Appendix C
Implementation Plan and AEAM Plan

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APPENDIX C

Implementation Plan for the Preferred Alternative of the Trinity River EIS/EIR

The proposed action consists of 6 components: 1) an increased flow regime and associated OCAP for managing releases and reservoir levels; 2) a channel rehabilitation program (mechanical rehabilitation); 3) a coarse and fine sediment management program; 4) infrastructure modifications; 5) upslope watershed restoration; and 6) an Adaptive Environmental Assessment and Management organization.

1. Increased Flow Regime and Trinity River Operating Criteria and Procedures

1.1 Legal Principles Concerning TRD Operations

In section 3406(b)(23) of the Central Valley Project Improvement Act (CVPIA) (Public Law 102-575, 106 Stat. 4600, 4720), Congress called for the development of operating criteria and procedures (OCAP) for the Trinity River Division (TRD), along with recommendations for necessary instream fishery flow requirements, for the restoration and maintenance of the Trinity River fishery. Accordingly, this document describes the legal principles and scientific recommendations that apply to TRD operations and establishes OCAP required for the proper operation of the TRD consistent with those principles and recommendations.

This section briefly describes the legal principles that apply to the operations of the TRD. A detailed description can also be found in the FEIS/EIR, chapter 1.

In 1955, Congress authorized the construction and operation of the TRD (Public Law 84-386). Although Congress authorized the TRD as an integrated feature of the Central Valley Project, the authorizing legislation also directed the Secretary of the Interior to ensure the preservation and propagation of the Trinity River's fish and wildlife resources. A 1979 Solicitor's Opinion stated that the 1955 Act thus required sufficient in-basin flows determined by the Secretary as necessary for fish and wildlife to take precedence over exports of Trinity River flows to the Central Valley. *Proposed Contract with Grasslands Water District* (Dec. 7, 1979). Following construction and operation of the TRD in the early 1960s, substantial fish populations declines occurred. A 1980 EIS concluded that insufficient stream flows in the Trinity River represented the most critical limiting factor. Therefore, Secretary Andrus initiated the Trinity River flow study in 1981 to determine necessary instream flows in the Trinity River and other measures necessary to restore and maintain the Trinity River fishery consistent with the statutory directives of the 1955 Act and the federal government's trust responsibility to the Hoopa Valley and Yurok Tribes.

Congress reiterated the importance of the Trinity River fishery in subsequent legislation. In 1984, Congress passed the Trinity River Basin Fish and Wildlife Management Act (Public Law 98-541) that established a goal to restore the basin's fish and wildlife populations to

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those that existed prior to construction of the TRD and directed the Secretary to implement measures to restore fish and wildlife habitat in the Trinity River. In re-authorizing this legislation in 1996 (Public Law 104-143), Congress further elaborated on the restoration goal, stating that restoration would be measured "not only by returning adult anadromous fish spawners," but also by the ability of dependent tribal, commercial, sport fishers to enjoy the benefits of restoration through a harvestable fishery resource.

With regard to tribal fishing rights, the Solicitor issued an opinion entitled "Fishing Rights of the Yurok and Hoopa Valley Tribes," M-36975 (Oct. 4, 1993). The Opinion recognized the historic dependence of the area's Indians upon the fishery resources of the Klamath River Basin (including the Trinity River) for subsistence, ceremonial, and economic purposes; determined that the Yurok and Hoopa Valley Tribes have federally reserved fishing rights as a result of this dependence and the subsequent establishment of their reservations; and concluded that the Tribes were entitled to an allocation of the Klamath Basin fishery harvest sufficient to support a moderate standard of living, but no more than 50 percent of the annual harvest allocation. However, during times of shortages tribal fisheries may take priority over other fisheries (Solicitors Opinion, footnote 39). The Opinion also stated that protection of these rights could affect off-reservation activities. Under the Magnuson Fishery Conservation and Management Act (16 U.S.C. § 1801 *et seq*.), the Department of Commerce adopted the Solicitor's determinations in an interpretative rule that restricted ocean harvest. 58 Fed. Reg. 68063 (Dec. 23, 1993). The Solicitor's Opinion and the subsequent rule were upheld by the United States Court of Appeals for the Ninth Circuit in *Parravano v. Babbitt*, 70 F.3d 539 (9th Cir. 1995).

Perhaps most significantly, Congress passed the CVPIA in 1992 that further addressed, *inter alia*, the need to restore the Trinity River and its resources. In section 3406(b)(23), Congress directed the completion of the flow study initiated by Secretary Andrus "in a manner that insures the development of recommendations, based on the best available scientific data, regarding permanent instream fishery flow requirements and [TRD OCAP] for the restoration and maintenance of the Trinity River fishery." Congress also provided for interim minimum flows to be continued in the Trinity River, consistent with a prior administrative decision by Secretary Lujan, pending completion of the flow study. The section further provided that, if the Secretary and the Hoopa Valley Tribe concur in these recommendations, then any increased instream fishery flows and the OCAP "shall be implemented accordingly." Thus, in meeting the statutory requirements of developing instream fishery flow requirements and TRD OCAP, Congress incorporated the previously recognized goals and rationale for the restoration of the Trinity River fishery, stating that the purposes of these efforts were "to meet the Federal trust responsibilities to protect the fishery resources" and "to meet the fishery restoration goals" of the 1984 Act.

It should also be noted that operations of the TRD must also be consistent with other applicable laws. For example, pursuant to the Endangered Species Act (16 U.S.C. § 1531 *et seq*.), TRD operations must avoid jeopardizing threatened coho salmon and associated critical habitat, as well as affirmatively taking actions to conserve listed species. Under the Clean Water Act, the Trinity River has been listed as an impaired water body by the State of California, and the State's Water Quality Control Plan for the North Coast Region states that "flow depletion" by TRD diversions to the Central Valley are a major cause of the river's impaired status in terms of sediment. The State of California's Water Resources Control

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Board has also addressed the needs of the Trinity River, *e.g.*, a 1990 water permit condition specifically states that TRD operations shall not "adversely affect salmonid spawning and egg incubation in the Trinity River."

These OCAP have been formulated according to the legal principles outlined above. These OCAP are designed to implement the recommendations provided in the Preferred Alternative in the FEIS / EIR in order to restore and maintain the fishery resources of the Trinity River. By determining the fishery flow requirements for the Trinity River pursuant to applicable law, including the CVPIA, the flow requirements and annual hydrology implicitly determine the surplus water available for diversion to the Central Valley. These OCAP amend and supplement those relating to the TRD in the 1992 Long-term Central Valley Project Operations Criteria and Plan (CVP-OCAP). To the extent inconsistent with the CVP-OCAP, these OCAP control.

1.2 Purpose and Use of This Document

This document provides supplemental information and guidance to support the implementation of the Record Of Decision (ROD) of the Preferred Alternative of the Trinity River Final EIS / EIR (May 2000). The Preferred Alternative increases dam releases to the Trinity River to restore the anadromous fishery resources. This document supplements and supersedes information on the Trinity River sections of the Long-term Central Valley Project Operations Criteria and Plan (LCVP-OCAP) (USBR 1992). For more detailed information regarding operations of the entire Trinity River Division of the Central Valley Project, refer to the CVP-OCAP (USBR 1992).

1.3 Instream Release Volumes to the Trinity River

Under the preferred alternative, releases to the Trinity River for salmon and steelhead restoration will vary with annual basin water runoff for the watershed upstream of Lewiston Dam (Table 1). Historical hydrology was used to delineate five water-year (WY) classes. A water year begins on October 1 and ends on September 30. Pre-dam flow records (WY1912 to 1960) from the USGS gaging station at Lewiston and post dam estimates (WY 1961 to WY 1995) of inflow into Trinity Lake were combined, ranked, and exceedence probabilities calculated. Annual instream fishery flows are based upon five water-year classes that were identified in the Trinity River Flow Evaluation Report (USFWS and Hoopa Valley Tribe, 1999).

TABLE 1
Annual (April through March) instream fishery flows for Trinity River.

Water-Year Class	Trinity River Allocation (TAF)	Annual Basin Water Runoff (TAF)[a]	Probability of Occurrence
Extremely Wet	815.2	2,000	0.12
Wet	701.0	1,350 to 2,000	0.28
Normal	646.9	1,025 to 1,350	0.20
Dry	452.6	650 to 1,025	0.28
Critically Dry	368.6	<650	0.12

[a]Based on the basin area above Lewiston Dam.

1.4 Operations Forecasting

Forecasting of hydrological conditions is an ongoing procedure that Reclamation uses to project water supply availability. This process is integral to the operations planning process whereby the current year is classified, river flow schedules are developed, and other beneficial uses of the water supply are determined.

Beginning in February, Reclamation begins forecasting the upcoming year hydrologic conditions and potential operations. Forecasts provide estimates of monthly information on water allocations, reservoir storage, instream releases, electrical generation and capacity. Forecasts are based upon precipitation and runoff conditions and snow course measurements. The runoff forecast in February is considered the first reliable forecast because more than one half of the precipitation year has occurred and snowpack measurements regularly occur. Runoff forecasts are updated in March, April, and May and are used in operational planning for the rest of the water year. Forecasts that occur later in the year are more reliable due to decreased variability of precipitation patterns. Forecasts are generally produced with 50 and 90 percent exceedence probabilities, but the 90 percent exceedence forecast is generally used for planning purposes and is required for CVP operational forecasts as a result of the 1993 Biological Opinion on Sacramento River winter run Chinook (NMFS, 1993).

1.5 Water Year Designation

Normally the water year type can be reliably determined by April 1, when maximum snow pack has occurred. To determine the water year type, annual basin runoff above the Lewiston gage is determined. Annual basin runoff is calculated by summing the amount of runoff that has occurred from October until April 1 and a volume of water that Reclamation forecasters predict (90 percent probability of exceedence) will runoff during the months remaining in the water year (i.e., April through September) using the April 1 runoff forecast projection from the California cooperative snow surveys, California Department of Water Resources, Bulletin 120. Total water runoff is then compared to the ranges in Table 1 to designate the water year class.

1.6 Dam Releases to the Trinity River

Beginning in early February, Reclamation will provide the Trinity Management Council (see the section Organizing to Implement the Trinity River Restoration Program) with a preliminary estimate of the water year classification. The Trinity Management Council (TMC) will formulate a preliminary instream fishery release schedule to the Trinity River and submit it to Reclamation for operational planning. Final decisions on the designation of the water year will be based on the April 1 runoff forecast. By April 15 of each year, Reclamation will request from the TMC, a final Lewiston Dam instream fishery release schedule. Reclamation will operate the TRD as closely to the proposed schedule as technically possible.

Initially, Lewiston Dam spring releases of 8,500 and 11,000 ft^3/s that are recommended for Wet and Extremely Wet water years, respectively, will not be released into the Trinity River due to the need to modify 4 bridges and address other existing improvements in the floodplain that may be affected by releases in excess of 6,000 ft^3/s. Peak spring releases for Wet and Extremely Wet water years will be held to 6,000 ft^3/s until sufficient construction activities have occurred to allow for the safe release of higher spring flows. It is currently anticipated that these construction activities will preclude releasing higher (>6,000 ft^3/s) spring flows until water year 2003 (See Footnote in Attachment 1).

