate in this opportunity throughout the year with the assistance of local partners like the Trinity County Resource Conservation District and The Watershed Research and Training Center.

TRRP and TCRCD hosted their annual River Day event with Coffee Creek School at Coffee Creek. The kids did several water-focused activities, including macro-invertebrate collection and identification, and an interactive animal/habitat game.

The Bureau of Land Management, Watershed Center, Yurok Tribal Fisheries Department and TCRCD hosted kids from Weaverville, Lewiston and Douglas City at the annual Day at the Wetlands. The event was held at the Bucktail boat launch recreation area in the spring of 2022. Staff from each agency hosted stations educating kids about river and plant ecology by playing games, collecting macro-invertebrates, and identifying plants.

TCRCD provides funding and outreach to two camps for local children. The Weaverville Summer Day Camp gives children in Trinity County the opportunity to spend three weeks outside learning about nature, art, food, farming, and cultural history in and around Weaverville. In 2022 Eric Peterson, TRRP's Natural Resources Specialist and Data Steward led kids in collecting macro-invertebrates in the East Weaver Creek. Kids had the opportunity to find living organisms and learn the important roll they play in river ecology.

Eric Peterson lead Weaverville Summer Day Campers in collection and identification. (TCRCD)

Veronica Yates talked with Bar 717 campers about native plant identification. (TCRCD)

3rd and 4th grade students are treated to a field trip to Hayfork to celebrate Indian Days in 2022. (TCRCD)

A 6th grade student at Bar 717 Environmental Camp checked measurements during an identification exercise with riparian ecologist, Veronica Yates. (TCRCD)

The second camp, the Bar 717 6th grade Environmental camp is a three day and two night camp for local 6th graders held at the Bar 717 Camp in Hyampom. In this immersive learning environment, kids get the opportunity to learn about local ecology from several agencies and perspectives. Hoopa Valley Tribe's riparian ecologist, Veronica Yates led kids in a discussion about native plant characteristics and identification.

Public Notifications

TRRP continued to reach out to the public about restoration projects and environmental compliance documents. The program's Implementation Branch sent two environmental documents out for scoping and public comment, a Gravel Augmentation Environmental Assessment and a Watershed Programmatic Environmental Assessment. Both of these multi agency efforts will streamline restoration activities within the Trinity Watershed. Scoping is a process that helps to engage interested parties, including the public. When a document is sent out for scoping, those tasked with writing the document request comments for consideration prior to analysis. For each EA there is also an additional public comment period post analysis yet prior to final review and publication.

Jeanne McSloy received the Employee of the Quarter award from NCAO Area Manager Don Bader. (Reclamation)

Staff Awards

Jeanne McSloy - Natural Resource Specialist

Bureau of Reclamation's Employee of the Quarter

Due to lack of staffing, the Northern California Area Office (NCAO) Shasta office had been struggling to complete its environmental compliance documents and Jeanne, outside of her normal duties, went above and beyond in assisting with this task. As a Natural Resource Specialist for the Trinity River Restoration Program, Jeanne was already familiar with these efforts; however, most of her current duties involve field work and GIS mapping expertise and analysis. Jeanne has been successfully coordinating with NCAO Shasta and Willows offices, as well as the regional environmental affairs group and NEPA consultants to ensure that projects on Reclamation land are able to move forward

with the appropriate environmental review and authorization.

Brandt Gutermuth - Natural Resource Specialist

Salmonid Restoration Federation Lifetime Achievement Award

Brandt Gutermuth, environmental scientist for the TRRP was awarded the Lifetime Achievement Award for over 21 years of enthusiastic efforts to restore the Trinity River and its fisheries. Also recognized that evening was Yurok fisheries scientist, Mike Belchik, Senior Fisheries Biologist for the Yurok Tribe. Mike was awarded the Gordon Becker Memorial River Advocate Award for close to 25 years of work in restoring the Klamath River watershed.

