

TRRP FY13 Preliminary Science Workplan

Title	Contact	Fate	Page	Description
Assessing effects of restoration on Chinook Salmon and Coho Salmon rearing and spawning habitat	Goodman	Inv. Plan	1	Habitat - 2H - Map and quantify the extent (area) of available fry/juvenile rearing habitat throughout the mainstem
Spring and fall Chinook and coho salmon and fall-run steelhead run-size estimation using mark-recapture methods	Kier	Inv. Plan	3	Fish (adult) - 13A - Monitor adult escapement of hatchery and naturally produced spring and fall Chinook, coho and fall steelhead
Trinity River Hatchery Chinook Coded Wire Tagging	Kautsky	Inv. Plan	5	Fish (adult) - 13A - Monitor adult escapement of hatchery and naturally produced spring and fall Chinook, coho and fall steelhead
Trinity River juvenile salmonid outmigrant monitoring program	Pinnix	Inv. Plan	7	Fish (juvenile) - 4J-FC and SC - Monitor smolt outmigrant numbers, Monitor smolt timing
Annual Operations Process (Reservoir forecasting; Reservoir modeling; River modeling; River temperature tracking)	Wittler	Staff	n/a	Annual Operations Process (Reservoir forecasting; Reservoir modeling; River modeling; River temperature tracking)
Temperature Model Support	Wittler	Ex. Contract	n/a	Temperature Model Support
Thermal heterogeneity	Wittler	Staff	n/a	Develop metric to define thermal heterogeneity and investigate the use of infrared thermal imaging (e.g., FLIR) as a tool to collect these data. What metric could be developed to capture existing thermal heterogeneity (e.g., simple channel vs. hyporheic zones, alcoves that warm, etc.)
Mainstem Chinook salmon spawning survey	Chamberlain	Inv. Plan	9	Monitor redd distribution, abundance and densities (includes carcass surveys)
Lower Klamath River Creel Census	Borok	Inv. Plan	11	Fish (adult) - 17A - Monitor harvest (tribal, sport and commercial) of naturally produced fall Chinook
Lower Trinity River Sport Harvest Survey	Kautsky	Inv. Plan	12	Fish (adult) - 17A - Monitor harvest (tribal, sport and commercial) of naturally produced fall Chinook
Hoopa Tribal harvest survey of Trinity River fall Chinook	Kautsky	Inv. Plan	14	Fish (adult) - 17A - Monitor harvest (tribal, sport and commercial) of naturally produced fall Chinook
Yurok Tribal Fisheries Monitoring	Williams	Inv. Plan	16	Fish (adult) - 17A - Monitor harvest (tribal, sport and commercial) of naturally produced fall Chinook
Gravel Implementation Monitoring	Gaeuman	Inv. Plan	17	Physical - - Implementation monitoring and analysis
Map and Quantify Riparian Vegetation	Hilton	Inv. Plan	18	Riparian - 1R - Map and quantify changes in riparian floodplain vegetation (e.g., species, age-class, initiation success, structural attributes) at GRTS sites, including near-channel vegetation
Trinity River Restoration Program Riparian and Riverine Bird Monitoring	Stephens	Ex. Contract	21	Wildlife - 4W - Monitor abundance and composition (richness/diversity) of riparian bird species during breeding, post-breeding and migration periods
Juvenile Salmonid Density Monitoring	Pinnix	Inv. Plan	23	Fish (juvenile) - 2J - Monitor fry density and abundance at GRTS sites across upper 40 miles (standing stock assessment)
Geomorphic monitoring and assessment of bed scour and mobility	Hilton	Inv. Plan	25	Physical - 6P - Monitor bed mobility and scour thresholds
Sediment Monitoring	Krause	Ex. Contract	n/a	Sediment Monitoring
Klamath-Trinity River fall/spring run Chinook scale age analysis	Kautsky	Inv. Plan	27	Fish (adult) - 22A - Develop cohort reconstructions for Chinook and coho and evaluate cohort performance or year class strength, and population growth rate
Develop cohort reconstructions for fall Chinook to evaluate cohort performance or year class strength, and population growth rate.	Kautsky	Inv. Plan	29	Fish (adult) - 22A - Develop cohort reconstructions for Chinook and coho and evaluate cohort performance or year class strength, and population growth rate
Wildlife - 11W - Monitor the abundance and distribution of FYLF egg masses throughout the forty mile system	Clarke	Inv. Plan	n/a	Wildlife - 11W - Monitor the abundance and distribution of FYLF egg masses throughout the forty mile system
Wildlife - 13W - Monitor the distribution and abundance of WPT	Clarke		n/a	Wildlife - 13W - Monitor the distribution and abundance of WPT
Assess design performance of specific design features (alcoves, side channels, lowered floodplains, etc)	Hilton	Market Research	n/a	Assess design performance of specific design features (alcoves, side channels, lowered floodplains, etc)
Retrospective evaluation of topographic changes at Rush Creek delta on the Trinity River.	Meyer	Inv. Plan	31	Physical - 2P - Monitor variability in bed elevations
Myxosporean parasites effects and energy reserves of juvenile Trinity R. Chinook	Foott	Inv. Plan	33	Trinity River Juvenile Chinook Salmon Disease Assessment
Unranked Items				
Rehabilitation Site Effectiveness Monitoring and Analytical Framework	Bandrowski	Inv. Plan	34	
Gravel Implementation Tracer Experiment	Gaeuman	Inv. Plan	36	Physical - - Implementation monitoring and analysis
Integrated Flow and Sediment Modeling to Predict Planform Dynamics	Gaeuman	Inv. Plan	37	Physical - - Implementation monitoring and analysis
Geomorphic Response to High Flow Duration	Krause	Inv. Plan	39	

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013
- Proposal Brief -

Title: Assessing effects of restoration on Chinook Salmon and Coho Salmon rearing and spawning habitat

Total Request: \$426,568.00

Focus: Both Systemic and Action-Specific

Hypotheses Addressed:

Trinity River Flow Evaluation Study (1999): The goal of the Program is to restore and sustain natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels, to facilitate dependent, tribal, commercial, and sport fisheries' full participation in the benefits of restoration

Big Questions Addressed:

- 2 Are Program actions on track to produce a sufficient area of suitable salmonid rearing, spawning, and adult holding habitat to meet Program objectives?
- 7b Are flows creating conditions necessary for fish survival across life stages (e.g. temp, velocity, depth)?

Performance Metrics:

Number of pieces installed at a rehab site
Change in square meters of Chinook Salmon and Coho Salmon rearing habitat from previous estimates
Square meters of Chinook Salmon and Coho Salmon rearing habitat for FY 2013 project reach
Change in square meters of Chinook Salmon and Coho Salmon rearing habitat from previously measured conditions at rehab sites

Investigators:

Damon Goodman, U.S. Fish and Wildlife Service, Arcata
Aaron Martin, Yurok Tribe Fisheries Program
Justin Alvarez, Hoopa Valley Tribe Fisheries Department

Abstract:

The primary goal of this study is to evaluate the effects of restoration on Chinook Salmon and Coho Salmon habitat. All aspects of the project are designed to provide information to the Trinity River Restoration Program (Program) adaptive management process by learning from past actions to maximize future benefits. Assessments are designed to evaluate effects at a variety of scales including 1) specific restoration features such as side channels or large wood installations, 2) bank rehabilitation sites which include a conglomeration of restoration features designed and implemented together and 3) the 64 km restoration reach. Tasks in this proposal relate directly to the highest priority IAP assessments identified by Program workgroups. Addressing these assessments will provide the Program with an evaluation of progress toward program objectives by quantifying the change in rearing habitat areas at various scales and relating these changes to site specific variables or restoration treatment types. This will provide Program managers with information to inform future management actions including, but not limited to, bank rehabilitation site designs, large wood installation types, and streamflow releases.

History / Future:

The primary goal of the Program is to restore and sustain natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels to facilitate dependent tribal, commercial, and sport fisheries' full participation in the benefits of restoration via enhanced harvest opportunities (Trinity River Restoration Program and ESSA Technologies Ltd. 2009). If naturally produced salmonid populations are to be restored and maintained, the habitat on which they depend must be rehabilitated (USFWS and HVT 1999). The primary limiting factor for salmonid populations within the restoration reach is the availability of rearing habitat. The restoration strategy for the Trinity River is designed to restore fluvial-geomorphic processes downstream of Lewiston Dam that should lead to systemic increases in salmonid habitat quantity and quality,

particularly above the confluence of the North Fork Trinity River. A fundamental assessment necessary to evaluate the effectiveness of Program restoration actions is to determine the changes in salmonid habitat resulting from the combination of mechanical channel rehabilitation and restoration of fluvial processes that improve and maintain riverine habitats.

We have implemented two primary methods for evaluating habitat on the Trinity River including map and hydraulic model based assessments. Mapping techniques used to evaluate the effects of restoration on rearing habitat were developed and implemented by Goodman et al. (2010). This was the first evaluation of the effects of restoration on rearing habitat since implementation of the ROD (DOI 2000) and includes pre-construction and post-construction assessments at several restoration features and bank rehabilitation sites. This work has been extended to include an assessment of effects at a restoration reach scale that was initiated in 2009 and applied annually. This assessment was developed to evaluate the status and trend of rearing habitat within the restoration reach.

The Program has used hydraulic modeling for habitat assessments and site designs purposes, in this proposal we plan to integrate these components. Hydraulic model based habitat assessment techniques were implemented to evaluate the effects of streamflow releases on rearing and spawning habitat availability and are currently under development. These models were developed at a subset of locations used for map based efforts in 2010. This same modeling technique has been utilized by Program design teams to compare design alternatives with existing conditions. Integration of the channel design process and habitat assessments have been discussed by the Program as a priority task which has not yet been accomplished. In this proposal and into the future we will bring together site design and habitat assessment efforts to further the adaptive management process and improve efficiency of the Program. In this proposal we exemplify this partnership through the development of a rehabilitation site assessment and design alternative model at Lorenz Gulch in collaboration with the Yurok design team.

Since 2009, fish habitat monitoring has been conducted as part of the Integrated Habitat Assessment Project (IHAP). The IHAP monitoring has been conducted for the purposes of: 1) implementing the monitoring strategies described in the Integrated Assessment Plan, 2) collect the data necessary to evaluate whether Trinity River Flow Evaluation Targets are being achieved within a specific water year class, and 3) to provide information about system response to management actions. Fish habitat monitoring conducted as part of the IHAP has been co-located at sites also monitored by other disciplines (geomorphology and riparian vegetation). Co-location of site monitoring will enable multi-discipline comparisons (integration analysis) that explore which physical variables and processes best relate to fish habitat. Integration analyses of data (fish habitat, physical, and riparian) collected in FY2013 will be included as a task in the FY2014 investigation plans. These analyses may include development of causal relationships between physical processes and channel form to ecosystem components such as fish habitat or riparian community structure. Integration analyses that will be undertaken in FY2012, evaluating data collected in FY2009-FY2011, will help guide future analyses to be undertaken in FY2014.

Coordination:

See History/Future section

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013

- Proposal Brief -

Title: Spring and fall Chinook and coho salmon and fall-run steelhead run-size estimation using mark-recapture methods

Total Request: \$856,307.00

Focus: Assess System Response

Hypotheses Addressed:

Trinity River Record Of Decision (2000): Are the Program goals (to restore and sustain natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels, to facilitate dependent, tribal, commercial, and sport fisheries' full participation in the benefits of restoration) being met?