Attachment 1 provides an average daily flow rate in cubic feet per second for Lewiston Dam releases to the Trinity River. Though the annual Trinity River fishery volumes will follow those identified in Table 1 according to water year type, the daily releases may be changed in magnitude and/or duration at a future date to achieve fishery resource restoration goals in the Trinity River. Potential changes will be identified and referred to Reclamation for action by the TMC, the decision-making group of the Adaptive Environmental Assessment and Management (AEAM) organization and consistent with all applicable laws.

In October 1991, the State Water Resources Control Board established temperature objectives for the Trinity River, that were approved by U.S. Environmental Protection Agency as Clean Water Act standards in March, 1992 (Table 2). To assure the objectives are met, flows of at least 450 ft^3/s are scheduled during the summer until October 15th, after which ambient conditions are typically cold enough to warrant reducing flows to 300 ft^3/s.

TABLE 2
Temperature Objectives for the Trinity River.

Time Period	Daily Average °F (not to exceed)	River Reach
July 1 to September 14	60	Lewiston to Douglas City
September 15 to October 1	56	Lewiston to Douglas City
October 1 to December 31	56	Lewiston to the Confluence with the North Fork Trinity River

1.7 Ramping Rates

The rate at which dam releases increase or decrease are an important fishery concern as is the ability to respond to rare hydrologic events that can risk dam safety. Acceptable rates of change can vary with time of the year or day, species, water temperature, fish distribution and channel morphology. Rates of decreasing flow are particularly important to reduce stranding of salmon and steelhead fry. The criteria in Table 3 have been suggested by the USFWS (Memorandum from the USFWS to USBR, February 5, 1997) and have been used by Reclamation since 1997. These criteria supersede those provided in the LCVP-OCAP (USBR 1992). Scientific justification for these rates is provided in Attachment 2.

TABLE 3
Criteria for releases to the Trinity River from Lewiston Dam.

Lewiston Dam Release (ft^3/s)	When Increasing Flow[a]	When Decreasing Flow[b]
At or above 6,000	1,000 ft^3/s per 2 hours	500 ft^3/s per 4 hours
6,000 to 4,000	1,000 per 2 hours	400 per 4 hours
2,000 to 4,000	500 per 2 hours	200 per 4 hours
500 to 2,000	250 per 2 hours	100 per 4 hours
300 to 500	100 per 2 hours	50 per 4 hours

[a]Criteria are based upon the 1992 LCVP-OCAP (USBR 1992), and dam releases can increase anytime during the day.

[b]Criteria are based upon a recommendation from USFWS for November 1 thru April 15, and dam decreases to flow are recommended only during the night. After April 15, decreases can occur anytime during the day.

Activities of the Preferred Alternative, such as increased river flow and mechanical manipulations, will alter the existing stream channel. As such, the ramping rates provided in Table 3 may be refined at a future date. The TMC, through the AEAM organization, will evaluate ramping rates identified in Table 3 to meet fishery resource restoration objectives.

1.8 Trinity Lake Storage and Safety-of-Dam Releases

Lake storage targets established for the period between November 1 and March 31 identified in the LCVP-OCAP (USBR 1992) are established to attempt to maximize storage and beneficial uses of stored water (for hydropower production and irrigation and M&I water supplies in the Central Valley), as well as to minimize the risk of catastrophic dam overtopping. Storage in Trinity Lake is regulated within the powerplant capacity to storages shown in Table 4. When storage targets are exceeded, Reclamation releases excess water from Trinity Dam, that is then discharged to the Trinity River or to the Sacramento River through the Clear Creek Tunnel. Such releases are termed Safety-of-Dam (SOD) releases. When such releases occur, the quantity of water used will not be considered part of the fishery's year class annual allocations.

1.9 Cold Water Storage

Availability of cold water throughout the spring, summer, and fall are important criteria that affect downstream fishery resources. To assure water temperatures are suitable for salmonids in the Trinity River, Reclamation operates Trinity Lake and Lewiston Reservoirs to provide suitably cold water for release to the Trinity River, as well as cold water resources for salmonids in the Sacramento Basin. Reservoir storage is maintained at levels that typically do not compromise the availability of cold water to meet Trinity River Basin temperature objectives. Trinity Lake storage of 1,000,000 acre-feet through the end of October typically provides adequate quantities of cold water while allowing for power generation at Trinity Dam. However, when storage is below roughly 750,000 acre-feet during the July- September period or below 1,000,000 af in October, Reclamation may have to use the lower most outlet, the auxiliary outlet, to discharge cold water, that forgoes power generation. During extremely dry conditions (e.g. multiple year drought), carryover storage as low as 400,000 acre-feet results in extensive use of the auxiliary bypasses to achieve suitably cold water.

TABLE 4
Target Storage of Trinity Lake.

Date	Storage (acre-feet)	Lake Surface Elevation (ft)
Nov 1 to Dec 31	1,850,000	2327
Jan 31	1,900,000	2334
Feb 28,29	2,000,000	2341
Mar 31	2,100,000	2348

1.10 Relationship to the Adaptive Environmental Assessment and Management Organization

An integral part of the new flow regimes for the Trinity River is the implementation of the AEAM organization. AEAM is an important process for management of complex physical and biological systems such as the Trinity River. The AEAM organization uses a designated team of scientists that recommend changes to fishery restoration efforts and annual operating schedules in response to monitored effects of implemented actions and in order to ensure that restoration goals of the Trinity River are effectively met. Annual recommendations are approved by the TMC. Alterations in magnitude and/or duration of releases into the Trinity River (while maintaining annual instream release volumes for each water year type) are dependent on the information/management needs of the Trinity River program. Any substantial deviation from the currently recommended fishery flow regime would be done in accordance with all applicable laws. For more specific information concerning the AEAM organization, refer to the AEAM section of the Trinity River Final EIS/EIR.

2. Mechanical Rehabilitation

2.1 Mainstem Mechanical Rehabilitation Program

Mechanical rehabilitation activities including the construction of channel rehabilitation and side channel projects will occur along the mainstem Trinity River from Lewiston Dam to the North Fork Trinity River confluence. Mechanical rehabilitation sites will increase the amount of shallow, low velocity areas for salmonid fry rearing, increase habitat complexity, provide stable habitat for salmonid fry and juveniles over a wide range of flows, and allow the river dynamics necessary to maintain an alluvial system. The intent of channel rehabilitation is to selectively remove the fossilized riparian berm (berms that have been anchored by extensive woody vegetation root systems and consolidated sand deposits), provide restoration of the natural riparian vegetation and age structure, and recreate alternate point bars similar in form to those that existed prior to the construction of the TRD.

Channel rehabilitation is not intended to completely remove all riparian vegetation, but to remove vegetation at strategic locations to promote alluvial processes necessary for the restoration and maintenance of salmonid populations. Channel rehabilitation projects will also allow fluvial processes to affect areas that do not receive mechanical treatments. The tightly bound berm material is hard to mobilize even at high flows, thus requiring some mechanical berm removal. After selected berm removal, subsequent high-flow releases and coarse sediment augmentation will maintain these alternate point bars and create a new dynamic channel.

Specific channel rehabilitation recommendations vary by river segment between Lewiston Dam and the North Fork Trinity confluence because the needs of channel rehabilitation change with tributary inputs of flow and sediment. A total of 44 potential channel-rehabilitation sites and 3 potential side channel-rehabilitation sites have been identified in the proposed action. These potential sites are located where channel morphology, sediment supply, and high-flow hydraulics would encourage a dynamic, alluvial channel. Appropriate agreements with landowners must be obtained before any access or construction on private lands. Other factors such as property ownership, access to sites, cost and available funding will then be considered in the prioritization process.

Before any actual physical work can begin on these sites, additional environmental documents, building upon, and "tiering" from, the Final EIS/EIR, will first have to be prepared. Furthermore, additional federal approvals (NEPA, ESA, 404, etc), along with

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approvals from Trinity County and the California Department of Fish and Game in some instances, will be necessary. A short implementation period for a significant number of these projects is recommended to quickly increase the quality and quantity of salmonid habitat. The remaining projects may then proceed following an evaluation of the interaction of the channel rehabilitation sites with the new flow regimes.

2.2 High Flow and Channel Rehabilitation Implementation

Although flows up to 11,000 ft^3/s will not likely occur before the completion of bridge and structure modifications, the construction of mechanical rehabilitation projects should begin as soon as possible. This will assure that some modifications will be in place that will allow the river to create additional habitat once high flows can be implemented. It is important to emphasize that projects should be constructed with the understanding that the higher flows as recommended for fishery restoration objectives will occur when floodplain structures have been modified to accept higher flows. Without increased flows, channel and habitat diversity will not be greatly improved at mechanical rehabilitation sites. High flows will help establish proper riparian function by maintaining a higher water table at critical times, sort and distribute coarse and fine sediment adding to substrate complexity, and provide nutrient dispersal across floodplains and within the channel by movement and deposition of wood and riparian debris. River flow is an integral component to restoring aquatic and floodplain habitats. High river flow will continue to be the primary reason for improvements to habitat at mechanical rehabilitation sites and the river as a whole.

2.3 Location and Implementation Plan

Twenty-four sites are proposed during the first three years of construction if adequate funding is available. Additional projects will be constructed after evaluation of the first series of projects under Adaptive Environmental Assessment and Management. This evaluation will be ongoing beginning with construction of the first projects, but an interim period without construction activities may be necessary to fully evaluate the effectiveness of project designs and the effect of the new flow regime before beginning construction on the remaining sites.

Locations of project sites will generally occur in areas of historic point bars, channel meander areas, and high flow channels. These sites were determined to be the most suitable areas when analyzed by aerial photos and during reconnaissance surveys in 1995. An additional field survey was conducted in late 1999 to determine if the original 47 proposed sites were still the most appropriate areas for projects. Most of the previously identified sites are still in need of mechanical rehabilitation; however, the morphology at some sites has changed and some sites appear to be more appropriate for more immediate construction than others.

To determine prioritization for construction, the Mainstem Restoration Subcommittee of the Trinity River Task Force has begun the development of biologic and geomorphic prioritization criteria. Potential benefits and the certainty of benefits for each project are evaluated based on several criteria. Each potential site will be evaluated by this process and given a score based on biological and geormorphic considerations. Appropriate agreements with landowners must be obtained before any access or construction on private lands. Other factors such as property ownership, access to sites, cost and available funding will then be considered in the prioritization process.

Construction of past pilot projects was limited by permit requirements to summer months to reduce fishery impacts. The primary construction season for future projects will likely be similarly constrained. However, construction during other seasons should not be precluded. Construction of the majority of any individual project could occur during other seasons with limited environmental impacts. Removal of riparian vegetation during other seasons could occur and the site could be built to grade without impacting in channel habitat. Tributary accretion that increases mainstem flows may create turbidity from sand and fine sediment, but this would occur regardless of the time of year a project is constructed. If a project is built during summer months, the fine sediment that remains on a point bar will still be moved into the channel by the first high flows following construction. Winter construction may actually be advantageous in some situations because later season floods that occur in January or February for example, may transport sediment out of the system more effectively than earlier freshets that occur in October or November. There may also be additional advantages to construction during other seasons such as eliminating impacts to nesting songbirds, increased assimilative capacity for construction-generated turbidity, and decreased construction costs.

