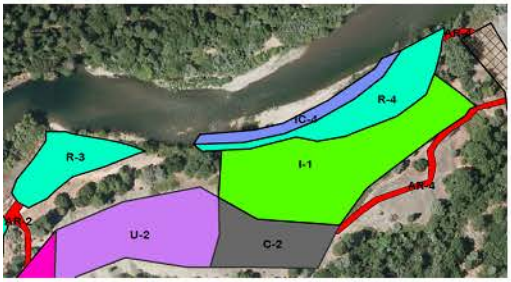
Trinity River Restoration Program 2014 Annual Report

Weaverville, California
May 2015



Trinity River Restoration Program

Thank You

To the Trinity River Restoration Program partners for their contributions to this report.

ON COVER: Collage representing TRRP activities. From top: A male Chinook salmon collected in the Trinity River; a tadpole of the foothill yellow-legged frog; analysts using an echo sounder array to map the river's bathymetry; a section of the revegetation plan for the Lower Junction City rehabilitation site; seedling trees ready for planting; the gills of a Chinook salmon showing common freshwater copepods (which pose no health risk to the fish or to humans); a mature, healthy foothill yellow-legged frog; view of a side channel at the Lower Steiner Flat site after construction and planting for revegetation.

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Introduction

Background

The Trinity River Restoration Program (TRRP or the Program) is a partnership of Federal, State, Tribal, and Trinity County entities that share in the responsibility to restore the Trinity River between Lewiston Dam and the confluence of the North Fork Trinity River. The Program was formed to mitigate for effects of the dams built on the Trinity River in the 1960's, Trinity Dam and Lewiston Dam. Greatly reduced flows in the river led to a steep decline in anadromous fish in the river. The restoration of these fishery resources takes a collaborative effort with other Federal, State, and local entities to develop projects beneficial to the fish, the river, and the watershed, and to meet tribal and public trusts. TRRP was founded in 2000, based on three comprehensive foundational documents:

1. The landmark Trinity River Flow Evaluation Final Report (TRFES) prepared by the U.S. Fish and Wildlife Service and the Hoopa Valley Tribe (USFWS and HVT 1999) with technical support from the U.S. Geological Survey, Bureau of Reclamation, the National Marine Fisheries Service, and the California Department of Fish and Game;
2. The Trinity River Environmental Impact Statement Final Report (TREIS/R; USFWS et al. 2000);
3. The Record of Decision (ROD; U.S. Department of the Interior 2000), which summarized the concepts found in the originating documents.

The active rehabilitation work of the Program began in 2004 with the first restoration flows and the first in-channel project in 2005. It encompasses seven activities outlined in the ROD: flow management, mechanical channel rehabilitation, sediment management, watershed restoration, infrastructure improvement, adaptive environmental assessment and monitoring, and environmental compliance and mitigation.

The Program is administered by the Bureau of Reclamation (Reclamation) and the U.S. Fish and Wildlife Service (USFWS) — bureaus of the U.S. Department of the Interior — as co-leads. Other partner agencies share in the decision-making process through the Trinity Management Council (TMC): the Hoopa Valley Tribe (HVT), the Yurok Tribe (YT), Trinity County, the California Resources Agency (which

Laws and Guiding Documents

1955: Congress authorized Trinity River Division of the Central Valley Project

1963: Trinity and Lewiston Dams are completed

1981: Interior Secretary increased flows to ~300 cfs (8.5 m^3/s) and initiated Flow Evaluation Study

1984: Congress enacted Trinity River Basin Fish and Wildlife Management Act to implement salmon restoration

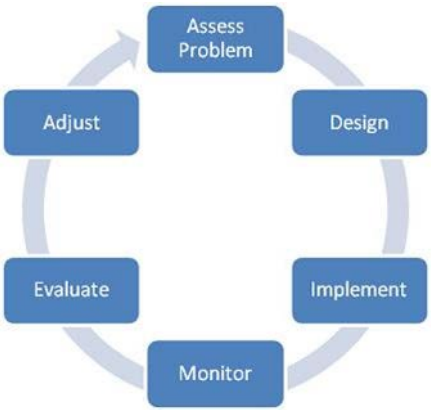
1992: Congress enacted Central Valley Project Improvement Act with 340,000 acre-feet (0.42 km^3) of water available to the Trinity River

1999: Flow Study is completed and is used as Preferred Alternative in EIS/EIR

2000: Record of Decision (ROD) signed, establishing modern TRRP with minimum water volume allocations determined annually by the water year type

Adaptive Management

The Trinity River Restoration Program was established by the Record of Decision as an adaptive management program. The Adaptive Environmental Assessment and Management (AEAM) component of the Program assesses changes in the river, providing interdisciplinary information that allows development of hypotheses about how the river has changed under past natural and man-made conditions. Teams of scientists, managers, stakeholders, and policy makers use this information to develop future management actions based on quantifiable knowledge gained from the assessments. The adaptive management process is repeated in a systematic way as management actions gradually result in the rehabilitation of the Trinity River and restoration of its fishery resources.



The steps of the adaptive management process.

includes the State of California's Department of Water Resources (CDWR) and Department of Fish and Wildlife (CDFW)), the U.S. Forest Service (USFS), and the National Marine Fisheries Service (NMFS). All activities of the Program are guided by the Federal laws that authorize the Trinity River Restoration Program and by documents that outline the Program functions and available alternatives for implementing restoration activities.

The ROD summarized the guidance found in the TRFES, the TREIS/R, and the Implementation Plan for the Preferred Alternative of the TREIS/R (Stalnaker and Wittler 2000). The ROD describes the permanent flow allocation for the Trinity River based on five different water-year types, varying from "critically dry" to "extremely wet" years.

The ROD also established the TMC, which has management responsibility for the Trinity River Restoration Program. It functions as a board of directors that sets the priorities and schedules for strategic implementation by the Program's Executive Director. This shared responsibility of the TMC assumes participation and support from each member organization through appointed representatives to the council. The ROD stated that the TMC will establish and guide Adaptive Environmental Assessment and Management (AEAM), an adaptive management program to monitor and evaluate the physical and biological responses to restoration activities.

One part of the AEAM organization is a federally appointed advisory committee under the oversight of the USFWS, the Trinity Adaptive Management Working Group (TAMWG — www.fws.gov/arcata/fisheries/tamwg.html). The TAMWG provides advice to the TMC; its members represent interest groups of local citizens, landowners, recreation, water users, environmental organizations, agriculture, utilities, business, and other agencies.

The Program is staffed by physical, environmental, and biological scientists, technicians, and administrative specialists drawn from the partner agencies and organizations to carry out the interdisciplinary rehabilitation and science activities specified in the preferred alternative of the TREIS/R. Each partner agency designates its own technical experts to participate on the work groups and teams funded by the Program that plan, design, implement, monitor, and assess TRRP restoration efforts. The technical work groups and

teams provide technical information and recommendations to the TAMWG, stakeholders, and the public to inform their advice to the TMC. Based on the technical recommendations, the TMC provides direction to the Program regarding monitoring and evaluation, and management action implementation.

Mission

The mission of the Program is to restore fisheries and wildlife to the Trinity River using a set of procedures outlined in the Program's foundational documents and conceptual plans (http://www.trrp.net/?page_id=3175) while still providing beneficial flows to the Central Valley. The Trinity River receives its flow through the Lewiston Dam, which receives water from Trinity Dam. Flows released to the Trinity River as described in the ROD are referred to as restoration flows.

The river was dammed and most of the flow was diverted to the Sacramento Valley beginning in 1963, as part of the Trinity River Division of the Central Valley Project, a Federal water development program for California, managed by Reclamation. The diverted water enters the Sacramento River near Redding, California, and provides for a variety of uses such as agriculture, industry, drinking water, recreation, electrical power generation, and habitat.

By 1970, it became apparent that the diversion of a major portion of the water to the Sacramento River was a cause of the declining fisheries in the Trinity River (USFWS and HVT 1999). Federal legislation at that time and in subsequent years has called for a variety of protections to the river, including Native American tribal rights to Trinity River fish in recognition of pre-dam levels of fisheries among other benefits for river users.

Studies of the river, culminating in the Record of Decision, concluded that the best option to both continue water deliveries to the Central Valley Project and recover fisheries in the Trinity River would require the commitment of approximately one-half the inflow to Trinity Reservoir for instream flows in the Trinity River, and a monitoring and assessment program to support adaptive management of a set of physical restoration actions to increase habitat for fish

Congressional Authorization

As early as 1955, Congress passed legislation authorizing the Trinity River Division (Public Law No. 84-386) as an integrated component of the Central Valley Project, specifically directing the Secretary of the Interior to ensure the preservation and propagation of fish and wildlife in the Trinity Basin through the adoption of appropriate measures.

Goals

The founding documents define the goal of restoring the Trinity River fishery resources in a managed river that has the characteristics of a healthy alluvial river, and TRRP's actions are designed to support this goal. The physical restoration efforts on the river, such as the Lower Junction City site completed in 2014, are designed to fulfill this goal. Environmental assessment and monitoring activities provide periodic scientific evaluations of the Program in meeting habitat and fishery restoration goals. Partner and collaborating natural resource management agencies work together to implement river and watershed projects to improve management of the river and restoration of the fishery resources. The TRRP partner agencies coordinate with the Bureau of Land Management (BLM), Trinity County Resource Conservation District, and the Natural Resources Conservation Service, as well as various nongovernmental organizations involved in watershed and fisheries restoration funded through the Program. More information on the Trinity River, the TRRP, and the Central Valley Project is available through links provided in the References section at the end of this annual report.

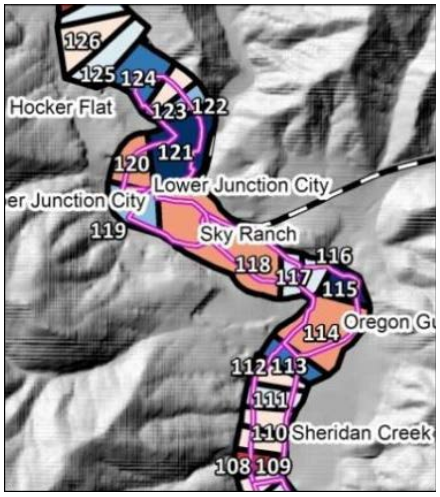
Phase I Channel Rehabilitation Project Review

The Program's Science Advisory Board (SAB) has been charged with overseeing a comprehensive evaluation of the first half of the planned channel rehabilitation projects (referred to as Phase I). Emphasis is to be placed on learning from past management actions, understanding ecosystem processes, development of guidance for hypothesis testing, and advancing adaptive management by the TRRP. Findings from the review will be used to plan future rehabilitation actions and to adjust the TRRP's adaptive management process. One of the emerging recommendations is that the Program should incorporate a Decision Support System to focus TRRP resources on desired outcomes.

The Program in 2014

TRRP broke ground on its first project in 2005, and in the past 10 years restoration activities have focused on the first five management action goals outlined in the ROD, supported by compliance and infrastructure work, in the context of environmental mitigation and adaptive management. The five goals place a priority on physical restoration of the river to create attributes of an alluvial river system that are known to enhance habitat for anadromous fish species. The ROD describes expected physical and biological outcomes from flow, rehabilitation, gravel and watershed restoration activities. Monitoring and evaluation activities mark progress toward these desired states. Through 2014, the Program completed 31 of the 47 projects described in the Flow Evaluation Study. 2014 provided the opportunity to build the Lower Junction City Channel Rehabilitation Project, a unique project constructed on exclusively privately owned lands. This project had site-specific objectives as well as features that enhanced the work done in 2012 at the Upper Junction City Project.

The TRRP also continued development of a 2-dimensional hydrodynamic-based logic modeling (2D-HBLM) tool, a model that identifies and prioritizes locations for channel rehabilitation actions based on evaluation metrics that reflect habitat quality, connectivity, and complexity. The metrics are derived from empirical observations, 2-D hydraulic modeling, and statistical analyses. The 40-mile (64-km) restoration reach was split into 200-meter river segments, based on the data frame developed by TRRP's Science Advisory Board (SAB) during the Phase I Review analysis. Each segment or "panel" was ranked relative to the other remaining panels, and scores across multiple panels were then analyzed to identify segments of the river most suitable for restoration action.



Clusters of river segments identified in 2D hydraulic modeling based on their suitability for restoration action.

In addition to implementing restoration flows and mechanical rehabilitation projects, TRRP continued sediment management, monitoring and assessments, and environmental compliance activities in 2014. Sections of the report are dedicated to each of these topics.

This report provides concise summaries of major program activities with our partners, as well as citations, references, and contacts for readers who desire more information.

Funding and Expenditures

Program funding has mostly varied between $10 million and $16.66 million per year. In 2014 the Program received a total of $15.90 million, as shown in the table at right.

Fiscal Year 2014 Funding (in millions of dollars)	
BUREAU OF RECLAMATION	
Water & Water-Related Fund	12.64
CVPIA* Restoration Fund	1.52
U.S. FISH & WILDLIFE SERVICE	
FY 2014 Appropriations	1.74
TOTAL	15.90

*Central Valley Project Improvement Act

Most of the funding supported physical modifications to the river and the associated watershed, modifications to floodplain infrastructure, and the monitoring of physical and biological responses. Other partner agencies contribute in-kind services to support Program activities.

The Program budget allocations for administration, implementation, and science and monitoring were about $2.9 million, $7.7 million and $5.5 million, respectively.

