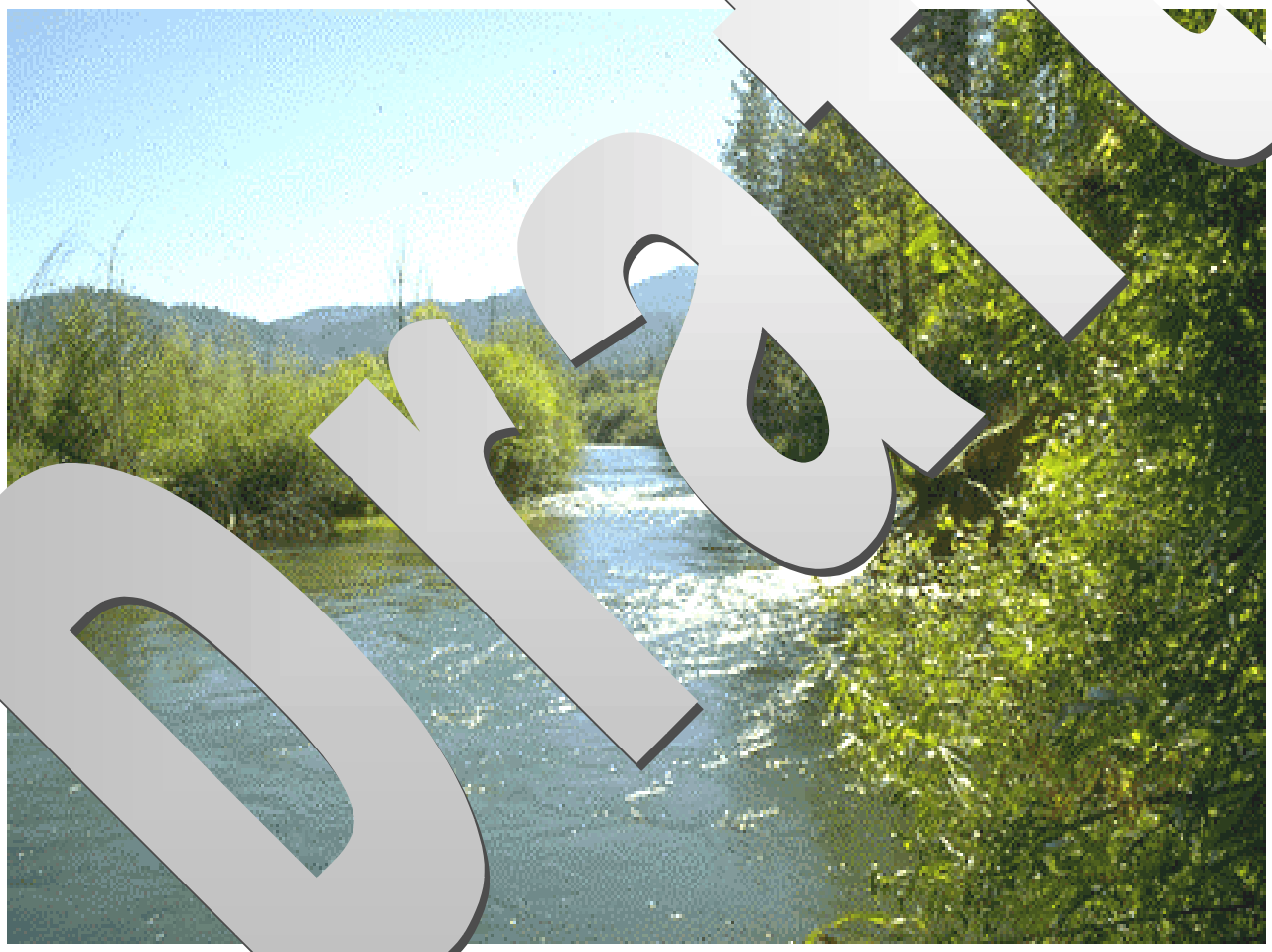
Mainstem Trinity River Habitat and Floodplain Modifications Information Report



United States Bureau of Reclamation
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Table of Contents

Forward

This Mainstem Trinity River Habitat and Floodplain Modification Information Report (Report) provides supplemental information on the mechanical rehabilitation and floodplain structural improvement components of the Trinity River Mainstem Fishery Restoration Environmental Impact Statement /Report (EIS/EIR). It was prepared under the direction of the Trinity River Basin Fish and Wildlife Task Force with the purpose of identifying the scheduling, funding, and prioritization requirements necessary to implement these activities if chosen as part of a future solution to restore the natural production of anadromous fish on the Trinity River mainstem downstream of Lewiston Dam.

This Report focuses on the actions necessary to prepare the various bridges, homes, and other improvements currently existing within the floodplain for 11,000 cfs releases from Lewiston Dam. It also discusses the logistics of constructing the 47 channel rehabilitation and side-channel projects contained in the Flow Evaluation, Percent Inflow, and Mechanical Restoration alternatives. Other issues such as gravel replacement, project monitoring, the establishment of an adaptive management program, and the need for additional gaging stations are also addressed.

Costs and schedules provided in this Report are based on the conditions associated with the Flow Evaluation Alternative. This information is also applicable all or in part to the other alternatives identified in the EIS/EIR as meeting the purposes, needs, goals and objectives of restoring the natural production of anadromous fish in the Trinity River.

Introduction

A combination of increased releases from Lewiston Dam and mechanical rehabilitation in the mainstem Trinity River has been proposed in the Flow Evaluation and Percent Inflow alternatives as critical components to restoring the natural production of anadromous fish in the Trinity River. Releases would be as high as 11,000 cfs during extremely wet years. The high flows are believed important to mobilize sediment, scour the riverbed, reshape the channel, and remove encroaching vegetation, and are expected to yield significant benefits to the riverine environment. Additional actions would be required; however, to address impacts to certain existing properties and structural improvements within the floodplain before any controlled releases over 6,000 cfs could be provided. A study entitled; Trinity River Damage Assessment-Lewiston to Douglas City has been prepared by the California Department of Water Resources to estimate impacts of the high flows on bridges, houses, and other improvements. Trinity County has also prepared a separate study providing more detailed designs and cost estimates for the affected bridges. Both documents were utilized for the information contained in this Report.

Because of the encroachment of the river channel by riparian vegetation and the limits on the size and frequency of high flows available, it has been determined that a mechanical rehabilitation program within the mainstem would be required under the Flow Evaluation, Percent Inflow, and Mechanical Restoration alternatives. Forty-seven areas within the Trinity River mainstem have been identified for mechanical rehabilitation, with 44 of the sites anticipated to be channel rehabilitation sites and the remaining 3 being side channel projects. Spawning gravel replacement would also be a part of the program, with the amount of the gravel required being dependent upon how the river reacts to the new flow schedule.

The EIS/EIR specifies that, under the Flow Evaluation Alternative, an Adaptive Environmental Assessment and Management (AEAM) program would be established. The purpose of AEAM would be to:

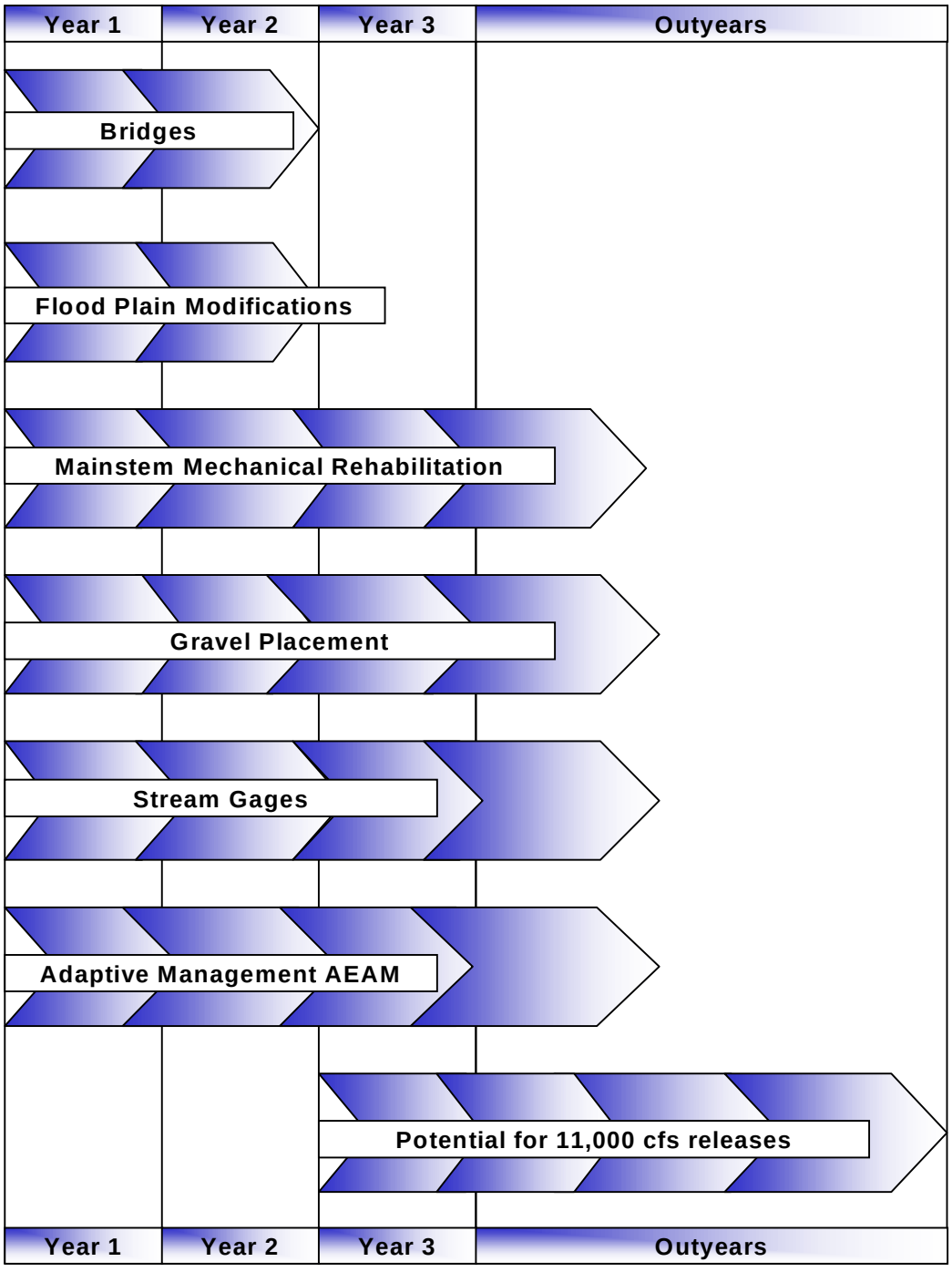
- Define restoration goals and objectives in measurable terms.
- Develop hypotheses, build predictive models, and design system modifications for promising alternatives
- Propose modifications to operations that protect, conserve and enhance the resource.
- Implement monitoring and research programs to examine how selected management actions meet resource management objectives.

A combination of increased releases and mechanical rehabilitation has been proposed for restoring the Trinity River

Initial efforts for the AEAM program would be focused on identifying a set of measurable responses to quantify the basic premises of the Trinity River Flow Evaluation Alternative recommendations. Monitoring programs would be designed and implemented that would document channel evolution over time, the increase in salmonid habitat that is expected to result, and juvenile salmonid production and growth. Progress toward the program objectives and any trends identified would be reported annually.

Under the Percent Inflow and Mechanical Restoration alternatives no formal AEAM program would be required.

This Report outlines the actions necessary to implement the mechanical rehabilitation and floodplain structural improvement components of the EIS/EIR, including the AEAM program, as required, for the first three years of the program. It provides an estimate of annual costs for budget formulation purposes and possible implementation schedules.


Year 1
Year 2
Year 3
Outyears
Bridges
Flood Plain Modifications
Mainstem Mechanical Rehabilitation
Gravel Placement
Stream Gages
Adaptive Management AEAM
Potential for 11,000 cfs releases
Year 1
Year 2
Year 3
Outyears

Action One

REMOVE AND REPLACE EXISTING BRIDGES

Purpose

To enable releases as high as 11,000 cfs from Lewiston Dam without causing damage to downstream bridges or increasing the risk of damage to other existing structures adjacent to the bridges.

Description

Both the Flow Evaluation and Percent Inflow alternatives provide for peak releases of up to 11,000 cfs from Lewiston Dam. In the Flow Evaluation Alternative, this maximum release would occur during 5 days in May. For the Percent Inflow Alternative the timing would vary based on the previous week's natural inflow above Trinity Dam. Current studies indicate that 4 existing bridges (Salt Flat, Bucktail, Poker Bar, and Treadwell) do not meet minimum design standards for an 11,000 cfs release from Lewiston Dam and must be replaced. Any increase in Lewiston Dam releases above current levels will substantially increase the risk of failure of the existing structures either from scour at the foundations or inundation of the superstructure. For the purposes of this Report, design elevations for the replacement structures are 3-feet above

Salt Flat Bridge

the 50-year floodwater surface or 3-feet above the flood level resulting in overtopping of the bridge road approaches. Salt Flat, Poker Bar, and Treadwell are privately owned bridges while Trinity County owns the Bucktail Bridge. Additional permanent rights-of-way will need to be acquired for all of the structures to accommodate the increased bridge lengths, new road approaches, and necessary river channel reconstructions. No releases from Lewiston Dam exceeding 6000 cfs are recommended prior to the completion of this bridge work.

Schedule

Activities required to accomplish this action include obtaining engineering design services, performing Federal and State environmental compliance including public involvement, obtaining rights-of-way, acquiring permits, performing pre-design surveys and field investigations, procuring a construction contractor, obtaining construction management services, and performing the actual construction and site rehabilitation. For this Report, a CEQA mitigated Negative Declaration and NEPA Categorical Exclusion is assumed adequate for environmental compliance. A critical constraint each year is the period of time equipment is allowed to work within the Trinity River wetted perimeter due to biological considerations. This is approximately July 1 – September 15 of each year. This period the first year of the project will be devoted to performing exploratory drilling at the anticipated bridge pier locations. This time period the second year would then be used for actual bridge construction. The total time required from initiating designs to completing construction of the 4 bridges therefore ranges from a minimum of 17 months to as long as 28 months depending upon how starting the work relates to this construction window.

Cost

$6,050,000 which includes:

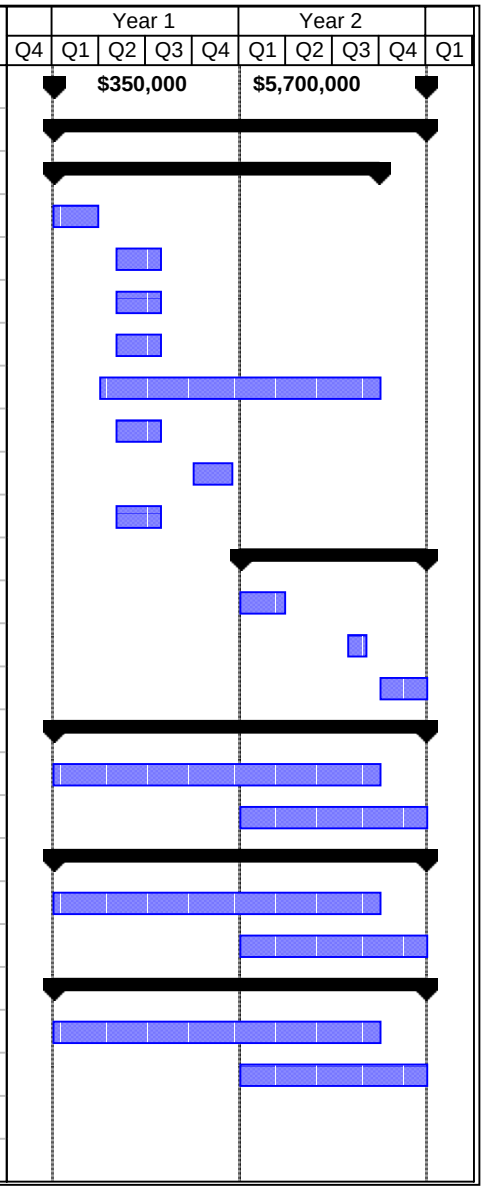
- Construction costs of $4,743,000
- Geo-technical investigations, design, permitting, environmental compliance, construction management costs of $1,307,000.

Relation to Other Alternatives

The schedule and cost information provided for this action is based on conditions associated with the Flow Evaluation Alternative. No action relative to existing bridges would be required under the Mechanical Restoration Alternative as peak flow releases proposed (2000 cfs) can be safely passed with the existing structures. Costs would slightly increase for the Percent Inflow Alternative since timing of an 11,000 cfs release would likely coincide with higher tributary inflows than under the Flow Evaluation Alternative, creating a higher design flood at the bridge locations. Costs for the Maximum Flow Alternative would increase by approximately 5% over the Flow Evaluation Alternative due to longer bridge spans and deeper scour protection.