Big Questions Addressed:

- 3 Are Program actions increasing natural production of healthy juvenile salmon and steelhead, and on track to meet Program objectives for natural smolt outmigrants, escapement, and harvest?
- 9 How are Program actions affecting fish and wildlife populations, and vegetation communities within the Program area?

Performance Metrics:

Investigators:

Mary Claire Kier, California Department of Fish and Game, Redding

George Kautsky

Abstract:

The purpose of this study is to produce run-size estimates on the Trinity River (for both hatchery and naturally produced components of fall and spring run Chinook salmon, coho salmon, and adult fall-run steelhead) primarily to aid in the status and trend monitoring used to evaluate long-term progress toward achieving Trinity River Restoration Program goals and objectives. The current naturally produced adult salmonid goals for the Trinity River basin are 62,000 fall Chinook; 6,000 spring Chinook; 1,400 coho; and 40,000 steelhead. Similar goals for hatchery adult production are 9,000 fall Chinook; 3,000 spring Chinook; 2,100 coho; and 10,000 steelhead. Additionally, the harvest estimate component of this study addresses the stated goal in the Record of Decision (ROD 2000) of increasing harvest opportunity for dependent fisheries. Run estimates and associated 95% CI will be estimated using Chapman's version of the Peterson single census method (Ricker 1975).

History / Future:

This will be the twenty-fifth year of this monitoring project reporting to the United States Bureau of Reclamation (USBOR), and informs a monitoring study/dataset that encompasses 35 years of data. The field work will be conducted by personnel of the California Department of Fish and Game's (CDFG) Klamath-Trinity Program in cooperation with personnel from the Hoopa Valley Tribal Fisheries (HVTF). This IP covers three Tasks of a six or seven task overall agreement with the Bureau, performed on the lower Klamath River, the main stem Trinity River, and at Trinity River Hatchery. The necessity for performing our Klamath-Trinity basin monitoring activities have been outlined in several Acts of Congress including Public Law 386 (69 Stat. 719), August 12, 1955; Public Law 98-541, October 24, 1984; the "Trinity River Basin Fish and Wildlife Management Reauthorization Act" of 1995; and the Trinity River "Record of Decision", 2000.

Coordination:

CDFG routinely consults with stakeholders in the form of public meetings (such as the Fish and Game Commission, salmon informational meeting (annual)), with constituent groups (guide associations, fishing groups) and on an ongoing basis as needed (e.g. CESA reviews), and has several advisory panels that deal with specific areas of interest i.e. salmon, trout, steelhead advisory panel. CDFG has also initiated Trinity River specific groups such as the Klamath fish health assessment team (KFHAT) and Trinity River Hatchery Ad Hoc

and technical teams. These teams are composed of member agencies and tribes representing the Klamath Basin. The Department also distributes to the public and agency/tribal entities ongoing weekly reports of field activities such as trapping and harvest summary reports. Additionally, the Department and Hoopa Valley Tribe conduct annual coordination meetings to discuss prior and up-coming year field activities, facilitate data exchange and provide a forum for input and discussion regarding field projects. This project is cooperative in nature and has Hoopa Valley Tribe participation in the form of technician support for the field aspects of the project. Biological samples taken at the weir are used in tribal ageing studies, and it is envisioned TRRP-funded USFWS smolt outmigration studies will lead to development of stock recruitment data such as adult to smolt ratios. Spawner recovery efforts are done in cooperation with tribal and USFWS partners as well. Other TRRP partners have integrated aspects of their study with ours (see Yurok Tribe steelhead radio tagging study, 2009). Project sites, including Trinity River Hatchery, are located on public lands and are therefore “open” to the public for viewing, and staff at these work sites provide descriptions and tours of our operations. The public and agencies are informed via weekly trapping summaries.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013
- Proposal Brief -

Title: Trinity River Hatchery Chinook Coded Wire Tagging

Total Request: \$123,340.00

Focus: Systemic

Hypotheses Addressed:

Trinity River Flow Evaluation Study (1999): The goal of the Program is to restore and sustain natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels, to facilitate dependent, tribal, commercial, and sport fisheries' full participation in the benefits of restore

Big Questions Addressed:

- 3 Are Program actions increasing natural production of healthy juvenile salmon and steelhead, and on track to meet Program objectives for natural smolt outmigrants, escapement, and harvest?
Marking hatchery fish enables estimating natural population.

Performance Metrics:

Investigators:

George Kautsky, Hoopa Valley Tribe Fisheries Department

Bill Matilton, Hoopa Valley Tribe Fisheries Department

Abstract:

The project objective is to apply a 25% constant fractional mark (CFM) of all Chinook production at Trinity River Hatchery (TRH) using Coded Wire Tags (CWT). This project applies CWTs and Ad fin clips to spring- and fall-run Chinook salmon reared at TRH. Twenty-five percent of each race (spring/fall) and each release strategy within race (smolt or yearling) are to be marked. An automated tagging trailer constructed by Northwest Marine Technology will be used in 2012. Representative marking will be ensured by the automated tagging trailer as well ensuring that 25 percent Ad CWT is assigned to each rearing pond sub-population. The marks subsequently recovered in juvenile and adult monitoring projects in river are used to estimate contributions of hatchery and natural populations in mixed stock marine and river fisheries and adult spawning escapements. Population estimates are used to assess juvenile and adult production by brood year, run, and rearing type. Brood tables constructed for hatchery and wild fish, based on Ad CWT results, may be used to model performance of hatchery and naturally spawned fish.

History / Future:

This project applies coded-wire tags and adipose clips (AD-CWTs) to spring and fall Chinook salmon for both fingerling and yearling production reared at Trinity River Hatchery (TRH). Hoopa Valley Tribal Fisheries has been marking and tagging chinook juveniles at Trinity River Hatchery since 1997 (Brood Year 1996). In late 1990's HVT sent a crew of technicians to Olympia, WA Northwest Marine Technologies (NMT) headquarters to learn how to operate the NMT Mark IV machine. Since first starting tagging in the mid 1990's, HVT has mastered tagging techniques and tagging methods. The manual CWT method at TRH marked a constant fraction of the hatchery production of all chinook salmon to be released. Constant fractional marking should allow fisheries managers to determine the hatchery component of chinook runs with a higher degree of precision. Coded wire tagging in general allows fisheries managers to determine the stock composition in mixed-stock fisheries and set harvest, allocation, and spawner escapement targets. AD-CWTs are the principle tool used to estimate the contribution of many natural and hatchery fish populations harvested along the Pacific coast. Population estimates are used to assess juvenile and adult production by brood year, run, and rearing type. Brood tables constructed for hatchery and wild fish, based on AD-CWT results, are used to forecast adult returns. Forecasts are used to manage commercial, recreational, and tribal fisheries. From 1997 until 1999, HVTFD manually marked a constant fraction of each race and type of release; approximately 9.4% for fall fingerlings, 16.5% for spring fingerlings and 35% of all spring and fall yearlings released. Beginning in

2000 and continuing every year, HVTFD will mark a constant 25% of all chinook released. In 2010, CDFG offered Bureau Of Reclamation (BOR) the use of an automated tagging trailer. The tagging trailer as described by Northwest Marine Technology is a 44 foot long trailer equipped with six automated tagging units, a manual tagging unit, and two sorters one of which just monitors the other counts and delivers fish to the appropriate tagging unit. Each tagging unit is set up to a specific size range. One tagging coordinator, one skilled operator and two assistants are required to run the automated tagger. Fish size range is 57mm – 142mm total length which is about 250 – 20 fish/lb. For ad-clipping and applying a CWT the target size is greater than or equal to 150 fish/lb (120 fish/lb preferred). The automated tagger can sort through 125,000 fish while ad-clipping and applying a 25% CWT. In the process, the automated trailer generates an inventory of all while examining for the quality of marks and tags. A unique tag code will be assigned to each brood year, run, rearing type, and raceway at TRH (constant fraction representational marking). Full length coded wire tags will be applied to approximately 25% of all chinook salmon in each raceway. HVT will utilize the automated tagging trailer in 2013.

Coordination:

This effort is coordinated with CDFG hatchery and biological staffs, USBOR biological staffs, and the Pacific States Marine Fisheries Commission.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013

- Proposal Brief -

Title: Trinity River juvenile salmonid outmigrant monitoring program

Total Request: \$748,524.00

Focus: Assess System Response

Hypotheses Addressed:

Trinity River Flow Evaluation Study (1999): The goal of the Program is to restore and sustain natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels, to facilitate dependent, tribal, commercial, and sport fisheries' full participation in the benefits of restor

Big Questions Addressed:

- 3 Are Program actions increasing natural production of healthy juvenile salmon and steelhead, and on track to meet Program objectives for natural smolt outmigrants, escapement, and harvest?
- 9 How are Program actions affecting fish and wildlife populations, and vegetation communities within the Program area?

Performance Metrics:

- 9 How are Program actions affecting fish and wildlife populations, and vegetation communities within the Program area?
- 7b Are flows creating conditions necessary for fish survival across life stages (e.g. temp, velocity, depth)?
- 3 Are Program actions increasing natural production of healthy juvenile salmon and steelhead, and on track to meet Program objectives for natural smolt outmigrants, escapement, and harvest?

Investigators:

William Pinnix, U.S. Fish and Wildlife Service, Arcata
Tim Hayden, Yurok Tribe Fisheries Program
Paul Petros, Hoopa Valley Tribe Fisheries Department
Nate Harris, Yurok Tribe Fisheries Program
Sean Ledwin, Hoopa Valley Tribe Fisheries Department

Abstract:

To quantitatively assess juvenile salmonid production in the Trinity River, the Yurok Tribal Fisheries Program (YTFP), Arcata U.S. Fish and Wildlife Service Office (AFWO), and Hoopa Valley Tribe Fisheries Department (HVTFD) propose to continue operations of rotary screw traps (RSTs) at two locations along the Trinity River. This assessment includes two components: the Upper Trinity River juvenile salmonid monitoring site and the Lower Trinity River juvenile salmonid monitoring site that will be jointly operated as a single Trinity River Juvenile Salmonid Assessment Program. The Upper Trinity River site at Pear Tree Gulch (TRPT) will be operated by HVTFD, and includes operation of RSTs in the downstream portion of the 40 mile reach between Lewiston Dam and the confluence of the mainstem Trinity River with the North Fork Trinity River. The Lower Trinity River site (TRWC) will be operated by YTFP and AFWO, and includes operations of multiple RSTs in the Lower Trinity River near Willow Creek. The AFWO will conduct fish marking at the Trinity River Hatchery for abundance estimation at both the TRPT and TRWC sites, coordinate data collection and entry, provide a field technician to be shared between trap sites to ensure consistency in protocol between trap sites, provide database support, and provide continuing training opportunities (data collection and entry, water quality instrumentation use, fish handling, and other training as necessary) for all staff involved in field operations.