Activities and Accomplishments

Flow Management

Water Year 2014 was a Critically Dry water year for the TRRP. The water volume for restoration releases is based on the forecasted water year type. The actual water year type is not known at the time that annual release schedules are developed, so water year forecasts are used. The forecast occasionally varies from the actual water year type, resulting in more or less water being released. The 2014 water year began with Trinity Reservoir at 1,301,200 acre feet (1.605 km^3), roughly 53.1 percent capacity, and ended with Trinity Reservoir at 605,600 acre feet (0.747 km^3), roughly 24.7 percent capacity (Figure 1).

Figure 1. Stuart Fork arm of Trinity Lake in February 2014. (Photo by U.S. Geological Survey.)

As this was a Critically Dry water year, the TMC recommended a restoration release of 369 thousand acre feet based on the April 1st 50-percent inflow forecast from the California Department of Water Resources. Reclamation implemented a modified Record of Decision hydrograph known as the ROD Critically Dry Hydrograph with Benches

(shown in Figure 2). This hydrograph provides constant flow benches on the descending limb to accommodate habitat monitoring efforts.

Flow releases constitute one of the primary management actions taken to restore the Trinity River fishery resources. The TRRP's Flow Workgroup, the TAMWG, and the TMC coordinate each year to develop the restoration flow release schedule recommended for implementation by Reclamation. The selection criteria used for determining each year's hydrograph include providing suitable temperatures for all salmonid life stages, reducing travel time of outmigrating smolts, managing riparian seed germination, transportation of fine sediments, and providing monitoring opportunities to support learning and adaptive management strategies.

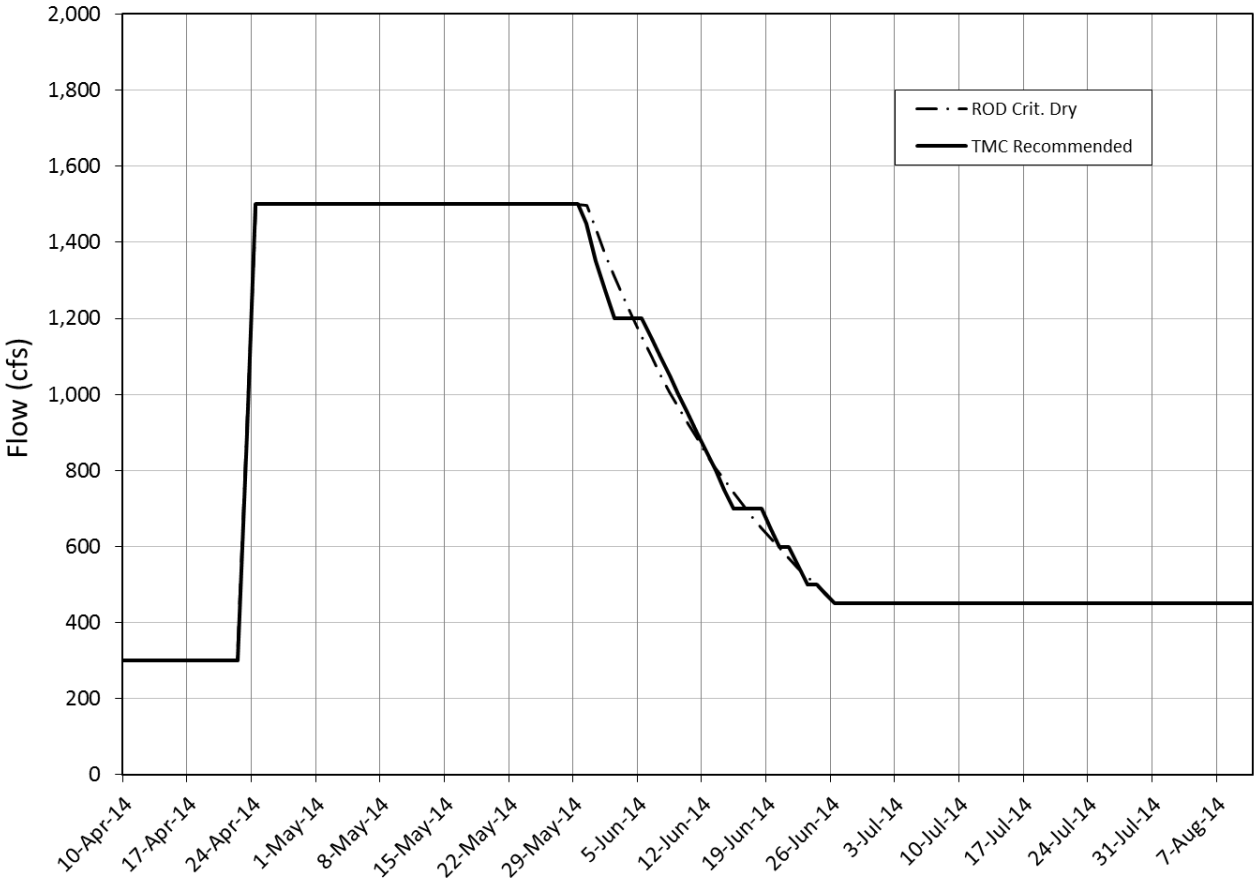


Figure 2. Water year 2014 flow release schedule, Lewiston Dam releases to the Trinity River recommended by the Trinity Management Council on April 14, 2014, for a Critically Dry water year. Schedule does not include releases for ceremonial purposes.

Flow Release Rates from Lewiston Dam

Figure 3 shows the actual WY2014 flow releases from Lewiston Dam to the Trinity River. Reclamation released flows higher than 450 cfs (12.7 m^3/s) in August and September to supplement flows in the lower Klamath River. All other flow releases were conducted for river restoration purposes (TMC flow). Figure 3 also shows the "full natural flow" (FNF) at Lewiston. FNF is the quantity of water that would have passed the gage at Lewiston if the Trinity and Lewiston Dams, or other diversions or impendences, had not been in place.

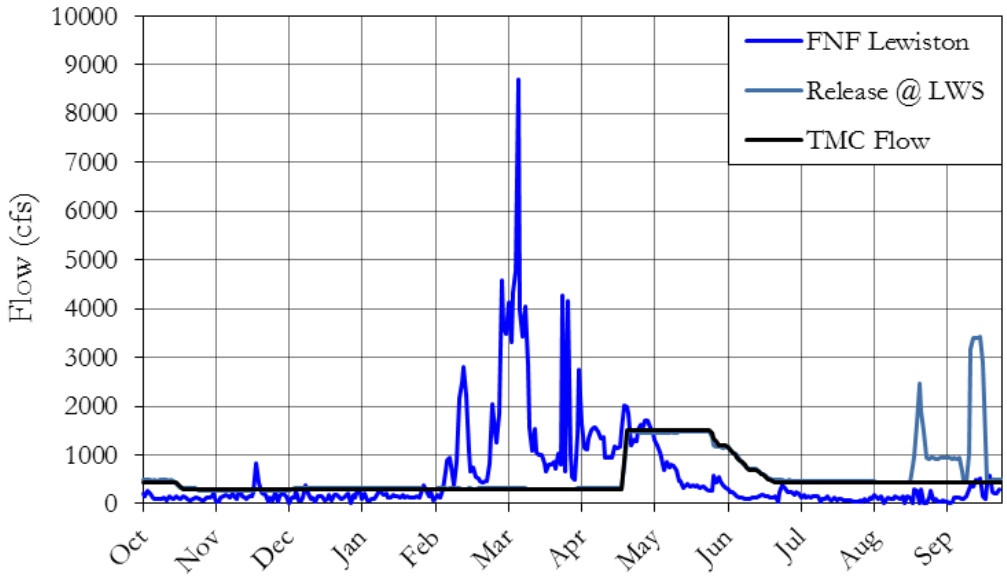


Figure 3. Actual releases from Lewiston Dam to the Trinity River in Water Year 2014, based on the average daily stream flow record from the Lewiston gage (USGS #11525500). Full natural flow is the estimated flow at Lewiston if no dams had been in place.

Implementation of Restoration Flow Schedule

Outcome of Hydrograph Implementation

Figure 4 illustrates the performance of the implemented 2014 hydrograph, as measured by the Lewiston gage located below Lewiston Dam (USGS #11525500). Apparent deviations from the planned release within the elevated flow period from April through July were small relative to stream-gage accuracy. Actual deviations were due to operational constraints of the gates at Lewiston Reservoir. Release flows above the TMC recommendation in August and September were supplemental flows Reclamation released to accommodate fisheries in the lower Klamath River.

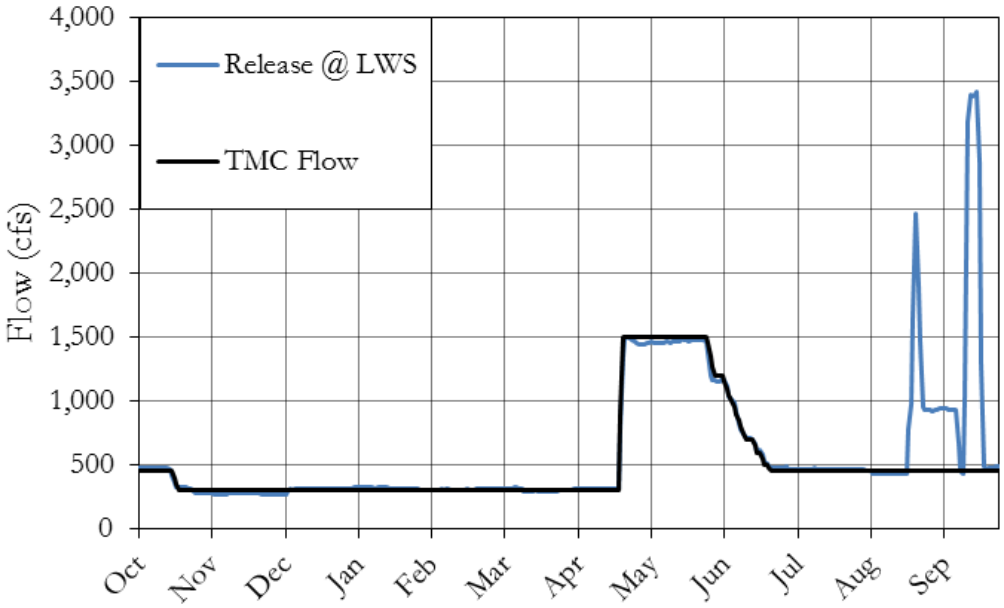


Figure 4. 2014 restoration flow release - actual versus planned. Actual release (blue line) is derived from the average daily streamflow record from the Lewiston gage (USGS #11525500). Planned flow (black line) is from the TMC's approved 2014 flow recommendation.

Temperature Targets and Compliance

With the purpose of protecting all life stages of Trinity River salmonids, regulatory compliance mandates and scientifically based temperature targets have been established for multiple time periods at multiple locations. The Trinity River temperature is measured at Douglas City and above the confluence with the North Fork Trinity River for regulatory compliance specified in State Water Resources Control Board Order WR 90-5 (SWRCB 1990). Additional targets for Douglas City and Weitchpec were added by the TREIS/R (USFWS et al. 2000). Temperature targets and dates are given in Table 1.

During Dry or Critically Dry years, temperature targets adjust to the 'Marginal' values (see Table 1). Figure 5 shows the flow rate, measured water temperature, and temperature targets at Hoopa during the spring outmigration period along with the average air temperature measured at Douglas City (DGC) (http://cdec.water.ca.gov/wquality/). As the graph shows, the water temperature this far downstream of the dams closely follows the air temperature. Mean daily temperatures remained below the marginal values through the end of April. Beginning in May temperatures increased and periodically exceeded

marginal target values for the remainder of the spring outmigration period.

Table 1. Trinity River Temperature Targets by Reach and Date

Source	Target Reach	Dates	Target
Basin Plan for the North Coast Region (NCRWQCB 2011) and WR 90-5		***All Years***	
	Lewiston to Douglas City	July 1–September 15	≤60 °F (15.5 °C)
	Lewiston to Douglas City	September 15–30	≤56 °F (13.3 °C) [1]
	Lewiston to North Fork	October 1–December 31	≤56 °F (13.3 °C) [1]
Springtime Objectives of the Record of Decision for the TREIS/R (USFWS et al. 2000)	Lewiston to Weitchpec	***Normal & Wetter Water Years — Optimum***	
		April 15–May 22	≤55.0 °F (12.8 °C)
		May 23–June 4	≤59.0 °F (15.0 °C)
		June 5–July 9	≤62.5 °F (17.0 °C)
		Dry & Critically Dry Water Years — Marginal	
		April 15–May 22	≤59.0 °F (15.0 °C)
		May 23–June 4	≤62.5 °F (17.0 °C)
		June 5–June 15	≤68.0 °F (20.0 °C)

[1] Mandated temperature requirements for operation of dams permits.