Activity Schedule**

ID	Task Name	Cost
1	**Action 1: Bridges**	**$6,050,000.00**
2	**Salt Flat (Design Flow 15,500 cfs)**	**$1,310,000.00**
3	**Pre-construction**	$138,000.00
4	Procure Design Services	
5	NEPA/CEQA Compliance	
6	Permits	
7	Rights of Way	
8	Design	
9	Surveys	
10	Geo-technical Investigations	
11	Negotiate O&M Agreement	
12	**Construction**	$1,172,000.00
13	Procure Construction Management	
14	Award Construction Contract	
15	Construction	
16	**Bucktail (Design Flow 16,500 cfs)**	**$2,170,000.00**
17	Pre-construction*	$186,000.00
18	Construction*	$1,984,000.00
19	**Poker Bar (Design Flow 31,000 cfs)**	**$1,870,000.00**
20	Pre-construction*	$182,000.00
21	Construction*	$1,688,000.00
22	**Treadwell (Design Flow 14,000 cfs)**	**$700,000.00**
23	Pre-construction*	$90,000.00
24	Construction*	$610,000.00



* Includes the same milestone elements as shown for the Salt Flat Bridge
** Based on a Federal Fiscal Year October 1 to September 30
** Based on Flow Evaluation Alternative

Action Two

ADDRESS IMPACTS TO PRIVATELY OWNED LANDS AND EXISTING STRUCTURAL IMPROVEMENTS FROM INCREASED FLOWS

Purpose

To enable releases as high as 11,000 cfs from Lewiston Dam without causing damage or increasing the risk of damage to private properties within the flood plain.

Description

Releases from Lewiston Dam as high as 14,000 cfs have occurred during flood periods in the past associated with uncontrolled spills upstream at Trinity Dam. Controlled releases from Trinity Dam through Lewiston Dam have historically been limited to 6000 cfs, to minimize downstream damage and in accordance with Safety of Dams criteria. Increasing releases from 6000 cfs to 11,000 cfs for restoration purposes 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, approximately 5 miles downstream, releases of 11,000 cfs actually exceed the current 100-year FEMA flood event of 8,500 cfs, which is based upon historical flood operation at Trinity Dam. Downstream of Rush Creek, 11,000 cfs releases would result in river flows less than the 100-year event as designated by FEMA. At a number of locations, including Bucktail Subdivision, Poker Bar Subdivision and Indian Creek Subdivision, releases from Lewiston Dam up to 11,000 cfs would encroach upon existing private flood plain structural improvements. 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 may also be affected. Procedures to prevent water damage to structures could include demolition and removal, temporary or permanent relocation, or construction of protective dikes. Access roads or driveways could be elevated or relocated. Private lands without existing structural improvements could be purchased, addressed through the acquisition of flood plain easements, or require no action at all, depending upon location and potential impact. The “Trinity River Damage Assessment – Lewiston to Douglas City – May 1997” prepared by the California Department of Water Resources is being

Trinity River Flood 1964

expanded to add the more remote sections of the river corridor to the high density areas provided in the original document. The hydraulic model used in the study to determine the stage/discharge relationship will also be rerun from Lewiston to Douglas City based on more accurate survey information. These enhancements will be completed by September 2000.

Schedule

Activities and time periods required to accomplish this action will largely depend upon the ability of the Federal Government to address the private property issues resulting from the proposed new releases. Some interpretations of Government liability for private property impacts in the flood plain may bring challenges from landowners, delaying implementation. For the purposes of this Report, schedules and costs are provided to mitigate for existing structures that would be damaged by a release of 11,000 cfs in May. Inundated lands upstream of Rush Creek and outside of the designated FEMA 100-year flood plain would be purchased or otherwise mitigated. Lands downstream of Rush Creek within the FEMA 100-year flood plain would be mitigated on a case by case basis based on potential damages. Impacted landowners would be contacted, and right-of-entry agreements would be negotiated to allow control surveys of structures. Options would be discussed, property appraisals performed as necessary, and various agreements would be negotiated. Conditions of the agreements, such as structure relocations, demolition, or flood proofing would then be performed. The total time required to allow full releases of 11,000 cfs is assumed to be 18 months.

Cost

$350,000 which includes:

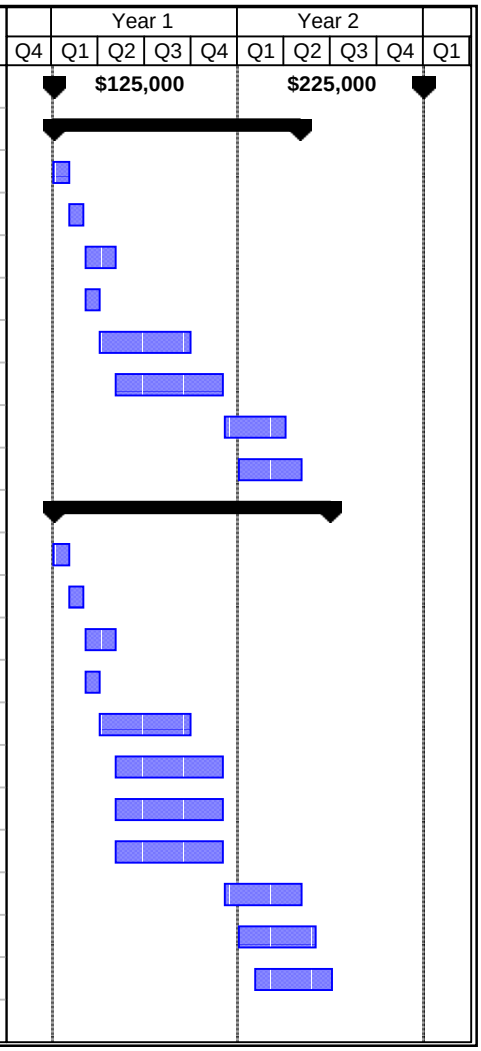
- Purchase, relocation, easement costs of $205,000
- Surveys, appraisals, document preparation costs of $145,000.

Relation to Other Alternatives

The schedule and cost information provided for this action is based on conditions associated with the Flow Evaluation Alternative. No action relative to flood plain modifications would be required under the Mechanical Restoration Alternative as peak flow releases proposed (2000 cfs) would be within the range of past historical releases from Trinity Dam. Impacts would be higher and costs would increase for the Percent Inflow Alternative by approximately 100 percent since timing of an 11,000 cfs release would likely coincide with higher tributary inflows than under the Flow Evaluation Alternative, impacting additional properties in the flood plain. Damages would increase dramatically under the Maximum Flow Alternative for releases of up to 30,000 cfs, potentially exceeding $10,000,000.

Activity Schedule*

ID	Task Name	Cost
1	**Action 2: Flood Plain Modifications**	**$350,000.00**
2	**Upstream of Rush Creek**	**$75,000.00**
3	Identify Impacted Properties	
4	Contact Landowners	
5	Obtain Right-of-entry	
6	Procure Surveying Services	
7	Perform Boundary Surveys	
8	Appraise Properties	
9	Negotiate Agreements	
10	Record Documents	
11	**Downstream of Rush Creek**	**$275,000.00**
12	Identify Impacted Properties	
13	Contact Landowners	
14	Obtain Right-of-entry	
15	Procure Surveying Services	
16	Perform Boundary Surveys	
17	Inventory Impacted Structures	
18	Identify Significantly Impacted Lands	
19	Appraise Properties	
20	Negotiate Agreements	
21	Record Documents	
22	Perform Structure Mitigations	



* Based on Federal Fiscal Year October 1 to Sept 30
* Based on Flow Evaluation Alternative

Action Three

CONSTRUCT MECHANICAL REHABILITATION PROJECTS

Purpose

To improve fish and wildlife habitat along the mainstem Trinity River.

Description

Reduced flows in the Trinity River have resulted in the formation of riparian berms along the river channel margins. These berms constrain the normal meandering characteristics of a healthy river, reducing the complexity and diversity of the riparian and riverine habitats. Because of the limits on the size and frequency of high flows available downstream of Lewiston Dam, it has been determined that a mechanical rehabilitation program within the mainstem under the Flow Evaluation, Percent Inflow, or Mechanical Restoration alternatives would be required. Forty-seven areas within the Trinity River mainstem have been identified for mechanical rehabilitation, with 44 of the sites anticipated to be channel rehabilitation sites and the remaining 3 being side channel projects. Construction equipment would be used to remove sections of the berms to widen the river channel or to allow part of the river to flow behind the berms. Plantings would be made on the constructed floodplain surfaces to accelerate the regrowth of a new, wider riparian corridor. Individual projects would be selected and prioritized through the use of biological and geomorphic screening criteria as well as other factors such as accessibility and secondary benefits. High flow releases above 6000 cfs are considered beneficial to the river system at any stage during the implementation of this action.