History / Future:

Intermittent juvenile salmonid investigations have been conducted in the Klamath River Basin by the U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office since 1981 (USFWS 1982). In 1988, a substantial monitoring effort was undertaken in both the mainstem Klamath and Trinity rivers utilizing frame nets

(USFWS 1989) and then rotary screw traps in 1989 (USFWS 1991). The purpose of this project was to monitor the abundance, timing, hatchery contribution, and biological parameters of emigrating anadromous salmonids in the mainstem Klamath and Trinity rivers. The effort on the Trinity River has continued since initiated in 1989 (USFWS 1991, 1992, 1994, 1998, 1999, 2001; Pinnix et al. 2007; Pinnix and Quinn 2008).

Information obtained from the salmonid outmigrant monitoring effort was critical in the development of salmonid outmigrant temperature components of the hydrographs recommended in the Trinity River Flow Evaluation (USFWS and Hoopa Valley Tribe 1999). One component of the restoration strategy employed by the Trinity River Restoration Program is to provide improved thermal regimes for rearing and emigrating juvenile salmonids. This objective is linked to the water temperature objectives for the lower Trinity River (USFWS and Hoopa Valley Tribe 1999, Table 5.11) and the timing of salmonid emigration (USFWS and Hoopa Valley Tribe 1999, Figure 5.46). Water-year specific hydrographs were developed to achieve optimum emigration temperatures throughout the majority of the spring/early summer outmigration period in normal and wetter years and marginal temperatures in dry and critically dry water years (USFWS and Hoopa Valley Tribe 1999, Appendix K). To evaluate the influence of the modified spring hydrographs on the salmonid production, including outmigration timing and the “health” of the outmigrants, the salmonid monitoring program implemented in the lower Trinity River was continued and expanded. Additionally, increases in spawning and rearing habitat should result in increased production of healthier salmonids, which can be assessed through the information collected by the outmigrant monitoring program.

It is intended that this information will provide basic biological information that can be used by managers to evaluate the effectiveness of habitat restoration efforts, especially the new flow regimes recommended in the Record of Decision (DOI 2000), in restoring the fishery resources of the Trinity River.

Coordination:

This project is an ongoing collaboration between the TRRP, USFWS, Hoopa Valley Tribe, and Yurok Tribe. The USFWS is responsible for coordination activities, and securing and marking fish at the Trinity River Hatchery for population estimation at the trapping sites. The Hoopa Valley Tribe is responsible for installing and operating the trapping site at Pear Tree Gulch. The Yurok Tribe is responsible for installing and operating the trapping site at Willow Creek. Due to the dangerous nature of the work performed at the sites, the public is not generally invited to participate; however, college interns are often invited to learn the methods used at the site and have been involved in the outmigrant monitoring operations. The tribes both seek to employ tribal members and individuals from local communities for this project. The USFWS has continued to shift its field responsibilities to the tribal agencies and provides training, technical support, and capacity building for tribal staff members.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013
- Proposal Brief -

Title: Mainstem Chinook salmon spawning survey

Total Request: \$228,706.00

Focus: Both Systemic and Action-Specific

Hypotheses Addressed:

Big Questions Addressed:

- 2 Are Program actions on track to produce a sufficient area of suitable salmonid rearing, spawning, and adult holding habitat to meet Program objectives?
- 3 Are Program actions increasing natural production of healthy juvenile salmon and steelhead, and on track to meet Program objectives for natural smolt outmigrants, escapement, and harvest?
- 9 How are Program actions affecting fish and wildlife populations, and vegetation communities within the Program area?

Performance Metrics:

Distribution and abundance of redds constructed by natural origin Chinook salmon females

Distribution and abundance of redds constructed by hatchery origin Chinook salmon females

Investigators:

Charles Chamberlain, U.S. Fish and Wildlife Service, TRRP Wvvl Office

Samantha Chilcote, U.S. Forest Service, Weaverville

Andy Hill, California Department of Fish and Game, Redding

Shane Quinn, Yurok Tribe Fisheries Program

Steve Gough, U.S. Fish and Wildlife Service, TRRP Wvvl Office

George Kautsky, Hoopa Valley Tribe Fisheries Department

Abstract:

This study targets spring and fall Chinook salmon spawning in the mainstem Trinity River. Trinity River Chinook salmon spawning begins in early September and continues through mid-December. Monitoring salmon redd and carcass abundance and distribution will inform estimates of total natural mainstem spawning escapement, and reveal temporal and spatial response of mainstem spawning to restoration through time. We postulate that the spatial distribution of returning spawners (hatchery fish excluded) is influenced not only by the spatial distribution of spawning habitat, but by the distribution of deposited eggs that successfully emerge, rear, and recruit to adulthood. The mainstem spawning distribution of natural origin Trinity River Chinook salmon upstream of the Burnt Ranch Gorge is currently skewed toward Lewiston Dam; the distribution of hatchery origin fish much more so (Sinnen 2004, Knechtle and Sinnen 2006, Hill 2009, Chamberlain et al In review). As the success of redds constructed in the mainstem increases in response to improved rearing habitat conditions, we expect spawning distribution to be driven increasingly by distribution of habitat, rather than proximity to the hatchery.

History / Future:

Temporally and spatially explicit mainstem Trinity River Chinook salmon spawning data have been collected since 2002. These provide a baseline to detect response to rehabilitation actions. Changes in the distribution of natural origin Chinook salmon spawning are expected to be realized quickly (and have been observed) at the localized rehabilitation site-scale as spawners colonize newly available spawning habitat (e.g. nests on a constructed bar surface or in a created side channel). Over much longer time periods (many salmon generations) we expect changes at the restoration reach scale (Lewiston Dam to North Fork) as spawning distribution is gradually driven more by increased availability of favorable fry and juvenile rearing conditions and less by the production of hatchery strays.

Coordination:

This project is accomplished by the willingness of multiple agencies to work together and consult with one another in order to successfully complete the monumental task of surveying over 182km of river on a bi-weekly basis. The United States Forest Service-Weaverville Ranger District of the Shasta-Trinity National Forest (USFS) annually funds its own participation in this effort. Reach 1 of our survey (Lewiston Dam to the Old Lewiston Bridge) largely falls on USFS administered lands and USFS conducts redd surveys within this reach and within portions of several tributaries to the Trinity River that flow through the Shasta-Trinity National Forest.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013

- Proposal Brief -

Title: Lower Klamath River Creel Census

Total Request: \$73,907.00

Focus: Estimate Sport Harvest

Hypotheses Addressed:

Trinity River Flow Evaluation Study (1999): The goal of the Program is to restore and sustain natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels, to facilitate dependent, tribal, commercial, and sport fisheries' full participation in the benefits of restoration

Big Questions Addressed:

9 How are Program actions affecting fish and wildlife populations, and vegetation communities within the Program area?

Adult Chinook Harvest

Performance Metrics:

Harvest totals

Investigators:

Sara Borok, California Department of Fish and Game, Redding

Abstract:

The objective of this project is to estimate the sport harvest of spring and fall Chinook salmon, coho salmon and fall-run steelhead. The purpose of this project is to quantify harvest of Trinity River produced salmonids in sport fisheries. Increased harvest of salmonids is a stated goal of the TRRP and addresses the primary hypothesis of the program "The goal of the Program is to restore and sustain natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels, to facilitate dependent, tribal, commercial, and sport fisheries' full participation in the benefits of restoration via enhanced harvest opportunities."

Harvest data will be tested for a positive slope against time series trend data.

History / Future:

Sport harvest monitoring has been ongoing since 1977. The major tasks of this project is sport harvest creel censuses in the lower Klamath River. Some of the analyses we plan to report on is catch and catch per unit effort, catch and release, contribution of hatchery- and naturally produced fish to harvest, and harvest timing. The main metric we plan to report on for Program use is harvest of Trinity River produced salmonids. Harvest is a key component of cohort reconstructions and adult run-size.

Coordination:

The Department routinely consults with constituents in the form of public meetings such as the Fish and Game Commission (bi-monthly), salmon informational meeting (annual), with constituent groups (guide associations, fishing groups, stakeholder groups) on an ongoing basis as needed, CESA review process, and has several advisory panels that deal with specific areas of interest i.e Salmon, trout, steelhead advisory panel. The Department has also initiated Trinity River specific groups such as the Klamath fish health assessment team (KFHAT) and Trinity River Hatchery Ad Hoc and technical teams. These teams are composed of member agencies and tribes representing the Klamath Basin. The Department also distributes to the public and agency/tribal entities ongoing weekly reports of field activities such as trapping and harvest summary reports. Additionally, The Department and Hoopa Valley Tribe conduct annual coordination meetings to discuss prior and up-coming year field activities, coordinate data exchange and provide a forum for input and discussion regarding field projects.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013
- Proposal Brief -

Title: Lower Trinity River Sport Harvest Survey

Total Request: \$66,386.00

Focus: Systemic

Hypotheses Addressed:

Trinity River Flow Evaluation Study (1999): The goal of the Program is to restore and sustain natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels, to facilitate dependent, tribal, commercial, and sport fisheries' full participation in the benefits of restoration

Big Questions Addressed:

- 3 Are Program actions increasing natural production of healthy juvenile salmon and steelhead, and on track to meet Program objectives for natural smolt outmigrants, escapement, and harvest?
- 7b Are flows creating conditions necessary for fish survival across life stages (e.g. temp, velocity, depth)?
- 9 How are Program actions affecting fish and wildlife populations, and vegetation communities within the Program area?

Performance Metrics:

Update Frequency
Timing
Description

Investigators:

George Kautsky, Hoopa Valley Tribe Fisheries Department
Bill Matilton, Hoopa Valley Tribe Fisheries Department

Abstract:

The overall project goal is to estimate total angler harvest of Chinook and steelhead from Willow Creek Weir (WCW) downstream to the confluence of Trinity River with Klamath River. This project evaluates the hypothesis that by restoring natural production of the Trinity River, dependent fisheries will be restored. The project monitors harvest by non-tribal fishers participating in annual recreational harvest of fish produced in the Trinity River. Complementary investigations assessing contribution of naturally produced Trinity River origin fish are also conducted within the Tribal harvest sector. Analysis comprises mathematical expansion of sample data values to generate estimates of total harvest within sample strata, and summing to season totals. A useful metric will be calculated estimates of uncertainty, or confidence intervals, for stratum and season total estimates. Developing methods for estimating uncertainty in results of the Lower Trinity River Sport Harvest Survey is a work-in-progress.

History / Future:

The Fisheries Management Division (FMD) of Hoopa Valley Tribal Fisheries Department has conducted creel surveys in the lower Trinity River since 1992. During the years 1995 -1998, this effort included the area from Willow Creek Weir (WCW) to Klamath/Trinity River confluence (K-T confluence). In 1999, the sample area was expanded to include Hawkins Bar in response to the need for real-time monitoring of the fishery. However, starting in 2006 the coverage area was reduced back to WCW to the K-T confluence. California Department of Fish and Game has infrequently conducted creel surveys in the upper Trinity River from Cedar Flat to Lewiston Dam since 1999. Nevertheless, the total harvest by recreational anglers for this reach is determined through recovery of reward tags applied to adult fish at WCW. Hence, the need for a directed creel survey above WCW is not essential for estimation of total harvest. Creel surveys provide a variety of information on fish caught by anglers such as number of fish caught by species, sex, length, as well as the relative catch rate by species. In addition, angler demographics such as length of fishing trip and distance

traveled are determined from creel interviews. The objectives of the FMD creel surveys have been to monitor the harvest of sport fish species, gather biological data on fish caught, and contribute to an overall summation of river run by species to assist fish harvest and habitat managers in understanding the relative contribution of hatchery and naturally produced fish to the river recreational fishery. HVT will use the same methods in 2013 to sample the lower Trinity River sport harvest.