Also noteworthy, Brandt Gutermuth retired at the end 2022 after serving with the Program since 2000. Brandt was one of the first employees of the Program and we miss both his vast knowledge of environmental compliance and his uncanny ability to brighten any room he walks into. We wish him the best in retirement and hope he comes by once in a while!

Above: Brandt Gutermuth (left) and Mike Belchik (right). Both were presented awards by the Salmonid Restoration Federationin 2022. (DJ Bandrowski, Yurok Tribe)

Left: A collage of Brandt Gutermuth, TRRP Environmental Scientist. Brandt spent 22 years working to restore the Trinity River and retired in 2022. (TRRP)

On the Cover: TRRP staff and volunteers from the public use all tools necessary to pull noxious weeds like Scotch Broom at a spring Invasive Plant pull at Bucktail Restoration Site. (TCRCD)

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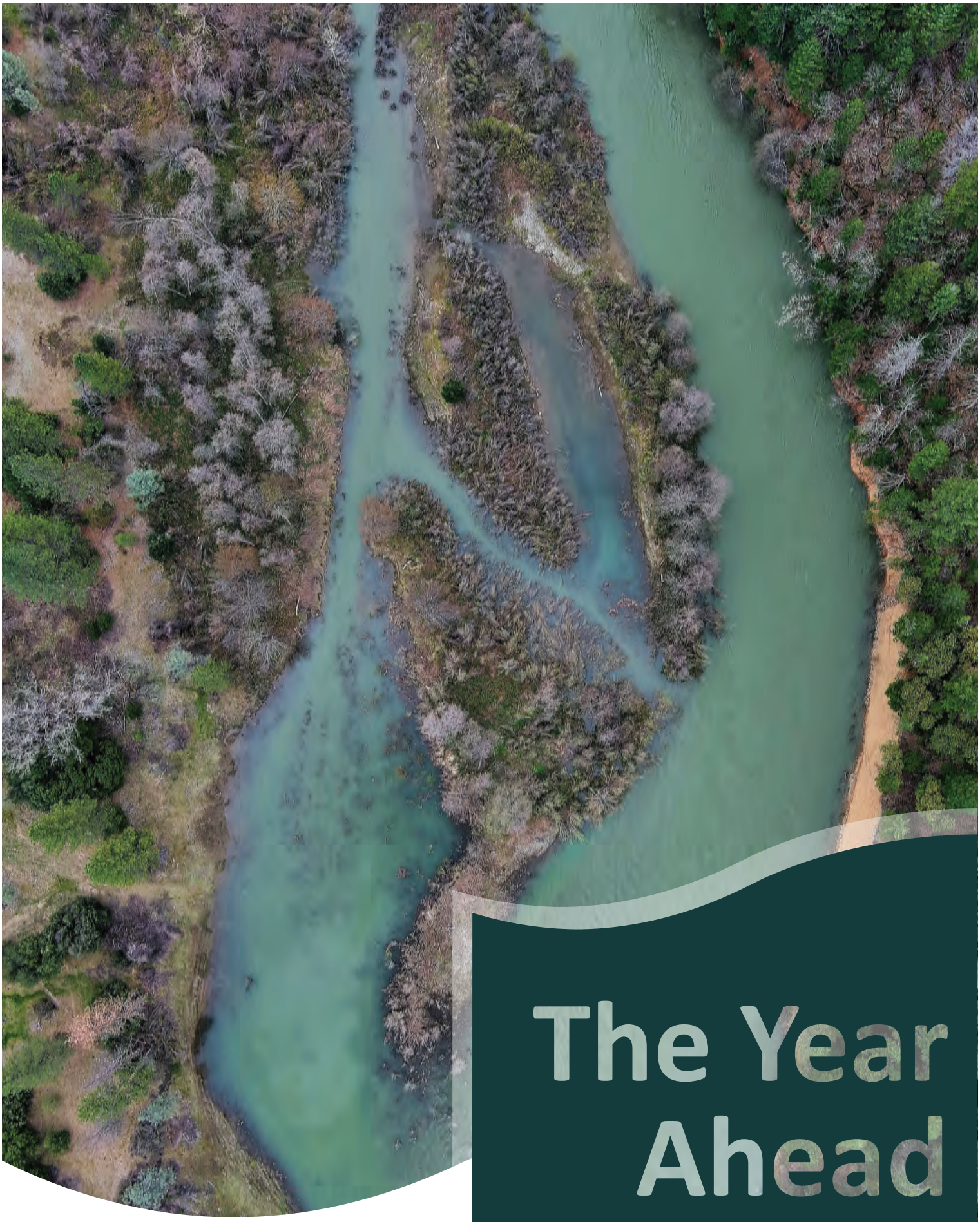