Biological and geomorphic monitoring prior to and after project construction will be critical to establish baseline conditions and document beneficial or deleterious effects. Monitoring information will be input into the Adaptive Environmental Assessment and Management (AEAM) program as required to examine how the mechanical rehabilitation projects are meeting resource management objectives of the overall restoration program. This action includes only those monitoring programs associated with mechanical rehabilitation. Other long term monitoring efforts such as redd surveys, adult counts, and juvenile emigration studies will be addressed as part of the AEAM program under the Flow Evaluation Alternative, or under other on-going fishery programs related to Trinity River restoration activities.

Pear Tree Gulch Feather Edge Site
September 1992

Schedule

Under the Flow Evaluation Alternative, twenty-four channel rehabilitation projects will be built in the first 3 years of the program, with additional projects considered contingent upon a formal adaptive management evaluation. Activities required to construct a mechanical rehabilitation project include performing Federal and State site-specific environmental compliance

including public involvement, obtaining rights-of-way, acquiring permits, performing pre-design, surveys and field investigations, preparing engineering designs, procuring a construction contractor, and managing and performing the actual construction and site rehabilitation. A critical constraint each year is the period of time equipment is allowed to work within the Trinity River wetted perimeter due to biological considerations. This is approximately July 1 - September 15 of each year.

Biological monitoring would include habitat mapping and fish use observations at project sites. Physical monitoring would document riparian conditions and substrate scour and depositional patterns. Index sites would be selected and monitored biannually while including a sub-sample of new sites that are constructed each year. Pre-project monitoring would also be performed on at least one of the sites that are proposed for construction in each of the first three years. For example, pre-project monitoring in the first year should include at least one site proposed for construction in that year and each of the following two years. This would allow pre-project monitoring for one to three years for these sites prior to the AEAM program review. Monitoring would continue for at least two years following construction. Thereafter, sites would be monitored periodically in years when substantial changes may occur, for example, following high flow events or dry periods.

Cost

$7,754,000 over the first 3 years, which includes:

- Construction costs of $5,700,000
- Design, permitting, environmental compliance, and construction management costs of $1,250,000
- Monitoring costs of $804,000 at $268,000 per year.

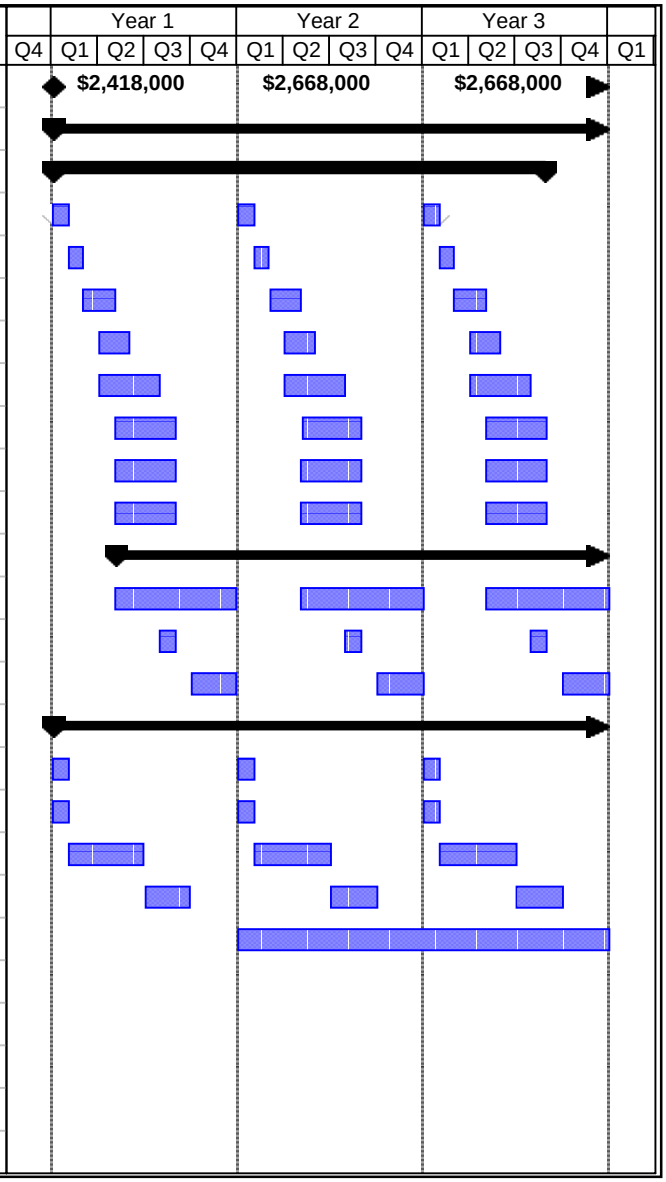
An additional $6,700,000 in capital costs and $268,000 per year in monitoring costs are anticipated after Year 3.

Relation to Other Alternatives

The schedule and cost information provided for this action is based on conditions associated with the Flow Evaluation Alternative. The same 47 mechanical rehabilitation projects would also be required under the Mechanical Restoration Alternative and the Percent Inflow Alternative. River flows are expected to adequately maintain the rehabilitation site after construction for the Flow Evaluation and Percent Inflow alternatives. Due to lower peak flows under the Mechanical Restoration Alternative, the use of construction equipment to maintain the newly constructed rehabilitation sites as well as 27 existing sites would be required at a cost of approximately $10,000 annually. This alternative also includes a sediment dredging program at a cost of $200,000 annually. No mechanical rehabilitation projects would be constructed under the Maximum Flow Alternative.

Activity Schedule**

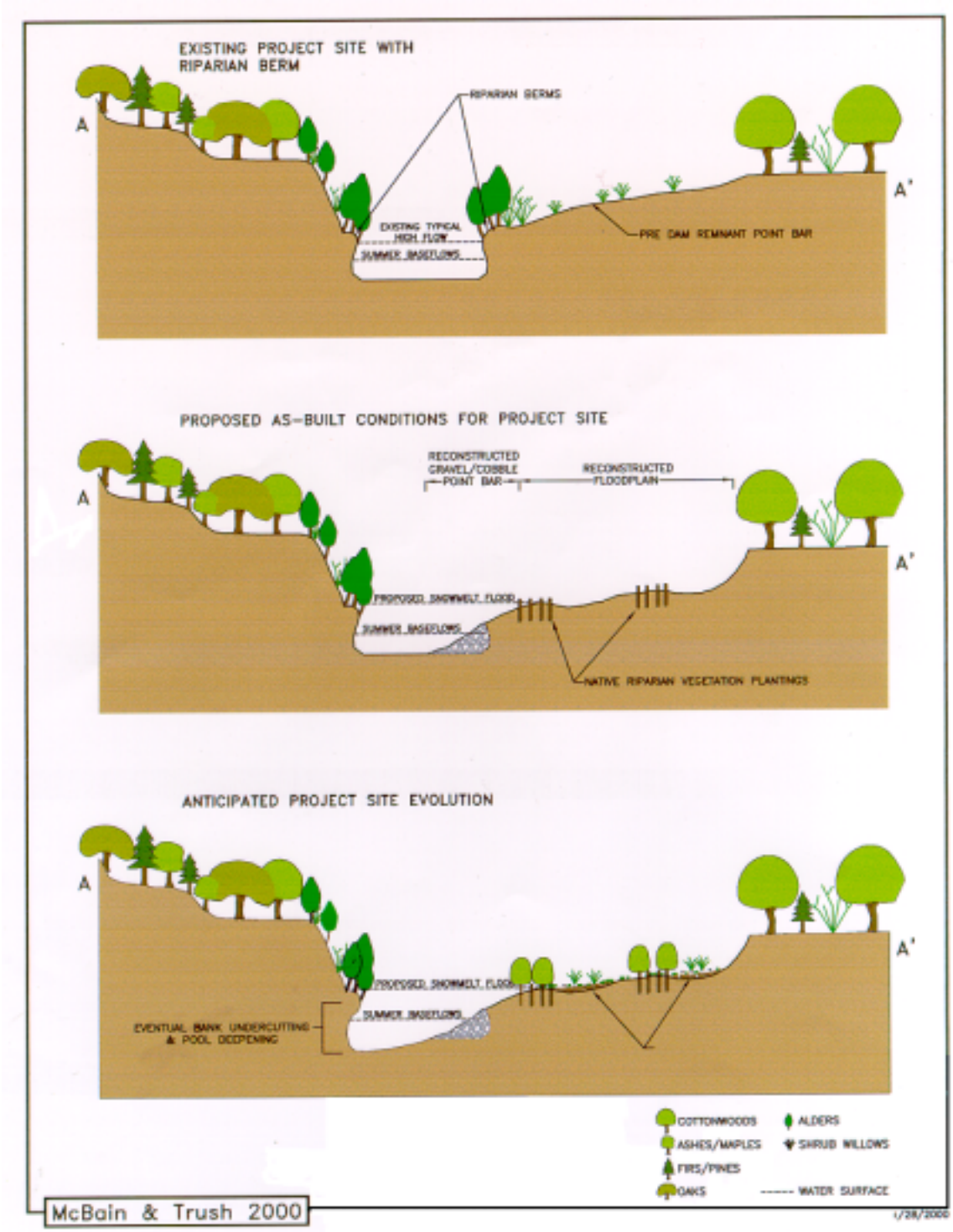
ID	Task Name
1	**Action 3: Mechanical Rehabilitation***
2	**Site Development**
3	**Preconstruction**
4	Prioritize Sites
8	Contact Landowners
12	Rights-of-way
16	Land Surveys
20	Design
24	NEPA/CEQA Compliance
28	Permits
32	Construction Easement
36	**Construction**
37	Construction Management
41	Award Construction Contract
45	Construction
49	**Monitoring**
50	Identify Index Sites
54	Identify Preconstruction Monitoring
58	Perform Index Monitoring
62	Perform Preconstruction Monitoring
66	Perform Postconstruction Monitoring