3. Coarse and Fine Sediment Management Program

3.1 Coarse Sediment Augmentation Program

A coarse sediment management program is needed to replenish substrate essential in creating abundant fish habitat and attaining a functional dynamic alluvial river system (McBain & Trush, 1997). Blocked by the dams of the TRD, coarse sediment supplies from Lewiston Dam to the confluence with Rush Creek have been reduced mainly to those quantities artificially supplied through a spawning gravel augmentation program. As a consequence the amount of gravel stored immediately downstream of Lewiston Dam is decreasing. The previous augmentation program that existed was not sufficient to achieve a necessary balance of coarse sediment supply. Increasing river flows to magnitudes greater than those that have occurred in the past will increase gravel transport capability and therefore will require an augmentation program.

3.1.1 Immediate Coarse Sediment Needs

Two sites require immediate coarse sediment augmentation for spawning purposes. A 1,500-foot reach immediately downstream of Lewiston Dam (River Mile (RM) 111.9) needs roughly 10,000 yd^3 of course material (5/16 to 5 inch). A 750 foot reach immediately upstream of the USGS cableway at Lewiston (RM 110.2) requires roughly 6,000 yd^3 of course material (5/16 to 5 inch).

Coarse sediment sources are available in the immediate area and will be used for initial augmentation. Sources include dredge tailing downstream from Lewiston at RM 108.5, RM 106.3, and other locations. Dredge tailings are to be screened and substrate ranging from 5/16 inch to 5 inches will be placed at designated sites. Subsequent environmental review and permitting might be necessary to develop new sources of coarse sediment unless local private mining operations in full compliance with environmental permitting requirements can meet the anticipated demand.

3.1.2 Future Coarse Sediment Augmentation

Increasing river flow through implementation of the Preferred Alternative will result in increased transport of coarse sediment through the river. Increased transport of coarse sediment from the upper river will require coarse sediment augmentation in most years. As part of the AEAM process, empirical data and model results will be used each year to identify the level of augmentation needed to balance the coarse sediment supply for the area between Lewiston Dam and Rush Creek. Estimates of the quantities needed for each year type are provided in **Error! Reference source not found.**. Coarse sediment placement will include use of heavy machinery to place gravels at desired sites during low flow conditions and also introductions during peak spring flows. The latter method entails placing the coarse sediment into the river at RM 110.9 where water velocity and hydraulic energy is sufficiently high allowing for fluvial dispersion.

Sources for the augmentation program include those sites that are to be used for immediate needs as well as other mine tailings located upstream and downstream of Lewiston. Coarse sediment at dredge tailings will be screened to eliminate fine sediment while providing spawning gravel that ranges from 5/16 inch to 5 inches.

TABLE 5
Estimates of Annual Coarse Sediment Augmentation.

Water Year Class	Cubic Yards per Year[a]
Extremely Wet	49,100
Wet	14,200
Normal	2,000
Dry	200
Critically Dry	0

[a]Actual volumes could vary by +/- 50 percent or greater. The AEAM process will monitor and test these hypotheses and recommend augmentation volumes on an annual basis based upon the results of previous years augmentation and modeling.

3.2 Fine Sediment Control: Dredging of Grass Valley Creek Sediment Collection Pools (Hamilton Ponds)

Hamilton Ponds in Grass Valley Creek periodically fill with decomposed granitic material due to historic logging practices and the highly erosive nature of the soils in the watershed. Without the periodic dredging, sediment would enter into the Trinity River and negatively impact salmonid spawning and rearing habitat. The dredging project is a continuation of from years past and involves periodically dredging roughly 42,000 yds^3 of mostly sand, and some gravel and cobble, from the three sediment collection basins (ponds) located just upstream from the confluence with the Trinity River. Dredging occurs when the ponds become full, that does not occur annually. Material will be dredged using an excavator. Loaded ten-yard dump trucks will haul the material to a designated spoils area located on site or offsite outside the creek's flood plain (see Negative Declaration and Initial Study, Trinity River Pool and riffle Construction for Fishery Restoration, April, 1985, State clearinghouse #84022805). The spoils area will be prepared by stripping and stockpiling topsoil for use on the top of the newly deposited spoils. This will occur for revegetative purposes. Dredging will typically be conducted between July 1 and October 15 of the year in which the ponds fill. The ponds often fill during a single storm and runoff, especially in wet and extremely wet water years, losing trap efficiency. Dredging should occur whenever the ponds fill, preserving trap efficiency. Winter dredging should be investigated because this would prevent the ponds from filling and subsequently discharging sediment into the Trinity River during the winter and spring.

4. Infrastructure Modifications—Locations/Sites and Implementation Plan

Increasing releases from 6,000 to 11,000 ft^3/s for Trinity River restoration purposes may impact four bridges and will inundate private properties downstream to a minimal extent in most cases to almost total inundation for a limited number of parcels. From Lewiston Dam to the confluence with Rush Creek (~5 miles), releases of 11,000 ft^3/s exceed the current 100-year Federal Emergency Management Agency (FEMA) flood event of 8,500 ft^3/s, that is based upon a 1976 Flood Study by the Army Corps of Engineers (USCOE, 1976). Downstream of Rush Creek, 11,000 ft^3/s would result in river flow less than the 100-year event as designated by FEMA. FEMA requires that any replacement bridge not increase the risk of damage to existing structures nor increase the Base Flood Elevation (most probable 100 year flood) more than one foot.

4.1 Bridge Replacement (site descriptions cited *from* Omni-Means, LTD, 2000)

Four bridges in Trinity County (Salt Flat, Bucktail, Poker Bar, and "Treadwell" on Steelbridge Road) will be replaced in order to accommodate 11,000 ft^3/s releases and associated tributary accretion in May. None of these bridges meets currently recommended design standards for water conveyance and debris clearance at the maximum prescribed flows, and the foundations of each appear to be inadequate to withstand the scouring action of the maximum prescribed flows.

The existing Salt Flat Bridge on Salt Flat Road, off of Goose Ranch Road west of Lewiston at River Mile 107, is a privately owned structure serving 27 parcels. The bridge is a single lane, 270-foot-long structure, 10-foot-wide, four-span railway car bridge. The river channel at this site is split at low flow. The left arm is a side channel constructed by USBR for fish spawning and habitat purposes.

The existing bridge at Bucktail on Browns Mountain Road, located about 0.25 miles northeast of Lewiston Road at River Mile 105, is a single span, 76-foot-long, 32 foot-wide , steel girder structure with pile-supported concrete abutments that is county owned, and services about 60 parcels. The replacement of Bucktail bridge includes a significant local channel improvement to accommodate a bridge of acceptable capacity. The required channel improvement consists of removal and grading of a portion of the right floodplain to accommodate the longer length required in a new bridge. The excavation will extend roughly 600-feet upstream and 150-feet downstream of the existing structure.

The existing bridge at Poker Bar on Bridge Road, is located 1.5 miles from State Highway 299, about halfway between the towns of Lewiston and Douglas City at River Mile 102. The bridge consists of two privately owned, single-span, railway car structures crossing two main channels (left and right) of the Trinity River that serve 77 parcels. The structure over the right channel is 87-foot-long, 18-foot-wide, and constructed with twin side-by-side railway cars. The car beams are supported on four steel "H"-piles at each abutment. The existing structure over the left channel is 52-foot-long, 20-foot-wide and is also constructed with two side-by-side railroad cars supported on steel "H" piles at each abutment. A concrete retaining wall and two concrete filled, riveted steel caissons are present in front of each of the abutments.

The existing Treadwell Bridge is located off Steelbridge Road about 3 miles upstream (east) of Douglas City. It is a privately owned, single-lane bridge and serves 9 parcels. The structure is a four-span, 201-foot-long, 12-foot wide, railway car bridge supported on concrete piers and abutments. Foundation type is unknown at both abutments and at each of the piers. The right abutment is established in fill encroaching on the river flood plain. The left abutment is established in the bank along the left edge of the channel. Prior to initiating any pre-construction activities bridge owners would be contacted and rights of entry negotiated. Transfer stipulations after construction including required operation and maintenance must also be addressed.

Pre-construction efforts will include procurement of design services, permitting , surveys, design and geotechnical investigations (USBR, 2000). The initial project (first year) will be to perform exploratory drilling at the anticipated bridge pier locations to determine depth to bedrock. Actual construction would occur in the second year. Total project time ranges from 17 to 28 months and depends on the construction window (the period of time equipment is allowed to work within the Trinity River wetted perimeter due to biological constraints). Assuming a time range of 17 to 28 months, projects that begin in summer 2000 (in pre-construction phase) would be completed by late 2001 to late 2002.

The construction window is roughly July 1 –September 15 of each year. In general, the following measures will be followed to reduce any potential impacts through the operation of heavy equipment:

- All sites will be surveyed for rearing coho in the immediate project area. Surveys for nesting owls and eagles will occur within a 0.5 mile radius of the project site prior to beginning work activities. The presence of coho will be determined by direct observation, beach seines or Electro-fishing. If a spotted owl or bald eagle nest site is located, scheduled work activities will be delayed (through July 10 for owls and August 31 for eagles) and/or an alternate site will be selected and surveyed. Alternatively, NMFS will be consulted with to address any impacts to listed species.
- Heavy equipment operation will be conducted between July 1 and September 15.
- All mechanical equipment used shall be free of grease, oil, or other external petroleum products or lubricants. Equipment shall be thoroughly checked for leaks and any necessary repairs shall be completed prior to commencing work activities.
- No herbicides or pesticides shall be used.
- All possible measures will be taken to minimize any increased sedimentation/turbidity in the mainstem from mechanical disturbance, such as leaving a small berm at the edge

of the channel to trap any sediments until all other work is completed. Turbidity and other water quality standards as identified in the "Water Quality Control Plan for the North Coast Region" and the Hoopa Valley Tribe Water Quality Control Plan will be monitored and maintained. If standards are not met, construction activities will cease until operations or alternatives can be done within compliance.

4.2 Structure Relocations

Structures at risk include at least one home, a number of mobile homes and trailers, various outbuildings and portions of access roads. Other improvements such as campgrounds, satellite dishes, garden and animal enclosures, mining operations and water systems would also be affected (USBR, 2000). Recognizing that implementation of the flows identified in the Preferred Alternative may affect these properties, mitigation measures may be appropriate and will be determined on a case by case basis. Affected land owners will be contacted, and right-of-entry and property modifications agreements negotiated to allow control surveys of structures.

The amount of time for home and structure relocation from initial identification and surveys to final actions is expected to be 18 months. Projects that begin in summer 2000 with structure identification and landowner contacts should be completed by summer 2001 to early 2002.

The limiting factor for initiation of high flows over 6,000 ft^3/s will therefore be construction of new bridges. If bridges are constructed by late 2001, flow increases above 6,000 ft^3/s would be allowable by spring 2002. Flows up to 6,000 ft^3/s could occur before houses and structures are relocated and before bridge construction is complete. It may be possible to release up to 8,500 ft^3/s prior to replacement of the Bucktail and Poker Bar bridges, if planned foundation investigations indicate that these bridges would not be damaged by the scouring action of flows of this magnitude. However, replacement/modification of all four bridges is necessary for safe implementation of Lewiston Dam releases of 11,000 $ft^3/s/s$ in an extremely wet year.