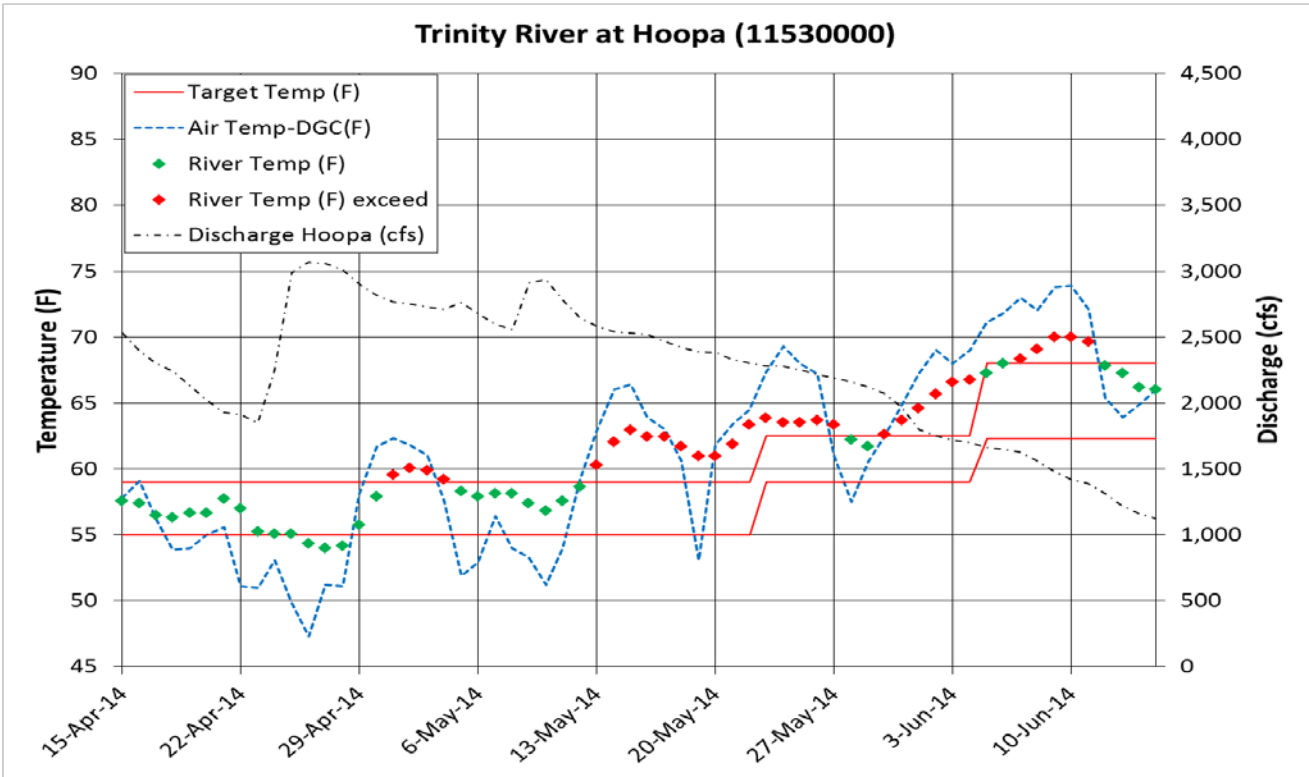


Figure 5. Trinity River spring and summer temperatures at Hoopa (HPA). Temperature targets are shown as solid red lines, with the upper red line indicating the highest temperatures for "marginal" conditions and the lower red line indicating the highest temperatures for "optimal" conditions.

In WY2014, the Trinity River temperatures at Douglas City remained near the temperature target during the summer holding period, while flows remained at baseflow (Figure 6). Targets were exceeded initially and periodically during the summer holding period prior to the Klamath flow releases. Temperature targets for summer holding fish were exceeded a total of 11 days with an average exceedance of 0.48 °F (0.17 °C) and a maximum of 1.2 °F (0.67 °C) on July 19.

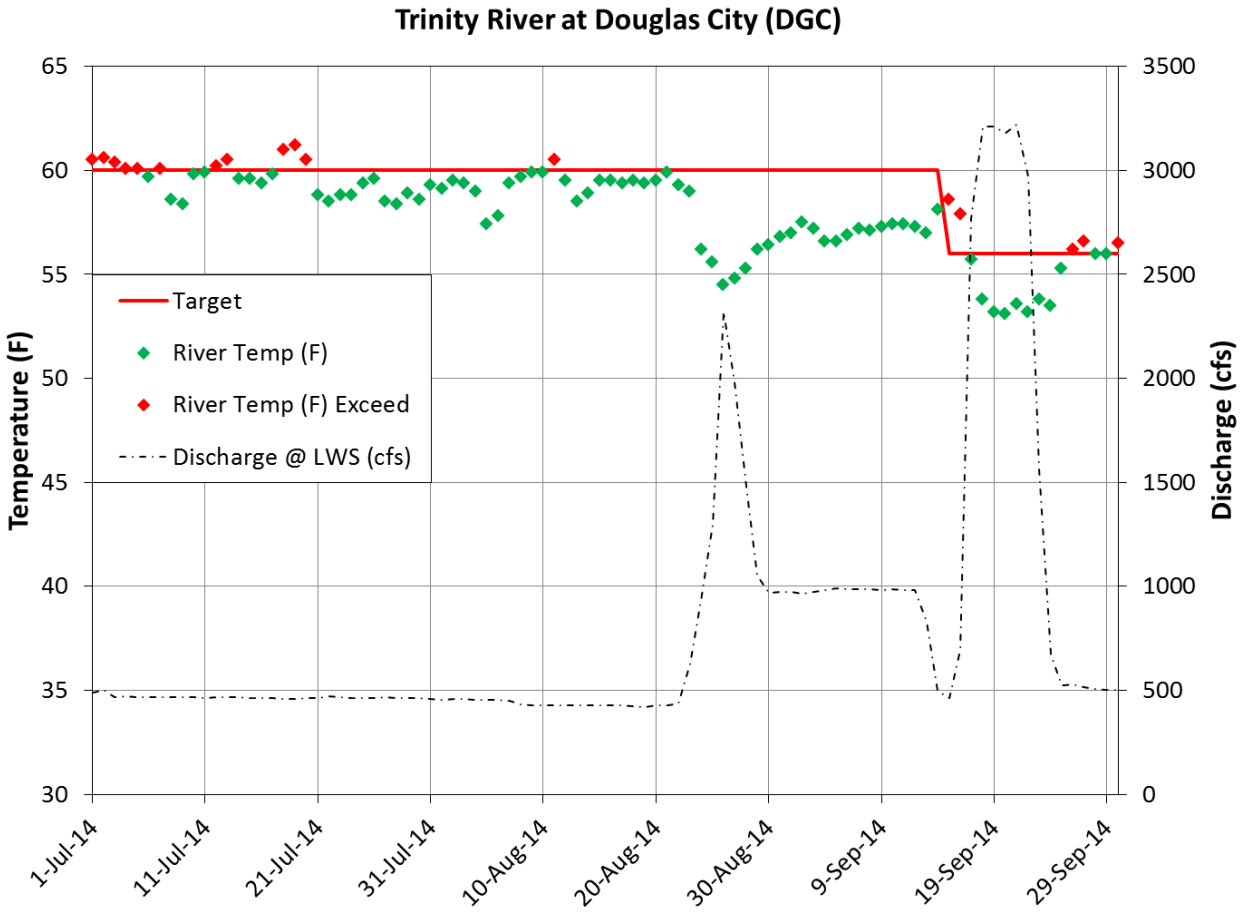


Figure 6. Trinity River summer and fall temperatures at Douglas City (DGC). Solid red line shows temperature compliance target at Douglas City. The dashed line shows discharge at the Lewiston Gage, LWS (USGS#11525500).

The spawning compliance temperatures (September 15–30) were exceeded during the first two days of the target period when flows were at the 450-cfs (12.7-m^3/s) summer baseflow level. River water again exceeded compliance temperatures on three days after flow rates returned to summer baseflow following the Klamath releases. Thus, five days exceeded the target (56 °F or 13.3 °C) during the spawning temperature

compliance period, with an average exceedance of 1.16 °F (0.64 °C) and a maximum of 2.6 °F (1.44 °C) on September 15. The number of days exceeding temperature targets was likely reduced as a side effect of the Klamath fisheries releases.

Water Volume Accounting

The total volume of water released from Lewiston Dam to the Trinity River in WY2014, calculated as the volume of water passing the Lewiston Gage (11525500), was 435,300 acre-feet (0.537 km^3). Of that total, TRRP restoration releases accounted for 370,500 acre-feet (0.457 km^3) and other releases accounted for 58,860 acre-feet (0.073 km^3).

Basin Export Volume

Reclamation exported a total of 618,600 acre-feet (0.763 km^3) of water from the Trinity River to the Sacramento River in WY2014, as reported for the Judge Francis Carr Powerplant per the California Data Exchange Center. Table 2 lists the history of the in-basin releases and basin exports, as well as calculates the balance, in terms of the average annual basin inflow. Exports via the Carr Powerplant were approximately 156 percent of WY 2014 FNF.

Table 2. Water Releases and Diversions as Percent of Long-Term Average Inflow [1]

Water Year	Restoration Releases to Trinity River	Diversions to Sacramento River	All Other Releases	Total Releases & Diversions
2001	30.3%	53.4%	0.3%	84.0%
2002	38.5%	50.2%	0.0%	88.7%
2003	35.7%	68.4%	8.6%	112.7%
2004	51.9%	78.7%	9.4%	140.0%
2005	51.6%	37.2%	0.3%	89.1%
2006	64.6%	107.7%	32.4%	204.7%
2007	36.2%	49.0%	0.3%	85.5%
2008	51.7%	44.3%	0.0%	96.0%
2009	35.5%	43.0%	0.9%	79.4%
2010	52.4%	21.9%	0.0%	74.3%
2011	57.6%	37.7%	0.9%	96.1%
2012	51.6%	56.6%	3.1%	111.3%
2013	36.0%	68.0%	2.3%	106.3%
2014	29.5%	49.3%	5.2%	84.0%
Average (2000–2014)	44.5%	54.7%	4.5%	103.7%
5-Year Average (2010–2014)	45.4%	46.7%	2.3%	94.4%

[1] The long-term average annual water inflow for Trinity Reservoir is 1,254,000 ac-ft per year, as reported by the Bureau of Reclamation for the period 1911–2007. Percentages above or below 100% are possible due to changes in reservoir storage across water years.

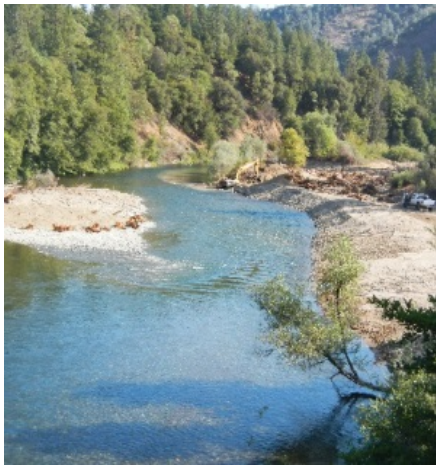
Reservoir Conditions

The water year began October 1, 2013, with Trinity Reservoir holding a total volume of 1,301,200 acre feet (1.605 km^3), roughly 53.1 percent capacity, and this had declined to 605,600 acre feet (0.747 km^3), roughly 24.7 percent capacity, by the year's end on September 30, 2014. Releases totaled 83.8 percent of the long-term average annual inflow for Trinity reservoir, or approximately 265 percent of WY 2014 FNF.

Mechanical Channel Rehabilitation

Lower Junction City

The Lower Junction City Project was successfully completed during WY2014. This site is part of the second phase of channel rehabilitation actions referred to as Phase II (the second half of the 47 ROD projects). Restoration features were designed to increase aquatic habitat for salmonid fish over a range of flow conditions by creating hydraulic and ecological complexity in the form of in-channel and riverine elements. These design elements, including mid-channel islands, split flows, side channels, off-channel ponds, alcoves, floodplains, large wood/boulder habitat structures, and riparian revegetation, provide a range of functional applications. Channel rehabilitation projects and the site-specific design features are intended to function and evolve over time when combined with the ROD flow releases, which then contribute to the restoration of the Trinity River mainstem fishery.



Lower Junction City site near conclusion of the project, as seen from the Dutch Creek Bridge.

The Lower Junction City channel rehabilitation project was designed using a multidisciplinary and multi-organizational collaborative approach which focused on including stakeholder input early in the design phase. The TRRP Design Team reached out to local landowners and the riverine community during the planning process to discuss and evaluate which design elements best met the project goals and objectives. Through this comprehensive process, several different alternatives were formally evaluated by using objective and quantitative metrics before the team agreed on the best alternative to implement. This more structured design process helped to foster better communication and transparency, and created an environment that allowed for consideration of new ideas and recommendations.

The Lower Junction City site is one of the original 44 channel rehabilitation sites identified in the flow evaluation study

(USFWS and HVT 1999). It is located in Junction City, California, between the Dutch Creek Bridge over the Trinity River and the confluence of the Trinity River with Canyon Creek (Figure 7). The site encompassed about 45 acres (18.2 hectares) of privately owned land along about a half-mile (0.8 km) of the river, from river mile 79.3 to 79.8.