* Anticipated capital expenditures of $6,700,000 and annual monitoring costs of $268,000 required after Year 3

** Based on a Federal Fiscal Year October 1 to September 30

** Based on Flow Evaluation Alternative


EXISTING PROJECT SITE WITH RIPARIAN BERM
A
A'
RIPARIAN BERMS
EXISTING TYPICAL HIGH FLOW
SUMMER BASEFLOWS
PRE DAM REMNANT POINT BAR
PROPOSED AS-BUILT CONDITIONS FOR PROJECT SITE
RECONSTRUCTED GRAVEL/COBBLE POINT BAR
RECONSTRUCTED FLOODPLAIN
PROPOSED SNOWMELT FLOOD
SUMMER BASEFLOWS
NATIVE RIPARIAN VEGETATION PLANTINGS
ANTICIPATED PROJECT SITE EVOLUTION
EVENTUAL BANK UNDERCUTTING & POOL DEEPENING
COTTONWOODS
ALDERS
ASHES/MAPLES
SHRUB WILLOWS
FIRS/PINES
OAKS
WATER SURFACE
McBain & Trush 2000
1/28/2000

	BIOLOGICAL PRIORITIZATION CRITERIA			Qualitative	Quantitative				
#	CRITERIA	HYPOTHESIZED BENEFIT	CERTAINTY OF BENEFIT	WEIGHTING	WEIGHTING	ZERO SCORE	ONE SCORE	TWO SCORE	COMMENTS/JUSTIFICATION
1	Is the site near a heavily used fall-run and spring-run chinook salmon spawning area?	Rearing habitat provided by bank rehabilitation projects adjacent to high spawning use areas will increase fry survival because the travel distance from redd to rearing habitat is shorter.	Medium certainty because redd maps availability is unknown and the relationship between fry travel distance and mortality is unquantified.	**High**	**35%**	No reaches would be scored a zero because there is spawning everywhere between Lewiston and NF Trinity	Reach is between Indian Creek (RM 95) and the NF Trinity River (RM 72)	Reach is between Lewiston Dam (RM 112) and Indian Creek (RM 95)	Based on redd surveys from 1991 to 1999 (Citations)
2	Is the site near a heavily used coho salmon or steelhead spawning area (including tributaries)?	Rearing habitat provided by bank rehabilitation projects adjacent to high spawning use areas or tributaries will increase fry survival because the travel distance from redd to rearing habitat is shorter.	Low certainty because redd maps availability is unknown and the relationship between fry travel distance and mortality is unquantified.	**High**	**5%**	No reaches would be scored a zero because there is spawning everywhere between Lewiston and NF Trinity	Reach is between Deadwood Creek (RM 110) and the NF Trinity River (RM 72)	Reach is between Lewiston Dam (RM 112) and Deadwood Creek (RM 110)	Based on professional judgement because there is no redd distribution data for coho and steelhead on the mainstem
3	Is site in a reach where salmon spawning habitat is over-utilized (locally, spawning habitat is limited)?	Additional spawning habitat in these areas can help reduce redd superimposition and improve fry production.	Medium certainty because it is not known if spawning habitat is over-utilized in certain reaches, and whether the projects will improve redd distribution to minimize superimposition.	**Medium, with redd mapping info, could be high**	**20%**	No reaches would be scored a zero because there is spawning everywhere between Lewiston and NF Trinity	Reach is between Deadwood Creek (RM 110) and the NF Trinity River (RM 72)	Reach is between Lewiston Dam (RM 112) and Deadwood Creek (RM 110)	Based on redd surveys from 1991 to 1999 (Citations)
4	Is site in reach with steeper gradient and larger particle size to create better over-wintering habitat for steelhead and coho?	over-wintering habitat is limited by embeddedness, and restoration projects and continued efforts to reduce fines will increase habitats with large, exposed cobbles with clean interstices	Low certainty because it is not known if over-wintering habitat is limiting. Could be very important for these species.	**Medium**	**3%**	less than 0.05 %	0.0005 to .002	Greater than 0.2%	Should be based on fine sediment supply, gradient, confinement, embeddeness. We used gradient as the criteria since we could get it from USGS maps
5	Is site in reach possessing high fry or juvenile stranding potential?	Removing riparian berms and restoring gently sloping banks will reduce fry and juvenile stranding areas.	Medium certainty because we know stranding is increased because of riparian berms (and will increase with higher flows), but we don't know the impact on overall production (are losses significant).	**High**	**25%**	Based on field assessment in notes (Low stranding potential)	Based on field assessment in notes (Medium stranding potential)	Based on field assessment in notes (High stranding potential)	Based on field notes: we considered berm depression, draining once inundated, hieght of berm (frequency of inundation/stranding),
6	Is there potential to take advantage of nearby habitat diversity to make the project site more diverse?	Tiering off existing high quality habitat will provide greater overall habitat quality and diversity (e.g., at Pear Tree Gulch rehabilitation site there is a tributary flowing into the upper end of the bar that creates more complex habitat at that site. At the Bell Gulch rehab site there is a natural side channel just upstream that flows into the upper end of the project site.	Low certainty because we can't quantify survival benefits of adding habitat diversity. (e.g, if a site is already diverse, will adding additional diversity make it better?)	**Medium, could be high if we could quantify benefits of habitat diversity**	**5%**	No bedrock outcrops, no sidechannels, and no nearby tributary delta	Site has one bedrock outcrops, sidechannel, or nearby tributary delta	Site has bedrock outcrops, sidechannel, and nearby tributary delta	Based on field assessment in notes and air photos (lots of opportunity, variable bedrock outcrops, tributary deltas to provide coarse sediment, tight meander bends, sidechannels)
7	Will a project affect tributary deltas and improve fish access to the tributary?	Steep deltas prevent upstream fish passage during low flows.	Medium certainty because we don't think that there are any deltas (with periodic exception of Indian Creek perhaps) upstream of the NF Trinity where passage is a problem.	**Low**	**2%**	Not near tributary delta	Not applicable	Project at Indian Creek, Rush Creek, Canyon Creek, Deadwood Creek	We don't think there is any migrational problems that are out of the ordinary-most are associated with low flow rather than delta aggradation???
8	Will other species benefit from the project? (e.g. yellow legged frogs, western pond turtles, killdeers, etc.)	Restoring exposed cobble/gravel bars, floodplains, and channel migration will increase habitat availability, quality, and diversity for these and other species.	High certainty for some species (frogs), low certainty for other species (pond turtles, and others that we have not studied much).	**Medium**	**5%**	Strict berm removal with no additional features	Project can construct off-channel wetlands, reclaim tailing piles, or ties into existing or proposed side channels (1 of 3)	Project can construct off-channel wetlands, reclaim tailing piles, and ties into existing or proposed side channels (all 3)	
					100%				