5. Watershed Protection Program

5.1 Watershed Protection

Roughly 80 percent of the lands within the Trinity River basin are federally managed. Of the remaining 20 percent of the Trinity River basin that is privately owned, roughly half (10 percent of the total) are industrial timberlands, with the remainder being small private holdings. The majority of industrial timberlands within Trinity County are owned by Sierra Pacific Industries (SPI). SPI does not permit access to their lands for non-employees for watershed inventories, stream inventories or publicly funded restoration projects. Therefore, the majority of work is likely to occur on federal lands within the basin in the near future, although county and non-industrial private roads require substantial improvements as well. In addition, other industrial timberland owners such as Simpson and Timber Products do participate in restoration projects.

To date, Trinity River Restoration Program (TRRP) funds expended on watershed restoration activities have largely gone to the Trinity County Resource Conservation District

(TCRCD), the U.S. Forest Service and the USDA - Natural Resources Conservation Service (NRCS) and Yurok Tribe. The relatively stable workload enables NRCS to maintain a field office and engineer in Weaverville. TCRCD and NRCS and Yurok Tribe have successfully leveraged funds from the TRRP to obtain outside grant funding for watershed restoration throughout the Trinity River basin.

The Northwest Forest Plan applies to BLM and Forest Service lands and requires extensive road rehabilitation and road decommissioning projects as described in the Aquatic Conservation Strategy (ACS). The Forest Service budget provides for maintenance of only 20 percent of its total road mileage, with an accumulated backlog of $8 billion (U.S. Forest Service Chief Michael Dombeck, 1999) Road maintenance budget shortfalls for National Forest lands in the Trinity River basin are comparable. The Forest Service budget has not yet been adequately supplemented with road maintenance funding since the rapid decrease in timber sale revenues during the 1990's. The South Fork Trinity River and mainstem Trinity River (above and below Trinity and Lewiston Dams) are listed under Section 303d of the Clean Water Act as waterbodies impaired by sediment. The U.S. Environmental Protection Agency (USEPA) has completed a Total Maximum Daily Load (TMDL) for sediment in the South Fork Trinity River watershed. However, an implementation plan has not yet been approved by the North Coast Regional Water Quality Control Board (NCRWQCB). A TMDL for the mainstem Trinity River for sediment is scheduled for completion by USEPA in December, 2001.

The Forest Service, USEPA and the NCRWQCB are in the process of coordinating a "Northern Province TMDL Implementation Strategy for Forest Service Lands" (January, 2000). The Hoopa Valley Tribe is in the process of finalizing a Water Quality Control plan. The Shasta-Trinity National Forest (STNF) has yet to complete the necessary watershed analyses, Access and Travel Management Plans, NEPA documentation and funding for large-scale on-the-ground restoration activities pursuant to the Northwest Forest Plan and TMDL's to address sediment problems on National Forest lands. Conversely, the Six Rivers National Forest (SRNF) has made significant progress in completion of its Watershed Analyses, Access and Travel Management Plans, NEPA documentation and obtaining funding sources (including State funds) to complete the necessary road rehabilitation and decommissioning projects.

Roughly 600 miles of County roads within the Trinity River basin are maintained by Trinity and Humboldt counties, that are part of the "Five Counties Coho Conservation Program." The Five Counties Program includes Trinity, Humboldt, Del Norte, Siskiyou and Mendocino counties. State funding through the Proposition 204 Delta Tributary Watershed Program has been obtained to inventory and mitigate erosion and fish migration barrier problems associated with county roads within the Trinity River basin. Roughly $360,000 of the funding designated for California from the Pacific Coast Salmon Restoration Initiative will go toward county road improvement projects in the Trinity River basin. Depending on the county road inventory results, there could be a substantial need for additional funding to implement road-crossing problems on county roads. In particular, many culverts will likely need replacement with expensive bridges or natural-bottom culverts. One noteworthy distinction for county roads is that they must be usable year-round to serve residents, whereas other road systems are often seasonally utilized. The ongoing decline in Forest Reserve Fund payments to counties from reduced timber harvest activities has negatively impacted the abilities of Humboldt and Trinity counties to adequately maintain, repair, and upgrade their road systems.

5.2 Description of Watershed Protection Work Activities

Road maintenance involves grading, rocking and clearance of drainage structures on existing roads to ensure that a minimum amount of erosion occurs. The current level of inadequate funding for road maintenance activities increases the risk of catastrophic failure of road fills when culverts and other drainage structures become plugged.

Road rehabilitation involves the upgrade of existing road systems, that have been determined to be necessary for long-term management purposes such as residential access, logging, recreation, fire protection, etc. Work consists of replacing undersized culverts with new culverts or bridges capable of accommodating a 100-year storm, associated debris, as well as fish passage in anadromous streams. Outsloping, rocking of roads, energy dissipaters, and the addition of new drainage structures to reduce the accumulation of water in inboard ditches are accepted methods of reducing erosion from road systems.

Road decommissioning is the removal of stream crossing structures, culverts, "Humboldt Crossings," and sometimes reshaping, ripping, seeding and mulching of the road surface, depending on slope, soil type and other conditions.

Grass Valley Creek Revegetation Program is the result of nearly 2 decades of investigations and restoration of the Grass Valley Creek watershed. The Trinity County Resource Conservation District is planting various native species to stabilize the highly erosive decomposed granite soils.

South Fork Trinity River Coordinated Resources Management Program (SF CRMP) is an ongoing cooperative watershed restoration effort . Efforts include road rehabilitation, road decommissioning, riparian improvements, water conservation and fish passage.

Lower Klamath Watershed Restoration is an ongoing cooperative effort between the Yurok Tribe, Simpson Timber, the State of California, with some funding provided by the Trinity River Restoration Program. Work consists primarily of road decommissioning and road rehabilitation. Public Law 104-143 extended the scope of funding authority under the Trinity River Restoration Program to the lower Klamath River between Weitchpec and the Pacific Ocean.

5.3 Prioritization of the Work/Implementation Plan

Watershed restoration priorities must address the physical, biological and legal issues associated with the Trinity River. The following criteria are recommended:

1. Tributary watersheds located between the North Fork Trinity confluence and Lewiston Dam shall be the highest priority.

2. Key watersheds designated pursuant to the Northwest Forest Plan

3. Refugia stream reaches noted for accommodating wild stocks of salmon and steelhead and / or listed species pursuant to / under the Endangered Species Act.

4. Roaded stream crossings at risk of catastrophic failure or migration barriers for anadromous fish.

5. Lands that are available for restoration because of landowner permission and/or completion of environmental compliance and permitting (Watershed Analysis, NEPA/CEQA/CWA 404, 401, etc.).

6. Projects that provide a cost share from the landowner/agency or other funding sources.

7. Sub-watersheds identified as priorities through the TMDL, as well as State and Tribal Water Quality Control Plan processes and monitoring programs.

8. Projects that allow continued collaboration through the restoration infrastructure of TCRCD and NRCS.

A significant decrease in the road mileage of the Trinity River Basin, in combination with the upgrade of integral roads, will shrink the size of the required overall road maintenance budgets.

5.4 Funding Sources

Watershed Restoration work in the Trinity River basin is currently funded through a variety of sources. Trinity River Restoration Program appropriations to the Bureau of Reclamation through the Energy and Water Development Appropriation Acts have historically been the single largest funding source in the Trinity River Basin restoration activities. Restoration of Grass Valley Creek, the South Fork Trinity River Coordinated Resource Management Plan (CRMP) Program and other activities have been extensively funded for many years by Reclamation to the TCRCD, NRCS and others. However, federal budgets have been cut and funding needs for restoration of the mainstem Trinity River fishery will increase through implementation of this ROD.

In recent years, Trinity County, the Trinity County Resource Conservation District, Six Rivers National Forest and others have obtained funding from other sources for supporting programs. The following is a brief list and description of potential funding sources available for watershed restoration in the Trinity River basin:

- S.B. 271 (California Salmon and Steelhead Restoration Account) This program is funded by the State of California through Tideland Lease revenues and the General Fund. A maximum of $8 million/year will be available through this for allocation through 2005, with three additional years to implement funded projects. This program places a high priority on watershed assessment and upslope watershed restoration activities. Over a million dollars of this funding has been allocated to projects in the Klamath-Trinity basins in 1997-99. Matching funds are encouraged, but not required.

- Clean Water Act Section 205j and 319h- these funds are available through the State Water Resources Control Board for water quality planning/monitoring and non-point source reduction, respectively. Significant non-federal matches are required, and contracting procedures are detailed and time-consuming. Historically, little funding has been made available to Trinity River basin projects through these programs because other funding is available in the Trinity River basin, that is not available elsewhere in the State.

- Pacific Salmon Restoration Initiative- Roughly $9 million was made available in FY 2000 through the Department of Commerce budget (NOAA / NMFS). Trinity and Humboldt counties intend to spend the funds on highest priority projects, that pose both erosion problems and fish passage barriers. Significant non-federal matches are required.
- USFS and BLM appropriated funds for land and watershed management.
- County road funds- in some cases, these funds may be available as a non-federal match for other funding sources, especially if an existing county road would otherwise require some sort of maintenance or improvements.
- Jobs in the Woods- In recent years, BLM has been dedicating a portion of its funds in this category for restoration and sediment reduction work in the Grass Valley Creek Watershed, primarily through the TCRCD. Additionally, the TCRCD has applied for and received USFWS Jobs in the Woods funds to implement watershed restoration throughout the Trinity River Basin.
- CVPIA Restoration Fund – An Interior Solicitor's Opinion states that these funds, appropriated by Congress from fees charged to CVP water and power users, could be used to implement this ROD. This could include watershed protection and restoration activities.
- Proposition 13 – In March, 2000, the voters of California approved a multi-million dollar bond act that can be used for fishery and watershed restoration activities that are part of this implementation program. The State of California intends to use these funds to provide the non-federal match for the Pacific Salmon Restoration Initiative.

6. Adaptive Environmental Assessment and Management

Alluvial river systems are complex and dynamic. Our understanding of these systems and our ability to predict future conditions are continually improving. Adaptive Environmental Assessment and Management (AEAM) gives decision makers the ability to refine previous decisions in light of the continual increase in our knowledge and understanding of the river and catchment.

The AEAM approach to management relies on teams of scientists, managers, and policy makers jointly identifying and bounding management problems in quantifiable terms (Holling, 1978; Walters, 1986). In addition, the adaptive approach "to management recognizes that the information on which we base our decisions is almost always incomplete" (Lestelle et al., 1996). This recognition encourages managers to utilize management actions to increase our knowledge of complex systems, that, in turn, results in better future decisions. AEAM need not only monitor changes in the ecosystem, but also develop and test hypotheses of the causes of those changes, in order to promote desired changes. The result is informed decisions and increasing certainty within the management process.

AEAM is a formal, systematic, and rigorous process of learning from the outcomes of management actions, accommodating change, and improving management (Holling, 1978). Traditional approaches to management of rivers are inadequate to preserve biotic community diversity evidenced by single species management, complexity of species

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interactions and interrelationships, and limited scientific knowledge about the interactions of abiotic and biotic factors. The concept of ecosystem management is not new; its implementation in regulated rivers is. It is important to stress not just flow recommendations and non-flow channel alterations but also the implementation of a new paradigm of river management built on the two-decade-old concept of Adaptive Environmental Assessment and Management [see also Hilborn and Walters (1992)].