The Year Ahead

Above: Shots of the Trinity River. (TRRP)

On the Cover: Aerial photography of Deep Gulch at 8000 cfs. (Aaron Martin/Yurok Tribe)

2023 Program Activities

In 2023, the Program will continue to execute the restoration strategy laid out in its foundational documents while pursuing ways to evolve through adaptive management as new information is collected and evaluated. Actions planned for 2023 include:

- Provide flow schedule modeling, planning and implementation
- Continue supporting efforts to identify priority watershed improvement projects
- Develop recommendations for coarse sediment augmentation locations and amounts, depending on the water year type and how much water is available to mobilize it, and explore possible alternative gravel augmentation sites
- Examine the influence of naturally variable winter and summer flows on Trinity River fisheries health and production
- Finalize and integrate the synthesis reporting work to plan future restoration monitoring activities.

Environmental Compliance

Gravel Augmentation Environmental Assessment

In 2023, the TRRP and partnering agencies will submit the final Environmental Assessment (EA) for gravel [sediment] augmentation for final public comment. The EA assesses impacts of high flow gravel augmentation at 9 proposed sites along the Trinity River near Lewiston and Douglas City, including removal and placement of materials on permitted areas.

Trinity River Watershed Restoration Project Programmatic Environmental Assessment

The TRRP, in collaboration with the BLM, Forest Service and the Bureau of Reclamation will put the finishing touches on the Trinity River Watershed Restoration Project Programmatic Environmental Assessment (PEA). The purpose of the project is to lay a foundation with agencies for future restoration actions by completing an

environmental assessment for targeted restoration within the Trinity River watershed. Future Trinity River watershed restoration activities that target improvement of the quality and quantity of cold-water habitats for aquatic species will tier off the finalized PEA.

2021 Endangered Species Act Re-initiation of Section 7 Consultation on the Long-Term Operation of the Central Valley Project and State Water Project - Trinity Division

Trinity Division interested parties continue to meet and discuss the long-term operation of the Central Valley Project and renew the Bureau of Reclamations commitment in adhering to the Endangered Species Act. A draft environmental impact statement is scheduled to be released for public comment by the end of the 2023 calendar year.

Channel Rehabilitation

Oregon Gulch Channel Rehab - Phase I/II

Yurok Tribal Construction Company will finish Phase I activities at Oregon Gulch in summer of 2023 and crews begin in-channel rehabilitation in July of 2023. Phase II activities will create a new river meander and lower targeted areas to floodplain levels. Overall, the project proposes to create up to 1,000 times the amount of juvenile rearing habitat for small salmon at the site. This large-scale addition of nursery habitat will help increase the size and number of young salmon and Steelhead that leave the Trinity River on their way to the ocean.

