APPENDIX D

WILD AND SCENIC RIVER, SECTION 7 ANALYSIS AND DETERMINATION

INTRODUCTION

Federal protection of this section of the Trinity River in the Wild and Scenic System was completed in order to preserve the Outstandingly Remarkable Values (ORV) identified on the date of designation (January 19, 1981). These ORV's include the free-flowing condition, anadromous and resident fisheries, outstanding geologic resource values, scenic values, recreational values, cultural and historic values, and the values associated with water quality. The Bureau of Land Management (BLM) has classified the Trinity River (mainstem) as a Recreational River from 100 yards below Lewiston Dam downstream to Cedar Flat.

This analysis and subsequent determination evaluates the effects of the proposed project (Canyon Creek Suite of Rehabilitation Sites: Trinity River Mile 73 to 78, which consist of four discreet sites – Conner Creek, Valdor Gulch, Elkhorn, and Pear Tree Gulch) on the Trinity River's free-flowing attributes and other ORV's, and ensures their protection as required under Section 7 of the Wild and Scenic Rivers Act. Due to the level of detail provided in the EA/DEIR, this analysis is presented in a summary format and refers the reader to the specific sections of Chapter 2, 3 and 4 of the EA/DEIR for additional information on water quality, fisheries, wildlife, flora and fauna, recreational, and aesthetic values.

SECTION 7 ANALYSIS

This analysis and determination follows the Evaluation Procedure presented in Appendix C of the Technical Report of the Interagency Wild and Scenic Rivers Coordinating Council, Wild and Scenic Rivers Act: Section 7. Under interagency agreement between the National Park Service, the BLM and the U.S. Forest Service, the BLM generally has responsibility for conducting Section 7 determinations for this river segment.

1) Establish Need

a. The specific purpose of the proposed project is to protect or enhance the values for which the river was designated as eligible; restore the natural characteristics of the river; and/or improves the water quality of the river. The proposed project would initiate channel rehabilitation activities as described in Chapter 2 of the EA/DEIR. The proposed project was included in the Record of Decision (ROD) issued by the Department of the Interior (DOI) in 2000, and is intended to restore the fish resources of the Trinity River. This project would be implemented in conjunction with other programs and projects under the direction of the Trinity River Restoration Program (TRRP). The implementation of the proposed action will incorporate measures to assure that the project is consistent with the goals established under the BLM's Redding Resource Management Plan, specifically to support management actions that would enhance Trinity River fisheries. The proposed project would not diminish the scenic, recreational, or water quality values of the river.

b. Project-related impacts to free-flowing characteristics of the river would be minimized to the extent practicable.

c. The Proponent and manager of the project is a Federal government entity. The proposed project has been developed through a cooperative effort by the Bureau of Reclamation (Reclamation), BLM and the Department of Water Resources (DWR) under the direction of the TRRP. The proposed action would actually improve the conveyance of flows by reestablishing alluvial attributes of the Trinity River, namely floodplains, and decreasing the potential for channel constriction by removing riparian berms.

The proposed project is consistent with management goals and objectives for the Trinity River and is designed to maintain and/or enhance the ORV's. It is also consistent with BLM objectives that support the TRRP.

2) Define a Proposed Activity

The project proponents, the project purpose and need for the project, and the geographic location of the project are described in Chapter 1 of the EA/DEIR. Specific information on the duration of the proposed project actions and the magnitude/extent of the proposed activities is provided in Chapter 2 of the DEA/EIR. Chapter 4 describes the relationship to past and future management activities with an emphasis on cumulative effects.

3) Describe How the Proposed Activities Would Directly Alter Within-Channel Conditions

Implementation of the proposed project would result in both short-term and long-term impacts. These impacts and relevant mitigation measures are described in Section 3.3 (Geology), Section 3.4 (Water Resources), Section 3.5 (Water Quality), and Section 3.6 (Fishery Resources) of the DEA/EIR.

The existing conditions at each of the four rehabilitation sites are the result of a variety of natural and management disturbance mechanisms that have occurred along the river corridor over the past 75 years. Channelization of the Trinity River is a result of historic dredge activities, and has been further exacerbated by the modified flows produced by the Trinity River Division of the Central Valley Project. At the date of designation, riparian berms had been developing for more than 20 years in each of the four rehabilitation sites and scientists recognized that the alluvial nature of the river had been modified extensively. Although recent changes in the flow regime provide some opportunity to modify the form and function of the Trinity River, the ROD

(Department of Interior 2000) recognized that mechanical channel rehabilitation would be needed to reconfigure sections of the river and provide opportunities for alluvial processes to occur.

Although there are short-term effects anticipated during project implementation, primarily with regards to water quality, juvenile salmonid rearing habitat and riparian vegetation, the long-term effects are expected to be positive and cumulatively beneficial over time.

4) Describe How the Proposed Activity Would Directly Alter Riparian and/or Floodplain Condition

The proposed project is anticipated to impact alluvial deposits adjacent to the Trinity River within the 5 mile reach containing the four rehabilitation sites. Although it's generally recognized that these alluvial deposits existed on the date of designation, the transitory nature of riverine environments precludes a quantification of these features. The extensive body of scientific evidence available for the Trinity River suggests that the riparian berms and floodplain features supported extensive, well established riparian communities at the time of designation. As a result of modified flow regimes, riparian berms came to be inhabited by a monoculture of riparian vegetation. The interaction between vegetation and fine sediment continued to expand this condition along the river corridor, although large floods such as that which occurred in 1997, modified this riparian community to some degree. Riparian berms tend to inhibited access to the floodplain.

Section 3.4 (Water Resources), Section 3.6 (Fishery Resources), and Section 3.7 (Vegetation, Wildlife and Wetlands) discuss the specific impacts and relevant mitigation measures associated with the proposed project relative to existing riparian and floodplain conditions. Although there are short-term effects anticipated during construction, the long-term effects are expected to be positive and cumulatively beneficial over time. As a component of the TRRP, the proposed project is expected to provide a positive benefit to the Trinity River's ORV's, including anadromous fish resources.