An AEAM organization combines assessment and management. Most agency and task force structures do not allow both to go on simultaneously (International Institute for Applied Systems Analysis, 1979). The basis of adaptive environmental assessment and management is the need to apply lessons learned from past experience, data analysis and fine-tuning project implementation. AEAM combines experience with operational flexibility to respond to future monitoring and research findings and varying resource and environmental conditions. AEAM uses conceptual and numerical models and the scientific method to develop and test management choices. Decision makers use the results of the AEAM process to manage environments characterized by complexity, shifting conditions, and uncertainty about key system component relationships (Haley, 1990; McLain and Lee, 1996).

Effective management strategies must have explicit and measurable outcomes. There are few clear-cut answers to complex population biology, hydraulic, channel structure, and water quality changes. The AEAM process allows managers to adjust management practices (such as reservoir operations) and integrate information relating to the riverine habitats and the system response as new information becomes available.

A well-designed AEAM organization: (1) defines goals and objectives in measurable terms; (2) develops hypotheses, builds models, compares alternatives, designs system manipulations and monitoring programs for promising alternatives; (3) proposes modifications to operations that protect, conserve and enhance the resource; (4) implements monitoring and research programs to examine how selected management actions meet resource management objectives; and (5) uses the results of steps 1-4 to further refine ecosystem management to meet the stated objectives. The intention of the AEAM organization is to provide a process for cooperative integration of water control operations, resource protection, monitoring, management, and research.

The concept of restoring the natural hydrograph pattern discussed by Poff et al. (1997) is still debated, especially the role of hydrologic variability in sustaining the ecological integrity of river ecosystems. Stanford et al. (1996) also discuss ecological integrity. An adaptive management approach to increase our knowledge and management ability should be accompanied by physical process modeling and an evaluation program to monitor the physical and biological responses. Physical and biological processes will be modeled to facilitate the AEAM approach to restoring the unique fish fauna by designing a program for rehabilitating the river channels to provide habitats much improved over existing conditions. Such a program, similar to the recommendations by Ligon et al. (1995), needs to be supported by a rigorous prediction, monitoring and model validation program. The creation of an interdisciplinary team of scientists that run simulations, design and carry out monitoring programs, and offer recommendations to management is critical to successful implementation of the AEAM philosophy.

To adequately manage river systems for multiple use and conserve the biotic resources, on going monitoring of flow, sediment, geomorphic, and biological status is essential. With such data and the use of simulation models, river systems can be adaptively managed. Such informed decision-making, utilizing water supply forecasting and predictions of system response, is within the state-of-the art. Establishment of an AEAM organization will create a focused interdisciplinary effort involving physical and biological scientists. Peer review of all analyses, project design, and monitoring are essential to establish and maintain scientific and public credibility.

7. Organizing to Implement the Trinity River Restoration Program

The purpose of the Trinity River Restoration Program is to restore the basin's fish and wildlife populations to those that existed prior to construction of the TRD and to implement measures to restore fish and wildlife habitat in the Trinity River. An AEAM organization will implement the restoration program. The purpose of the Trinity River AEAM organization is two-fold. First, the AEAM organization will design and direct monitoring and restoration activities in the Trinity River basin. Second, the AEAM organization will provide recommendations for the flow modifications for the OCAP of the Trinity River Division (TRD) of the Central Valley Project, if necessary. The Rehabilitation Implementation Group will coordinate the federal fisheries restoration effort in the Trinity River watershed. For more information on specific biological and geomorphic objectives, and on the initial working scientific hypotheses of the preferred alternative, please refer to the TRFE, pp. 278-289.

Implementing the Trinity River AEAM organization requires a collaborative and cooperative approach among government agencies, tribes, landowners, and stakeholders. The Implementation Plan establishes a Trinity Management Council (TMC) that is responsible for organization oversight and direction. A Trinity Adaptive Management Working Group (TAMWG) provides policy and technical input (Technical Advisory Committees) on behalf of Trinity basin stakeholders to the TMC. Figure 1 shows the AEAM organization structure. The focus of the AEAM organization is the Trinity Management Council and an AEAM Team consisting of a Technical Modeling and Analysis Group (TMAG) and a Rehabilitation Implementation Group (RIG). The organization includes a support staff (AEAM Team) of engineers and scientists charged with assessing the Trinity River fishery restoration progress. The AEAM Team may recommend management changes based on annual assessments of the evaluation of rehabilitation and flow schedule activities. The AEAM Team coordinates independent scientific reviews of the AEAM organization. The AEAM Team works closely with the resource management agencies that are responsible for implementing specific Trinity River restoration program activities. For instance, the USDA Forest Service or BLM may carry out a channel rehabilitation project on their lands. They would do so in collaboration with the AEAM Team.

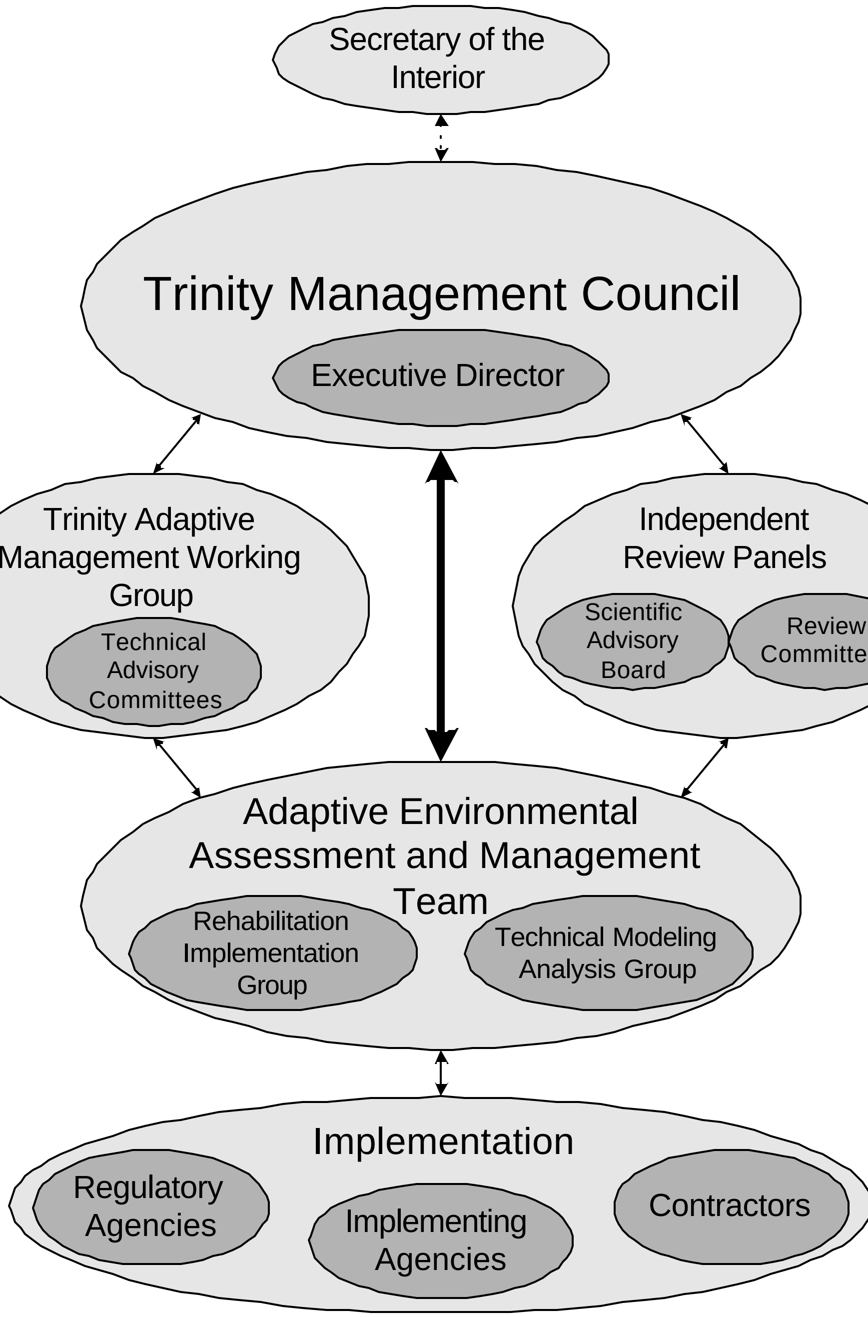

Figure 1 Trinity River Adaptive Environmental Assessment and Management organization structure.

The AEAM organization will be funded primarily by the U.S. Department of the Interior. The Trinity Management Council (TMC) and Executive Director will be the decision-making body for the organization, operating as a board of directors and advising the Secretary of the Interior. Within the overall AEAM organization structure are Stakeholder Groups, Independent Review Panels, Regulatory Agencies, and the Adaptive Environmental Assessment and Management Team.

The membership and staff specifications presented herein should be considered flexible as funding changes and the organizational scope matures. The AEAM organization staff should be stationed in a single location in northern California. The office should be in close proximity to the Trinity River Division (TRD) with reasonable travel accessibility for visiting managers and scientists.

Implementation of the TREIS/R preferred alternative will be managed by the Trinity Management Council, and Executive Director, and carried out through individual agencies (state, federal, and local) and tribes acting within their existing authorities as well as through contracts awarded through a competitive process. Implementation by federal and state agencies is subject to annual appropriations.

All agencies will retain their existing authorities. However, when the TMC recommends a particular project or program, agencies will be expected to undertake those projects. If agencies do not implement the recommended actions or projects, they must explain to the TMC in writing why they have not done so.

7.1 AEAM Organization

The following sections describe the AEAM organization and each element of the structure including:

- Membership
- Roles & Responsibilities
- Staff

Finally, an example of assessment and monitoring based on the scheduling of the peak flow release during an extremely wet water-year follows the description of the organization elements.

7.1.1 Trinity Management Council (TMC)

Membership

Part-time designees from the following organizations:
US Fish & Wildlife Service (Service)
US Bureau of Reclamation (Reclamation)
US Forest Service
Hoopa Valley Tribe (HVT)
Yurok Tribe (YT)
State of California (designee from Secretary of Resources)
Trinity County
NOAA National Marine Fisheries Service

A Chairperson (Federal Agency) selected from the membership

Roles & Responsibilities

Has decision making authority for their agency/organization
Interprets and recommends policy, stays out of day-to-day operations, similar to board of directors
Coordinates and reviews management actions
Provides organizational budget oversight

When necessary elevates unresolved conflicts within the council to the Secretary
Conducts search for and selects a nominee for Executive Director (actual hiring conducted within appropriate agency's personnel rules and regulations)
Reviews personnel actions by Executive Director
Authorizes and approves Requests-For-Proposals (RFP's) to be developed by Technical Modeling and Analysis Group
Ensures policy level consideration of issues submitted through Executive Director by regulatory agencies, stakeholder, and other management groups
Coordinates with other management groups and actions through the Executive Director
Considers proposed modifications of the annual flow schedule
Hires and supervises the Executive Director through a lead Interior agency as determined by the Secretary

Staff

Federal, Tribal, State, and local governing agencies – Existing staff
Staff 1/10th-time
Travel and Incidental Expenses

Executive Director

Executes policy and management decisions of the Trinity Management Council
Is the focus for all and oversees all activities of the Trinity River AEAM Organization. Coordinates with agencies implementing specific program elements

Membership

Full-time Executive Director
Full-time Administrative Assistant

Roles & Responsibilities

Hired and supervised by a lead Interior agency as determined by the Secretary
Coordinates execution of all TMC decisions through the Adaptive Environmental and Assessment Management Team
Hires Administrative Assistant and AEAM Team members subject to TMC authority
Acts as point of contact for public relations
Supervises the Adaptive Environmental Assessment and Management Team and coordinates the Independent Review Panels (including the Scientific Advisory Board (SAB)) the TMC, Stakeholder Groups, and Regulatory Agencies.
Coordinates flow schedule and rehabilitation activities with other operational agencies
Schedules and conducts information exchange workshops with stakeholders & regulatory agencies
Submits annual flow schedule to TMC for review and approval
Submits annual budget to TMC for review and approval
Monitors budget expenditures
Secures necessary permits for all program activities
Reports progress towards restoration goals to TMC, Stakeholders, Regulatory Agencies, and the public

Staff

2 Full Time Equivalent (FTE) employees

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7.1.2 Trinity Adaptive Management Working Group (TAMWG)

The Trinity Adaptive Management Working (TAMWG) group consists primarily of representatives of stakeholders, with participation from tribes, state, local, and federal agencies on the TMC with a legitimate intent to restoration of the Trinity River. The purpose of the TAMWG is to assure thoughtful involvement in the Trinity River restoration program, particularly the adaptive management process. TAMWG provides an opportunity for stakeholders to give policy and management input about restoration efforts to the TMC. TAMWG will be formally organized, including technical committees. The TAMWG may be chartered under the Federal Advisory Committee Act (FACA). TAMWG will hold at least two meetings per year of the full group, involving the public. The technical advisory committees may hold additional meetings with the TMAG to discuss technical issues, review annual flow schedules, and RFP's for implementation activities.