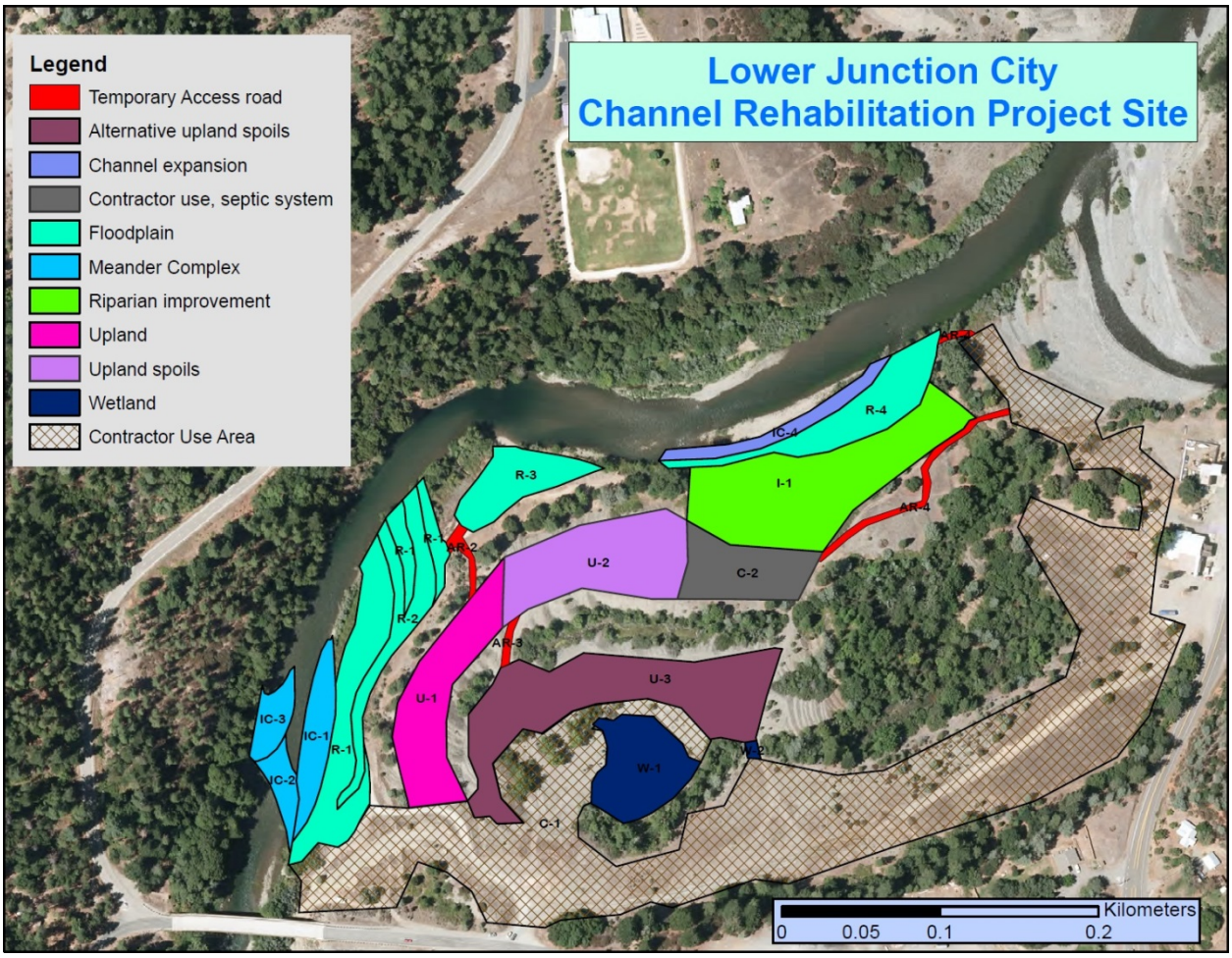


Figure 7. Generalized site plan for the Lower Junction City rehabilitation site.

The Lower Junction City project incorporated several diverse design elements, including a meander complex where a bend was excavated along the right bank, a diagonal riffle, and a point bar featuring an apex log jam. About 2 acres (0.8 hectares) of surface area was lowered and terraced to create a new floodplain area that progressively inundates from near base flow to about 8,000 cfs (230 m^3/s). Another half-acre of floodplain was terraced and stocked with large wood for enhanced habitat area. An existing bar and channel were widened by 30 feet (9 m), creating a chute channel with an

apex wood jam and multiple smaller wood placements scattered over the surface. A riparian wetland area was created by excavating about three-fourths of an acre of upland area (0.3 hectares) 2 to 3 feet (0.6–0.9 m), making it suitable for natural riparian recruitment.

This combination of features required the excavation of approximately 31,000 cubic yards (23,700 m^3) of sediment, which was then strategically placed in key locations for upland enhancement. An additional 3,600 cubic yards (2,750 m^3) of cobble/gravel fill was used to construct the split flow island complex.

Revegetation was a key element at the Lower Junction City site. Planting took place on more than 6 acres (2.4 hectares), using a variety of more than 9,000 riparian and upland plants. Almost all the plants were derived from container stock which had been grown and supplied by local nurseries. One of the most significant changes at Lower Junction City from past projects was the development and integration of a highly simplified and economical "Water Canon Sprinkler" — an irrigation system designed to support revegetation success with relatively little manual labor. This change in the irrigation method is a prime example of the adaptive management process in action, with applied modifications resulting from a range of past project monitoring.

Planting for revegetation at the Lower Junction City site, November 2014.

Coarse Sediment Management

Trinity and Lewiston Dams trap the supply of coarse sediment (gravel and small cobble) above Lewiston Dam. The Record of Decision directs that a coarse-sediment augmentation program be implemented below Lewiston Dam to replace the coarse sediment trapped behind the dams and balance the coarse sediment transported during high-flow releases. The combination of the high-flow releases and coarse sediment augmentation is intended to increase the availability and quality of physical habitat by promoting the processes of scour and fill that maintain bars, pools, juvenile rearing habitat, spawning beds, and other elements of channel complexity. Progress toward these goals is assessed by measuring coarse sediment transport, estimating sediment fluxes, and tracking changes in channel topography.

ROD Sediment Actions

"Sediment management includes the supplementation of spawning gravels below the Trinity River Division and reduction in fine sediments which degrade fish habitats."

Water year 2014 was a Critically Dry year, in which a spring high flow with a maximum daily mean discharge of 1,490 cfs (42 m^3/s) was released from Lewiston Dam. As flows of this

Photo from a previous year showing addition of coarse sediment to the river. Because of low flows, no sediment augmentation was done in 2014.

magnitude are incapable of transporting coarse sediment, no coarse sediment was added to the river in 2014. Coarse-sediment management planning nonetheless continued as TRRP scientists conducted analyses to support environmental permitting and future coarse-sediment management activities. A new technical report (Gaeuman 2014) presented analyses that support coarse sediment augmentations of as much as 7,690 cubic yards (5,880 m^3) in extremely wet water years, with a long-term average annual augmentation rate of about 1,900 cubic yards (1,450 m^3) per year.

Sediment Transport Monitoring

For the first time since 2003, no sediment transport monitoring was conducted on the mainstem Trinity River in 2014. Sediment monitoring was suspended due to California's continuing drought. WY2014 was classified as a Critically Dry year, and the maximum flow of 1,490 cfs (42 m^3/s) released from Lewiston Dam was insufficient to transport significant amounts of sediment. Considering the relatively low transport rates measured in the normal year release of 2012 and the very low transport rates observed in the dry year release of 2013, more than three consecutive years have passed since the river last experienced flows capable of rejuvenating sediments in the channel and in the adjacent riparian zone.

Infrastructure Modification and Improvements

TRRP's restoration strategy includes improvements to existing public and private infrastructure, primarily to accommodate restoration flows. TRRP and Trinity County had previously identified a need to replace the Bucktail Bridge, located on the Trinity River near Lewiston, California, even though the bridge had been deemed structurally sound. (The California Transportation Office of Structure Investigations gave the bridge a 96.6 sufficiency rating in September 2013; Caltrans 2013, p. 931.) A hydraulic model prepared for the Federal Emergency Management Agency in 2012 confirmed that the low chord of the existing bridge is too low to convey the 100-year flood event based on requirements of the California Department of Transportation and the Federal Highway Administration. The low chord creates a "pinch point" that constricts flow, causing water to back up and flood areas upstream of the bridge, including the boat ramp access road

and the recreation area (Figure 8). The pinch point also increases the velocity of streamflow under the bridge.

These conditions cause inundation and erosion upstream and downstream (on public and private land) and scouring of the abutment at the west end of the bridge. Constructing a new, longer clear-span bridge and completing channel modifications would allow a more natural distribution of flows across the floodplain, and safer year-round access to Bureau of Land Management (BLM) property and private parcels in the Bucktail subdivision.

In 2011, TRRP funded the geotechnical investigation, hydraulic evaluation, and engineering designs for a new bridge at Bucktail. Proposed conditions included raising and fortifying the existing upstream dike, increasing the spillway chute capacity, and replacing the existing bridge with a 155-foot (47.2-m) truss-style bridge made of weathering steel. TRRP was not eligible to fund the new bridge itself, as it had previously funded repairs to the bridge, but it could still provide technical assistance.

Figure 8. Water backs up behind the Buckhorn Bridge during the high flow release of May 2011.

In 2014, TRRP worked with the Trinity County Transportation Commission and the BLM to apply for funding assistance for the construction of a new bridge through the Federal Lands Access Program (Access Program). The Access Program provides funds for work on public highways, roads, bridges, trails, and transit systems that are located on or adjacent to Federal lands and provide access to those lands. In California, the Programming Decisions Committee of the California Federal Lands Access Program reviews project applications and ranks them based on the Committee's own weighted selection criteria.

The proposed project design to replace the bridge would improve access across the Trinity River near the Bucktail Boat Ramp and Recreation Area, managed by the BLM. The design includes a new, longer bridge, more elevated road approaches, the lowering of the floodplain under the bridge, and opening an existing overflow channel to perennial flows to improve flood conveyance. These improvements would reduce scour potential and erosion, thereby securing access to the recreation area and minimizing the threat to public safety and potential damage to property posed by the existing high likelihood of flooding.

The project would expand parking areas in the recreation area to include additional vehicle and trailer parking in conjunction with development of two trails: (1) a new hard-surface, handicapped-accessible trail from the existing rest rooms to the river and (2) an interpretive trail providing access for bank fishing. Bridge replacement, road improvements, channel modification, improvements to boat ramp access, expanded parking, and construction of trails suitable for new users are proposed to establish a renovated recreation area that provides the opportunity for new uses, while encouraging ongoing use by fishermen and area residents for bird-watching, wildlife-viewing, hiking, and bicycling.

The Programming Decisions Committee will release a short-list of projects in early spring 2015 that will be reviewed in greater depth for possible acceptance into the Access Program.

Physical and Biological Responses to Restoration Flows

Bed Mobility and Scour Monitoring

Bed mobility and bed scour were monitored to evaluate core WY 2014 riparian vegetation and related geomorphic tasks described in the proposals submitted to the TRRP: "Map and Quantify Riparian Vegetation" and "Geomorphic Monitoring and Assessment of Bed Scour and Mobility." Previous annual assessments have evaluated whether the Program is addressing the geomorphic and riparian objectives in Chapter 8 of the TRFES (USFWS and HVT 1999). WY 2014 was unique in that it is the first year since the implementation of ROD flows that was determined to be a Critically Dry water year (CDWR 2014). The TRFES did not establish geomorphic objectives for Critically Dry water years and established only minimal riparian objectives to discourage the germination of riparian plants on lower bar surfaces for the early portion of the seed release period.

During Critically Dry water years, bed mobility and scour are not expected (and thus no objectives have been established). Monitoring experiments were installed on exposed active bars in fall 2013, prior to the water year designation, to document effects of flows possibly as great as those that could occur in an Extremely Wet water year. Once it became evident that WY 2014 was a Critically Dry water year, field assessments and subsequent reporting were scaled back to reduce the level of effort, and resources were reallocated to other needed TRRP geomorphic and riparian assessments. Bed mobility and bed scour experiments were rapidly monitored following the spring ROD release. Cross-section surveys, last performed in fall 2013, were not repeated after WY 2014 peak flow events because topographic changes were not expected.

Consistent with expectations, the majority of monitored sites had no bed mobility in response to the WY 2014 winter peak streamflow (320 cfs or 9 m^3/s at the USGS Lewiston gaging station, 4,700 cfs or 133 m^3/s at the USGS Above North Fork Trinity River gaging station). Vandalism at several sites reduced the number of experiments from 24 to 18; of these 18, 15 had no mobility and the remaining three had only partial mobility. Narrowing these results to the higher risk riparian encroachment zone (450–2,000 cfs or 12.7–57 m^3/s inundation) mobility was seen at only one monitoring site. Experiments

were reset at all sites for the spring ROD release, and two of the 24 were vandalized. The WY 2014 ROD release (1,660 cfs or 47 m^3/s at Lewiston, 1,770 cfs or 50 m^3/s at North Fork) resulted in no mobility at all 22 monitored sites for the entire extent of the monitored cross sections as well as within the higher risk riparian encroachment zone.

Similar to bed mobility, bed scour is not expected during a Critically Dry water year. Results showed all monitoring sites experienced no bed scour following both winter peak and spring ROD release flows. These same results apply to bed scour within the higher risk riparian encroachment zone.

While little geomorphic change is expected during Critically Dry water years, the one area of technical inquiry unique to WY 2014 is the increased likelihood for fine sediment deposition and berm formation along the riparian fringe of active bars. Fine sediment deposition on active bars and along the riparian fringe can be amplified during consecutive Critically Dry (and potentially Dry) water years, as ROD flows are not large enough to mobilize or scour active bar surfaces and emerging vegetation, but are capable of depositing fine sediment on these surfaces and thus increasing the risk of berm formation. Bed deposition resulting from the WY 2014 spring ROD release was documented by measurements and photographs. Overall, fine sediment deposition was small but variable between monitoring sites: 13 of 24 sites had at least one cross section with recorded deposition, and deposition ranged from <0.4 in to 1.6 in (<1 cm to 4 cm), averaging 0.4 in (1 cm).

As a separate part of the WY 2014 annual assessment, planform topographic change over the 2009–2012 period was evaluated at 12 selected 1,300-ft (400-m) GRTS segments.[1] Topographic changes were computed within the 11,000-cfs (311-m^3/s) flow zone using a topographic surface differencing method. All sites showed a combination of net scour and aggradation, with cut and fill areas generally balanced (i.e., no apparent trend toward net aggradation or net scour). Channel migration was largely limited to adjustments in the thalweg location, with some additional small changes occurring along lateral margins. No major planform shifts in channel location occurred at any of the sites.