5) Describe How the Proposed Activity Would Directly Alter Upland Conditions

The proposed project would remove material (primarily fine textured sediments) from riparian berms and floodplains located within each of the four rehabilitation sites and place this material on nearby uplands, above the 100-year floodplain. Much of the material proposed for removal is tailing remnants deposited by bucket-line dredge activities that occurred in the Trinity River between 1930 and 1950. These deposits typically consist of long linear piles of sand, gravel, cobbles and boulders, devoid of vegetation, and are piled on floodplains and terrace features adjacent to the current river channel. Removal of tailing remnant material from riparian berms and floodplains would change the productivity potential of these areas, thus increasing the diversity potential for occupation by vegetative and wildlife species. An upland and riparian corridor revegetation program will be incorporated into the proposed project and will emphasize the re-establishment of native species and vegetative community types throughout the entire project area. Section 3.4 (Water Resources), Section 3.6 (Fishery Resources), Section 3.7

(Vegetation, Wildlife and Wetlands), Section 3.8 (Recreation), Section 3.11 (Cultural Resources) and Section 3.14 (Aesthetics) discuss the specific impacts and relevant mitigation measures relative to upland conditions as they relate to the ORV's for the Trinity River.

6) Evaluate and Describe How Changes in On-Site Conditions Can/Would Alter Existing Hydrologic or Biologic Processes

As discussed in previous sections, the EA/DEIR provides a detailed description of the existing condition and environmental impacts associated with the project at each of the four rehabilitation sites, including a substantial number of mitigation measures. A primary objective of the proposed project is to reestablish alluvial processes within each rehabilitation site, and provide the opportunity for the river to reoccupy the floodplain with greater frequency. A basic premise of the TRRP is to promote changes to the alluvial reaches of the river in a manner that restores the physical processes and biological resources that were recognized as ORV's at the time of designation.

7) Estimate the Magnitude and Spatial Extent of Potential Off-Site Changes

Chapter 4 of the EA/DEIR discusses the other impacts of the proposed project, including cumulative impacts that might be produced by proposed project actions at each subsequent rehabilitation site extending along the river corridor. With the exception of short-term water quality impacts (construction related turbidity), implementation of the proposed project would not adversely impact the Trinity River. In fact, the intent of the proposed project is to promote large-scale beneficial changes to the riverine environment and adjacent physical habitat. Such changes are expected to enhance efforts to restore the Trinity River's fishery resources.

8) Define the Time Scale over Which Steps 3-7 are Likely to Occur

Project implementation is anticipated to occur between Summer 2006 and Fall 2007. Specific limitations on project operations may be incorporated into the project as a result of applicable legal requirements.

9) Compare Project Analyses to Management Goals

Management goals relative to free-flow, water quality, riparian area, and floodplain conditions would not be affected by the proposed action. It is expected that one of the primary benefits of this project would be to increase the ORV (anadromous fishery) of the Trinity River. Impacts to the visual resources of the Trinity River would be minimal with the implementation of design criteria and mitigation measures. The proposed project would be consistent with any future actions taken by the TRRP.

10) Section 7 Determination

Implementation of the proposed action, as described in Chapter 2 of the EA/DEIR, would not affect the free-flowing condition of this segment of the Trinity River.

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Listed/Proposed Threatened and Endangered Species for Trinity County (Candidates Included)

November 1, 2005

Document number: 933453652-14389

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KEY:

(PE) Proposed Endangered Proposed in the Federal Register as being in danger of extinction
(PT) Proposed Threatened Proposed as likely to become endangered within the foreseeable future
(E) Endangered Listed in the Federal Register as being in danger of extinction
(T) Threatened Listed as likely to become endangered within the foreseeable future
(C) Candidate Candidate which may become a proposed species Habitat Y = Designated, P = Proposed, N = None Designated
* Denotes a species Listed by the National Marine Fisheries Service

Type		Scientific Name	Common Name	Category	Critical Habitat
Plants					
		Arabis macdonaldiana	McDonald's rock-cress	E	N
Fish					
		Hypomesus transpacificus	delta smelt	T	Y
	*	*Oncorhynchus kisutch*	S. OR/N. CA coho salmon	T	Y
	*	*Oncorhynchus mykiss*	Central Valley steelhead	T	Y
	*	*Oncorhynchus mykiss*	Northern California steelhead	T	Y
	*	*Oncorhynchus tshawytscha*	CA coastal chinook salmon	T	Y
	*	*Oncorhynchus tshawytscha*	Central Valley fall/late-fall chinook salmon	C	N
	*	*Oncorhynchus tshawytscha*	Central Valley spring-run chinook salmon	T	Y
	*	*Oncorhynchus tshawytscha*	winter-run chinook salmon	E	Y
Amphibians					
		Rana aurora draytonii	California red-legged frog	T	Y
Birds					
		Brachyramphus marmoratus	marbled murrelet	T	Y
		Coccyzus americanus	Western yellow-billed cuckoo	C	N
		Haliaeetus leucocephalus	bald eagle	T	N
		Strix occidentalis caurina	northern spotted owl	T	Y
Mammals					
		Martes pennanti pacifica	Pacific fisher	C	N

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Listed/Proposed Threatened and Endangered Species for the DEDRICK Quad (Candidates Included)

November 1, 2005

Document number: 933453654-143912

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KEY:

(PE) Proposed Endangered Proposed in the Federal Register as being in danger of extinction
(PT) Proposed Threatened Proposed as likely to become endangered within the foreseeable future
(E) Endangered Listed in the Federal Register as being in danger of extinction
(T) Threatened Listed as likely to become endangered within the foreseeable future
(C) Candidate Candidate which may become a proposed species Habitat Y = Designated, P = Proposed, N = None Designated
* Denotes a species Listed by the National Marine Fisheries Service

Type	Scientific Name	Common Name	Category	Critical Habitat
Fish				
*	*Oncorhynchus kisutch*	S. OR/N. CA coho salmon	T	Y
Birds				
	Coccyzus americanus	Western yellow-billed cuckoo	C	N
	Haliaeetus leucocephalus	bald eagle	T	N
	Strix occidentalis caurina	northern spotted owl	T	Y
Mammals				
	Martes pennanti pacifica	Pacific fisher	C	N

PROGRAMMATIC AGREEMENT
AMONG THE U. S. BUREAU OF RECLAMATION,
U. S. FISH AND WILDLIFE SERVICE, U.S. BUREAU OF LAND MANAGEMENT,
HOOPA VALLEY TRIBE,
CALIFORNIA STATE HISTORIC PRESERVATION OFFICER, AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
REGARDING IMPLEMENTATION OF
THE TRINITY RIVER MAINSTEM FISHERY RESTORATION

WHEREAS, the U.S. Bureau of Reclamation (Reclamation), U. S. Fish and Wildlife Service (Service), U.S. Bureau of Land Management (Bureau), and the Hoopa Valley Tribe (Tribe) have determined that implementing the actions (Undertaking) outlined in the Trinity River Mainstem Fishery Restoration Environmental Impact Statement/Report (Trinity EIS/R) for purposes of protecting, restoring, and enhancing fish and wildlife, may affect historic properties; and