GEOMORPHIC AND RIPARIAN PRIORITIZATION CRITERIA

#	CRITERIA	HYPOTHESIZED BENEFIT	CERTAINTY OF BENEFIT	WEIGHTING	WEIGHTING	ZERO SCORE	ONE SCORE	TWO SCORE	COMMENTS/JUSTIFICATION
1	Is there an adequate supply of coarse sediment to maintain site?	Coarse sediment supply from nearby tributary, or cumulative tributary input downstream of Indian Creek, will improve self-maintenance of site.	High certainty; the larger the tributary and/or further downstream from Lewiston Dam, the larger the certainty because coarse sediment supply will be larger.	**High**	**15%**	More than 5 miles downstream of major tributary delta (Deadwood, Rush, Grass Valley, Indian, Weaver, Reading, Browns, Canyon creeks) AND between Lewiston Dam and Indian Creek	Between 1 mile and 5 miles downstream of major tributary delta (Deadwood, Rush, Grass Valley, Indian, Weaver, Reading, Browns, Canyon creeks) OR between Indian Creek and Dutch Creek (RM 86)	Less than 1 mile downstream of major tributary delta (Deadwood, Rush, Grass Valley, Indian, Weaver, Reading, Browns, Canyon creeks) OR downstream of Indian Creek	
2	Is there risk of the site being buried by fine sediment deposited during episodic flood event?	Episodic high fine sediment loading will bury site in decomposed granitic sand.	Low certainty; fine sediment control efforts in Grass Valley Creek has radically lowered fine sediment supply, and Hoadley Gulch only produces substantial fine sediment during large floods.	**Low**	**5%**	Less than 1 mile downstream of Grass Valley Creek or Hoadley Gulch	Between 1 mile and 2 miles downstream of Grass Valley Creek or Hoadley Gulch	More than 2 miles downstream of Grass Valley Creek or Hoadley Gulch	
3	Is site on meander with a small radius of curvature?	Meanders with low radius of curvatures will have greater shear stress and bedload transport across bar surface, improving self-maintenance of site.	Medium certainty; every bend produces different hydraulic characteristics.	**Medium**	**12%**	Meander bend has radius of curvature greater than 1000 ft	Meander bend has radius of curvature between 500 and 1000 ft	Meander bend has radius of curvature greater less than 500 ft	
4	Does site have bedrock or other roughness features to direct channel into?	Bedrock outcroppings increase hydraulic complexity during high flows, increasing habitat complexity	Medium certainty; every bedrock outcrop produces different hydraulic characteristics.	**Medium**	**10%**	Reach has no exposed bedrock	Reach is on a bend with existing exposed bedrock outcroppings and large woody debris	Long straight reaches with exposed bedrock outcroppings and large woody debris	Prioritizes sites that presently have little to no habitat complexity but have the opportunity to create much more; sites with complex channel are prioritized less because restoration won't improve habitat as much as the former case.
5	Does the channel have the ability to migrate in the reach?	Bedrock outcroppings will eliminate the ability of the river to migrate.	High certainty; bedrock stops channel migration, but does add channel complexity	**Low**	**10%**	Reach is tightly confined by valley walls (e.g., Browns Creek Canyon) or bedrock	At least one bank is entirely alluvial (allowing channel migration)	Both banks entirely alluvial	Criteria 4 and 5 SHOULD NOT cancel each other out
6	Is site adjacent to dredger tailings?	Reclaiming dredger tailings as introduced gravels and restored floodplains will increase geomorphic benefit of project.	High certainty; adding gravel will increase and maintain downstream bars, floodplains will improve riparian vegetation.	**Medium**	**25%**	No dredger tailings are available	No dredger tailings are available on site, but terrace material is available	Dredger tailings are available on-site	Evaluates whether gravel sources are available for on-site point bar creation or off-site gravel introduction near Lewiston Dam
7	Is longitudinal site gradient less than 0.002?	Lower slope will encourage smaller particle size (D_{max} < 150 mm) and encourage increased channel sinuosity.	Medium certainty; particle size is more certain, but channel sinuosity depends on controlling bank structure (bedrock, etc.).	**Medium**	**5%**	Reach has high flow energy slope less than 0.0005 or greater than 0.002	Reach has high flow energy slope between 0.001 and 0.002	Reach has high flow energy slope between 0.0005 and 0.001	Gradient should be estimated from 1997 photogrammetry of low flow water surface elevation
8	Is the site near a healthy stand of seed producing cottonwoods (both genders must be present)	Seedling recruitment potential increases with proximity to seed producing mature trees.	High certainty; natural cottonwood regeneration typically cannot occur without a seed source.	**High**	**8%**	Site is greater than 2 miles away from large seed producing stand	Site is between 0.5 miles and 2 miles of large seed producing stand	Site is within 0.5 miles of large seed producing stand	Newly created floodplains cannot naturally regenerate without a nearby viable seed source
9	Is valley width large enough to increase floodplain width, riparian coverage, and provide space for spoil materials?	The wider the floodplain, the more riparian vegetation that can be planted and naturally recruited.	High certainty; more space = more riparian coverage.	**medium**	**10%**	Valley width is less than 500 ft, and restored side is less than 50 ft	Valley width is less than 500 ft but restored side is greater than 100 ft	Valley width is greater than 500 ft and restored side is greater than 100 ft	Addresses floodplain and riparian restoration, and provides space for spoils of sand and mature riparian trees removed from the berm
					100%				

	BIOLOGICAL WEIGHTING CRITERIA (see column E in "criteria" worksheet)									GEOMORPHIC AND RIPARIAN WEIGHTING CRITERIA (see column E in "criteria" worksheet)									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Total**
	35%	*5%*	*20%*	*3%*	*25%*	*5%*	*2%*	*5%*	*100%*	*15%*	*5%*	*12%*	*10%*	*10%*	*25%*	*5%*	*8%*	*10%*	*100%*
							Total = sum (score * wieghting criteria)												
			Biological Prioritization Criteria									Geomorphic Criteria							
Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	1	2	3	4	5	6	7	8	9	Total
A	9	2	2	1	2	1	1	0	4.25	1	1	1	1	1	1	1	1	2	1.1
B	1	2	2	1	1	1	0	0	1.18										0
C	1								0.35										0
D									0										0
E									0										0
F									0										0
G									0										0
H									0										0
I									0										0
J									0										0
K									0										0
L									0										0
M									0										0
N									0										0
O									0										0
P									0										0
Q									0										0
R									0										0
S									0										0
T									0										0
U									0										0
V									0										0
W									0										0
X									0										0
Y									0										0
Z									0										0
AA									0										0
AB									0										0
AC									0										0
AD									0										0
AE									0										0
AF									0										0
AG									0										0
AH									0										0
AI									0										0
AJ									0										0
AK									0										0
AL									0										0
AM									0										0
AN									0										0
AO									0										0
AP									0										0
AQ									0										0
AR									0										0
AS									0										0
AT									0										0
AU									0										0
AV									0										0

			Biological Prioritization Critera									Geomorphic Criteria									
Site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	1	2	3	4	5	6	7	8	9	Total
AW									0										0
AX									0										0
AY									0										0
AZ									0										0
BA									0										0
BB									0										0
BC									0										0
BD									0										0
BE									0										0
BF									0										0
BG									0										0
BH									0										0
BI									0										0
BJ									0										0
BK									0										0
BL									0										0
BM									0										0
BN									0										0
BO									0										0
BP									0										0
BQ									0										0
BR									0										0
BS									0										0
BT									0										0
BU									0										0
BV									0										0
BW									0										0
BX									0										0
BY									0										0
BZ									0										0
CA									0										0
CB									0										0
CC									0										0
CD									0										0
CE									0										0
CF									0										0
CG									0										0
CH									0										0
CI									0										0
CJ									0										0
CK									0										0
CL									0										0
CM									0										0
CN									0										0
CO									0										0
CP									0										0
CQ									0										0
CR									0										0
CS									0										0
CT									0										0
CU									0										0
CV									0										0
CW									0										0
CX									0										0
CY									0										0
CZ									0										0

Action Four

PLACE SPAWNING GRAVEL

Purpose

To improve spawning, rearing, and overwintering habitat within the Trinity River.

Description

Coarse sediment of appropriate size and quantity is required throughout the length of the Trinity River to provide spawning habitat for adult salmonids and rearing and overwintering habitat for juveniles. Construction of the Trinity and Lewiston Dams has blocked the coarse sediment supply that historically was provided from the upper watershed, leaving certain reaches of the river in a coarse bed material deficit. Any of the EIS/EIR alternatives selected would require some amount of annual gravel placement. Studies indicate that under the Flow Evaluation Alternative an average of 10,300 cubic yards of coarse gravel would need to be mechanically placed in the river annually. The actual amounts required would vary from year to year based on water year type and observations from the on going monitoring program. The need for gravel placement would continue indefinitely into the future. It is anticipated that permanent locations would be established along the river based on access and river hydraulics where gravel would be delivered in advance, stockpiled, and then placed as conditions dictate. The mechanical rehabilitation sites would also provide good locations to introduce coarse sediments to the system.