[1] Sampling was conducted using a generalized random-tessellation stratified (GRTS) sampling design, as described in Stevens and Olsen (2004).

Riparian Vegetation Monitoring

During WY 2014, two types of riparian vegetation monitoring were conducted: (1) System-wide riparian mapping between Lewiston Dam and the North Fork Trinity River confluence, and (2) more detailed riparian monitoring and mapping at sites also used for fish habitat and geomorphic assessments. The system-wide mapping repeated similar system-wide mapping conducted in 2003 and in 2008–10. The more detailed, site-specific riparian monitoring was conducted at twelve 1,300-ft (400-m) GRTS selected sites and at 25 channel rehabilitation sites. This monitoring included bank classification and assigning transition states to mapped vegetation. Large wood storage was evaluated at the 12 GRTS sites. All riparian monitoring was conducted in the summer of 2014.

System-wide vegetation maps were developed in the field during 2014 using summer 2013 aerial photography. All vegetated and unvegetated areas within a defined boundary were mapped between Lewiston Dam and the North Fork Trinity River confluence. An ArcGIS-compatible vegetation layer was prepared from the field maps. By comparing the current vegetation area to the areas estimated during previous mapping in 2003 and 2010, the trajectory of future vegetation changes was estimated.

The area of riparian vegetation mapped in 2014 was similar to the system-wide area mapped in 2003, before ROD channel rehabilitation site construction and streamflow releases began. Riparian vegetation area has increased since 2010 and, unless scoured away by a future large flood, should equal or exceed the area of riparian vegetation that existed prior to ROD implementation (Table 3).

Table 3. Riparian Area in 2003, 2010, and 2014 Between Lewiston Dam and the North Fork Trinity River Confluence

Mapping Year	Riparian Area	
	Acres	Hectares
2003	979.3	396.3
2010	955.3	386.6
2014	970.1	392.6

During the 2014 system-wide field mapping, several cottonwood cohorts were observed, and their approximate ages were estimated based on diameter, height, and vigor (Figure 9). The oldest cohorts were estimated to have been established prior to 1940. The most recent cohorts were estimated to have geminated since 2013. The estimated frequency of establishment ranged from 10 to 20 years.

Figure 9. A location along the mainstem Trinity River where three cottonwood cohorts coexist, estimated to date from ca. 2006, ca. 1990–2000, and ca. 1974.

Site-specific 2014 riparian vegetation monitoring followed a revised strategy initially identified in the Integrated Assessment Plan (TRRP and ESSA 2009). Monitoring was conducted at 37 sites. Twelve of these were the same sites used for fish habitat monitoring; they were selected using a GRTS routine, and each of them extended along a 1,300-ft (400-m) channel centerline segment. The other 25 sites were

channel rehabilitation sites: 20 had been constructed and the remaining 5 were being monitored before construction.

At the 37 monitoring locations, vegetated polygons were assigned a transition state classification based on approximate age, growth, reproductive capacity, and presence or absence of disease and/or canopy dieback (e.g., colonizing, establishing, mature, or decadent). The transition state classification could be considered a coarse proxy for the age of the stand, as each class has a probability of replacement or succession into a different stand type over a given period of years, depending on the type, frequency, and magnitude of environmental disturbance. At these same 37 sites, the 450-cfs (13-m3/s) wetted edges on both banks of the river were mapped and delineated into segments for observing longitudinal changes in bank erosion, deposition, or bedrock/valley wall.

Within the 37 sites monitored, the 2014 area of riparian vegetation was greatest in the 2,000- to 4,500-cfs (57–127 m^3/s) inundation zone. The largest proportion of riparian vegetation was classified as being in the mature or senescent transition states regardless of the inundation zone. Over half of riparian biohabitat below the 11,000-cfs (311-m^3/s) inundation elevation at the 37 sites was "decadent," meaning that in these areas vertical growth has ceased, some dead branches or disease were evident in the canopy, and the dominant species may or may not produce flowers and seeds in the same abundance as when it was mature. At each of the 37 sites the proportion of each bank type along the digitized 450-cfs (13-m^3/s) wetted edge was calculated, and it was found that depositional and erosional banks make up more than 70 percent of the bank types mapped at sites in 2014.

Large wood pieces greater than 8 in (20 cm) across and occurring below the 2,000-cfs (57-m^3/s) inundation elevation were mapped at the twelve 2014 GRTS sites, and the quantity found was similar to that observed in previous years (Figure 10). Large wood storage was estimated to be approximately 6.8 pieces of wood greater than 8 in (20 cm) in diameter per 100 m (305 ft) length of channel. The wood pieces were classified in the following proportions:

White alder 39.6%
Conifers (including Douglas-fir, ponderosa pine, and incense cedar) ..... 16 %
Willow 9.2%
Cottonwoods 2.5%
Unidentified 32.5%

Figure 10. Large wood recruitment on a design feature at the Wheel Gulch rehabilitation site.

Over a one-year period (2013–14), large wood storage increased 15 percent at six coincident GRTS Panel 1 sites. However, over a five year period (2009–14), large wood storage increased 25 percent at five GRTS Panel 2 sites.

Fisheries Monitoring

Salmonid Spawning Escapement and Harvest

The TRRP monitors the run size and escapement of naturally produced and Trinity River Hatchery produced spring and fall-run Chinook and coho salmon, and fall-run adult steelhead. The provisional 2014 spawning escapement estimate for adult fall Chinook in the Trinity Basin is approximately 32,000 fish. Preliminary estimates for 2014 indicate that 12,229 naturally produced fall-run Chinook and 19,606 hatchery produced fall-run Chinook returned to natural river areas or to the hatchery. Table 4 provides details of the 2014 escapement monitoring for Trinity River salmonids, and Figure 11 presents a recent perspective of naturally produced fall-run Chinook escapement.

Table 4. Preliminary 2014 adult escapement estimates for Trinity River salmonids (preliminary data provided by CDFW)

Species	Natural Produced Escapement		Hatchery Produced Escapement	
	2014 Run	Program Goal	2014 Run	Program Goal
Spring Chinook Salmon	2,035	6,000[a]	4,268	3,000
Fall Chinook Salmon	12,229	62,000	19,606	9,000
Coho Salmon	903	1,400	9,318	2,100
Fall Steelhead Adults	5,847	40,000	4,370	10,000

[a] The natural spring Chinook salmon spawning escapement goal is for the entire Trinity Basin, but the run-size estimate only accounts for the population above the Junction City Weir and does not include spawning escapement into the South Fork of the Trinity, the North Fork of the Trinity, the New River, or Canyon Creek.

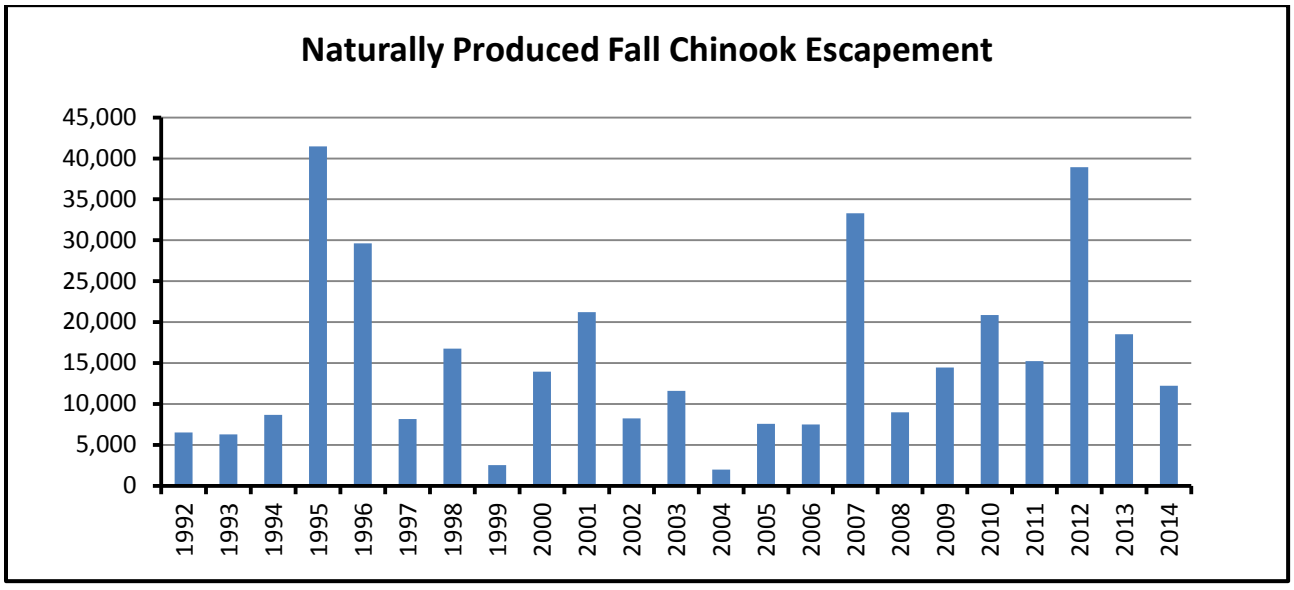


Figure 11. Adult natural fall Chinook salmon spawning escapement above the Willow Creek Weir, 1992–2014.

Adult Fall Run Chinook Salmon Harvest

A component of the TRRP's goal to restore anadromous fish populations is to support dependent ocean fisheries, as well as in-river recreational and tribal fisheries. Natural and hatchery-produced 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 Yurok Tribal fishery in the lower Klamath River below its confluence with the Trinity.

In 2014, the estimated adult fall Chinook salmon harvest for the recreational fishery was 812 fish on the Trinity River and 2,968 fish on the lower Klamath River (river mouth to

Weitchpec). The estimated tribal harvest of adult fall Chinook salmon was 2,439 fish by the Hoopa fishery and 23,473 fish by the Yurok fishery.

Fish Habitat Assessment

Lorenz Gulch — The Lorenz Gulch channel rehabilitation site was completed in the fall of 2013. Salmon rearing habitat was evaluated before and after construction at summer base streamflows. Total presmolt rearing habitat area increased by 76 percent and in optimal areas by 170 percent. The greatest improvements resulted from the addition of a constructed split channel (Figure 12), two side channels, and an off-channel pond. Additional benefits were measured at two constructed alcoves and an engineered log jam. Overall, these design elements resulted in a more complex channel-form leading to improved habitat conditions for rearing salmonids.

Figure 12. Salmonid presmolt rearing habitat areas before (left) and after (right) construction of a split channel at Lorenz Gulch. Red areas indicate optimal habitats, orange areas are suitable habitats, and red and orange areas combined are total habitat. Blue areas indicate low quality habitat area in the wetted channel.

Restoration Reach Evaluation — Flow and channel rehabilitation actions are anticipated to create changes in rearing habitat availability through the 40-mile (64-km) restoration reach. Rearing habitat availability was mapped at 16 randomly selected sites in 2009, and these sites were revisited in 2014 as part of a multiyear study. Between the initial and revisit surveys, channel rehabilitation actions had occurred at three sites: Lowden Meadows, Wheel Gulch, and Lorenz Gulch. In addition, the sites experienced five high streamflow releases from Lewiston Dam up to 12,300 cfs (350 m^3/s), the largest release since initiation of the TRRP. Median total presmolt habitat area increased from 21,900 sq. ft. (2,034 m^2) to 23,700 sq. ft. (2,200 m^2), and 9 of the 16 sites showed higher values in the 2014 survey. All sites with channel rehabilitation actions completed since the 2009 survey showed improvements, demonstrating the benefits of these restoration actions (Figure 13). However, only one of the five sites where channel rehabilitation had been done before the 2009 survey showed improvements, and sites with no channel rehabilitation actions showed little change.

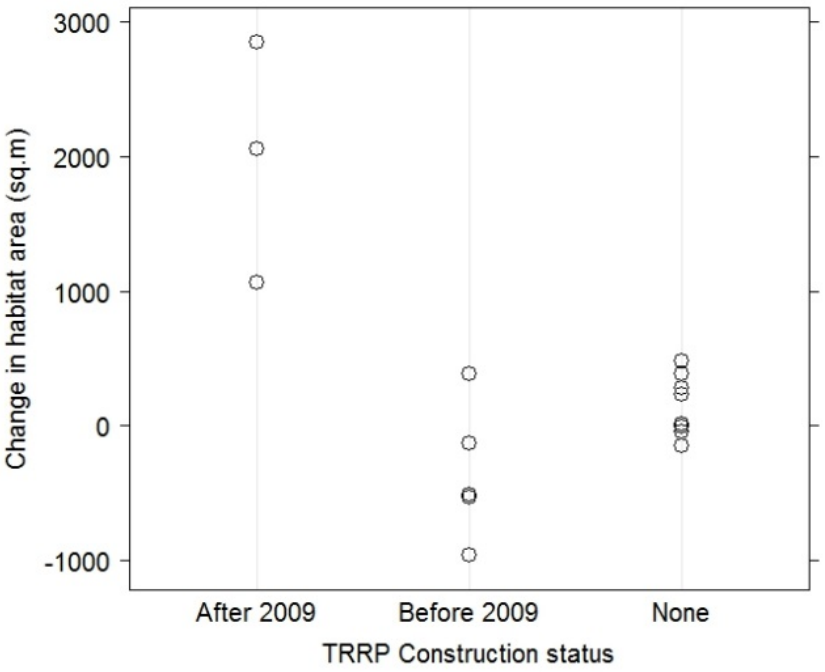


Figure 13. Change in total presmolt rearing habitat area at sites surveyed in 2009 and again in 2014. Construction status indicates sites that were rehabilitated after the 2009 survey (*n* = 3), before the 2009 survey (*n* = 5), or never (*n* = 8). Positive values indicate an increase in habitat between 2009 and 2014 and negative values indicate a reduction. Data presented is preliminary and subject to change.