WHEREAS, Reclamation, the Service, the Bureau (agencies) and the Tribe have elected to comply with Section 106 of the National Historic Preservation Act(NHPA) for the Undertaking through execution and implementation of a Programmatic Agreement (Agreement) pursuant to 36 CFR Section 800.14, because not all Trinity EIS/R implementing actions have as yet been identified and because neither the scope and magnitude of the Undertaking's effects to historic properties nor the historic properties themselves have been identified at the time of execution of this Agreement; and

WHEREAS, the agencies, pursuant to 36 CFR 800.8(a)(1) and 800.8(a)(3), will coordinate compliance with the requirements of the National Environmental Policy Act (NEPA) for actions covered by this Agreement with the requirements of Subpart B of 36 CFR Part 800, and as part of this process of coordination, may use the NEPA process and associated documentation to supplement compliance with Subpart B; and

WHEREAS, pursuant to 36 CFR Section 800.2(c)(2)(ii), the Tribe=s representative shall be included in the term Tribal Historic Preservation Officer (THPO) for undertakings occurring on or affecting historic properties on its tribal lands and affecting properties of religious and cultural significance to the Tribe located on or off-tribal lands, and for any such undertakings, the primary responsible Federal agency (RFA) shall also consult with the THPO, in addition to the SHPO, where consultation is required under this Agreement; and

WHEREAS, the agencies have consulted with the California State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (Council) pursuant to Section 800.14 (b) of the regulations (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act (NHPA) (16 U.S.C. 470f) to resolve any adverse effects of the Undertaking on historic properties; and

WHEREAS, throughout the implementation of this Agreement, Reclamation and the Service the shall consult with Indian tribes, organizations and individuals that may attach religious and cultural significance to, or that may have concerns about the Undertaking's effects on historic properties,

NOW, THEREFORE, Reclamation, the Service, the Bureau, the Tribe, the SHPO, and the Council agree that the following stipulations shall be implemented in order to take into account the effects of the Undertaking on historic properties, and that these stipulations shall govern the Undertaking and all of its parts until this Agreement expires or is terminated.

STIPULATIONS

Reclamation and the Service shall ensure that the following measures are carried out:

I. ASSIGNMENT OF RESPONSIBILITY

Either Reclamation or the Service will be responsible for ensuring that the terms of this Agreement are carried out for all individual actions authorized or funded by the Department of the Interior comprising the Undertaking, irrespective of where or by whom the action will be carried out. Prior to preparation of environmental documentation for each action covered by this Agreement, Reclamation and the Service will consult to determine which agency will serve as primary responsible federal agency (RFA) for such action. The selected RFA will be responsible for implementing the terms of this Agreement with respect to the action proposed. The Service shall comply with the terms of this Agreement for the Undertaking and all individual actions therein, in lieu of the Programmatic Agreement among the Service, Council, and the SHPO executed on May 7, 1997.

II. AREAS OF POTENTIAL EFFECTS (APEs)

a. For purposes of this Agreement, the APE for the Undertaking in its entirety shall consist of the area within the 500 year floodplain of the Trinity River from the Trinity Reservoir downstream to the Hoopa Valley Indian Reservation, the area within the drawdown zones of the Trinity Reservoir, and ancillary areas within or outside of the 500 year floodplain that will be affected by implementing actions and associated facilities, such as material borrow sites, access roads, sediment pond construction and maintenance.

b. At the earliest stage of planning for any action comprising the Undertaking, the RFA will determine and document an area of potential effects (APE)in strict accordance with the definition set forth in 36 CFR 800.16(d). The APE for an action covered by this Agreement will be defined either before or concurrently with the earliest stages of NEPA compliance for the action.

III. REVIEW OF TRINITY EIS/R IMPLEMENTING ACTIONS

a. Coordination with NEPA

The RFA shall ensure that compliance with the terms of this Agreement is coordinated with NEPA compliance. When a specific Trinity EIS/R implementing action is identified, the RFA=s archaeologist will establish an APE pursuant to Stipulation III.B., below, and ensure that an appropriate level of effort is conducted to identify historic properties within that APE. Specific steps taken to comply with this Agreement will be included in an Environmental Assessment (EA) or categorical exclusion checklist (CEC) prepared for a Trinity EIS/R implementing action. An EA will, to the extent possible,

describe efforts to identify historic properties and, if applicable, identify and discuss measures that will avoid, minimize or mitigate potential adverse effects to historic properties. CECs will be prepared for minor actions where no historic properties have been identified within the APE. All CECs will be reviewed by Reclamation's Regional Archeologist, or by the Bureau=s Redding or Arcata Field Archeologist, or by the Service=s Regional Archeologist, to ensure that no historic properties will be affected by a proposed action. The final EIS or subsequent NEPA documentation for a Trinity EIS/R implementing action shall include, to the extent possible, appropriate documentation evidencing compliance with the terms of this Agreement. The RFA will ensure that the Finding of No Significant Impact or the Record of Decision for any action includes a plan for the treatment of historic properties adversely affected by such action.

b. IDENTIFYING HISTORIC PROPERTIES

36 CFR 800.4(b)(1) is the general standard which the RFA will use to determine the level of effort needed to identify historic properties within the APE of each Trinity EIS/R implementing action covered by this Agreement. In addition, as part of identification, the RFA will place special emphasis on the consultation prescribed by 36 CFR 800.4(a)(4) and by 36 CFR 800.4(b). The general standard set forth in 36 CFR 800.4(b)(1) will be supplemented by the following:

(1) The results of the cultural resources overview prepared for the Trinity River Mainstem Fishery Restoration EIS/R;

(2)Applicable inventory standards identified in Reclamation Instructions (376.3B) or in the Service's Administrative Manual and the Service's Cultural Resource Management Handbook (1985). Cultural resources and historic properties identified during inventory will be recorded as follows:

(a) A new or updated California Department of Parks and Recreation Form DPR 523 (series 1/95) will be completed in accordance with the Instructions for Recording Historical Resources (Office of Historic Preservation, March 1995). The RFA will ensure that forms are submitted to the appropriate Information Center of the California Historical Resources Information System (CHRIS) for assignment of permanent site numbers. These site numbers will be used to the extent possible as inventory reports are prepared.