Stakeholders will have an opportunity to submit alternative hypotheses and/or alternative restoration actions to the TMC for consideration in their capacity as an advisory group. The TMC will seek review of alternatives proposed by the Technical Modeling and Analysis Group (TMAG) and the Rehabilitation Implementation Group (RIG) (see discussions of TMAG and RIG).

Membership

Members of TAMWG should be senior representatives of their respective constituent groups with a legitimate link to restoration activities on the Trinity River. They should have authority to speak on behalf of their organization(s) and commit to following up TAMWG and TMC discussions with their colleagues. If the Secretary charters TAMWG under FACA, minimum membership qualifications should include at least the following:

Individuals are senior representatives of their organization(s) authorized to speak on their behalf and, where appropriate, commit funds.

Individuals should have extensive knowledge of the Trinity River Restoration Program and the Trinity Adaptive Management Organization.

Members should elect a strong and fair chairperson that recognizes when discussions stray.

Technical committee participants must have appropriate technical qualifications to engage in technical discussions.

TAMWG members should expect to commit at least 10 percent of their time to this effort.

Members of TAMWG technical committees should expect to commit at least 25 percent of their time to this effort.

TAMWG should/will replace representatives on the Working Group or technical committees that do not actively participate or attend meetings.

May include representatives from these and other interests:

- Recreation
- Environment
- Landowners
- Commercial fishing
- Sport fishing
- Timber
- Power
- Agriculture

- Water users
- Agencies
- Others

Roles & Responsibilities

Provide policy and management recommendations on all aspects of the program to TMC via Executive Director

Develop and submit alternative hypotheses for consideration by TMC and potential analysis by TMAG and RIG

Recommend management actions and studies for RFP development and implementation

Staff

Provided by each stakeholder group

7.1.3 Adaptive Environmental Assessment and Management Team

This team provides expert support to the TMC as relates to both scientific evaluation of restoration progress and managements implementation. However, the team expertise is subdivided into staff focusing their efforts toward either management implementation or analyses and scientific assessment. The AEAM Team office should be in close proximity to the Trinity River Division (TRD) with reasonable travel accessibility for visiting managers and scientists.

7.1.3.1 Technical Modeling and Analysis Group (TMAG)

Interdisciplinary group of scientists, engineers, and technical specialists, responsible for conducting and managing complex technical studies and projects, and integrating the products of those studies and projects into management objectives and recommendations. Supervised by the Team Leader under the Executive Director. The TMAG conducts technical analyses, model projections for achieving restoration objectives, design for comparison with ongoing approaches, planning, peer review, and budgeting. The TMAG makes recommendations to the TMC through the Executive Director for implementation and testing of appropriate hypotheses. The TMAG recommends modifications to the annual flow schedule within the annual water year-type allocation. The TMAG oversees scientific evaluation and design of all rehabilitation projects including: bank rehabilitation, gravel augmentation, riparian re-vegetation, floodplain creation, sediment management, and watershed rehabilitation. The TMAG develops the scope of work for these actions. The TMAG serves as the Contracting Officer's Technical Representative (COTR). The TMAG shares some COTR responsibilities to the RIG.

Membership

Full-time Group Leader Interdisciplinary experience in water resources management or river restoration / rehabilitation with expertise in biological and geomorphological sciences. Supervised by the Executive Director.

Four full-time, multi-disciplinary scientists / engineers representing these disciplines:

- Fisheries Biology
- Fluvial Geomorphology / Hydraulic Engineering
- Riparian Ecology / Wildlife Ecology
- Water Quality / Temperature

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- Hill Slope Geomorphology / Watershed Hydrology
- Information Management / Computer Modeling

A part-time representative from USBR Operations (CVP) serves as a member of this team when formulating the annual flow schedule.

Roles & Responsibilities

Team members collaborate in:

- Habitat modeling and mapping, SALMOD, habitat quality (gravel quality), statistics, population modeling
- Sediment transport, channel response, channel design
- Riparian revegetation, regeneration, and encroachment and removal
- Water temperature and other water quality indicator modeling
- Information Management and GIS
- Flow release recommendations and annual flow schedule formulation
- Integration of appropriate models for describing the response of the stream corridor to management alternatives
- Watershed restoration

Evaluates previous year & historical monitoring results with respect to existing hypotheses
Re-visits scientific hypotheses as appropriate
Conducts sediment transport modeling, habitat modeling, temperature modeling and salmon production modeling
Integrates multidisciplinary information and identifies alternatives to resolve conflicting ecological management needs
Coordinates with operations and presents analyses to TMC for resolving conflicts and assessing management needs
Provides short term research project development and oversight
Conducts long-term trend monitoring development and oversight
Sets standards and protocols for monitoring information (datum, coordinate systems, reporting techniques and formats, etc)
Ensures effective data management, storage, analysis, and distribution
Solicits technical input review from stakeholder groups and regulatory agencies
Analyzes and submits implementation plans for scientific peer review
Coordinates review from Scientific Advisory Board and Review Committees
Submits designs in collaboration with the RIG for Rehabilitation Activities and Objective Specific Monitoring
Is responsible for RFP development and preparation of statements of work in cooperation with the RIG Contracting Officer
Contracting Officer's Technical Representative - assist in Objective Specific Monitoring and Rehabilitation Activities contracting
Provides program reporting
Completes special duties as requested by Executive Director

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Staff

Six FTE's
Group Leader / Scientist
Secretary
Four full-time technical staff (May include agency staff detailed under the Inter-Governmental Personnel Act)
Travel and Incidental Expenses - Computers, software, hardware, supplies
Technical support resources including modeling, data analysis, etc

7.1.3.2 Rehabilitation Implementation Group (RIG)

A group of engineers, technicians, and contract specialists responsible for implementing the on-the-ground design and construction activities associated with the AEAM organization. The group is supervised by a Group Leader who is under the supervision of the Executive Director. The Rehabilitation Implementation Group (RIG) collects design data, prepares designs, awards contracts, and manages construction for bridge replacements, rehabilitation projects, gravel augmentation, riparian revegetation, flood plain creation, objective specific monitoring, and sediment management projects. The RIG performs all necessary realty actions and environmental permit requirements including environmental compliance. Contacts the public to address implementation issues such as obtaining borrow and waste sites, access agreements, and maintenance agreements. The RIG works closely with the TMAG to achieve a common understanding of desired design concepts and coordinates construction activities to insure any rehabilitation activity modifications are implemented with full approval of the TMC.

Membership

Full time Group Leader with background in engineering and experience in management of river restoration programs. Directly supervised by the TMC Executive Director.
Civil Engineer
Engineering Technician / Surveyor
Contracting Officer
Part-time support from:
- Construction Inspector
- Construction contract specialist
- Realty Specialist
- Field Engineer

Roles & Responsibilities

Preparing and implementing contracting for objective specific monitoring and rehabilitation activities upon approval of the TMC
Collaborates with TMAG and Executive Director on program implementation
Submits annual report to Executive Director on accomplishments, expenditures, and budget needs

<u>Channel Rehabilitation</u>

Collaborates with TMAG to develop design concept for each site and environmental review
Contacts property owners to explain concept and obtain right of entry
Collects design data, prepares location maps, performs field explorations
Coordinates with TMAG to obtain pre- and post-project monitoring
Prepares designs, cost estimates, and information on local contractors

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Awards construction contracts
Performs management during construction including quality control and contractor payments
Bridge Replacements
Prepare design concept for each site
Contacts property owners to explain concept and obtain right of entry and maintenance agreements
Collects design data, prepares location maps, performs field explorations
Prepares designs and cost estimates
Awards construction contracts
Performs construction management
Flood Plain Creation
Collaborates with TMAG to develop design concept for each site and environmental review
In concert with gravel augmentation and fine sediment management and revegetation
Obtains/Identifies inundation zones
Locates impacted flood plain improvements
Performs property surveys
Negotiates easements including structure removal/relocation agreements
Remove/Relocate existing structures
Gravel Augmentation and Fine Sediment Management
Collaborates with TMAG to develop design concept for each site and environmental review
Prepares designs and cost estimates
Awards augmentation contracts
Performs gravel placement activities
Objective Specific Monitoring
In concert with TMAG, select objective specific monitoring and rehabilitation activity contractors
Provide contract management for all monitoring activities
Watershed Rehabilitation
Coordinates with land management agencies

Staff

Four FTE's including:
Group Leader
Civil Engineer
Contracting Officer
Engineering Technician/Surveyor

Travel and Incidental Expenses
Computers

7.1.4 Independent Review Panels

To assure scientific credibility all monitoring and studies will be awarded through a competitive process using RFP's and independent outside review panels. A Scientific Advisory Board will provide overall review and recommendations to the TMC relative to the science aspects of the AEAM organization. Specific Review Committees will be organized as needed to review rehabilitation, monitoring and study designs as well as proposals and reports.

7.1.4.1 Scientific Advisory Board

Five scientists, recognized as experts in the disciplines of fisheries biology, fluvial geomorphology, hydraulic engineering, hydrology, riparian ecology, wildlife biology, or aquatic ecology, form a Scientific Advisory Board (SAB). It is important that members serve a reasonably long term to reduce "get up to speed" expenses, but short enough that the organization periodically gets new ideas and perspectives. Members must be objective in keeping the science separate from policy. Each member serves a four-year rotating term. The Executive Director appoints the members of the Board from candidates nominated by the TMC, TMAG Team Leader, TAMWG, and Regulatory Agencies, based upon technical capability. They would meet at least once each year with the TMAG.

Membership

Part-time. Five recognized scientists in various disciplines. Time commitment roughly 5% – 10%/yr that may come in periodic bursts of effort such as when the TMAG develops alternative hypotheses, study plans, flow recommendations, rehabilitation activities, and special data collection activities for the coming year.