Remote Sensing: Aerial Photography, Aerial LIDAR, and Terrestrial Laser Scanning

High-resolution aerial photography may be the most widely used data across the Program partnership, as it provides context for documenting changes in the river channel, designing restoration actions, planning scientific investigations, and communicating both within the Program and with the public. The annual collection of aerial photography from Lewiston Dam to the North Fork Trinity River provides a reliable census of the visual form of the river from a standardized point of view, which enables a variety of analyses of change over time. Historic aerial photography datasets going as far back as 1944 provide context for current river conditions (Figure 14). Aerial photography spanning the entire Trinity River from Lewiston Dam to the confluence with the Klamath river was collected July 9th, 2014; this one-time extension of our regular data collection to the confluence was done to support fish production modeling and is not expected to continue annually. Aerial photography is also collected over small areas in winter to document recent rehabilitation sites.

Detailed topographic data has similarly widespread utility and can be collected over large areas by aerial LIDAR (Light Detection And Ranging). LIDAR is significantly more expensive than aerial photography, so annual data collection is limited to documentation of the rehabilitation sites completed each year, and reach-wide collection occurs less frequently. LIDAR and aerial photography were collected for the as-built condition of the Douglas City and Lorenz Gulch rehabilitation sites in January 2014 (Figure 15), and for the Lower Junction City site in November 2014.

TRRP shares access to a terrestrial laser scanning (TLS) system with Reclamation's Mid-Pacific Region Survey and Mapping Branch. This system is being used to supplement aerial LIDAR collection in areas where additional detail is needed, such as with large wood structures. While standard photography can provide a visual image of changes over time, TLS enables volumetric quantification of changes and provides high-resolution documentation for specific features. The combination of aerial photography, aerial LIDAR, and TLS provided solid documentation of TRRP actions for accurate monitoring of site and feature evolution over time. TLS was used in 2014 for high-resolution documentation of several wood structures and islands at the Lorenz Gulch and Douglas City rehabilitation sites.

Data Management

The ultimate products of the Program will be twofold: a more functional river and the information we gather about it. The Program's online data portal (ODP), at http://odp.trrp.net, is a key resource for managing TRRP information and coordinating data across the partnership. The ODP is a data storage and access system under development to provide equal access to Program information products for Program partners, stakeholders, and the public. During 2014 the mapping component of the ODP was refined (http://odp.trrp.net/Map/), providing convenient and intuitive access to 12 data overlays and 6 aerial photography datasets dating as far back as 1944. The ODP now provides convenient access to more than 1,300 reports and other documents, more than a hundred meeting agendas and summaries, 45 data packages, and millions of individual records of streamflow, water temperature, and reservoir operations. Many of the reports and documents are scanned items dating as far back as 1900. Using web services to automatically provide up-to-date information on data and document holdings, the ODP interacts with the program's general website at http://www.trrp.net.

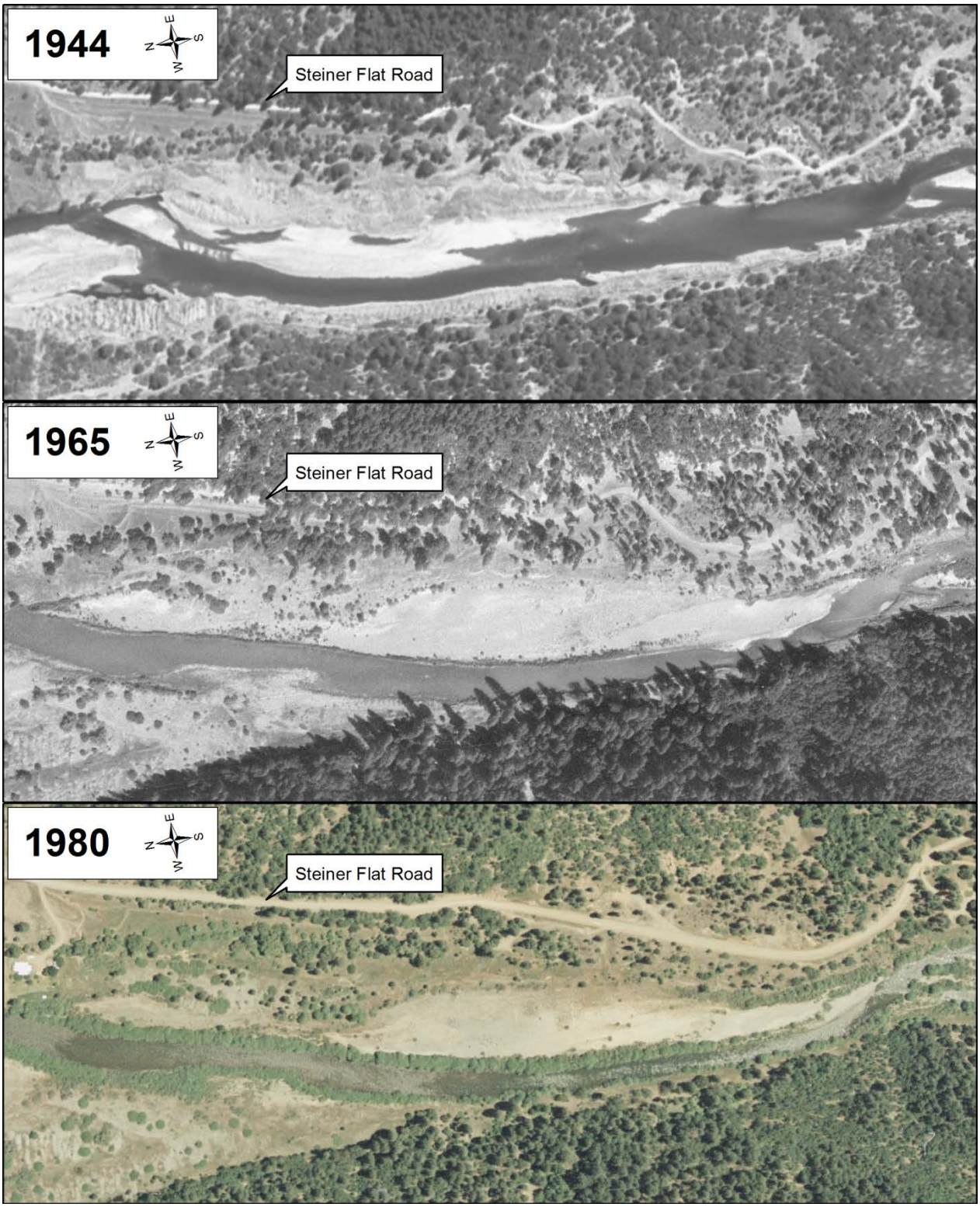


Figure 14. Comparative aerial photographs of the (upper) Lorenz Gulch reach of the Trinity River. In 1944, the channel was highly complex, with tailings from dredge mining evident in places. In 1965, the channel had been reworked into a sequence of transverse bars with alcoves, presumably by the 1955 flood, though alcoves and off-channel ponds remained. By 1980, flow regulation had enabled thick vegetation to grow along the low-water edge, simplifying the channel.

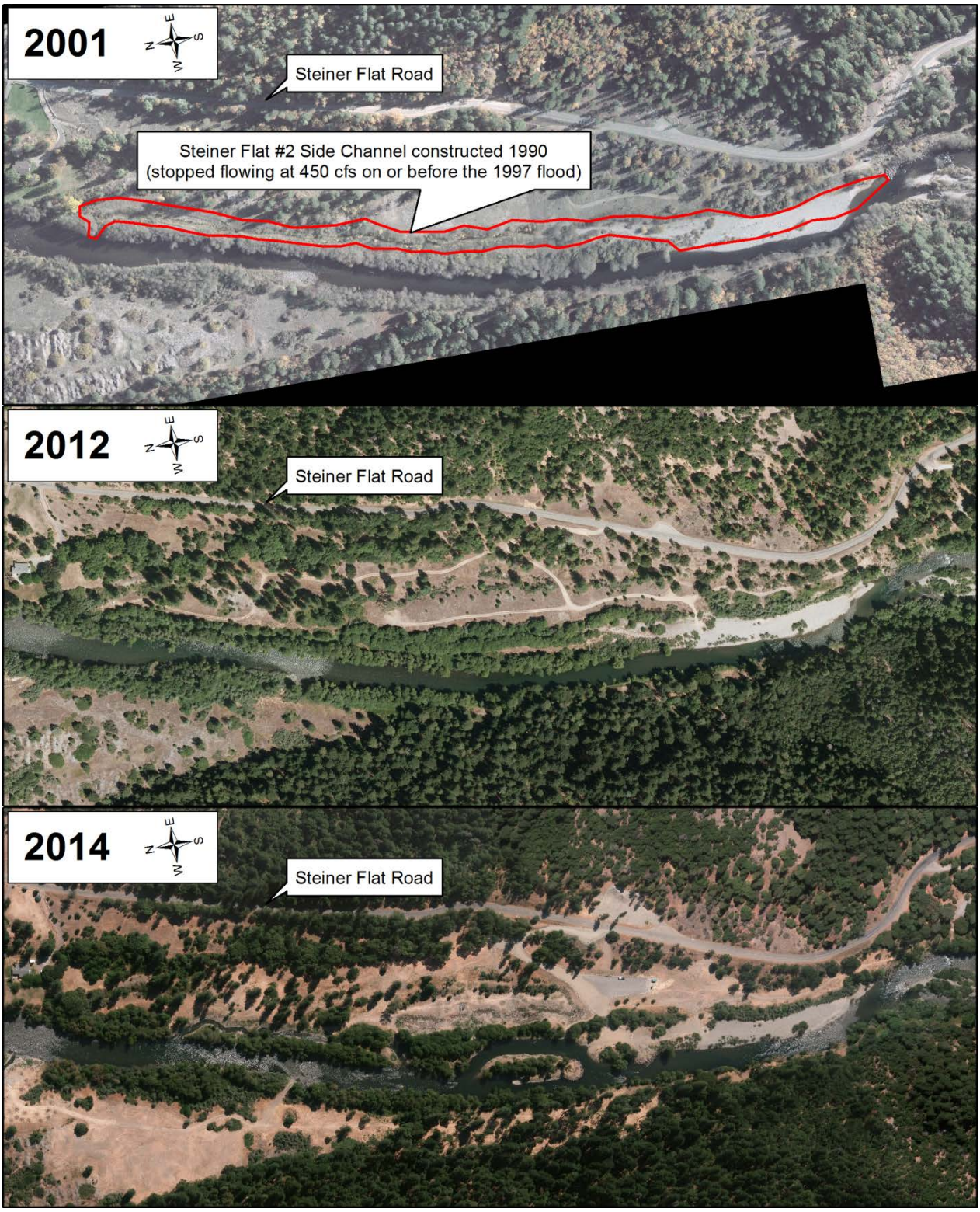


Figure 14 (continued). The 2001 photo also shows this uniform riparian vegetation, but remains of a side channel constructed in 1990 are still visible. The 2012 photo shows the site prior to rehabilitation. The 2014 photo shows changes due to rehabilitation, with newly built side channels (which take advantage of the old side channel for additional ephemeral connections), an island, and wetlands.

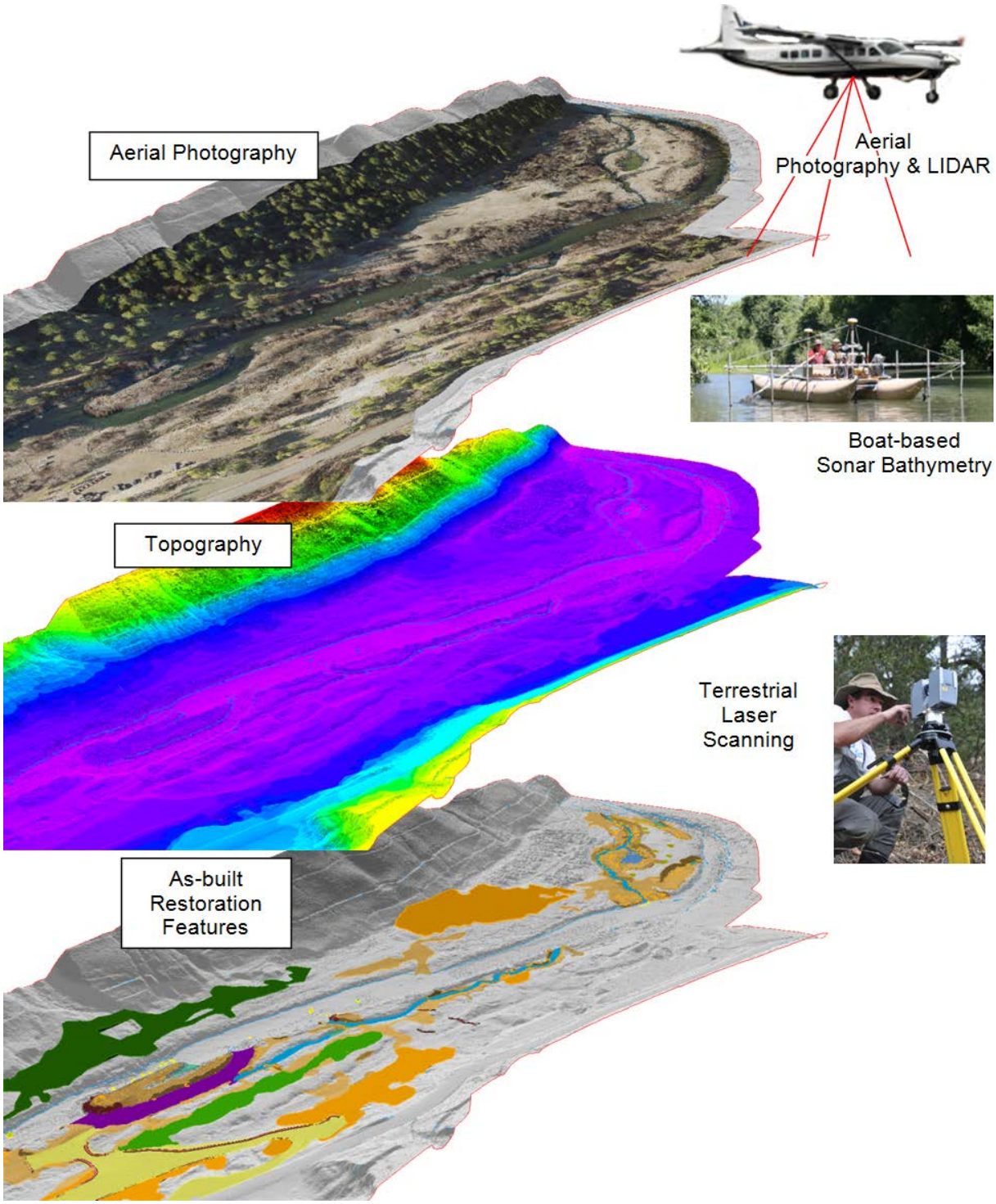


Figure 15. As-built documentation of Lorenz Gulch Channel Rehabilitation Site. After completion of civil construction, the site was surveyed aerially with photography and LIDAR, by boat for sonar bathymetry, through traditional survey methods in shallow waters, and Terrestrial Laser Scanning (TLS) for higher resolution in particular areas of interest. The resulting aerial photos and topographic models provide a 3-D visual record of the site as it was built. GIS work based on the photos and topography, plus the site design, provides a 2-D classified map of the "as-built" restoration features.