(b) National Register Bulletin 38 will be the standard used by the RFA to identify and document traditional cultural properties, based on consultation with the Tribe and other tribes, organizations, or individuals who may attach religious and cultural significance to historic properties that may be affected by the Undertaking. Traditional cultural properties identified during inventory may be recorded on the DPR 523 unless the Tribe or another Indian tribe, organization or individual objects. If such objection arises, the properties may be recorded on a form and in a manner that is in accordance with the recommendations of the Tribe or other Indian tribes, organizations or individuals, subject to the confidentiality requirements set forth in Stipulation VI.C., below. If traditional cultural properties affiliated with

other parties are identified during inventory, these parties will be consulted by the RFA in accordance with 36 CFR 800.2(c)(6).

(c) The applicable cultural resource data base including information available from the appropriate Information Center of the California Historical Resources Information System (CHRIS), and professional staff estimation; and

(d) The National Park Service publication, "The Archeological Survey: Methods and Uses" (King 1978);

c. EVALUATING PROPERTIES AND DETERMINING EFFECTS

(1) A Trinity EIS/R implementing action will be exempt from further consideration under this Agreement if any of the following conditions are met:

(a) The RFA=s archaeologist determines that there are no cultural resources in the APE, based on the results of identification efforts outlined in Stipulation III.B. above; or

(b) The RFA=s archaeologist determines that no cultural resources will be affected, based on the results of identification efforts outlined in Stipulation III.B.and C.; or

(c) The RFA=s archaeologist determines that cultural resources may be affected, but based on the evaluation prescribed in paragraph C.2.of this stipulation, such resources are determined ineligible for inclusion in the National Register of Historic Places (NRHP).

(2) If the RFA=s archaeologist determines that an action covered by this Agreement may affect a cultural resource, the RFA=s archaeologist will evaluate the cultural resource in accordance with the process set forth in 36 CFR 800.4(c)(1) before any activity that may affect the resource is initiated. If the resource in question may be a traditional cultural property, the RFA will use National Register Bulletin 38 in conducting the evaluation.

(3) If the RFA determines pursuant to paragraph C.2. of this stipulation, that the cultural resources subject to effects are eligible for inclusion in the NRHP, the RFA=s archaeologist will follow 36 CFR 800.5 to determine whether such effects may be adverse.

(a) If this consultation results in a finding of no adverse effect to historic properties, the RFA=s archaeologist will conclude the consultation by complying with 36 CFR 800.5(d).

(b) If this consultation results in a finding that historic properties will be adversely affected, the RFA=s archaeologist will ensure that the adverse effects are taken into account in accordance with paragraph D. of this stipulation.

d. HISTORIC PROPERTY TREATMENT PLANS (HPTPs)

(1) The RFA=s archaeologist will develop HPTPs to resolve the adverse effects on historic properties of actions covered by this Agreement. Separate HPTPs may be prepared for individual Trinity EIS/R implementation actions. HPTPs will be developed by the RFA in consultation with the SHPO, the Tribe, other Indian tribes, organizations and individuals, and the Council if it so requests, and with any interested parties identified by the signatory parties to this Agreement. HPTPs will be submitted for review according to the procedures set forth in paragraph D.4. of this stipulation.

(2) HPTPs will be consistent with the AArchaeology and Historic Preservation: Secretary of Interior=s Standards and Guidelines (FR 44716-44742), including the "Secretary of the Interior's Standards and Guidelines for Archaeological Documentation" (48 FR 44734-37)" and the Council's "Recommended Approach for Consultation on Recovery of Significant Information from Archeological Sites" (64 FR 27085-87). HPTPs shall at a minimum:

Describe the historic property or portion of the property where treatment will be implemented. The HPTP shall contain a description of the values that make the property eligible for the National Register of Historic Places, and describe the measures proposed to protect each historic property. These measures may include, but not necessarily be limited to avoidance, monitoring, capping, fencing, land use policy and planning techniques such as zoning restrictions, protective covenants, etc. The preservation of historic properties is the preferred alternative, wherever feasible; if data recovery is proposed, the HPTP also shall:

(a) Specify the research questions to be addressed through recovery of data;

(b) Explain why it is in the public interest to address these research questions, including a description of any efforts to interpret the result of the investigations for the public;

(c) Explain how the historic properties subject to data recovery can address these research questions;

(d) Specify the methods to be used in field work and analysis, and explain how these methods are relevant to the research questions;

(e) Indicate how recovered material and records will be disposed of, taking into account the expressed wishes of the Tribe, of other Indian tribes, organizations, or individuals and, as applicable, of interested parties;

(f) Provide a schedule for completing data recovery, including analysis, reporting and disposition of materials and records;

(g) Include a schedule for providing the Tribe, other Indian tribes, organizations and individuals, SHPO and, as applicable, interested parties, with the opportunity to review and comment on reports documenting implementation of HPTPs.

(h) Include a schedule for completing final data recovery reports and specify when and to whom this report will be distributed;

(i) Provide for development and implementation of a Plan of Action in accordance with 43 CFR 10 for the management of Native American cultural items that will be repatriated to the Tribe or to other Indian tribes pursuant to the Native American Graves Protection and Repatriation Act (NAGPRA); or, where non-federal property is involved, a plan providing for the treatment of Native American human remains and items associated with Native American burials in accordance with the requirements of Sections 5097.98 and 5097.991 of the California Public Resources Code;

(j) Specify that, following any repatriation pursuant to item I., above, the RFA will ensure that all records and all non-repatriated objects resulting from data recovery are curated in accordance with 36 CFR 79;

(k) Include a plan for the treatment of properties discovered during implementation of an action covered by this Agreement;

(l) Include a plan for monitoring construction activities that may affect historic properties; this plan shall include a monitoring schedule, provide for the participation of a professional archeologist, and, as appropriate, Tribal member(s), members of other Indian tribes, organizations, individuals and interested parties.

(3) The RFA will submit draft HPTPs to the SHPO, the Tribe, other Indian tribes, organizations and individuals, the Council if it so requests after being informed of its development, and to any interested parties identified by the signatory parties, for review and comment. These parties shall have 30 days from receipt of any draft HPTP to comment. Failure to respond within this time frame shall not preclude the RFA from finalizing the HPTP. Before it finalizes the HPTP, the RFA will provide the reviewing parties with documentation indicating whether and how any comments from the parties will be incorporated into the final HPTP. Unless the reviewing parties object to this documentation within 15 days following receipt, the RFA may finalize the HPTP as it deems appropriate, and proceed to implement the final HPTP. If the RFA proposes to change a final HPTP, it will notify the reviewing parties about the proposed changes. Reviewing parties will have 10 days from receipt of notification to comment. Failure to respond within this time frame shall not preclude the RFA from changing the final HPTP. Before it changes the final HPTP, the RFA will provide the reviewing parties with documentation indicating whether and how any comments from the parties will be incorporated into the proposed changes. Unless the parties object to this documentation within 10 days following receipt, the RFA may change the final HPTP as it deems appropriate, and proceed to implement the amended final HPTP.