Coordination:

HVT fisheries personnel provide CDFG personnel with summaries of the week sampling data and harvest estimates at various intervals in the sampling season.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013

- Proposal Brief -

Title: Hoopa Tribal harvest survey of Trinity River fall Chinook

Total Request: \$75,721.00

Focus: Systemic

Hypotheses Addressed:

Trinity River Flow Evaluation Study (1999): The goal of the Program is to restore and sustain natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels, to facilitate dependent, tribal, commercial, and sport fisheries' full participation in the benefits of restoration

Big Questions Addressed:

- 3 Are Program actions increasing natural production of healthy juvenile salmon and steelhead, and on track to meet Program objectives for natural smolt outmigrants, escapement, and harvest?
- 7b Are flows creating conditions necessary for fish survival across life stages (e.g. temp, velocity, depth)?
- 9 How are Program actions affecting fish and wildlife populations, and vegetation communities within the Program area?

Performance Metrics:

UpdateFrequency

Timing:

Description

Investigators:

George Kautsky, Hoopa Valley Tribe Fisheries Department

Bill Matilton, Hoopa Valley Tribe Fisheries Department

Abstract:

The primary goal of this study is to provide a total estimate of Hoopa Tribal harvest of fall Chinook. CWT recovery and analysis is necessary to determine the contribution of Trinity Hatchery fish to the overall harvest. CWT data are also useful for correcting bias in the estimates of scale-based age structures for fall Chinook. Further, hatchery/natural composition for fall Chinook is estimated through expansion of CWTs recovered in this fishery. This provides the Program with a tool to assess the potential confounding influence of hatchery stock on the naturally produced fall Chinook target. Methods include field acquisition of catch and biological data and samples in a two-stage sampling schedule. Analyses include two-stage calculations of harvest estimates for sampling state and season totals, calculations of statistical confidence intervals, proportions of hatchery and natural -origin fish of each species. Reporting metrics include timely generation of catch estimates, and magnitudes of statistical uncertainty.

History / Future:

Tribal harvest is composed of both net and tribal hook and line harvests. Hook and line fishing generally produces less than 10% of the total tribal Chinook harvest. The Fisheries Management Division (FMD) of the Hoopa Valley Tribal Fisheries Department has conducted net harvest surveys on the Hoopa Valley Reservation since 1982. In addition, tribal hook and line surveys have been carried out since 1992. Net harvest surveys are conducted on four random days per week, and tribal hook and line surveys on three random days per week. Harvest surveys provide a variety of information on fish caught by fishermen such as number of fish caught, sex, length, as well as age, which is determined through scale analysis. The primary objectives of the FMD are to document the Hoopa tribal harvest of fall Chinook and gather biological data on fish caught. These objectives contribute to an overall summation of river run fall Chinook and assist fish harvest and habitat managers in understanding the relative contribution of hatchery and naturally produced fall Chinook. HVT will use the same methods in 2013 to sample Hoopa tribal harvest of fall Chinook.

Coordination:

Report total fall Chinook harvest estimate to co-managers for publication in “Mega-Table”, thus contributing to Klamath Basin Chinook management.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013

- Proposal Brief -

Title: Yurok Tribal Fisheries Monitoring

Total Request: \$255,000.00

Focus: Provides feedback on fish production

Hypotheses Addressed:

Big Questions Addressed:

- 3 Are Program actions increasing natural production of healthy juvenile salmon and steelhead, and on track to meet Program objectives for natural smolt outmigrants, escapement, and harvest?
- 7b Are flows creating conditions necessary for fish survival across life stages (e.g. temp, velocity, depth)?
- 9 How are Program actions affecting fish and wildlife populations, and vegetation communities within the Program area?

Performance Metrics:

Investigators:

Desma Williams, Yurok Tribe Fisheries Program

Abstract:

The goal of this project is to gather information from the Yurok Tribal spring and fall fishery to assess the harvest of Klamath/Trinity fish stocks by the Yurok Tribe. This information is critical to determine the abundance of particular broods of spring and fall-run Chinook from the Klamath and Trinity Basins, as well as their hatchery or natural origin. The companion age composition project then allows this information to be apportioned to each brood. The Tribal harvest numbers, combined with the age composition, and coded wire tag recoveries, can be used to develop a cohort reconstruction for ocean escapement of Trinity River fall Chinook; both hatchery and natural origin fish. This project will not conduct this cohort reconstruction analysis, but will provide information from the Yurok harvest that is necessary to conduct this analysis.

The cohort reconstruction modeling will provide the number of ocean recruits (pre-harvest adult fish) per brood, which can then allow for an evaluation of brood year success relative to environmental factors (such as flow regimes), as well as an evaluation of the success of the Trinity River Restoration Program (TRRP). The Tribe's harvest information is also used for the management of Klamath/Trinity fall Chinook fisheries.

This project also allows the tracking of progress toward meeting long-term TRRP goals as identified in the IAP, such as restoring and sustaining natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels, to facilitate dependent tribal, commercial, and sport fisheries' full participation in the benefits of restoration via enhanced harvest opportunities.

History / Future:

This project is the latest installment of decades of monitoring the Yurok fishery. The output of the project will continue to be necessary in the foreseeable future.

Coordination:

None.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013
- Proposal Brief -

Title: Gravel Implementation Monitoring

Total Request: \$86,200.00

Focus: Provide Restoration Action Feedback

Hypotheses Addressed:

- Surface grain sizes on bars has decreased
- Some pools have filled and others have not

Big Questions Addressed:

- 1 Are Program actions rehabilitating the river itself, restoring the attributes that produce a healthy alluvial river system?
- 6 Which channel rehabilitation actions designed to create dynamic alluvial river processes are most effective at creating and maintaining fish habitat?
- 7a Are flows and volume of coarse sediment augmentation sufficient to create and maintain fish habitat?
- 7c Is fine and coarse sediment effectively routed through the system?

Performance Metrics:

- bed level change

Investigators:

- David Gaeuman, U.S. Bureau of Reclamation, TRRP Wvvl Office
- Andreas Krause, U.S. Bureau of Reclamation, TRRP Wvvl Office

Abstract:

This proposal integrates monitoring activities needed to evaluate the transport and deposition of gravel introduced into the channel via high-flow injection or low-flow placement, and to support the planning and design of future gravel augmentation activities. These monitoring activities will also help to evaluate the performance of individual rehabilitation design elements and rehabilitation strategies. The proposed monitoring builds upon similar activities initiated in FY2011 and continued in FY2012 under the heading of Implementation Monitoring. However, the focus of the work has shifted slightly to place greater emphasis on the consequences of gravel augmentation and less emphasis on the performance of channel rehabilitation designs. This shift was made in response to increasing concern about the potential for added gravel to negatively impact adult holding habitats (large pools) throughout the TRRP project domain.

History / Future:

Continues work started in 2010, as described in the project description. The coarse sediment augmentation component of the program requires two types of feedback to close the adaptive management loop. First, TRRP is responsible for assessing and documenting the outcome of gravel augmentations at and downstream from augmentation locations to prevent unintended adverse consequences. The TRRP gravel augmentation program is potentially beneficial to the Trinity River fishery by stimulating bed mobility, increasing topographic complexity, and improving substrate conditions for spawning, but it is also potentially problematic for private property and infrastructure, and could negatively impact adult holding habitat and recreation. TRRP received considerable public criticism of its gravel augmentation program during 2011 and 2012. In particular, various stakeholders alleged that gravel augmentation and channel rehabilitation activities were causing holding pools and steelhead runs to fill with gravel throughout the river. In response, an analysis of pool change in response to management actions (gravel augmentation, channel rehabilitation, and flow releases) throughout the study domain was initiated in 2011, with analysis and reporting due 2012. This FY2013 will build on that work.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013

- Proposal Brief -

Title: Map and Quantify Riparian Vegetation

Total Request: \$456,534.00

Focus: Systemic and site-specific

Hypotheses Addressed:

Trinity River Flow Evaluation Study (1999): The synergistic effects of mechanical manipulation of the channel, coarse sediment augmentation, large wood management and release of geofluvial flows will dramatically increase habitat quantity, quality, and diversity through rehabilitation of alluvial function. It is expected that riparian vegetation quantity, quality, and diversity will improve as a direct result of rehabilitation actions, and that the aquatic and terrestrial habitat benefits will also increase through time as the sites evolve and translate downstream.

TRRP Integrated Analysis Plan (2009): Hypothesis 1: The magnitude, frequency, and sequencing of ROD flows are sufficient to mobilize and scour the bed frequently enough to prevent most riparian hardwoods along the low flow channel from exceeding two years old, or approximately 0.51 to 0.75 cm diameter at root collar. Once the hardwoods exceed a size (or age) threshold, the root system is extensive enough that peak ROD flows cannot scour the hardwood. Additionally, the hardwood size begins to influence local hydraulics, causing fine sediment (sand) deposition and initiation the berm building process (Bair 2003). Once the size/age threshold has been exceeded, the only way to remove riparian hardwoods along the low flow channel is through lateral channel migration or mechanical removal.

Sub-hypothesis 1-1: Flow releases of 311 cms (11,000 cfs), occurring in 12 out of 100 years on average, will cause bed scour >2D84's depth along the low water edge of exposed cobble bars.

Sub-hypothesis 1-2: Flow releases of 241 cms (8,500 cfs), occurring in 28 out of 100 years on average, will cause bed scour >1D84's depth along the low water edge of exposed cobble bars.

Sub-hypothesis 1-3: Flow releases of 170 cms (6,000 cfs), occurring in 20 out of 100 years on average, will cause bed mobilization along the low water edge of exposed cobble bars.

Sub-hypothesis 1-4: Over the long-term, this combination of bed mobility and scour will be sufficient to cause scour mortality to riparian plants along the low flow channel to prevent riparian encroachment.

Sub-hypothesis 1-5: If three Dry or Critically Dry years occur in series, then the riparian seedlings will not be scoured, exceeding the three year (0.76 to 1 cm diameter at root collar) growth window, and riparian encroachment will occur.

TRRP Integrated Analysis Plan (2009): Hypothesis 2: The magnitude, duration, timing, and ramping rate of flows in wetter water years will be sufficient to create seedbeds, and allow the seedlings' roots to follow the declining soil moisture front down to the summer groundwater table. Rooting depth is controlled by the roots' ability to respire and is a function of each plant species' physiology. The root growth rate is also a function of plant species, as well as soils and rate of groundwater decline.

Sub-hypothesis 2-1: ROD flow releases of 241 cms (8,500 cfs) and 311 cms (11,000 cfs) during wetter water years, in combination with tributary generated high flows, will cause fine sediment deposition on upper bar surfaces and floodplains, creating adequate nursery sites for riparian hardwood initiation.

Sub-hypothesis 2-2: ROD flow releases of 170 cms (6,000 cfs) for 5 days will provide favorable soil moisture conditions on upper bar surfaces and floodplains to enable seed germination.