Environmental Compliance and Mitigation

NEPA and CEQA

On January 1, 1970, President Nixon signed the National Environmental Policy Act (NEPA) into law. In California, Governor Reagan followed suit by signing the California Environmental Quality Act (CEQA) into law on September 18 of the same year. These laws compel Federal, State, and local agencies to consider environmental impacts when making decisions by requiring agencies to analyze and disclose potential environmental effects to the public. In the case of CEQA, mitigation measures must be used to minimize significant adverse environmental effects to the extent feasible. NEPA applies specifically to proposed Federal actions, whereas CEQA applies to proposed State and local government actions in the State of California.

In order to meet these requirements, TRRP continues its outreach efforts to inform the Northern California community of Program proposals, including all partners, collaborators, and public and private stakeholders. Public meetings are held during the early stages of project site design and gravel augmentation planning. Subsequent meetings also help keep the public informed of the modifications made to designs based on input, and of associated monitoring and evaluation before, during, and after in-channel project construction and revegetation. In 2014, the Program continued to generate site-specific environmental assessments and initial studies based on programmatic NEPA and CEQA documents for environmental compliance. The *Trinity River Mainstem Fishery Restoration Final Environmental Impact Statement* (TREIS/R; USFWS et al. 2000) serves as the programmatic document under NEPA, and the *Master Environmental Impact Report for Channel Rehabilitation and Sediment Management for Remaining Phase 1 and Phase 2 Sites* (Master EIR; NCRWQCB and TRRP 2009) functions as the programmatic document under CEQA.

The Program's rehabilitation projects have the potential to create long-term impacts to protected Trinity River resources. These impacts can have direct, short-term effects, which are mitigated if needed, to ensure long-term beneficial results. Local landowners and agencies alike have seen the river change with Program activities. Channel rehabilitation projects are designed to re-establish pre-dam conditions — those

Applicable Environmental Laws and Authorizations:

- The National Environmental Policy Act (NEPA)
- California Environmental Quality Act (CEQA)
- Endangered Species Act of 1973
- Clean Water Act
- Wild and Scenic Rivers Act
- National Historic Preservation Act
- Arch Resources Protection Act of 1979
- Executive Order (EO) 11988 for floodplain management
- EO 11990 for the protection of wetlands
- EO 13112 for invasive species
- EO 12898 for environmental justice

physical and hydrological attributes that are now rare along the Trinity River Program reach. The natural state of the Trinity River system and the particular processes that sustained a healthy fishery were severely altered by early mining and logging operations, as well as from the effects of decades of restricted flows since the dams were put in over 50 years ago. Stakeholders request assurances that the changes will continue to create mutually beneficial results for the fishery resources, river health, and tribal and public trusts.

The Program partners also work to minimize and monitor impacts to non-target species (e.g., birds and other wildlife) and to cultural resources. In addition to NEPA and CEQA, the following statutes, Acts, and Executive Orders illustrate the many mandates that dictate the actions that the Program can perform for the health of the Trinity River fishery:

- The National Environmental Policy Act (NEPA)
- California Environmental Quality Act (CEQA)
- Endangered Species Act of 1973
- Clean Water Act
- Wild and Scenic Rivers Act
- National Historic Preservation Act
- Arch Resources Protection Act of 1979
- Executive Order (EO) 11988 for floodplain management
- EO 11990 for the protection of wetlands
- EO 13112 for invasive species
- EO 12898 for environmental justice

The Environmental Assessment/Initial Study for the Lower Junction City channel rehabilitation site (NCRWQCB et al. 2014) provides site-specific details for the project, which was proposed and constructed in 2014. The activities included constructing a meander complex, using a point-bar design with an apex wood structure and a constructed diagonal riffle. These features served to narrow the channel width and steer flow into the right bank, which was lowered to reconnect the channel with the floodplain. The meander complex creates hydraulic diversity, which in turn engenders a suite of diverse physical habitats.

Riparian improvement included revegetating wetland, upland, and riparian zone areas. A variety of native sedges, rushes, and willows were planted in the wetland/slope areas after the physical work was completed. In the lower riparian zones, clusters of cottonwoods, California grape, white alder, and American dogwoods were planted using container stock.

These young plants will be irrigated for the first several years post-construction. Green- and white-leaf manzanita, canyon live oak, and ponderosa pine, among others, were installed in the upland areas and will also be irrigated until they can establish a healthy root system, capable of surviving these increasingly harsh, dry conditions.

Designs for the Bucktail channel rehabilitation site were initially included in the Environmental Assessment/Initial Study for 2014. Both internal and external reviewers recommended refinement of the design, so the project was re-scheduled for further review in the coming year.

Projects performed on public lands managed by the USFS or the BLM must also meet guidelines of the Northwest Forest Plan and the Aquatic Conservation Strategy. In the same way that TRRP works with private landowners to implement mutually beneficial projects on their lands, it also works with Federal partners to ensure that agency environmental compliance needs are met for each project.

Other Compliance Activities

In 2014, TRRP began an updated analysis of Program actions that are authorized under the State Environmental Protection Agency's North Coast Regional Water Quality Control Board Water Quality Certifications for sediment management and general channel rehabilitation activities. TRRP reviewed its activities that, by design, evolve under adaptive management practices, to learn whether these activities have changed in a manner that could have significant effects. The analysis was still ongoing at the end of the year; its results will be submitted to the regional Water Board. When the analysis is completed, the agency will determine if there are any new effects that may adversely impact the environment. In any event, the Water Board will publish the results and, most likely, accept the Program's application for permit renewals.

The TRRP also began a Biological Assessment to address any possible new effects of Program activities to listed species since the 2000 Biological Opinion was issued. Some species that may be present in the Program area have been listed since 2000, and one — the Bald Eagle — has been de-listed. Also, any activities or methods that have been modified through adaptive management decisions need to be analyzed for their continued benefits to the Trinity River ecosystem. The Biological Assessment is projected to be completed in 2015.

Environmental Mitigation

Specific measures are required to avoid, minimize, and mitigate for short-term negative effects, such as riparian and wetland vegetation removal, in order to support the goal of long-term benefits to the Trinity River fishery and associated habitats. TRRP uses performance monitoring to determine the success of mitigation efforts. Environmental permits require that a minimum of 50 percent of impacted vegetation be replaced by planting, with the remainder having the proper conditions for natural recruitment of native vegetation. Contractors provide either healthy native container stock or dormant cuttings. They also weed, mulch, fertilize, irrigate the new plantings, and install browse protection. Data collection includes field surveying pre- and post-project, aerial imagery, GIS documentation, and detailed reporting.

Another important job is the removal of invasive species such as Dyer's Woad, star-thistle, and Tree-of-heaven. Non-native species out-compete native vegetation. Removal is labor-intensive, as the use of herbicides is prohibited on public lands in Trinity County, and re-infestation must be prevented until native species can become established. The TRRP contracts with local agencies to maintain sites post-project, but success is hard-won. Drought and high temperatures can reduce the survival rate of native plants to less than half of what is planted. This means that crews must return to the project sites annually to counter vegetation losses and keep survival at or above replacement requirements.

Turbidity

Turbidity, a measure of the cloudiness of water, is typically low in the Trinity River during summer conditions but is a natural occurrence in rivers during storms or other runoff events. It may also be caused by construction or other human activities in the river. The permits needed for restoration projects such as gravel augmentation or mechanical channel rehabilitation require TRRP construction contractors to strictly adhere to permit requirements specified in the Program's general water quality certification.

In 2009, the Regional Water Board worked with TRRP to develop water quality mitigation measures that are included in the TRRP's general permit (Order Number R1-2010-0028) and that are followed on TRRP projects today. At that time, the agencies determined that an allowable zone of turbidity

dilution is appropriate and necessary in order for Trinity River restoration activities to be accomplished in a meaningful, timely, and cost-effective manner that fully protects beneficial uses without violating the North Coast Regional water quality objective for turbidity.

The general permit limits allowable turbidity levels at 500 feet downstream of the work zone to no more than 20 nephelo-metric turbidity units (NTU). Compared to the Trinity River's usually excellent water clarity, turbidity levels between 10 and 20 NTUs appear cloudy, but these permitted levels allow construction of river restoration projects and are protective of beneficial river uses (NCRWQCB and TRRP 2009).

Turbidity Monitoring at Lower Junction City, 2014

On June 25, 2014, TRRP researchers deployed a YSI 6820 multi-parameter sonde to monitor turbidity in the main-stem Trinity river at Lower Junction City. The sonde monitored turbidity in NTU's. Measurement data was collected every 15 minutes through July 27 at 5:30 a.m., when power to the sonde was lost. The sonde was re-powered and continued collecting 15-minute data from August 15 at 12:15 p.m. through September 16 at 4:45 p.m.

The highest turbidity values were measured from August 15 to 22, during which time the contractor was cleaning out and placing wood in location IC-4, which was located immediately upstream of the Reclamation sonde. Reclamation's turbidity values were higher than the contractor's values during this period. This difference is likely explained by the longitudinal difference in monitoring locations. Reclamation's sonde was immediately downstream, as close as 15 feet (4.6 m), while the contractor monitored 500 feet (150 m) downstream, per permit conditions.

During 2014 construction, the contractor successfully employed best management practices (e.g., isolation of work areas, pumping of turbid water into upslope sediment ponds, and the slowing of equipment work during periods of increased turbidity) to ensure that turbidity consistently stayed within permit levels (Figure 16). Given the contractor's attention to detail and full-time awareness to keep the Trinity River as clear as possible, 2014 visual turbidity impacts were minimized.

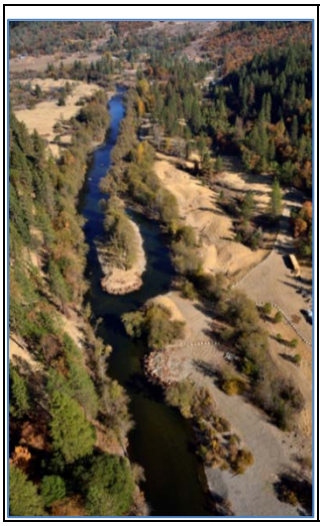
Figure 16. Contractor using a temporary berm to control turbidity during construction at the Lower Junction City site.

Public Outreach in 2014

The Program completed an ambitious public outreach schedule in 2014 with both new and continuing efforts, including:

- **Public Events –** Public events included the Lorenz Gulch River Access Area Dedication, the Water Conservation Workshop, sessions during the TRRP-hosted Collaborative Adaptive Management Network (CAMNet) Rendezvous on the Trinity River, and the first of the Program's "Lessons Learned" workshops.

  Events such as these provide the opportunity to see restoration sites up close and to witness how these activities set the stage for natural processes to take over, allowing the river to use the new "tools" — variable flows, gravel, wood, and more complex physical features — to form dynamic and more sustainable habitats for fish and riparian wildlife.



SAVE THE DATE!

Saturday, June 7, 2014

Dedication at 12:00pm

The U.S. Bureau of Land Management and the Trinity River Restoration Program invite you to attend the dedication of the new Lorenz Gulch River Access Area.