IV. NATIVE AMERICAN CONSULTATION, CURATION AND TREATMENT OF CULTURAL MATERIALS AND HUMAN REMAINS OF NATIVE AMERICAN ORIGIN

a. Reclamation and the Service will ensure that Indian tribes, organizations and individuals are consulted during, and are invited to participate in, the implementation of the terms of this Agreement. Such

consultation and participation shall include the preparation of reports that document such implementation.

b. Reclamation and the Service shall ensure that all records and materials resulting from activities carried out pursuant to this Agreement are curated pursuant to 36 CFR 79 and the provisions of the NAGPRA, 43 CFR 10, as applicable.

c. Reclamation and the Service shall ensure that any Native American human remains and objects defined under NAGPRA encountered through activities carried out pursuant to this Agreement are treated with due respect, and according to the provisions of NAGPRA, its implementing regulations, 43 CFR 10, and, as appropriate, in accordance with applicable state law.

d. Reclamation and the Service will ensure that the expressed wishes of Indian tribes, organizations, and individuals are taken into account when decisions are made relating to the treatment and disposition of Native American archaeological materials and records not subject to the provisions of NAGPRA.

V. PUBLIC PARTICIPATION

Reclamation and the Service shall use the NEPA process, and any other process they deem appropriate, to solicit public comment on the actions covered by this Agreement. The RFA shall ensure that historic preservation issues are included in notices of public meetings so that these issues can be considered and addressed in a timely manner.

VI. DOWNSTREAM AND RESERVOIR DRAWDOWN IMPACTS TO HISTORIC PROPERTIES

Reclamation and the Service shall incorporate and consider effects to historic properties in its conduct of the overall adaptive management program for the Trinity River, should such program be carried out.

Within 1 year of the execution of this Agreement, Reclamation and the Service shall ensure that a cultural resources management plan is developed addressing the identification, evaluation, and assessment of effects to historic properties within the APE downstream of and within the drawdown zone of Trinity Dam that may be affected by inundation, erosion, vandalism, and other indirect effects of the Undertaking. A draft version of the Plan shall be provided to the signatories to this Agreement for a 30-day review, revised to address the comments received, and then implemented. The Plan, developed in consultation with the SHPO, the Tribe, the agencies, and other tribes, organizations, and individuals who may attach religious and cultural significance to historic properties within this specified area, shall discuss:

a. How historic properties will be identified and evaluated for their National Register of Historic Places eligibility;

b. How changes to the integrity and physical condition of historic properties attributable to erosion, inundation, vandalism, and other effects of the Undertaking will be identified and treated; and

c. A schedule for carrying out items 1 and 2, above.

VII. ADMINISTRATIVE STIPULATIONS

a. PROFESSIONAL STANDARDS

(1) All work required by this Agreement that addresses the identification, evaluation, treatment and documentation of historic or potentially historic properties shall be carried out by or under the direct supervision of a person or persons meeting at a minimum the Secretary of Interior=s Professional Qualifications Standards (48 FR 44738-39) (PQS) in the appropriate disciplines. However, nothing in this stipulation may be interpreted to preclude Reclamation and/or Service or any agent or contractor thereof from using the properly supervised services of persons who do not meet the PQS.

(2) All documentation required by this Agreement that addresses the identification, evaluation, and treatment of historic or potentially historic properties shall be responsive to contemporary professional standards, to the Secretary of Interior=s Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716-40), National Park Service Bulletin 38, as well as to standards and guidelines established by the SHPO.

b. REPORT DISTRIBUTION

The RFA shall ensure that copies of all technical reports prepared to satisfy the terms of this Agreement are provided upon completion to the SHPO, the Tribe, other Indian tribes, the appropriate CHRIS Information Center, and to any interested parties designated by the signatory parties to this Agreement. The content of these reports shall be subject to the confidentiality requirements set forth in paragraph C. of this stipulation.

c. CONFIDENTIALITY

(1) Reclamation and the Service shall ensure that all sensitive information, as defined in Section 9 of the Archeological Resources Protection Act (ARPA), Section 304 of the NHPA, and NAGPRA, is managed in such a way that historic properties, traditional cultural properties, sacred objects, and human remains are not compromised, to the fullest extent available under law.

(2) Signatory and concurring parties to this Agreement shall safeguard information about the nature and location of archeological, historic, and traditional cultural properties, and not reveal that information to any additional parties, pursuant to Section 304 of the NHPA and Section 9 of the ARPA, without the express written permission of Reclamation or the Service.

d. REVIEWING IMPLEMENTATION OF THE AGREEMENT

(1) No later than one year after execution of this Agreement, and by the anniversary date of such execution each year thereafter, until the signatory parties to this Agreement agree in writing that its terms have been

fulfilled, Reclamation assisted by the Service, will prepare and provide to all parties to this Agreement, and to each Indian tribe involved in any action covered by this Agreement, a written report that includes, but is not necessarily limited to the following:

(a) A narrative that indicates how many actions were undertaken and that describes and discusses how and with what results, the requirements of Stipulations III. - V., inclusive, were met for each action;

(b) An assessment of the effectiveness of this Agreement;

(c) A discussion of any problems or unexpected issues encountered during the year;

(d) Any changes that Reclamation or the Service believe should be made in implementing this Agreement.

The reviewing parties shall have 45 days from the date of receipt to provide Reclamation and the Service with comments on the annual report. Reclamation and the Service shall take all comments received into account when considering modifications to this Agreement.