Sub-hypothesis 2-3: The gradual decline in water surface caused by ROD ramping rate from 170 cms (6,000 cfs) to 13 cms (450 cfs) is less than the maximum seedling root growth rate, enabling seedling roots to reach the stable summer water table and ensuring hardwood initiation is successful.

Sub-hypothesis 2-4: ROD flow releases up to 311 cms (11,000 cfs) will not cause hardwood scour on upper bars and floodplains, ensuring initiating hardwood survival and establishment.

Sub-hypothesis 2-5: The sequence of riparian establishment events, combined with periodic mortality from scour, deposition, disease, and old age, will diversify species composition and age structure within riparian patches.

Big Questions Addressed:

- 4 Are Program actions sustaining or enhancing the riparian community structure including: vegetation, fish, and wildlife?
- 9 How are Program actions affecting fish and wildlife populations, and vegetation communities within the Program area?

Performance Metrics:

Age class distribution

Stem Density

Patch type frequency, abundance, spatial and size distribution at GRTS selected sites

Patch type frequency, abundance, spatial and size distribution

Region of river bank above summer baseflows where woody riparian plant species are initiating and establishing

Invasive exotic vegetation area at channel rehabilitation site within ESL's

Patch type boundaries

Riparian vegetation area at channel rehabilitation site within ESL's

Exposed active bar surfaces at 13 cms (450 cfs) index flow from air photos

Large wood Storage

Area, frequency, and abundance of colonizing and established riparian patches between 13 and 57 cms (450 and 2,000 cfs)

Frequencies, or areas, of bars or pools as mapped on air photos with or without field recon preferably supplemented by bathymetry or other survey data

Area frequency and abundance of established riparian patches on constructed upper bar and floodplain surfaces at individual channel rehabilitation site

Bank Stability and/or erodibility index that is descriptive of the type of bank stability

Unvegetated cover type frequency, abundance, distribution and area

Investigators:

Andrea Hilton, Hoopa Valley Tribe Fisheries Department

John Bair, McBain & Trush, Inc.

Abstract:

The Program developed an Integrated Assessment Plan ([IAP] Trinity River Restoration Program and ESSA Technologies Ltd. 2009) to identify assessments that: (1) evaluate long-term progress toward achieving Program goals and objectives; and (2) provide short-term feedback to improve Program management actions. The IAP identifies priority assessments necessary to evaluate the effectiveness of the restoration efforts (management actions) in meeting intended objectives, as well as, evaluating the overall effectiveness of the restoration strategy in meeting Program goals. Tasks implemented under this investigation plan (IP) address a subset of the IAP assessments, and employ multi-disciplinary monitoring efforts, where appropriate and possible, to address cause-and-effect relationships between physical processes and riparian vegetation response.

Riparian monitoring tasks will be conducted along the mainstem Trinity River and at specific sites. Vegetation mapping will be conducted along the mainstem river between Lewiston Dam and the North Fork Trinity River within previously defined mapping boundaries. A complete census of channel rehabilitation sites will be conducted as part of the systemic vegetation mapping effort. For large wood mapping, site selection will follow the systemic GRTS 400 m segment based sub-sampling strategy that was developed and used in WY

2010-2012, and will be co-located with the fish habitat assessment sample sites. The initial GRTS 400 m segment based sampling design was revised for certain geomorphic and riparian related objectives (Pickard 2012). As part of the revised study design, a complete census of exposed bars channel margin conditions (Objective 2) will be conducted between Lewiston Dam and the North Fork Trinity River, then a sub-sample of exposed bars will be selected using the GRTS method to evaluate TRFER riparian seedling scour and riparian recruitment.

Methods, analyses, and metrics used for the study have been previously used in Trinity River geomorphic and riparian study plans (McBain and Trush 2004, McBain and Trush 2006, McBain and Trush 2007). Band transects will be used to document changes in woody plant demographics resulting from spring ROD flows and results from the GRTS sample sites will be expanded to describe systemic response to WY2013 high flow event(s). Metrics will be changes in plant density with different age classes which can be compared to management objectives in the TRFER. At all channel rehabilitation sites, the 2013 riparian vegetation cover will be compared to the area of impacted vegetation, the rate of riparian vegetation recovery calculated, and a brief narrative will relate evolution and recovery to the various channel rehabilitation site design objectives. The proposed revisions to the WY2010-2012 study designs will greatly improve our ability to assess whether TRFER seedling scour and establishment targets are being met, the risk of systemic encroachment on currently mobile features, and better inform channel design process.

History / Future:

Riparian monitoring has been an integral component of evaluating whether the ROD high flows are achieving year specific management objectives described in the TRFER, and assessing TRRP regulatory compliance related to riparian habitat impacts and subsequent recovery. The monitoring effort has evolved from assessing individual channel rehabilitation sites to also include untreated sections of the river to develop systemic estimates of how riparian vegetation is responding to ROD streamflows, gravel augmentation, and channel rehabilitation. The IAP recommends that monitoring and assessment occur at both the channel rehabilitation site scale to inform the design process, as well as at the systemic scale to evaluate whether year-specific TRFER management objective are being achieved. In recent years, riparian monitoring was co-located with fish habitat and geomorphic assessments at 400 meter long GRTS sites to facilitate integration. The rotating panels of GRTS selected 400 m segments was deemed adequate for evaluating objectives related to large wood studies. However, the 400 meter GRTS sites did not always have exposed bars (i.e., locations deemed to be at the greatest risk of being detrimentally encroached with establishing riparian elevation) suitable for conducting the geomorphic and riparian cause and effect assessment and encroachment risk evaluation, which was causing difficulties in expanding results to be meaningful at the system scale. Therefore, in collaboration with the Trinity River Restoration Program: Monitoring Guidance Report (Pickard 2012), the sample design proposed for WY 2013 has been modified as follows: 1) riparian and geomorphic monitoring have been de-coupled from the fish habitat monitoring at rotating panels of GRTS selected 400 m segments, and a new GRTS selected sampling frame is proposed that focuses on selecting a sub-sample from the entire population to exposed point bars and mid-channel bars in the study reach, 2) a census of all channel rehabilitation sites is proposed to document riparian vegetation recovery, response to design features, and whether riparian related design objectives are being met.

Coordination:

This proposal has been coordinated with the TRRP monitoring guidance effort (Pickard 2012), the riparian bird species assessment proposal (Clarke), the bed mobility and scour threshold assessment proposal (McBain and Hilton), and juvenile fry and rearing habitat proposal (Goodman proposal). This coordination has occurred with the Point of Contacts listed above and/or during technical workgroup meetings. This proposal has historically been combined with the geomorphic assessment and fry and juvenile rearing habitat assessment, and though these proposals are now separated, the coordination with those proposals continues. The system-wide riparian map provides data for regulatory compliance, avian habitat relationships, and fish habitat correlations. Large wood maps will be developed at the same study sites used by the fish habitat assessment project. This project includes substantial effort from Tribal members employed within the Hoopa Valley Tribal Fisheries Department, and thus the project will continue to build capacity for Tribal members to conduct field work, data entry and reduction, and coordination with other IP's and landowners.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013
- Proposal Brief -

Title: Trinity River Restoration Program Riparian and Riverine Bird Monitoring

Total Request: \$177,279.00

Focus: Both Systemic and Action-Specific

Hypotheses Addressed:

TRRP Integrated Analysis Plan (2009): See notes.

Big Questions Addressed:

- 4 Are Program actions sustaining or enhancing the riparian community structure including: vegetation, fish, and wildlife?
- 9 How are Program actions affecting fish and wildlife populations, and vegetation communities within the Program area?

Performance Metrics:

Riparian bird territory density

Riparian bird nest success and productivity (pending 2012 pilot field season)

Riparian bird community composition

Riparian and riverine bird relative abundance

Investigators:

Jaime Stephens, Klamath Bird Observatory

Ian Ausprey, Klamath Bird Observatory

Abstract:

Restoration-associated changes in fish abundance and riparian habitat complexity are expected to affect riparian and riverine bird communities on the Trinity River. We have created a multi-scale, multiple-methodology monitoring program designed to meet and assess compliance requirements and inform the adaptive management process by tracking avian response to restoration actions. Our three overarching goals are to (1) monitor temporal changes in riparian species performance metrics at the scale of the rehab site, river reach, and 40-mile program area, (2) monitor temporal changes in riverine species performance metrics at the scale of the river reach and 40-mile program area, and (3) determine restoration-associated mechanisms that explain variation in riparian bird performance metrics at the scale of the rehabilitation site. Specifically, we will (1) monitor temporal changes in riparian bird abundance and composition and target riverine bird abundance, and (2) link variation in the density, size and configuration of target riparian bird territories both temporally and spatially to restoration-associated changes in microhabitat complexity (defined here as the aggregation of patch size and configuration, species composition, and vertical and horizontal structure) at select rehabilitation sites. We will also conduct a pilot nest monitoring effort in 2012 to examine the costs/benefits of using this method to link annual variation in demographic parameters (i.e., nest survival and productivity) and nest site selection to restoration-associated changes in habitat complexity at select rehabilitation sites. Point count survey data will be used to calculate relative abundance estimates, community composition, and associated temporal trends for the riparian bird community at the scale of the rehab site, river reach, and 40-mile program area. Estimates of relative abundance for target riverine bird species will be derived from float survey data at the scale of the river reach and 40-mile program area. Vegetation data collected at point count stations will be analyzed for changes in structure and composition. Spot-map surveys and intensive vegetation sampling methods will be used to estimate territory density, configuration, and size for target riparian bird species and track restoration-associated changes in microhabitat complexity within select rehabilitation sites.

History / Future:

Our work both embraces and builds upon the monitoring strategy implemented by Redwood Sciences Lab

(RSL) from 2002 – 2009. At the scale of the program area we will continue sampling riparian and riverine bird species and associated vegetation metrics using the original study design and protocols. Within select rehabilitation sites we will continue sampling the original point count stations established by RSL while also broadening our effort to include spot-map surveys, intensive vegetation sampling, and a pilot nest monitoring program. Our work will add value to past monitoring efforts by focusing exclusively on the breeding season and discontinuing the operation of constant effort mistnetting stations. In particular, spot-map and intensive vegetation surveys will allow us to precisely examine how riparian birds use habitat that is either fragmented by restoration actions or regenerating within constructed floodplains. These changes in the monitoring strategy have been designed to (1) meet refined objectives, (2) inform the adaptive management process by mechanistically linking avian performance metrics to restoration strategies, and (3) continue to meet and assess programmatic compliance.