Roles & Responsibilities

Scientific peer review of hypothesis testing, proposed annual flow schedules, short and long-term monitoring plans, research priorities.

Periodic review (roughly every 5 years) of the overall AEAM Organization

Review reports & recommendations produced by the Technical Modeling and Analysis Group.

Review suggestions for new or alternative hypotheses & methods of testing of existing hypotheses.

Staff

No additional staff. The TMAG will provide support. SAB members will be reimbursed for their time and travel at their current organizational or industry rates

Total Five FTE's

7.1.4.2 Review Committees

Outside review committees will be formed to review specific proposals and study designs. For each proposed Objective Specific activity a review committee of subject area experts, not directly involved with the proposed project or otherwise having a conflict of interest, will be solicited to provide recommendations on specific proposed activities. These peer reviews will provide recommendations on proposals submitted in response to RFP's.

Membership

Review Committee members will be selected from nominations by the SAB, AEAMT and TAMWG.

When no conflict of interest exists TAC members of TAMWG having appropriate expertise will serve on individual reviews.

Roles and Responsibilities

For each Trinity Restoration Program funded activity a specific Review Committee will be formed to provide input and recommendations relative to personnel qualifications and experience, study approach, statistical design, adequacy of proposed budget, etc.

7.2 Objective Specific Monitoring

Long-term monitoring evaluates the overall restoration effort, and also provides baseline and subsequent data for trend analyses. Long-term data include gaging data, sediment transport data, water temperature data, smolt outmigration data, adult escapement estimates, redd mapping, monitoring index reaches, and rehabilitation sites. Restoration program funded long-term monitoring will be awarded by contract or self-governance agreements if applicable to agencies, tribes, and contractors in response to RFP's authorized by the TMC.

Short-term monitoring seeks to evaluate cause and effect in the context of specific hypotheses, and competing hypotheses for specific calendar years given the water year runoff forecast, sediment input, and level of salmon escapement. Short-term monitoring may include studies such as water temperature-salmonid growth rates, delta maintenance needs, and riparian regeneration processes. Short-term monitoring may be needed simply to fill information gaps. To assure scientific credibility all monitoring and studies will be awarded through a competitive process using RFP's and independent review panels.

Membership

Personnel of successful applications from:

- Agencies
- Tribes
- Contractors

Roles & Responsibilities

- Short-term specialized monitoring such as annual site specific data collection for hypothesis testing, would be contracted through annual solicitations from agencies, tribes, universities, and consulting firms by issuing Requests For Proposals (RFP's) and awarding annual or multiple year contracts
- Long-term trend monitoring needs would be contracted with local Agencies and Tribes having technical expertise. The local agency and / or tribe will prepare work plans and data collection designs based upon scopes of work developed by the TMAG. They will submit the work plans for scientific peer review and after appropriate review and modification the agencies and / or tribes will be funded.
- Implement monitoring projects as specified in contracts

7.3 Funding for ROD Implementation

Table 6 presents costs for implementation of the Record of Decision over a period of three years. The majority of funds are expected to come through the Department of Interior agencies. Additional program funding however may be obtained from the State of California, other federal agencies, and other sources (See section 5.4).
itemizes a further breakout of the objective specific monitoring costs for long and short-term monitoring and GIS maintenance and public information.

TABLE 6
Funding for ROD Implementation[a,b] (Amounts in Thousands of Dollars)

Activity	Year 1 ($)	Year 2 ($)	Year 3 ($)	Total 3 yrs ($)
Bridge Construction[c]	350	5,700	0	6,050
Houses/outbuildings[c]	125	225	0	350
Channel Rehab projects[c]	2,150	2,400	2,400	6,950
Watershed Restoration	2,000	2,000	2,000	6,000
Coarse and Fine sediments[c]	50	50	355	455
Objective Specific Monitoring[d]	5,640	5,176	5,176	15,992
AEAM Team (Staffing)[d]	2,025	2,025	2,025	6,075
TOTAL	12,340	17,576	11,956	41,712

[a]Estimated out-year costs. During the first 3 years, half of the channel rehabilitation projects will be constructed. Additional out-year funds will be necessary to complete the second half. Costs are assumed to be the same as the first half. For watershed restoration, $2 million annually for roughly 20 years is necessary. Annual coarse and fine sediment costs are expected to average $260,00 per year but will vary depending on needs identified through adaptive management. Adaptive management costs are approximated at $5.2 million per year indefinitely.

[b]Bridge and Infrastructure modifications are phased in (included in years 1 and 2) with the bulk reflected in year 2. Therefore, a true estimate for an "annual" budget would be best represented by year 3 at $11.8 million.

[c]Costs taken from USBR Mainstem Trinity Habitat and Floodplain Modifications Report (2/2000).

[d]Costs taken from Stalnaker and Wittler AEAM report (4/2000).

TABLE 7
Break Out Costs for Objective Specific Monitoring (1,000s of $)

Long term monitoring:	
Fish monitoring (escapement, smolt production, etc)	2,247
Fish monitoring and modeling (habitat, temp, SALMOD)	914
Channel morphology and riparian monitoring	330
Gaging stations	175
Hydraulic and sediment transport monitoring/modeling	160
GIS maintenance and public info	145
Subtotal	**3,971**
Short term directed monitoring	1205
TOTAL	**5,176**
Additional first year only cost (GIS system and gaging stations)	464
TOTAL FIRST YEAR COSTS	**5,640**

7.4 Peak Flow Release Example for Extremely Wet Water Year

The theory, objectives, and structure of the proposed adaptive environmental assessment and management (AEAM) organization are broadly described in the Trinity River Flow Evaluation Report (USFWS and HVT, 1999). The material presented in previous sections of this report provides more detail on roles, responsibilities, and budgetary needs of the organization. However, to date, there has not been a detailed example of how adaptive management would actually be used to manage the Trinity River. As stated in the Trinity River Flow Evaluation Study:

> *"a well-designed AEAM program (1) defines goals and objectives in measurable terms; (2) develops hypotheses, builds models, compares alternatives, and designs system manipulations and monitoring programs for promising alternatives; (3) proposes modifications to operations that protect, conserve and enhance the resources; and (4) implements monitoring and research programs to examine how selected management actions meet resource management objectives."*

The following section provides an example of the AEAM process, using the magnitude and duration of the annual high flow release as the example.

7.4.1 High Flow Magnitude

Hypotheses:

- Bed and bar scour discourages riparian vegetation establishment, thereby maintaining salmonid spawning and rearing habitat (and salmonid production)
- Adequate bed mobility results in reduced fine sediment storage in surface layer, reduced embeddedness, and improved habitat for benthic invertebrates and salmon spawning (and salmonid production)
- Bar scour and re-deposition (combined with reduced fine sediment supply) flushes spawning gravels, improving salmonid egg-emergence success (and salmonid production)
- There is a quantifiable relationship between increasing discharge and the amount of bed and bar scour depth and deposition
- Higher flows occur more frequently during wetter water years

Objectives:

1. Mobilize D_{84} gravel bed surface on bars and riffles
2. Scour and re-deposit bars and riffles to a depth greater than 2 D_{90}'s

Empirical data show that flows greater than 6,000 ft^3/s cause general bed mobilization indicated by the D_{84} particle size on bars and riffles. In a mixture of river gravels, the D_{84} represents the size for which 84 percent of the particles are finer. Empirical data relating flow and hydraulic conditions to bed scour (Wilcock, 1995; McBain and Trush, 1997) show flows ranging between 8,000 ft^3/s and 16,000 ft^3/s cause relative scour depths (scour/D_{90}) greater than two over most of the bar/bed surface. Observations of bed scour at the Bucktail bank rehabilitation site indicate a peak flow of 11,400 ft^3/s caused relative bed scour ranging from several D_{90} layers deep down in the channel to 1.35D_{90} deep midway up the point bar. A combination of Bucktail site data and median values of the compiled empirical data resulted in an initial conclusion that a peak discharge of 11,000 ft^3/s should be released in Extremely Wet water years to satisfy the bar surface scour objective. AEAM will enhance ability to achieve specific objectives by: 1) continuing to add empirical data relating bed scour to discharge at index sites, 2) developing / utilizing models that better describe the physical processes that cause bed scour.

7.4.2 High Flow Duration

Hypotheses:

- Increasing, maintaining, and routing coarse sediment supply will increase number and extent of bars
- Increased number and extent of bars will increase quantity and quality of salmonid spawning and rearing habitat, and salmonid production will thereby increase.
- Removing delta-formed backwaters will allow coarse sediment to route through the reach from upstream reaches, further increasing the number and extent of bars.
- Transporting fine sediment at a rate greater than input will decrease fine sediment storage in the mainstem Trinity River
- Decreasing fine sediment storage in the mainstem Trinity River will increase pool depth, decrease embeddedness, and decrease percent fines in spawning gravels (thereby increasing salmonid production)

Objectives:

1. Transport coarse sediment in upper river (near Deadwood and Rush creeks) at a rate equal to input.
2. Transport fine sediment in upper river (near Deadwood, Rush, and Grass Valley creeks) at a rate greater than input

Combining high flow magnitude with duration determines the total coarse and fine sediment transport capacity of the mainstem Trinity River. Measurements have been and continue to be taken on the mainstem Trinity River and tributaries to develop relationships between flow magnitude and fine & coarse sediment transport. This information can be predicted virtually on a real-time basis.

<u>Objective 1</u>

Evaluate objective 1 by comparing coarse sediment transport rates at both the Lewiston (RM 110) and Limekiln Gulch gaging stations (RM 98) with cumulative coarse sediment input rates from Deadwood Creek and Rush Creek. On an interim basis, because the TRD has greater influence on mainstem sediment transport closer to the dam, use the Rush Creek and Deadwood Creek coarse sediment yield as the management objective (transport sediment on the mainstem at a rate equal to input from Rush and Deadwood creeks). The duration of high flow recommendations in the TRFES is based on extrapolation of measured data to a long-term record to estimate sediment transport needs for each individual water year. For Extremely Wet water years, the duration is 5 days at 11,000 ft^3/s. Tributary sediment yield is most dependent on peak flow magnitude (that is partially dependent on water year class, i.e., typically, the wetter the water year, the more coarse sediment delivered to the mainstem); therefore, there is variability in year-to-year tributary sediment yields.

Objective 2

Evaluate Objective 2 by comparing fine sediment flux at the Limekiln Gulch gaging station with the estimated cumulative fine sediment yield from Deadwood Creek, Rush Creek, and Grass Valley Creek. Attempts to extrapolate fine sediment yield by water year class is more variable than coarse sediment.

7.4.3 Adaptive Management Example

Peak flows of five days' duration is the recommended starting point for the scheduled annual flows; in reality, peak flow duration should vary by the volume of sediment delivered to the mainstem Trinity River from tributaries for each individual water year (rather than averaging many years for a water year class). Using the coarse sediment management objectives as an example, AEAM would implement high flow recommendations based on the following real-time approach:

October 1 to April 1

1) Establish coarse sediment monitoring cross sections in mainstem Trinity River, focusing on the deltas (with large coarse sediment storage) and downstream reaches (with small coarse sediment storage).
2) Install bed mobility and scour projects at representative study sites. Develop bed mobility and or scour models to predict as a function of flow magnitude.
3) Monitor the volume of coarse sediment delivered to the mainstem Trinity River by tributaries by natural storm runoff events, particularly from Rush Creek. Summarize the volume of coarse sediment contributed by each tributary. For example, assume that 10,000 yd^3 of tributary derived coarse sediment needs to be transported by the mainstem during a given year.
4) Refine mainstem coarse sediment transport rates based on field measurements
5) Develop a hydraulic and sediment routing model for the upper portion of the mainstem Trinity River. Combine mainstem sediment transport relationship (input) with physical data downstream of tributaries into a sediment routing model (e.g., HEC-6 or better) to better calibrate model. This model will predict yd^3 of coarse sediment transported as a function of flow magnitude and duration, and will predict channel response (increasing or decreasing coarse sediment storage) at each cross section.