(2) At the request of any signatory, Reclamation or the Service shall hold a consultation meeting to facilitate review and comment on the annual report, or to resolve questions, issues or adverse comments that have been raised by the other signatories or by a member of the public. The signatory parties shall consult to identify other parties who may be invited to attend this meeting.

e. RESOLVING OBJECTIONS

(1) Should any signatory to this Agreement, any Indian tribe, organization or individual, or member of the public object in writing to Reclamation or to the Service regarding the manner in which the terms of this Agreement are carried out, or to any documentation prepared in accordance with and subject to the terms of this Agreement, the RFA shall consult with the objecting party to address the objection. The RFA shall determine a reasonable time frame for this consultation. If resolution is reached within this time frame, the RFA may proceed with its action in accordance with the terms of the resolution. If resolution is not reached within this time frame, the RFA shall forward all documentation relevant to the objection to the Council, including the RFA=s proposed response to the objection. Within 30 days after receipt of all pertinent documentation, the Council shall exercise one of the following options:

(a) Advise the RFA that the Council concurs in its proposed response to the objection, whereupon the RFA will respond to the objection accordingly. Thereafter, the RFA may proceed with its action in a manner consistent with its proposed response; or

(b) Provide the RFA with recommendations, which the RFA will take

into account in reaching a final decision regarding its response to the objection. Upon reaching its final decision, the RFA will notify the objecting party and the Council of its final decision, and may thereafter proceed with its action; or

(c) Notify the RFA that the objection will be referred for comment, pursuant to 36 CFR 800.7(a)(4), and proceed to refer the objection and comment. In this event, the RFA shall ensure that their agency heads are prepared to take the resulting comment into account in accordance with 36 CFR 800.7(c)(4) and Section 110(l) of the NHPA. Thereafter, the RFA shall notify the objecting party and the Council of its final decision regarding the objection ,and may thereafter proceed with its action.

(2) Should the Council not exercise one of the foregoing options within 30 days after receipt of all pertinent documentation, the RFA may assume the Council=s concurrence in its proposed response to the objection, advise the objecting party of that response and proceed with its action in a manner consistent with that response.

(3) Disputes pertaining to the NRHP eligibility of cultural resources covered by this Agreement shall be addressed through consultation among the signatories. If such consultation fails to resolve the dispute within a time frame deemed reasonable by the RFA, the dispute will be addressed by the RFA in accordance with 36 CFR ' 800.4(c)(2).

f. AMENDMENT AND TERMINATION

(1) If any signatory believes that this Agreement should be amended, that signatory may at any time propose amendments, whereupon the signatories will consult to consider the amendment pursuant to 36 CFR ' 800.6(c)(7) and 800.6(c)(8). This Agreement may be amended only upon the written concurrence of the signatory parties.

(2) Any signatory party may terminate this Agreement. Termination of this Agreement shall proceed in accordance with the applicable provisions of 36 CFR Part 800.

(3) If this Agreement is terminated and the RFAs elect to proceed with the Undertaking, the RFAs shall comply with 36 CFR ' 800.14(b)(2)(v).

g. DURATION OF THE AGREEMENT

This Agreement will remain in effect for a period of 20 years after all the signatory parties have executed it. At the end of this time period, the Agreement will become null and void, unless it is extended by written agreement of the signatory parties. Not later than 6 months prior to the expiration of the Agreement the RFAs will notify all other parties to the Agreement of its pending expiration and, if the parties choose to continue considering the Undertaking, the RFAs shall reinitiate review of the Undertaking in accordance with 36 CFR Part 800.

h. EFFECTIVE DATE

This Agreement shall take effect when it has been executed by all of the signatory parties.

EXECUTION of this Programmatic Agreement by Reclamation, the Service, the Bureau, the Tribe, the SHPO and the Council and implementation of its terms, evidence that Reclamation, the Service, the Bureau and the Tribe have afforded the Council a reasonable opportunity to comment on the implementation of the alternatives evaluated in the Trinity EIS/R and its effects on historic properties, and that Reclamation, the Service, the Bureau and the Tribe have taken into account the effects of each action comprising implementation of the Trinity River Mainstem Fishery Restoration program on historic properties.

SIGNATORY PARTIES:

ADVISORY COUNCIL ON HISTORIC PRESERVATION

BY: ________________________________ **DATE:**_________

TITLE: _____________________________

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

BY: ________________________________ **DATE:**_________

TITLE: _____________________________

U.S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

BY: ________________________________ **DATE:**_________

TITLE: _____________________________

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

BY: ________________________________ **DATE:**__________

TITLE: _____________________________

HOOPA VALLEY TRIBE

BY: ________________________________ **DATE:** __________

TITLE: _____________________________

CALIFORNIA HISTORIC PRESERVATION OFFICER

BY: ________________________________ **DATE:**_________

TITLE: _____________________________

CONCURRING PARTIES:

STATE OF CALIFORNIA Arnold Schwarzenegger, Governor

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-4082
(916) 657-5390 - Fax

RWQCB
REGION 1
OCT 28 2005

October 25, 2005

Mr. Dean Prat
Regional Water Quality Control Board, Region 1
5550 Skylane Boulevard, Suite A
Santa Rosa, CA 95403

Re: Canyon Creek Suite of Rehabilitation Sites; Trinity River Mile 73 to 78 SCH# 2005102025

Dear Mr. Prat:

Thank you for the opportunity to comment on the above-referenced document. The Commission was able to conduct a Sacred Lands File search of the approximate project area, which identified no recorded Native American sites within the proposed project site. However, the lack of recorded sites does not preclude the possibility that cultural resources may be present. Additionally, this document contains no supporting documentation prepared in accordance with the CEQA Guidelines (15063 (d) (3)), regarding the conclusion that the project will cause no identifiable impacts to cultural resources. In order to address this shortfall, the Commission recommends that all of the following actions be taken.

- Contact the appropriate California Historic Resources Information Center for a record search. The record search will determine:
  - If a part or all of the area of project effect (APE) has been previously surveyed for cultural resources.
  - If any known cultural resources have already been recorded on or adjacent to the APE.
  - If the probability is low, moderate, or high that cultural resources are located in the APE.
  - If a survey is required to determine whether previously unrecorded cultural resources are present.
- If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
  - The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum, and not be made available for public disclosure.
  - The final written report should be submitted within 3 months after work has been completed to the appropriate regional archaeological Information Center.
- Lack of surface evidence of archeological resources does not preclude their subsurface existence.
  - Lead agencies should include in their mitigation plan provisions for the identification and evaluation of accidentally discovered archeological resources, per California Environmental Quality Act (CEQA) §15064.5 (f). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American, with knowledge in cultural resources, should monitor all ground-disturbing activities.
  - Lead agencies should consider avoidance, as defined in Section 15370 of the CEQA Guidelines, when significant cultural resources could be affected by the proposed project.
  - Lead agencies should include in their mitigation plan provisions for the disposition of recovered artifacts, in consultation with culturally affiliated Native Americans.
  - Lead agencies should include provisions for discovery of Native American human remains and cemeteries in their mitigation plans. Health and Safety Code §7050.5, CEQA §15064.5 (e) and Public Resources Code §5097.98 mandate the process to be followed in the event of an accidental discovery of any human remains in a location other than a dedicated cemetery.