Coordination:

1. We are partnering with Mad River Biologists as the administrator of the bird monitoring contract for this project.
2. We are in continual partnership with Redwood Sciences Laboratory (RSL) in (1) transferring relevant materials and institutional knowledge regarding the historical bird monitoring strategy, (2) conducting analyses of bird monitoring data, and (3) creating this Investigation Plan.
3. We are working with McBain and Trush to (1) utilize their vegetation maps in future analyses, (2) consider collocating our vegetation surveys with current cross section and band transect survey locations, and (3) partner in developing intensive vegetation survey methods that achieve both riparian bird and riparian habitat monitoring goals.
4. We are working with TRRP staff and partners through the Wildlife and Riparian Work Group to assure bird monitoring aligns with program goals. We will create reports and materials that summarize bird monitoring results for targeted audiences, including the TRRP, partnering agencies, and the public. We are also working with TRRP staff to identify fish datasets that may be used to model riverine bird performance metrics.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013
- Proposal Brief -

Title: Juvenile Salmonid Density Monitoring

Total Request: \$426,509.00

Focus: Assess System Response

Hypotheses Addressed:

Trinity River Flow Evaluation Study (1999): The goal of the Program is to restore and sustain natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels, to facilitate dependent, tribal, commercial, and sport fisheries' full participation in the benefits of restoration

Big Questions Addressed:

- 2 Are Program actions on track to produce a sufficient area of suitable salmonid rearing, spawning, and adult holding habitat to meet Program objectives?
- 3 Are Program actions increasing natural production of healthy juvenile salmon and steelhead, and on track to meet Program objectives for natural smolt outmigrants, escapement, and harvest?
- 7b Are flows creating conditions necessary for fish survival across life stages (e.g. temp, velocity, depth)?
- 9 How are Program actions affecting fish and wildlife populations, and vegetation communities within the Program area?

Performance Metrics:

Longitudinal and temporal estimates of juvenile fish density in restoration reach

Investigators:

William Pinnix, U.S. Fish and Wildlife Service, Arcata
Mary Claire Kier, California Department of Fish and Game, Arcata
Tim Hayden, Yurok Tribe Fisheries Program
Sean Ledwin, Hoopa Valley Tribe Fisheries Department

Abstract:

The goal of this project is to assess the spatial and temporal distribution and density of juvenile salmonids in the mainstem Trinity River restoration reach, Lewiston Dam to confluence with North Fork Trinity River. This project is not intended to estimate fry population size or standing stock in the restoration reach, but rather provide a spatial and temporal picture of the density of juvenile salmonids in the restoration reach during the primary rearing period

The Integrated Assessment Plan (IAP) version 1.0 (TRRP 2009) states:

Changes in the abundance or density of juveniles over time and in relation to parental spawner abundance produced from the upper Trinity River is the primary metric proposed for assessing whether rehabilitation and flow actions have increased natural salmonid production. One of the Key performance measures in 3.2.1 of the IAP is *Fry density and abundance*.

History / Future:

The 2013 juvenile density project builds upon the field work conducted in 2012. This proposal should be considered a guideline for field work conducted in 2013 and is subject to change pending analyses of 2012 data which will occur in summer of 2012. It is anticipated that minor changes to the sampling method presented here are likely, but overall goals and objectives remain the same between 2012 and 2013.

The budget for 2013 is substantially larger than 2012 by approximately \$100,000. This is in part due to equipment and software needs (see detailed budget), but also due to increases in overhead costs and lodging/per diem requested by CDFG that was not present in the 2012 budget.

Coordination:

This project is an ongoing collaboration between the TRRP, USFWS, California Department of Fish and Game, the Hoopa Valley Tribe, and the Yurok Tribe. All partner agencies are responsible for providing 3 field crew and supervision time for the proposed project. Due to the dangerous nature of the work performed at the sites, the public is not generally invited to participate; however, college interns are anticipated to be invited to learn the methods utilized in the study. All partner agencies seek to employ tribal members and individuals from local communities for this project. The USFWS has continued to shift its field responsibilities to the tribal agencies and provides training, technical support, and capacity building for tribal staff members. In addition, many of the items in the equipment section will build capacity for the tribal agencies to take on more of the data processing role as the project develops.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013
- Proposal Brief -

Title: Geomorphic monitoring and assessment of bed scour and mobility

Total Request: \$458,317.00

Focus: Systemic and site-specific

Hypotheses Addressed:

Trinity River Flow Evaluation Study (1999): Flow management actions are meeting target bed mobility objectives relative to water year class

Trinity River Flow Evaluation Study (1999): Flow management actions are meeting target bed scour objectives relative to water year class

Big Questions Addressed:

7 Are flow and sediment actions meeting annual objectives for each water year?

Performance Metrics:

Bed scour and deposition

Channel bathymetry and planform topography

Bed mobility

Channel geometry

Investigators:

Andrea Hilton, Hoopa Valley Tribe Fisheries Department

John Bair, McBain & Trush, Inc.

Scott McBain, McBain & Trush, Inc.

Geoff Hales, McBain & Trush, Inc.

Abstract:

The Trinity River Restoration Program developed an Integrated Assessment Plan ([IAP] Trinity River Restoration Program and ESSA Technologies Ltd. 2009) to identify assessments that: (1) evaluate long-term progress toward achieving Program goals and objectives, and (2) provide short-term feedback to improve Program management actions. The IAP identifies priority assessments necessary to evaluate the effectiveness of the restoration efforts (management actions) in meeting intended objectives, as well as evaluating the overall effectiveness of the restoration strategy in meeting Program goals. Tasks implemented under this investigation plan (IP) address a subset of the IAP assessments, and employ multi-disciplinary monitoring efforts where appropriate and possible, to address cause-and-effect relationships between physical processes and riparian vegetation response.

Geomorphic monitoring will be conducted at selected sites along the mainstem Trinity River. Site selection will follow both systemic sampling and site-specific sampling strategies that have been revised from the WY 2009-2012 approach based on coordination with the Conceptual Monitoring Plan for Rehabilitation Sites on the Trinity River (Pickard 2012). To better achieve objectives, slight revisions to the 2010-2012 study design are proposed that will greatly improve our ability to assess systemic bed mobility and scour objectives, better assess topographic change at channel rehabilitation sites, and better inform channel design process.

Proposed methods, analyses, and metrics are consistent with those used over the past 20 years. For bed mobility and scour assessments, tracer rocks and scour chains will be used to document actual field conditions, and results from the GRTS sample sites will be expanded to describe systemic response to WY2013 high flow event(s). Metrics will be percentage of bed mobilized and relative scour depth, which can be compared to management objectives in the TRFEFR. In addition, bed mobility and scour results from previous years will be synthesized to describe the evolution of results over the past 10 or more years. At channel rehabilitation sites,

evaluations will be both qualitative and quantitative; qualitative evaluations are descriptive, and quantitative evaluation metrics will include change in surface area and volume of bars, change in pool depths, change in side channel entrance elevations and flow thresholds, and channel migration distance.

Following field work, data entry and reduction, and basic analyses described above, results from the bed mobility and scour analysis will be compared with the riparian band transect results (see WY2013 Riparian Monitoring Proposal) to establish cause and effect relationships at the GRTS sample sites.

History / Future:

Geomorphic monitoring has been an integral component of evaluating whether the ROD high flows are achieving year specific management objectives described in the TRFEFR for many years. The monitoring effort has evolved from assessing individual channel rehabilitation sites to also include assessing whether geomorphic management objectives are being achieved over the entire 40 mile study reach. The IAP recommends that monitoring and assessment occur at both the channel rehabilitation site scale to inform the design process, as well as at the systemic scale to evaluate whether year-specific TRFEFR management objective are being achieved. In recent years, geomorphic monitoring was co-located at 400 meter long GRTS sites with the fish habitat assessment to facilitate integration; however, many of the 400 meter GRTS sites did not have exposed bars suitable for conducting the geomorphic monitoring and assessment, which was causing difficulties in expanding results to the system scale. Therefore, in close coordination with the Conceptual Monitoring Plan for Rehabilitation Sites on the Trinity River (Pickard 2012), the sample design proposed for WY 2013 has been modified as follows: 1) the GRTS-based geomorphic monitoring has been de-coupled from the fish habitat monitoring, and a new GRTS sample site selection is proposed that focuses the sample population to exposed point bars and mid-channel bars in the study reach, 2) a descriptive census of all channel rehabilitation sites is proposed to document evolution of all sites in a cost and time-effective manner, and 3) quantitative monitoring of a subset of channel rehabilitation sites is proposed to better inform the future channel rehabilitation site design process. In addition, a summary of historic bed mobility and scour results is proposed to synthesize previous results and document evolution in bed mobility and scour trends since commencement of the ROD implementation in the early 2000's.

Coordination:

This proposal has been coordinated with the TRRP monitoring guidance effort (Pickard 2012), implementation monitoring and analysis proposal (Gaeuman), riparian vegetation (Bair and Hilton), and juvenile fry and rearing habitat proposal (Goodman proposal). This coordination has occurred with the Point of Contacts listed above and/or during technical workgroup meetings. This proposal has historically been combined with the riparian assessment and fry and juvenile rearing habitat assessment, and though these proposals are now separated, the coordination with those proposals continues. This project includes substantial effort from Tribal members employed within the Hoopa Valley Tribal Fisheries Department, and thus the project will continue to build capacity for Tribal members to conduct field work, data entry and reduction, and coordination with other IP's and landowners.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013

- Proposal Brief -

Title: Klamath-Trinity River fall/spring run Chinook scale age analysis

Total Request: \$127,396.00

Focus: Assess System Response

Hypotheses Addressed:

Trinity River Flow Evaluation Study (1999):

Big Questions Addressed:

- 3 Are Program actions increasing natural production of healthy juvenile salmon and steelhead, and on track to meet Program objectives for natural smolt outmigrants, escapement, and harvest?
- 7b Are flows creating conditions necessary for fish survival across life stages (e.g. temp, velocity, depth)?
- 9 How are Program actions affecting fish and wildlife populations, and vegetation communities within the Program area?

Performance Metrics:

Investigators:

George Kautsky, Hoopa Valley Tribe Fisheries Department

Desma Williams, Yurok Tribe Fisheries Program

Bill Matilton, Hoopa Valley Tribe Fisheries Department

Abstract:

This project is dependent upon partnering with fishery managers responsible for monitoring the harvest and escapement of spring and fall Chinook within the Klamath-Trinity Basin. Scales collected from these field efforts are catalogued, cleaned, impressed on acetate slides, and aged by the proposers. Age structure data complements general totals estimated for the Klamath Basin Chinook run stratified by recovery sector (e.g. fishery, hatchery, or natural spawning areas). This project contributes invaluable information to related efforts such as the annual Chinook harvest management process of the PPMC and the development of cohort reconstructions to assess performance of subsequent broods of Klamath-Trinity Chinook. This project evaluates long-term progress toward achieving TRRP goals and objectives. An Adult Fish PITA in the IAP summarizes: "What is the effect of TRRP habitat improvements on recruits per spawner and harvest, after removing effects of ocean conditions, temperatures, in-river flows, etc.?" One method for probing this question is the completion of cohort analyses based upon age-structured assessments of river returns by run and their specific contributions to fisheries. Cohort reconstructions are dependent upon age-structured run and fishery recovery data that are developed by the activity proposed herein.

History / Future:

Prior to 1991, the age composition of the inriver run was estimated by using a combination of: (1) scale analysis from a beach seining study conducted in the estuary and (2) the age composition of coded wire tagged fall chinook (fingerling releases) that returned to Iron Gate and Trinity River Hatcheries. Due to termination of the beach seining project and concerns that coded wire tagged hatchery fish may not reflect the age composition of the entire run, analysis of fall chinook scales collected from spawner surveys and fisheries throughout the Klamath-Trinity Basin has been utilized since 1992. The annual age composition project based upon scales collected from throughout the basin was initiated by the United States Fish and Wildlife Service (USFWS) in 1992 (STT 1995). Prior to 1995, the USFWS conducted the age composition project for the entire basin. Since 1995, the Hoopa Valley Tribe has conducted the project for the Trinity River. The USFWS and the Yurok Tribe have cooperatively conducted the Klamath Basin age composition project since 1996, and the Yurok and Hoopa Valley Tribes have cooperatively compiled the report for the entire basin since 1997

(e.g. see KRTAT 2011)

Coordination:

Cooperators include, but not limited to (carcass surveys involve numerous volunteers) California Department of Fish and Game, U.S. Fish and Wildlife Service, U.S. Forest Service, Salmon River Restoration Council, Karuk Tribe, and the Mid-Klamath Watershed Council.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013
- Proposal Brief -

Title: Develop cohort reconstructions for fall Chinook to evaluate cohort performance or year class strength, and population growth rate.