March 1 to April 1

6) Water supply forecasting to predict water year, culminating in a final water year designation on April 1. Assume an Extremely Wet year for this example.

April 1 to May 1

7) Because it is predicted to be an extremely wet year, the magnitude of the recommended flow is set at 11,000 ft^3/s to achieve bed/bar mobility and scour objectives.
8) Predict the duration of 11,000 ft^3/s flow release needed to transport 10,000 yd^3 of coarse sediment. Run sediment routing model predict the duration of 11,000 ft^3/s needed to transport 10,000 yd^3. Assume that model indicates 4 days. Therefore, the recommended duration of the 11,000 ft^3/s flow release is 4 days. Timing will be based on Chinook salmon smolt outmigration information; assume May 24-May 27.
9) This recommendation integrates into other team recommendations for that year and is forwarded to decision makers.

May 24-May 27

10) Conduct release.
11) Monitor coarse sediment transport to calibrate and improve sediment transport model
12) Monitor hydraulic parameters to calibrate and improve sediment transport model, bed mobility models, and bed scour models

May 27-July 22

13) Downramp flows to 450 ft^3/s.
14) Begin reducing and analyzing data.

July 22-October 1

15) Monitor coarse sediment storage by resurveying cross sections. This will also evaluate the coarse sediment transport model predictions, and will help better calibrate the model for future predictions.
16) Monitor bed mobility and bed scour at representative study sites. Evaluate and calibrate bed mobility and bed scour models.
17) Analyze data, summarize results, prepare reports, and solicit outside scientific review of hypotheses, study plan, modeling, and results.
18) Revise hypotheses, study plan, and models as appropriate.

This approach greatly enhances our ability to achieve specific objectives, while allowing a much better predictive capability in each successive year (predict and monitor rather than simply reacting to long-term monitoring results).

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Attachment 1
Lewiston Dam Releases to the Trinity River

Date	Extremely Wet	Wet	Normal	Dry	Critically Dry
01-Oct thru 15 Oct	450	450	450	450	450
16-Oct thru 21-Apr	300	300	300	300	300
22-Apr	500	500	500	300	300
23-Apr	500	500	500	300	900
24-Apr	500	500	500	300	1,500
25-Apr	500	500	500	300	1,500
26-Apr	500	500	500	300	1,500
27-Apr	500	500	500	900	1,500
28-Apr	500	500	500	1,500	1,500
29-Apr	1,500	2,000	2,500	2,500	1,500
30-Apr	1,500	2,000	2,500	3,500	1,500
01-May thru 05-May	1,500	2,000	2,500	4,500	1,500
06-May	2,000	2,500	4,000	4,306	1,500
07-May	2,000	2,500	6,000	4,121	1,500
08-May	2,000	2,500	6,000	3,943	1,500
09-May	2,000	2,500	6,000	3,773	1,500
10-May	2,000	2,500	6,000	3,611	1,500
11-May	2,000	2,500	6,000	3,455	1,500
12-May	2,000	2,500	5,784	3,307	1,500
13-May	2,000	2,500	5,574	3,164	1,500
14-May	2,000	3,000	5,373	3,028	1,500
15-May	2,000	4,000	5,178	2,897	1,500
16-May	2,000	6,000	4,991	2,773	1,500
17-May	2,000	8,500 [a]	4,811	2,653	1,500
18-May	2,000	8,500 [a]	4,637	2,539	1,500
19-May	2,000	8,500 [a]	4,469	2,430	1,500
20-May	3,000	8,500 [a]	4,307	2,325	1,500
21-May	4,000	8,500 [a]	4,151	2,225	1,500
22-May	6,000	7,666 [a]	4,001	2,129	1,500
23-May	8,500 [a]	6,833 [a]	3,857	2,037	1,500
24-May	11,000 [a]	6,000	3,717	1,950	1,500
25-May	11,000 [a]	6,000	3,583	1,866	1,500
26-May	11,000 [a]	6,000	3,453	1,785	1,500
27-May	11,000 [a]	6,000	3,328	1,708	1,500
28-May	11,000 [a]	6,000	3,208	1,635	1,500
29-May	10,444 [a]	5,690	3,092	1,564	1,500
30-May	9,889 [a]	5,322	2,980	1,497	1,497
31-May	9,333 [a]	4,977	2,872	1,433	1,433
01-Jun	8,778 [a]	4,655	2,768	1,371	1,371
02-Jun	8,222 [a]	4,354	2,668	1,312	1,312
03-Jun	7,667 [a]	4,072	2,572	1,255	1,255
04-Jun	7,111 [a]	3,809	2,479	1,201	1,201
05-Jun	6,556 [a]	3,562	2,389	1,150	1,150
06-Jun	6,000	3,332	2,303	1,100	1,100
07-Jun	6,000	3,116	2,219	1,053	1,053
08-Jun	6,000	2,915	2,139	1,007	1,007
09-Jun	6,000	2,726	2,062	964	964
10-Jun	6,000	2,550	2,000	922	922
11-Jun	5,664	2,385	2,000	883	883
12-Jun	5,359	2,230	2,000	845	845
13-Jun	5,071	2,086	2,000	808	808
14-Jun	4,798	2,000	2,000	774	774
15-Jun	4,540	2,000	2,000	740	740

Attachment 1
Lewiston Dam Releases to the Trinity River

Date	Extremely Wet	Wet	Normal	Dry	Critically Dry
16-Jun	4,295	2,000	2,000	708	708
17-Jun	4,064	2,000	2,000	678	678
18-Jun	3,845	2,000	2,000	649	649
19-Jun	3,638	2,000	2,000	621	621
20-Jun	3,443	2,000	2,000	594	594
21-Jun	3,257	2,000	2,000	568	568
22-Jun	3,082	2,000	2,000	544	544
23-Jun	2,916	2,000	2,000	521	521
24-Jun	2,759	2,000	2,000	498	498
25-Jun	2,611	2,000	2,000	477	477
26-Jun	2,470	2,000	2,000	450	450
27-Jun	2,337	2,000	2,000	450	450
28-Jun	2,212	2,000	2,000	450	450
29-Jun	2,093	2,000	2,000	450	450
30-Jun thru July 9	2,000	2,000	2,000	450	450
10-Jul	1,700	1,700	1,700	450	450
11-Jul	1,500	1,500	1,500	450	450
12-Jul	1,350	1,350	1,350	450	450
13-Jul	1,200	1,200	1,200	450	450
14-Jul	1,050	1,050	1,050	450	450
15-Jul	950	950	950	450	450
16-Jul	850	850	850	450	450
17-Jul	750	750	750	450	450
18-Jul	675	675	675	450	450
19-Jul	600	600	600	450	450
20-Jul	550	550	550	450	450
21-Jul	500	500	500	450	450
22-Jul to 30 Sep	450	450	450	450	450
Acre-Feet (Thousands)	**815.2 (721.1)[b]**	**701.0 (671.3)[b]**	**646.9**	**452.6**	**368.6**

[a]Releases restricted to 6,000 ft^3/s until floodplain improvements have occurred

[b]Annual allocations that reflect a maximum Lewiston Dam release of 6,000 ft^3/s until floodplain improvement projects are completed.

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United States Department of the Interior

FISH AND WILDLIFE SERVICE

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Feb 5, 1997

Mr. Paul Fujitani
U.S. Bureau of Reclamation
Central Valley Operations
Sacramento, CA 95821

Subject: Down ramping from unscheduled winter flows in the Trinity River.

We appreciate your invitation to provide assistance in evaluating the current ramping schedules used on the Trinity River system. In particular, we would like to provide some input regarding stranding of salmonid sac-fry and fry during the winter storm season and how down ramping schedules could be modified to help protect these early life stages.

General Information

Evaluation of stranding of salmonids in the Trinity River has been conducted in the past. During the time the Flow Evaluation was being conducted by the Service, staff assessed stranding of juvenile salmon and steelhead. Typically these surveys occurred after scheduled high flow events which occurred in late Spring. These surveys used direct observation with mask and snorkel to determine presence or absence of fish in areas behind the berms adjacent to the Trinity River. Results of these studies and others (CH2M Hill 1990, Bauersfeld 1978, Hamilton and Buell 1976, Hunter 1992, Bradford et al. 1995, Olson and Metzgar 1987) found reduced stranding with increased fish size (>50 mm).

While stranding of juveniles (> 50 mm) does not appear to be a problem in the Trinity River, more recent studies on the Trinity River have indicated that stranding of the earlier life stages (< 50 mm)(sac-fry and fry), can be significant (Memo to files from Zedonis, April 5, 1996 and memo to the Bureau of Reclamation from CDFG, April 12, 1996). During these studies, it was found that many sac-fry, fry, and a few juvenile salmonids were stranded when unscheduled flows were reduced using the current OCAP ramping schedule (Table 1). Although not studied in the Trinity, stranding of aquatic insects, a popular food source for salmonids, probably also occurs (Gislason 1985).

Timing of Down ramping can also influence the rate at which sac-fry and fry can be stranded. During the winter months, when water temperatures are cold, fry are generally found hiding in and around cover objects near the waters edge during the daylight hours (Zedonis pers. comm and many others). Because flow reductions during this time are generally not sensed by these fish, they become stranded (Bradford et al. 1995). Contrary to day-time, salmonid fry and

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juveniles become more active and less dependent on cover items during the night in the winter (Zedonis pers. comm; Campbell and Neuner 1985) and therefore are less vulnerable to stranding (Woodin 1984, Bradford et al. 1995).

Recommendations

In light of the information provided, and the possibility of this years flows resulting in some stranding, the Service would like to recommend the following conservative ramp schedule to better protect early life stages of salmonids and aquatic invertebrates.

1. Limit fluctuations in flow during the incubation and early rearing periods (January thru March) to prevent cumulative loss of fry and sac-fry.

2. Slow down ramping to levels below those listed in the OCAP report during the winter months when fish are small and more susceptible to stranding (see Table 1).

3. Limit flow reductions to night-time hours during the winter months.

4. Conduct studies, when opportunities arise, to better ascertain limitation and or refinements to these recommendations.

Table 1.

If existing release is:	Rate of Change (ft^3/sec)	
	Existing OCAP Decrease	Recommended Decrease
Above 6,000	500 per 4 hr	500 per 4 hr
6,000 to 4,000	500 per 4 hr	400 per 4 hr
2,000 to 4,000	500 per 4 hr	200 per 4 hr
500 to 2,000	200 per 4 hr	100 per 4 hr
300 to 500	100 per 4 hr	50 per 4 hr

Should you have any questions or need additional information, please contact Paul Zedonis of my staff at 707-822-7201.

Sincerely,

Tom T. Kisanuki

(for) Bruce Halstead
Project Leader