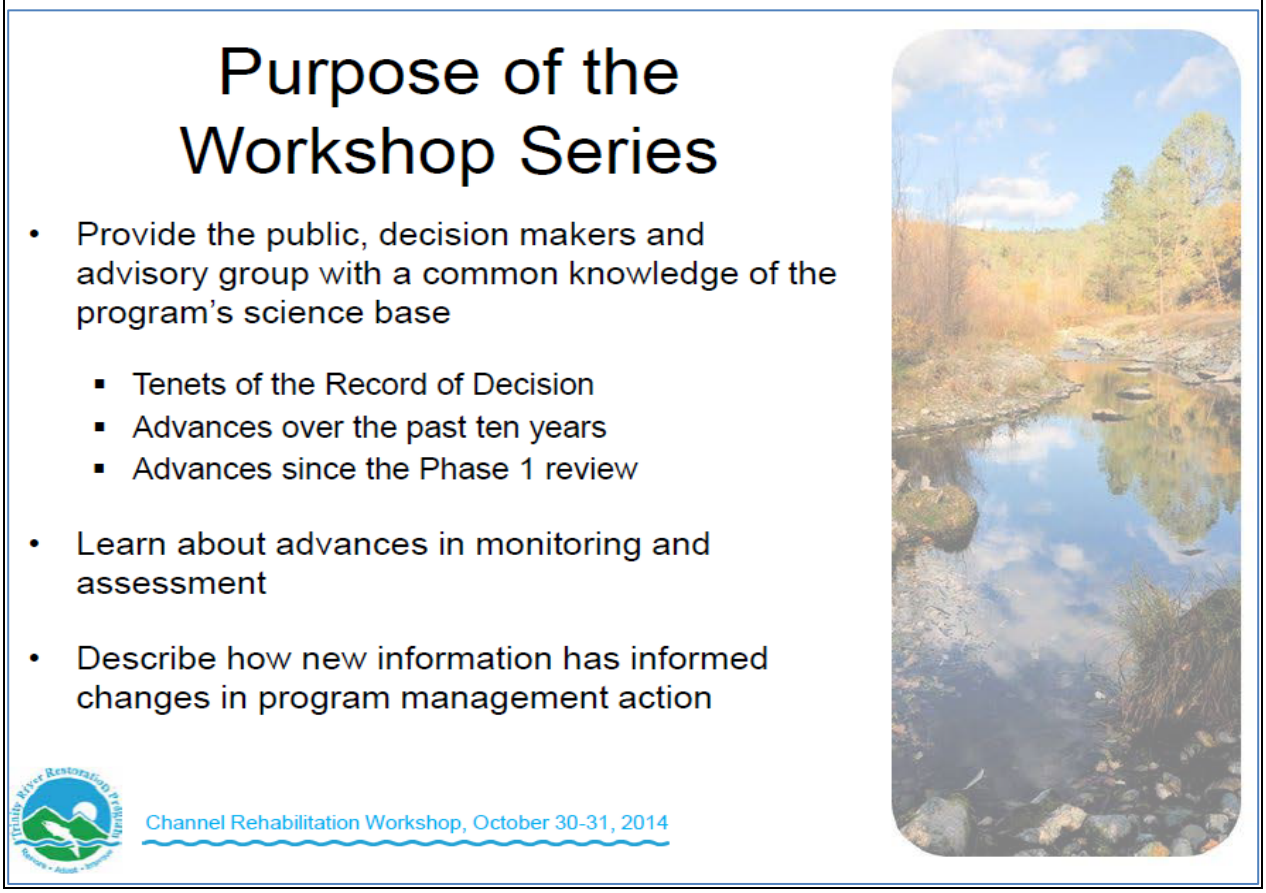
The agencies, organizations and individuals who worked together to build the Lorenz Gulch River Access Area welcome you to visit the newest public access and boat launch areas on the Trinity River. Please plan to join us on Saturday, June 7, 2014, for this special event.

RSVP to wkuntz@blm.gov to participate in a river float at 10am or 1pm, or call (530) 224-2157 or 623-1800 for details

- **Public Meetings and Workshops –** Formal and informal meetings were held to describe proposed restoration flows and rehabilitation projects scheduled for implementation in 2014 and to gather public input about possible actions and mitigation measures related to these restoration actions. The meetings provide a public venue to discuss the biological and physical science behind flow and rehabilitation project objectives, features, and approaches. Watershed project coordination and implementation were provided through TRRP funding to the Trinity County Resource Conservation District.

TRRP partners gave members of the public an up-close view of restoration projects along the Trinity River during the CAMNet Trinity River Rendezvous in October 2014.

- *TRRP Programmatic Workshop; October 30-31, 2014*
- Meeting Room, Weaverville Public Library
- 351 Main St.
- Weaverville, CA 96093
- October 30-31, 2014



A primary objective of public meetings is to enhance public knowledge and understanding of the roles of Program partners and cooperators in implementing TRRP science activities, including monitoring and evaluation. They provide an opportunity for TRRP staff to describe how restoration flow releases, watershed projects, and in-channel projects are designed and implemented in collaborative partnerships between public agencies, nongovernmental organizations, and groups of landowners and other private citizens. Several workshops were held to elicit input and answer questions about the Program in general, and to meet with local and regional supporters of river restoration efforts to share successes, challenges, and lessons learned about adaptive management.

- **Expanded Presence at Community Events –** TRRP provides financial support to the Trinity County Resource Conservation District for the Salmon Festival, Trinity County Fair, Children's Festival, Wetlands and Salmon classes, the Weaverville Summer Day Camp, and the Environmental Camp. TRRP technical staff volunteered as science instructors for "Science in the Field" and the "Day in the Wetlands" for local school students. The TRRP continues community participation as part of the Program's educational outreach at the Trinity River Salmon Festival, the Children's Festival, the Trinity County Fair, and other community events.

"Science in the Field" Day in October 2014 gave Douglas City School 7th and 8th graders an opportunity to use high-tech equipment and old-fashioned field skills to calculate sediment movement, cross-section surveying, and revegetation monitoring methods. The event ties into the Department of the Interior's "Youth in the Great Outdoors" initiative to empower young people to share in the restoration and conservation of land and water.

- **Funding of the Conservation Almanac –** TRRP continued to fund the publishing and distribution of the *Conservation Almanac*. The Fall-Winter 2014 edition featured information about the continuing drought conditions in Trinity County and across the state of California. It also featured local Scout members working at TRRP restoration sites, planting Oregon white oak acorns that had been collected by Hoopa Tribal Civilian Community Corps members.
- **In-Person Contact and Response –** Inquiries about the Program and its projects were welcomed from walk-ins, telephone calls, and email messages at the Weaverville TRRP office. We received a wide range of questions, often regarding spring restoration flow release schedules,

duration, ramping rates, and maximum peaks. TRRP volunteers and private citizens continue to post the approved restoration hydrographs at approximately 40 sites along the river to update river users about the coming changes in the river flows.

- **One-on-One Meetings –** Individual meetings with private landowners were held on their properties to arrange for rights of entry for projects and monitoring of revegetation at a previous project site.
- **Internet and Media Presence –** The official Program website is http://www.trrp.net/. Here, the Program posts announcements and makes available a broad spectrum of information for the public. In 2014, the Program continued to review, improve, and update website content to provide pertinent, useful, and accessible information for the public. A number of articles regarding the TRRP 2014 activities appeared in various regional media outlets.

Looking Ahead: 2015 Program Activities

Upper Douglas City rehabilitation site, one of the sites proposed for construction in 2015.

The Program will continue to execute the restoration strategy in 2015, as described in the Record of Decision (U.S. Department of the Interior 2000), the Trinity River Environmental Impact Statement (USFWS et al. 2000), and the Trinity River Flow Evaluation Report (USFWS and HVT 1999). Proposed activities include the construction of two channel rehabilitation projects (Limekiln Gulch and Upper Douglas City), the completion of designs and compliance requirements for the Bucktail site, planning and implementation of the WY 2015 flow schedule, completion of priority watershed projects, coarse sediment augmentation dependent on water year type, and the continuation of monitoring and assessment projects.

Other noteworthy activities planned for 2015 include:

- **Phase II Rehabilitation Project Plan** – Based on Phase I review findings and in consultation with the SAB, the TRRP is moving forward with the implementation plan to design and construct sequenced priority channel rehabilitation projects. The plan uses a quantitative approach to combine two-dimensional hydraulic modeling with ecological factors in a logic model to evaluate temporal and spatial sequencing of remaining projects.

- **TRRP Program Workshops** – A workshop series has been developed to build a common understanding among TRRP policy makers, stakeholders, and staff about (1) what has been learned during the past nearly 10 years of Program implementation and (2) how that information will influence future management and restoration actions. This "Lessons Learned" series will involve presenting the adaptive management approach as it pertains to each program management action. The 2015 workshop is anticipated to focus on coarse sediment management strategies.

- **Environmental Compliance** – During 2014 the TRRP re-initiated endangered species consultation with the NMFS and USFWS. TRRP partners are developing a Biological Assessment (BA) of TRRP effects on federally listed species based on new information since consultation was originally completed in 2000. The BA is partly programmatic in nature and will include information on the TRRP decision-making processes that provide for protection and support of the Trinity River ecosystem. It will also cover elements of the TRRP that may affect threatened, endangered, or sensitive species: channel rehabilitation, sediment management (fine and coarse), limited infrastructure, and watershed program elements. The BA will incorporate information about current conditions to update the original scope and techniques used to describe restoration actions and evaluate potential impacts to the status of listed species.

  The TRRP is also applying for the renewal of the following general and specific water quality certification permits for channel rehabilitation and gravel augmentation:

  - Long-term coarse sediment management
  - Fine sediment management
  - General channel rehabilitation

  Initial studies are currently underway for all of the activities authorized under these permits. The Regional Water Board will determine if any substantial changes to the activities have been proposed, or if any actions could result in the potential for significant impacts to the environment or to the beneficial uses of the Trinity River.

- **Fish Production Model** – Also based on an SAB recommendation, the TRRP is developing a salmonid production model for the Trinity River that will link to existing Trinity River physical models and a Klamath River

fish production model. The model will be a component of the TRRP Decision Support System that can be used to evaluate:

1. The response of fish production to different flow management alternatives;
2. The response of fish production to different proposed channel rehabilitation actions;
3. The response of fish growth and resulting production to variations in water temperature; and
4. How the growth and size of fish responds to different flow/temperature alternatives and how this response relates to potential survival.

- **Stakeholder involvement** continues through the advisement of the Trinity Adaptive Management Working Group, frequent outreach updates and products, continuing improvements to the website (www.trrp.net), public meetings and seminars, science floats, private landowner cooperation in rehabilitation projects, and educational outreach to students through field days, instruction, and informational booths at fairs and festivals.

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U.S. Department of the Interior. 2000. Record of Decision, Trinity River Mainstem Fishery Restoration, Final Environmental Impact Statement/Environmental Impact Report. December 19, 2000. <http://odp.trrp.net/Data/Documents/Details.aspx?document=227>

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USFWS et al. (U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, Hoopa Valley Tribe, and Trinity County). 2000. Trinity River Mainstem Fishery Restoration Final Environmental Impact Statement / Environmental Impact Report. <http://www.fws.gov/arcata/fisheries/reports/technical/treis/final_document_new.html>

Web Sources

- http://www.trrp.net/background/
  The TRRP website with information on the Trinity River and the Program.
- http://www.trrp.net/background/foundations/
  A chronological list with links to foundational and other pertinent documents.
- http://www.fws.gov/arcata/fisheries/activities/habRestoration/default.html
  Describes the TRRP on the Arcata Fish and Wildlife website.
- http://www.usbr.gov/mp/cvp/
  The Bureau of Reclamation's website on the Central Valley Project.

- http://en.wikipedia.org/wiki/Central_Valley_Project
  A description of the Central Valley Project available on Wikipedia.
- http://www.trrp.net/background/legislative-history/
  Legislative History on TRRP website
- http://www.fws.gov/arcata/fisheries/reports/technical/Trinity_River_Flow_Evaluation_-_Chapter_1-2.pdf
  Legislative History from Chapter 2 of the Flow Study
- http://www.fws.gov/arcata/fisheries/reports/technical/treis/draft/trin_eir/ch_1.pdf
  Legislative History from Sec 1.4 of the Draft EIS/EIR
- http://www.trrp.net/structure/tmc/
  TMC information including bylaws
- http://www.fws.gov/arcata/fisheries/reports/tamwg/Charter & Bylaws/Signed Charter Jan 8, 2013.pdf
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The 2014 Annual Report of the Trinity River Restoration Program is available electronically at www.trrp.net and includes web links to reference material and agencies.

Appendix A: Acronyms

AEAM	Adaptive Environmental Assessment and Management
BA	Biological Assessment
BLM	Bureau of Land Management
°C	degrees Celsius
CAMNet	Collaborative Adaptive Management Network
CDFW	California Department of Fish and Wildlife
CDWR	California Department of Water Resources
CEQA	California Environmental Quality Act
cfs	cubic feet per second
DGC	Douglas City (rehabilitation site)
EIR	Environmental Impact Report (required under CEQA)
EIS	Environmental Impact Statement (required under NEPA)
°F	degrees Fahrenheit
FNF	full natural flow
GRTS	generalized random-tessellation stratified (sampling design) (Stevens and Olsen, 2004)
HPA	Hoopa (rehabilitation site)
HVT	Hoopa Valley Tribe
km	kilometer(s)
LIDAR	light detection and ranging
LWS	Lewiston Gage
m	meter(s)
m^3/s	cubic meters per second
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NTU	nephelometric turbidity units
ODP	online data portal
ROD	Record of Decision
SAB	Scientific Advisory Board
TAMWG	Trinity Adaptive Management Working Group
TLS	terrestrial laser scanning
TMC	Trinity Management Council
TREIS/R	Trinity River Environmental Impact Statement
TRFES	Trinity River Flow Evaluation Final Report
TRRP	Trinity River Restoration Program (also “the Program”)
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WY	water year (October through September)
YT	Yurok Tribe

On Back Cover:

Before and after views of the Lower Junction City rehabilitation site, looking downstream from the Dutch Creek Bridge. Top: Before construction in September 2013. Bottom: After construction in August 2014.