Total Request: \$18,112.00

Focus: Provide Restoration Action Feedback

Hypotheses Addressed:

Trinity River Flow Evaluation Study (1999): The goal of the Program is to restore and sustain natural production of anadromous fish populations downstream of Lewiston Dam to pre-dam levels, to facilitate dependent, tribal, commercial, and sport fisheries' full participation in the benefits of restoration

Big Questions Addressed:

- 3 Are Program actions increasing natural production of healthy juvenile salmon and steelhead, and on track to meet Program objectives for natural smolt outmigrants, escapement, and harvest?
Marking hatchery fish enables estimating natural population.
- 7b Are flows creating conditions necessary for fish survival across life stages (e.g. temp, velocity, depth)?
- 9 How are Program actions affecting fish and wildlife populations, and vegetation communities within the Program area?

Performance Metrics:

Investigators:

George Kautsky, Hoopa Valley Tribe Fisheries Department
Dave Hankin, Humboldt State University
Jerry E. Logan, Hoopa Valley Tribe Fisheries Department
Bill Matilton, Hoopa Valley Tribe Fisheries Department

Abstract:

The objective of developing and maintaining a cohort model is to provide insight on the performance of successive cohorts of naturally produced fish as a first step toward analyzing the variability in adult recruitment and parental stock size. This effort assembles and analyzes existing data for coded-wire-tag recoveries of Trinity River Hatchery fall Chinook in marine and freshwater recovery areas. Trinity River Hatchery-origin cohort numbers are reconstructed. Using hatchery-origin cohort numbers-at-age and annual age-specific river run estimates, this effort attempts to reconstruct numbers-at-age for cohorts of naturally produced Trinity River fall Chinook. Integration of each year's new data, with subsequent cohort reconstruction of additional brood years and ages of fish, produces useful stock-attribute information for project managers. This investigation will also focus on more detailed documentation of the cohort model for fall Chinook. Making such information available to partners fulfills a primary reporting metric.

History / Future:

Reconstructing cohorts of Trinity River origin naturally produced fall Chinook was launched in 2010 by efforts of Hoopa Valley Tribal Fisheries, working in coordination with the cohort reconstruction sub-group of the Fish 'Work Group' and CDFG office in Santa Rosa. The Hoopa Valley Tribal Fisheries intends to continue its work with the assistance of other sub-group members. Primary efforts in 2013 will be to update the model with another year's recovery data to be obtained from CDFG Santa Rosa. We also intend to develop output formats best suited for TRRP purposes as inspired by participation of sub-group members.

Coordination:

This effort is generally guided by the TRRP's Fish Work Group and the Cohort Reconstruction Sub-group of same. The Cohort Sub-group includes fishery biologists with expertise in adult fish population assessment:

Wade Sinnen (CDFG), Dave Hillemeier (Yurok Tribal Fisheries), Desma Williams (Yurok Tribal Fisheries), Joe Polos (USFWS). Consultations: Periodic progress reports and discussions with colleagues within the TRRP Fish Work Group and Cohort Sub-group. Partnerships and Capacity Building: This effort is partnered with numerous contributors including NOAA Fisheries and CDFG Santa Rosa (KOHM), TRRP scientists for application concepts, and other agencies involved in the recovery of marine and riverine CWT data in fisheries and escapement areas (Yurok Tribe, USFWS, USBOR, ODFW, PSMFC, USDA, CDFG).

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013

- Proposal Brief -

Title: Retrospective evaluation of topographic changes at Rush Creek delta on the Trinity River.

Total Request: \$54,701.00

Focus: Site Specific (Rush Creek Delta)

Hypotheses Addressed:

TRFES: (1) Rush Creek delta is no longer aggrading due to increased sediment transport from ROD high flow releases, and 2) coarse sediment is not routing through the Rush Creek backwater, and instead is depositing as a depositional wedge at the upstream end of the Rush Creek backwater.

Big Questions Addressed:

7 Are flow and sediment actions meeting annual objectives for each water year?

7c Is fine and coarse sediment effectively routed through the system?

Performance Metrics:

TRFEFR Tributary Delta Management Objectives

Investigators:

Fred Meyer, Hoopa Valley Tribe Fisheries Department

Andreas Krause, U.S. Bureau of Reclamation, TRRP Wvvl Office

Scott McBain, Hoopa Valley Tribe Fisheries Department

Andrea Hilton, Hoopa Valley Tribe Fisheries Department

Abstract:

Objectives:

- 1) Quantitatively document topographic changes (elevation, volume) that have occurred since 1996 from the Rush Creek delta, and since 2004 from the Rush Creek backwater depositional zone.
- 2) Summarize changes with respect to ROD management objectives (are we achieving ROD objectives?).
- 3) As is possible, relate topographic changes to causal mechanisms (ROD high flow releases, tributary floods).

Hypotheses: (1) Rush Creek delta is no longer aggrading due to increased sediment transport from ROD high flow releases, and 2) coarse sediment is not routing through the Rush Creek backwater, and instead is depositing as a depositional wedge at the upstream end of the Rush Creek backwater.

Contemporary topographic data will be evaluated against earlier topographic data to test these hypotheses. The TRFEFR objective of transporting Rush Creek delta material at a rate equal to input is an annual objective, but is also a long-term objective. Annual delta surveys have been discontinued; therefore, this effort will evaluate whether the objective is being met over a longer time-scale, which is a more appropriate assessment than an annual assessment due to the variability in sediment delivery and transport. Field observations by TRRP staff indicates that coarse sediment is not routing through the Rush Creek delta backwater, and will likely take many years to occur; the proposed field work to re-survey the depositional wedge at the upstream end of the Rush Creek backwater is to track progress towards filling the backwater (likely very small), and to make rough projections on how long it will take for natural deposition to fill the backwater and begin routing coarse sediment through the Rush Creek delta.

History / Future:

Background:

The duration of high flows in the TRFEFR is based on the general objective of transporting the volume of coarse sediment delivered by downstream tributaries (USFWS and HVT 1999). Prior to the ROD, Rush Creek, Grass Valley Creek, and Indian Creek were the largest sediment contributors in the reach immediately below Lewiston Dam. Construction and maintenance of Hamilton Ponds on Grass Valley Creek has virtually eliminated sediment delivery from Grass Valley Creek. Because the Indian Creek delta is constrained by valley walls on the right bank, sediment delivery from Indian Creek is largely transported by tributary and ROD high flow events; however, Rush Creek delta is less confined, and more dependent on ROD high flow releases to transport delivered sediments. Therefore, the specific TRFE high flow duration management objective is to transport the volume of coarse sediment from the Rush Creek delta at the same rate as delivery. A longer term management objective is to fully route sediment through all reaches of the Trinity River, including the backwater reaches immediately upstream of the Rush and Indian Creek tributary deltas.

Topographic surveys were started on Indian Creek delta in 1991, and on Rush Creek in 1996 (M&T and HVT 1997). Additional topographic and bathymetric surveys have been conducted over the past 15 years by DWR, Graham Matthews and Associates, and the Hoopa Valley Tribe. In addition, bathymetric and terrestrial LiDAR topography was collected in 2009.

Coordination:

Consultation: See:

United States Department of Interior. 2000. Record of Decision Trinity River Mainstem Fishery Restoration EIS/EIR. Washington, D.C.

United States Fish and Wildlife Service and Hoopa Valley Tribe. 1999. Trinity River Flow Evaluation Final Report. U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata, CA and Hoopa, CA.

Partnerships and Capacity Building:

This project will utilize data from the California Department of Water Resources, Graham Matthews and Associates, and TRRP. The investigation will be coordinated with the TRRP's Physical Work Group, including Partner agencies' technical representatives.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013
- Proposal Brief -

Title: Myxosporean parasites effects and energy reserves of juvenile Trinity R. Chinook

Total Request: \$18,662.00

Focus: Both Systemic and Action-Specific

Hypotheses Addressed:

Trinity River Flow Evaluation Study (1999): Myxosporean infection and triglyceride content(energy reserve) are similar in juvenile Chinook from the upper and lower reaches

Trinity River Flow Evaluation Study (1999): Cshasta and Parvicapsula minibicornis infections impair ocean entry of TR smolts

Big Questions Addressed:

- 3 Are Program actions increasing natural production of healthy juvenile salmon and steelhead, and on track to meet Program objectives for natural smolt outmigrants, escapement, and harvest?
are there spatial differences in parr fitness

Performance Metrics:

Investigators:

J. Scott Foott, USFWS, CA-NV Fish Health Center

Abstract:

There are 2 separate elements to this proposal: 1) A survey of parr and smolts from rotary screw traps at Pear Tree (RM94) and Willow Creek (RM21) for *Ceratomyxa shasta* (CS) and *Parvicapsula minibicornis* (PM) infection, and energy reserves (condition factor and whole body triglyceride content), and 2) an experiment to determine the effect of low level CS infection and moderate to high level PM infection on ocean entry survival of Trinity R. smolts.

History / Future:

Coordination:

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013

- Proposal Brief -

Title: Rehabilitation Site Effectiveness Monitoring and Analytical Framework

Total Request: \$87,000.00

Focus: Provide Restoration Action Feedback

Hypotheses Addressed:

TRRP Integrated Analysis Plan (2009): Management actions will increase and improve both quantity and quality of habitat (especially rearing habitat for target fry and pre-smolt salmonids) from Lewiston Dam to the North Fork Trinity.

TRRP Integrated Analysis Plan (2009): Targeted water year specific flows will in concert prevent riparian vegetation seedlings from exceeding detrimental encroachment thresholds

TRRP Integrated Analysis Plan (2009): Program management activities (ROD flows, coarse sediment additions, and mechanical actions) are intended to increase fluvial processes beyond key magnitude, duration, and frequency thresholds, preventing detrimental riparian encroachment

TRRP Integrated Analysis Plan (2009): Program actions will maintain or increase productivity and abundance of target riparian bird species in the Program area by increasing the complexity of riparian habitat from the water's edge to the upland boundary of the floodplain.

TRRP Integrated Analysis Plan (2009): Management of flow releases in association with construction activities (channel rehabilitation site construction, gravel placement, riparian planting) will increase quantity and availability of both terrestrial and aquatic macroinvertebrate habitat.

TRRP Integrated Analysis Plan (2009): Increasing the quality and availability of suitable fry and juvenile rearing habitat will increase size, growth, condition and overall health of natural fry and juvenile salmonids.