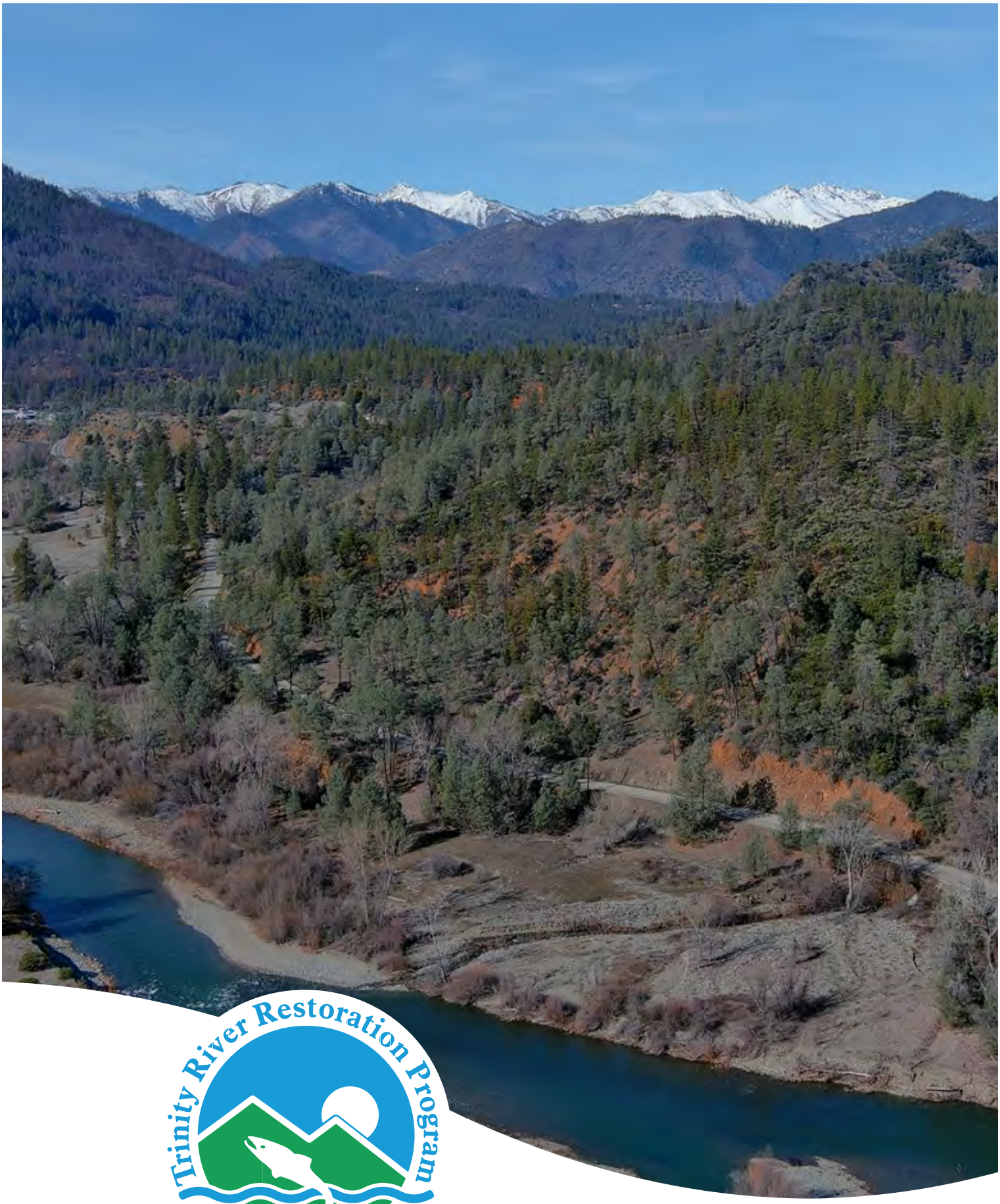
Stakeholder Involvement

The Program will continue to hold several community events in an effort to educate the community about the Trinity River in 2023 through:

- Updating and adding new features to the TRRP website to share Program information in easily accessible platforms
- Working with river front and other private property owners on rehabilitation projects in the Junction City and Lewiston areas
- Working with partners to produce educational events for community members that benefit the Trinity River.

The 2023 Spring Wildflower Hike lead by Riparian Ecologist, Veronica Yates.
(Veronica Yates, Hoopa Valley Fisheries Department)

On the Back Cover: A view of the Trinity River and Trinity Mountains near Oregon Gulch.
(Aaron Martin, Yurok Tribal Fisheries Department)


Trinity River Restoration Program
Restore • Adapt • Improve