Early consultation with tribes in your area is the best way to avoid unanticipated discoveries once a project is underway. Enclosed is a list of Native Americans individuals/organizations that may have knowledge of cultural resources in the project area. The Commission makes no recommendation of a single individual or group over another. Please contact all those listed; if they cannot supply you with specific information, they may be able to recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe or group. If you have not received a response within two weeks' time, we recommend that you follow-up with a telephone call to make sure that the information was received.

Sincerely,

Carol Gaubatz

Carol Gaubatz
Program Analyst
(916) 653-6251

CC: State Clearinghouse

Native American Contacts
Trinity County
October 25, 2005

Hoopa Valley Tribe
Clifford L. Marshall, Chairperson
P.O. Box 1348 — Hoopa - Hupa
Hoopa, CA 95546
marshallatlaw@pcweb.net
(530) 625-4211
(530) 625-4594 Fax

Wintu Educational and Cultural Council
Robert Burns
12138 Lake Blvd. — Wintu
Redding, CA 96003
(530) 246-3313

Nor-Rel-Muk Nation
John W Hayward, Chairperson
PO Box 673 — Wintu
Hayfork, CA 96041
(530) 628-4226
(530) 628-5100 FAX

Wintu Tribe of Northern California
2675 Bechelli Lane — Wintu
Redding, CA 96002
wintu_tribe@hotmail.com
(530) 226-8088
(530) 223-2879 - Gene Malone

Round Valley Reservation/Covelo Indian Community
Shannon Barney, President
P.O. Box 448 — Yuki; Nomolaki
Covelo, CA 95428 — Pit River
(707) 983-6126 — Pomo
(707) 983-6128 - Fax — Concow
Wailaki; Wintun

Tsnungwe Council
Charles Ammon
P.O. Box 373 — Southern Hoopa
Salyer, CA 95563
(530) 629-3356
(530) 629-3356 FAX

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resource assessment for the proposed Canyon Creek Suite of Rehabilitation Sites, Trinity River Mile 73 to 78, SCH# 2004102035, Trinity County

MP-153
ENV-3.00

Mr. Clifford L. Marshall
Chairperson, Hoopa Valley Tribe
P.O. Box 1348
Hoopa, CA 95546

Subject: Compliance with Section 106 of the National Historic Preservation Act for Habitat Restoration Projects on the Trinity River, Trinity County, California

Dear Mr. Marshall:

The Bureau of Reclamation is planning to continue its Trinity River Restoration Program (Restoration Program) with a series habitat improvement projects along Trinity River between Junction City, California and the confluence with the North Fork of the Trinity River. The four project sites include Conner Creek, Valdor Gulch, Elk Horn, and Pear Tree (see enclosed photos). Activities at these locations include removing stream side vegetation, grading feathered stream edges, and creating open flood plains. The proposed project provides the opportunity to:

- Increase the diversity and area of habitat for salmonids, particularly habitat suitable for rearing;
- Increase rearing habitat for juvenile salmonids, including coho, chinook, and steelhead;
- Increase the structural and biological complexity of habitat for various species of wildlife associated with riparian habitats;
- Increase hydraulic and fluvial geomorphic diversity and complexity;
- Measure/demonstrate the ecological response to changes in flow regimes, morphological features, and aquatic, riparian, and upland habitats.

Reclamation prepared an environmental impact statement for the larger Restoration Program and developed a programmatic agreement (PA) to manage the cultural resource compliance efforts. The Hoopa Valley Tribe signed the PA. In compliance with PA and National Historic Preservation Act (NHPA) requirements, Reclamation conducted archeological inventories at each of the areas of potential effect. This field work revealed to mining sites related to dredger mining during the middle of the 20th century. No archeological resources were discovered, due, in part, to the extensive modification experienced within the study area.

These specific habitat improvement projects also require preparation of an initial study to comply with California Environmental Quality Act requirements. The Native American Heritage Commission was contacted about the project and provided your name as a possible source of information regarding possible Native American concerns in Trinity County. We are contacting you for input.

The implementing regulations for Section 106 of the NHPA require that Federal agencies identify Indian tribes that might attach religious and cultural significance to historic properties in the APE (36 CFR 800.3(f)(2)). If any such properties exist, the regulations require that Federal agencies invite Indian tribes to participate in the Section 106 process as consulting parties. Reclamation, as the Federal agency approving this suite of restoration actions along the Trinity River, is initiating Tribal consultation as part of our Section 106 compliance process. Accordingly, Reclamation requests your input regarding the presence of any properties of religious and cultural significance within the APE for the four habitat restoration sites. If these historic properties are confidential, 800.11(c) allows Federal agencies to withhold this information from the public.

Please contact the Regional Archeologist, Mr. Patrick Welch, at 916-978-5040 if you have questions or comments regarding this effort to identify Native American cultural resources along this segment of the Trinity River.

Sincerely,

Michael Nepstad
Deputy Regional Environmental Officer

Enclosures

cc: Mr. Dean Prat
Regional Water Quality Control Board, Region 1
915 Capitol Mall, Room 364
Sacramento, CA 95814
(w/o encl)

bc: NC-153 (BGuthermuth)
(w/o encl)

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MP-153
ENV-3.00

Mr. Shannon Barney
President, Round Valley Reservation
P.O. Box 448
Covelo, CA 95428

Subject: Compliance with Section 106 of the National Historic Preservation Act for Habitat Restoration Projects on the Trinity River, Trinity County, California

Dear Mr. Barney:

The Bureau of Reclamation is planning to continue its Trinity River Restoration Program (Restoration Program) with a series habitat improvement projects along Trinity River between Junction City, California and the confluence with the North Fork of the Trinity River. The four project sites include Conner Creek, Valdor Gulch, Elk Horn, and Pear Tree (see enclosed photos). Activities at these locations include removing stream side vegetation, grading feathered stream edges, and creating open flood plains. The proposed project provides the opportunity to:

- Increase the diversity and area of habitat for salmonids, particularly habitat suitable for rearing;
- Increase rearing habitat for juvenile salmonids, including coho, chinook, and steelhead;
- Increase the structural and biological complexity of habitat for various species of wildlife associated with riparian habitats;
- Increase hydraulic and fluvial geomorphic diversity and complexity;
- Measure/demonstrate the ecological response to changes in flow regimes, morphological features, and aquatic, riparian, and upland habitats.