TRRP Integrated Analysis Plan (2009): Variable flow magnitudes and frequencies (dependent on water year type) will promote the establishment and maintenance of healthy riparian vegetation

TRRP Integrated Analysis Plan (2009): Program actions will maintain or increase productivity and abundance of target riparian bird species in the Program area by increasing the complexity of riparian habitat from the water's edge to the upland boundary of the floodplain.

TRRP Integrated Analysis Plan (2009): Program actions at rehab sites are intended (in conjunction with ROD flows and coarse sediment additions) to prevent detrimental riparian encroachment and increase the topographic and structural complexity of the river channel

Big Questions Addressed:

- 6 Which channel rehabilitation actions designed to create dynamic alluvial river processes are most effective at creating and maintaining fish habitat?
- 7 Are flow and sediment actions meeting annual objectives for each water year?
 - 7a Are flows and volume of coarse sediment augmentation sufficient to create and maintain fish habitat?
 - 7b Are flows creating conditions necessary for fish survival across life stages (e.g. temp, velocity, depth)?
 - 7c Is fine and coarse sediment effectively routed through the system?
 - 7c Is fine and coarse sediment effectively routed through the system?
- 9 How are Program actions affecting fish and wildlife populations, and vegetation communities within the Program area?

Performance Metrics:

Investigators:

DJ Bandrowski, U.S. Bureau of Reclamation, TRRP Wvvl Office

Darcy Pickard, ESSA Technologies

Abstract:

It is critical to assemble key findings from the Program's individual monitoring efforts at rehabilitation sites and synthesize these across: space, time, and disciplines and, most importantly, to relate these back to the design objectives. This investigation is intended to undertake that necessary synthesis of ongoing monitoring while in addition, developing and implementing a new approach for the qualitative assessment of the performance of all rehabilitation site features compared with their design objectives. This coarse level census will be combined with rigorous, quantitative assessments of a random sample of design objectives/features. A systematic framework will be developed for deciding which design objectives and features require quantitative measurements and how they should be selected from the population. This framework will ensure that there is no duplication of effort among proposals and will prioritize monitoring gaps and objectives with the greatest uncertainty. The primary reason for monitoring rehabilitation sites is to inform future designs, therefore this proposal is critical to ensure that all of the available information is systematically evaluated and used to answer questions that are of interest to the design team in a useful time-frame.

History / Future:

The Trinity River Restoration Program (TRRP) - Record of Decision (ROD) outlined 47 mechanical channel rehabilitation project sites that would be implemented across a "Phase I" and "Phase II" program. The TRRP completed the Phase I rehabilitation project sites between 2005 and 2010. The TRRP is now underway planning, designing, and constructing the Phase II rehabilitation project sites that will continue through approximately 2018 timeframe. The goal of this proposal is to synthesize existing data from other proposals and collect additional data from both Phase I and future Phase II sites on an annual basis. Both the historical and future synthesis of data and analyses will help develop trends and inform the current design process, help answer design team questions, and refine future design goals and objectives.

Coordination:

Coordination and collaboration is the essence of this proposal. The analytical framework that would be developed provides a systematic and strategic vehicle for data synthesis and reporting from other proposals that are performing monitoring at channel rehabilitation project sites. Coordination will occur at multiple levels and throughout annual rehab site monitoring activities to ensure redundancy is not occurring and efficiency is being achieved amongst program partners. For the new design effectiveness monitoring activities there will be direct coordination and support between the Design Team and existing monitoring teams. This coordination will help determine which program partner could most efficiently collect similar or additional data to look at rehab project sites to determine if implementation activities have met the site/feature specific design goals and objectives.

The overall goal of this proposal is to integrate between monitoring activities at rehab project sites and the Design Team, effectively providing an adaptive management loop between design, implementation, and monitoring.

Consultations: Detailed planning and coordination meetings will be conducted between key monitoring groups to address rehab monitoring logistics and determine where efficiencies could be realized and redundancies reduced.

Partnerships and Capacity Building: The proposal will provide a link between the Design Team and monitoring teams to create a broader and more specific partnership to help synthesize data and integrate analyses in order to refine rehab project site designs.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013
- Proposal Brief -

Title: Gravel Implementation Tracer Experiment

Total Request: \$206,000.00

Focus: Provide Restoration Action Feedback

Hypotheses Addressed:

Gravel augmentations tend to disperse with distance from the augmentation location.

Augmented gravel particles typically travel no more than a few geomorphic channel units per year.

Gravel augmentations have minimal effect on bed elevations at distances greater than a few geomorphic channel units downstream from the augmentation locations.

Big Questions Addressed:

- 1 Are Program actions rehabilitating the river itself, restoring the attributes that produce a healthy alluvial river system?
- 6 Which channel rehabilitation actions designed to create dynamic alluvial river processes are most effective at creating and maintaining fish habitat?
- 7a Are flows and volume of coarse sediment augmentation sufficient to create and maintain fish habitat?
- 7c Is fine and coarse sediment effectively routed through the system?

Performance Metrics:

Gravel travel distances

Investigators:

David Gaeuman, U.S. Bureau of Reclamation, TRRP Wvvl Office

DJ Bandrowski, U.S. Bureau of Reclamation, TRRP Wvvl Office

Abstract:

This proposal is intended to demonstrate the extent to which gravel injected into the channel during high flow events is transported downstream. This investigation will provide an independent line of evidence regarding the fate of augmented gravel to improve confidence in inferences drawn in a related investigation (Gravel Implementation Monitoring).

History / Future:

The proposed use of out-of-basin gravel could be continued in the future, but we currently have no plans to do that.

Coordination:

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013

- Proposal Brief -

Title: Integrated Flow and Sediment Modeling to Predict Planform Dynamics

Total Request: \$211,740.00

Focus: Both Systemic and Action-Specific

Hypotheses Addressed:

Vegetation plays an important role in reducing effective stress acting on grains and increasing the strength of alluvial banks

Changes in flow characteristics result in undetermined changes in sediment transport conditions and capacity, and morphologic change, including bank erosion in alluvial reaches

Management activities to improve fish habitat result in changes to channel hydraulics at the local and reach scales

The net result of changes in flow regime and channel characteristics at individual reaches affect sediment-transport conditions, requirements for gravel augmentation and downstream morphology

Changes in channel width result in associated changes in shear stress

Big Questions Addressed:

- 1 Are Program actions rehabilitating the river itself, restoring the attributes that produce a healthy alluvial river system?
- 4 Are Program actions sustaining or enhancing the riparian community structure including: vegetation, fish, and wildlife?
- 6 Which channel rehabilitation actions designed to create dynamic alluvial river processes are most effective at creating and maintaining fish habitat?

Performance Metrics:

Predicted bank erosion rates

Investigators:

David Gaeuman, U.S. Bureau of Reclamation, TRRP Wvvl Office

David Bandrowski, U.S. Bureau of Reclamation, TRRP Wvvl Office

Abstract:

A data collection and numerical modelling methodology is proposed to predict the hydraulic, sediment transport, and bank erosion processes that will occur as the results of TRRP management actions. The methodology can be used to assess the bank erosion that may occur within a specific project site and it can also be used to assess the effect that one project site may have on surrounding project sites. In addition, the cumulative effect of multiple management activities can be assessed using this methodology. The methodology includes the collection of detailed bank properties within the select reach, and uses Bureau of Reclamation's 2-D flow and sediment transport model (SRH-2D) with the Bank-Stability and Toe-Erosion Model (BSTEM). In the first year of this effort, the methodology will be applied to the Trinity River from Upper Junction City through Chapman Ranch. The simulations will include the effect of various design features and include the calibration of the model to historical data. This methodology can be applied to additional reaches in the future to increase our understanding of the system and improve the design, implementation, and staging of TRRP activities.

History / Future:

This project builds on previous work of integrating the Bureau of Reclamation's 2-D flow and sediment transport model (SRH-2D) with the Bank-Stability and Toe-Erosion Model (BSTEM). Model integration is currently being conducted and will be tested in the Upper Junction City Reach for existing and design conditions, initially as two separate models with an interface and later, as a fully integrated model. Further

application of the integrated model will be proposed for the reach upstream of Junction City to assess the sediment processes over a larger reach and incorporating several TRRP project sites including Upper Junction City, Sky Ranch, Oregon Gulch, Sheridan Creek, Deep Gulch, and Chapman Ranch, encompassing approximately 3 miles of the Trinity River. The model will assess the hydraulic, sediment transport, and bank erosion process within each project site and the interactions between the project sites.

Coordination:

This project will be in collaboration with personnel at the BOR Technical Services Center and will engage the TRRP Design Workgroup. This study intends to link together the impacts associated with multiple designs by multiple entities involved in the TRRP and by its nature will tend to increase the collaboration between project partners as well as the personnel involved on this proposal.

Trinity River Restoration Program - Proposed Investigation for Federal Fiscal Year 2013
- Proposal Brief -

Title: Geomorphic Response to High Flow Duration

Total Request: \$61,500.00

Focus: Provide Restoration Action Feedback

Hypotheses Addressed:

2010 Sediment Symposium: Maximum bar growth occurs at maximum flow magnitude (i.e. depth) and varies across the release hydrograph.

Big Questions Addressed:

- 1 Are Program actions rehabilitating the river itself, restoring the attributes that produce a healthy alluvial river system?
- 7 Are flow and sediment actions meeting annual objectives for each water year?
- 7a Are flows and volume of coarse sediment augmentation sufficient to create and maintain fish habitat?

Performance Metrics:

Investigators:

Andreas Krause, U.S. Bureau of Reclamation, TRRP Wvvl Office
Scott McBain, McBain and Trush
Mark Smelser

Abstract:

Little guidance exists in the literature or in practice to develop the duration of high flow release schedules intended to accomplish geomorphic work. The Trinity River Flow Evaluation Study (USFWS et. al. 1999) and the Record of Decision recommended high flow release magnitudes and durations to convey sediment supplied by Rush Creek. It was envisioned that those releases would also to build and maintain a complex channel, with a specific focus on building bars, initiating channel migration, and other physical processes. Uncertainty surrounding the appropriate high flow duration target would be reduced by the including additional geomorphically based targets. One potential additional target identified by the Physical Workgroup and 2010 Sediment Symposium is the duration of flow where the rate of bar building decreases, which has been considered on the Glen Canyon Project. This proposed study aims to develop geomorphic response curves for bar height, bar volume, pool depth, and residual pool volume that could also be used to help develop annual high flow release duration recommendations. Topographic monitoring will be conducted at selected bar and pool locations during a high flow release hydrograph exceeding 8,500 cfs to develop these geomorphic response curves. Such flow releases only occur in wet and extremely wet water years that happen in about 4 out of 10 years. Deliverable dates shown in this proposal assume WY2013 will be a wet or extremely wet water year.

History / Future:

This is a one-time project is targeted at informing development of high flow release hydrograph duration recommendations. Ideally, the geomorphic response curves developed under this proposed work would indicate an optimal flow duration that maximizes geomorphic response while using a minimum volume of water.

Coordination:

This proposal was developed jointly developed by members of the Flow Duration Sub-group of the Flow Workgroup. Sub-group members include: Reclamation, Hoopa Valley Tribe, and the California Dept. of Fish and Game. The proposal is in response to a need flow duration uncertainties identified in the Trinity River

Flow Evaluation Study (USFWS et. al. 1999) and incorporates recommendations from the 2010 Trinity River Sediment Symposium and the Flow Duration Sub-group.