Placing Spawning Gravel
September 1989

Schedule

For all alternatives, releases from Lewiston Dam would not exceed 6000 cfs for the first two years of the program. A “normal” water year gravel demand of 2000 cubic yards under the Flow Evaluation Alternative is assumed for those years. A “wet” year demand of 14,200 cubic yards was assumed for the third year. Activities required to place gravel include performing Federal and State site-specific environmental compliance, obtaining rights-of-way, acquiring permits, preparing construction specifications, procuring a construction contractor, and managing and performing the actual gravel placement. A critical constraint each year is the period of time equipment is allowed to work within the Trinity River wetted perimeter due to biological considerations. This is approximately July 1 - September 15 of each year.

Cost

$455,000 over the first 3 years, which includes:

- Construction costs of $364,000
- Design, permitting, environmental compliance, and construction management costs of $91,000

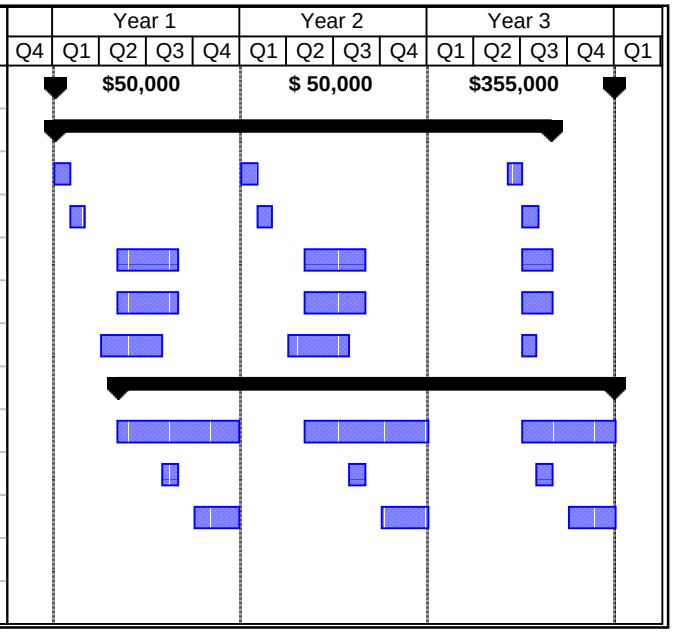
An additional $275,000 per year in gravel placement costs are anticipated after Year 3.

Relation to Other Alternatives

The schedule and cost information provided for this action is based on conditions associated with the Flow Evaluation Alternative. The needs for varying amounts of gravel are also anticipated under the other EIS/EIR alternatives, ranging from an average of 950 cubic yards per year for the Percent Inflow Alternative to 16,400 cubic yards per year for the Maximum Flow Alternative.

Activity Schedule**

ID	Task Name	Cost
1	**Action 4: Place Spawning Gravel***	**$455,000.00**
2	**Preconstruction**	**$91,000.00**
3	Identify Need	
7	Right-of-way	
11	NEPA/CEQA Compliance	
15	Permits	
19	Design	
23	**Construction**	**$364,000.00**
24	Construction Management	
28	Award Construction Contract	
32	Construction	



* Annual expenditures of $257,500 will be required after Year 3

** Based on a Federal Fiscal Year October 1 to September 30

** Based on Flow Evaluation Alternative

Action Five

INSTALLING, OPERATING AND MAINTAINING STREAM GAGING STATIONS

Purpose

To obtain accurate, real time information on flow amounts, water temperature and water quality within the Trinity River and its tributaries from Lewiston Dam to the North Fork Trinity River.

Description

Effective assessment and management of future restoration activities will depend upon the ability to obtain real time information on river discharges, temperatures, and water quality.

Monitoring Station

Providing this information requires state-of-the-art gaging stations at various locations that are

accurately calibrated, data accessible through the California Data Exchange Center (CDEC), and operated and maintained by experienced personnel. The Trinity River Task Force has identified the requirement for 5 stations on the Trinity River mainstem and 9 stations on major tributaries. All fourteen of these stations have already been installed. Nine stations have data reporting to CDEC. Five stations need to be upgraded to CDEC standards as soon as possible. After all the installations are brought up to CDEC standards, the gages will then be calibrated and put into service. Eleven of the locations require cableways or other installations to allow safe measurements during high flows. Presently, five locations need cableways. Depending on safety requirements and data collection protocol six additional cableways may need to be installed. Sediment bedload sampling would also be conducted at several of these sites. Frequent quality control of measurements and the publishing of the data are critical components of the work. The need to upgrade, operate, and maintain existing stream gages downstream of the North Fork should also be recognized, and adequately addressed by other appropriate programs and agencies.

Schedule

An individual gage installation requires the development of a power source (solar or connection to existing grid), telemetry system, data logging equipment and data probes, and the construction of a protective equipment enclosure. The total time required to upgrade the five stations, from initiating equipment purchases to completing construction of the gage enclosures and installing equipment, is approximately 6 months. Cableways for high flow measurements must be engineered for safe operation and anchored at competent locations on the stream bank. Some site work may be required for construction access and ease of operation. Access across the river generally limits construction to low flow periods. Design and construction of the five cableways will be performed over a period of 12 months in priority order as determined by the Trinity River Task Force.

Cost

$987,000 over the first 3 years, which includes:

- $67,000 for upgrading 5 gages
- $95,000 for 5 new cableways
- $360,000 for sediment bedload sampling
- $456,000 in O&M costs.

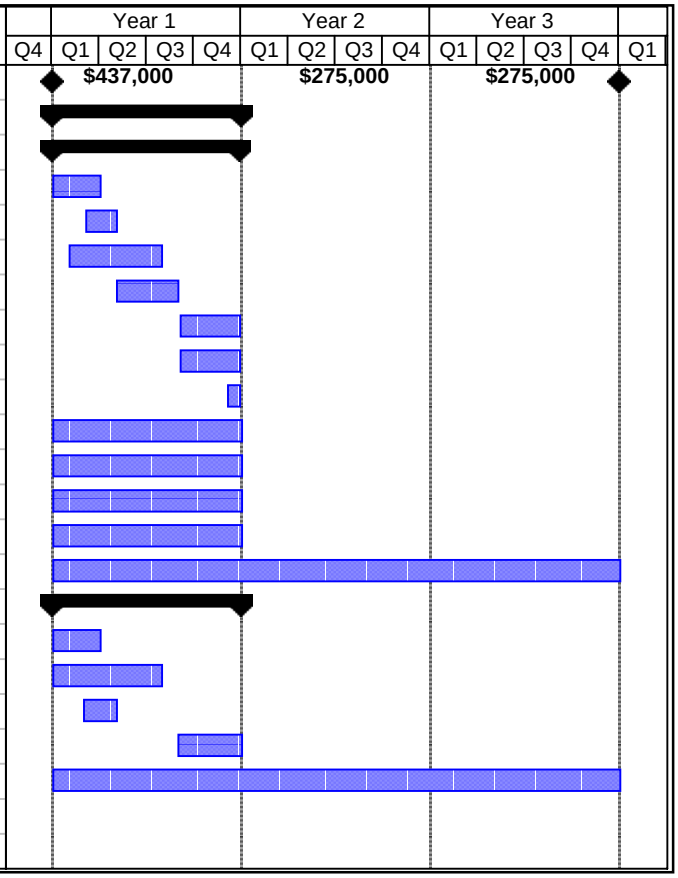
Annual costs for sediment bedload sampling ($120,000) and gage operation and maintenance ($155,000) will continue after Year 3.

Relation to Other Alternatives

The schedule and cost information provided for this action is applicable to all alternatives.

Activity Schedule

ID	Task Name	Cost
1	**Action 5: Stream Gaging Stations**	**$987,000.00**
2	**Update 5 Stations to CDEC**	**$67,000.00**
3	Reading Creek	$15,000.00
4	NEPA/CEQA Compliance	
5	Rights-of-way	
6	Procure Equipment	
7	Permits	
8	Construct Civil Stucture	
9	Install Equipment	
10	Calibrate Gage	
11	Indian Creek*	$11,000.00
12	Brown's Creek*	$15,000.00
13	Canyon Creek*	$15,000.00
14	Deadwood Creek*	$11,000.00
15	**O&M of 14 Stations****	**$465,000.00**
16	**Install 5 Cableways**	**$95,000.00**
17	NEPA/CEQA Compliance	
18	Design	
19	Rights-of-way	
20	Construction	
21	**Sediment Bedload Sampling**	**$360,000.00**



* Includes the same milestones as shown for the Reading Creek Gage

****** Anticipated expenditures of $155,000 annually after Year 3

******* Assumes cableways on mainstem and North Fork only. All tributaries will be a double drum system for high flow measurements. If tributaries need cableways cost will increase.

******** Based on a Federal Fiscal Year October 1 to September 30

Action Six

DEVELOPING & IMPLEMENTING AN ADAPTIVE ENVIRONMENTAL ASSESSMENT AND MANAGEMENT PROGRAM

Purpose

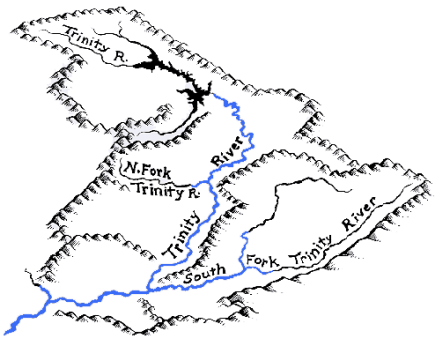
To assess the results and effects of the increased reservoir releases and mechanical rehabilitation projects on achieving restoration goals. Assessments will determine if actions should be sustained or modified.

Description

As restoration actions are implemented for the Trinity River, the Adaptive Environmental Assessment and Management (AEAM) program will be a formal, systematic, and rigorous process of learning from the outcomes of management actions, accommodating change, and improving management. The premise of the Flow Evaluation Alternative is that a combination of mechanical alterations and vegetation removal followed by managed high-flow releases in the spring will promote geofluvial processes leading to a new channel form expected to provide significantly increased spawning and rearing habitat for anadromous salmonids. The AEAM program will represent this premise in measurable terms, develop and implement monitoring and research programs to verify performance, and recommend alternative management actions as required. An organizational structure would be established that ensures involvement and participation of fishery agency representatives as well as Trinity River Division managers and stakeholders. Independent review panels would also be formed to provide peer review of all technical studies, analyses, and evaluations generated by the program.

Schedule

The AEAM management and technical modeling and analysis teams will meet periodically throughout the year as required. A critical time will be February of each year associated with the initial water supply forecasts. Ongoing monitoring and modeling actions will be reviewed and adjusted to maximize data collection benefits. New hypotheses and methodologies may be developed based on previous year results. Progress toward program objectives and any trends identified will be reported annually to stakeholders. At the conclusion of the third year of the program, a program review will be performed that will determine management strategies for the remainder of the mainstem mechanical rehabilitation work.



Cost

$7,600,000 over 3 years, which includes:

- $2,700,000 in Year 1 during base line data collection
- $2,450,000 in years 2 and 3

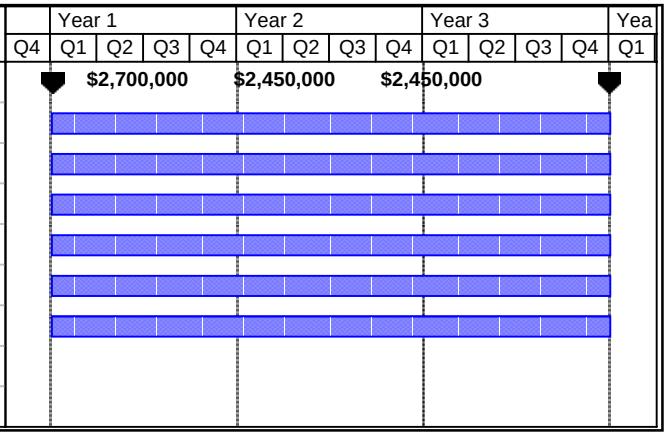
An additional $2,450,000 per year are anticipated after Year 3.

Relation to Other Alternatives

The schedule and cost information provided for this action is based on the Flow Evaluation Alternative of the EIS/EIR. No other alternative includes a formal AEAM program.

Activity Schedule**

ID	Task Name	Cost
1	**Action 6: AEAM***	**$7,600,000.00**
2	Fishery Monitoring	$4,200,000.00
3	Riparian Monitoring	$525,000.00
4	Topo/Bathy Monitoring	$525,000.00
5	Hydraulic Monitoring	$1,050,000.00
6	Baseline Data	$250,000.00
7	Management	$1,050,000.00



* Anticipated annual expenditures of $3,450,000 required in Years 4,5,and 6

** Based on a Federal Fiscal Year October 1 to September 30

** Based on Flow Evaluation Alternative

Budget Formulation Summary

	Year 1		Year 2		Year 3		Total	*Outyears	**Annual O&M
	Capital	O&M	Capital	O&M	Capital	O&M			
Action 1: Bridges	$ 350,000		$ 5,700,000				$ 6,050,000		
Action 2: Flood Plain Modifications	$ 125,000		$ 225,000				$ 350,000		
Action 3: Mechanical Rehabilitation	$ 2,418,000		$ 2,668,000		$ 2,668,000		$ 7,754,000	$ 6,700,000	$ 268,000
Action 4: Gravel Placement		$ 50,000		$ 50,000		$ 355,000	$ 455,000		$ 257,000
Action 5: Stream Gaging Stations	$ 117,000	$ 272,000	$ 243,000	$ 272,000		$ 272,000	$ 1,176,000		$ 272,000
Action 6: Adaptive Management		$ 2,700,000		$ 2,450,000		$ 2,450,000	$ 7,600,000		$2,450,000
Total	$ 3,010,000	$ 3,022,000	$ 8,836,000	$ 2,772,000	$ 2,668,000	$ 3,077,000	$23,385,000	$ 6,700,000	$3,247,000

* Capital costs

** Required annual O&M costs after Year 3

Issues

Action 1

REMOVE AND REPLACE EXISTING BRIDGES

- Need for a second Poker Bar bridge to the campground must be verified
- Ability to tie Bucktail Bridge upstream channel reconstruction to protection of adjacent properties should be investigated
- Transfer stipulations including operation and maintenance requirements must be negotiated with the ultimate bridge owners
- Need for Poker Bar, Bucktail bridges to be replaced must be verified
- Federal financial responsibility for constructing replacement bridges in general must be verified

Action 2

ADDRESS IMPACTS TO PRIVATELY OWNED LANDS AND EXISTING STRUCTURAL IMPROVEMENTS FROM INCREASED FLOWS

Federal financial responsibility must be verified on:

- Undeveloped lands above Rush Creek outside 100-year FEMA event,
- Undeveloped lands below Rush, Creek within 100-year FEMA event,
- Structures impacted within the 100-year FEMA event,
- Impacts from future channel meandering.

Action 3

CONSTRUCT MECHANICAL REHABILITATION PROJECTS

- The most efficient organizational arrangement to administer this long-term program must be determined and agreed upon
- Requirements and desires on the use of minority, small business, and local contractors must be determined
- Length of time of AEAM program review after year 3 must be established
- Government reaction to inability to obtain landowner access must be determined relative to impact on high flows

Action 4

PLACE SPAWNING GRAVEL

- Potential for the purchase of mine tailings in the upper river with on-site processing of gravels should be evaluated
- Impact to downstream resting holes from gravel placement locations should be considered
- Criteria to determine gravel needs should be developed

Action 5

INSTALLING, OPERATING AND MAINTAINING STREAM GAGING STATIONS

A strategy for who does the various components of this work must be agreed upon. A number of agencies and the Hoopa Valley Tribe may wish to participate, additional issues to be addressed are:

- Cost
- Quality
- Timeliness
- Credibility

Action 6

DEVELOPING AND IMPLEMENTING AN ADAPTIVE ENVIRONMENTAL ASSESSMENT AND MANAGEMENT PROGRAM

Funding priority of this action as compared to other actions must be determined.

Acknowledgments

This report was prepared under the direction of the TRRP Mainstem Subcommittee:

- Ed Solbos, United States Bureau of Reclamation
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- Daniel Newberry, Hoopa Valley Tribe
- Tom Stokely, Trinity County
- Arnold Whitridge, Trinity County
- Mike Belchik, Yurok Tribe

Informational reports used included:

- Trinity River Mainstem Fishery Restoration Environmental Impact Statement/Report
- Trinity River Flow Evaluation Alternative Final Report June 1999 – US Fish & Wildlife Service and Hoopa Valley Tribe
- Structure Planning Study for Treadwell, Poker Bar, Salt Flat and Bucktail Bridges: for The Trinity County Planning Department and Trinity River Restoration Program of the Department of the Interior – Omni • Means December 1999
- Trinity River Damage Assessment: Lewiston to Douglas City – State of California Department of Water Resources, Northern District

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