Reclamation prepared an environmental impact statement for the larger Restoration Program and developed a programmatic agreement (PA) to manage the cultural resource compliance efforts. In compliance with PA and National Historic Preservation Act (NHPA) requirements, Reclamation conducted archeological inventories at each of the areas of potential effect. This field work revealed two mining sites related to dredger mining during the middle of the 20th century. No archeological resources were discovered, due, in part, to the extensive modification experienced within the study area.

These specific habitat improvement projects also require preparation of an initial study to comply with California Environmental Quality Act requirements. The Native American Heritage Commission was contacted about the project and provided your name as a possible source of information regarding possible Native American concerns in Trinity County. We are contacting you for input.

The implementing regulations for Section 106 of the NHPA require that Federal agencies identify Indian tribes that might attach religious and cultural significance to historic properties in the APE (36 CFR 800.3(f) (2)). If any such properties exist, the regulations require that Federal agencies invite Indian tribes to participate in the Section 106 process as consulting parties. Reclamation, as the Federal agency approving this suite of restoration actions along the Trinity River, is initiating Tribal consultation as part of our Section 106 compliance process. Accordingly, Reclamation requests your input regarding the presence of any properties of religious and cultural significance within the APE for the four habitat restoration sites. If these historic properties are confidential, 800.11(c) allows Federal agencies to withhold this information from the public.

Please contact the Regional Archeologist, Mr. Patrick Welch, at 916-978-5040 if you have questions or comments regarding this effort to identify Native American cultural resources along this segment of the Trinity River.

Sincerely,

Michael Nepstad
Deputy Regional Environmental Officer

Enclosures

cc: Mr. Dean Prat
Regional Water Quality Control Board, Region 1
915 Capitol Mall, Room 364
Sacramento, CA 95814
(w/o encl)

bc: NC-153(BGuthermuth)
(w/o encl)

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MP-153
ENV-3.00

Mr. John W. Hayward,
Chairperson, Nor-Rel-Muk Nation
P.O. Box 673
Hayfork, CA 96041

Subject: Compliance with Section 106 of the National Historic Preservation Act for Habitat Restoration Projects on the Trinity River, Trinity County, California

Dear Mr. Hayward:

The Bureau of Reclamation is planning to continue its Trinity River Restoration Program (Restoration Program) with a series habitat improvement projects along Trinity River between Junction City, California and the confluence with the North Fork of the Trinity River. The four project sites include Conner Creek, Valdor Gulch, Elk Horn, and Pear Tree (see enclosed photos). Activities at these locations include removing stream side vegetation, grading feathered stream edges, and creating open flood plains. The proposed project provides the opportunity to:

- Increase the diversity and area of habitat for salmonids, particularly habitat suitable for rearing;
- Increase rearing habitat for juvenile salmonids, including coho, chinook, and steelhead;
- Increase the structural and biological complexity of habitat for various species of wildlife associated with riparian habitats;
- Increase hydraulic and fluvial geomorphic diversity and complexity;
- Measure/demonstrate the ecological response to changes in flow regimes, morphological features, and aquatic, riparian, and upland habitats.

Reclamation prepared an environmental impact statement for the larger Restoration Program and developed a programmatic agreement (PA) to manage the cultural resource compliance efforts. In compliance with PA and National Historic Preservation Act (NHPA) requirements, Reclamation conducted archeological inventories at each of the areas of potential effect. This field work revealed to mining sites related to dredger mining during the middle of the 20th century. No archeological resources were discovered, due, in part, to the extensive modification experienced within the study area.

These specific habitat improvement projects also require preparation of an initial study to comply with California Environmental Quality Act requirements. The Native American Heritage Commission was contacted about the project and provided your name as a possible source of information regarding possible Native American concerns in Trinity County. We are contacting you for input.

The implementing regulations for Section 106 of the NHPA require that Federal agencies identify parties who might have an interest in the area of potential effects (APE). Further, Federal agencies must seek information about historic properties in the area and issues relating to the undertaking's potential effect on any historic properties found within the APE (36 CFR 800.4(a) (3). Reclamation asks that if you have concerns about these restoration projects on the Trinity River, that you identity those concerns to us, as noted below. If there are properties that your group wishes to be kept confidential, 800.11(c) allows Federal agencies to withhold this information from the public.

Please contact the Regional Archeologist, Mr. Patrick Welch, at 916-978-5040 if you have questions or comments regarding this effort to identify Native American cultural resources along this segment of the Trinity River.

Sincerely,

Michael Nepstad
Deputy Regional Environmental Officer

Enclosures

<u>Identical letters sent to:</u>

Mr. Charles Ammon
Tsnungwe Council
P.O. Box 373
Salyer, CA 95563

Mr. Robert Burns
Wintu Educational and Cultural Council
12138 Lake Boulevard
Redding, CA 96003

Kelli Hayward
Wintu Tribe of Northern California
2675 Bechelli Lane
Redding, CA 96001

cc: Mr. Dean Prat
Regional Water Quality Control Board, Region 1
915 Capitol Mall, Room 364
Sacramento, CA 95814

bc: NC-153 (BGuthermuth)
(w/encl)

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HOCKER FLAT HYDRAULICS REPORT

(08/10/04)

Introduction

The completion of Trinity and Lewiston Dams in 1964 led to years of low flows in the Trinity River, which greatly decreased the ability of the river to transport its bed and bank material. This decreased sediment transport ability has created a simplification and fossilization of the mainstem river channel from Lewiston dam downstream to the North Fork Trinity River. The Hocker Flat project is designed to return a one-mile reach of river to a functional dynamic alluvial system. This will be done by scaling the river channel down to better fit with the existing and future flow regimes described in the 2000 Trinity River Record of Decision.

This document describes the hydrologic flow conditions that were considered as part of the project design, and the hydraulic changes that will occur as a result of project implementation.

Hydrology

Three separate hydrologic flow conditions were factored into the design of the Hocker Flat project: the summer low-flow condition, the bankfull flow condition, and the flood flow condition.

Low Flow Condition

A dam release of 300 cfs and tributary accretion of approximately 150 cfs combine to make a summer low-flow condition of 450 cfs in channel. This flow and the corresponding water surface elevation are important because in many areas earthwork will begin at the rivers edge and work back onto the bank and floodplain.

Bankfull Flow Condition

The bankfull flow is the flow that occurs on average approximately every 1.5 years. The bankfull flow for Hocker Flat was calculated in a document prepared by McBain and Trush titled *Trinity River Hocker Flat Bank Rehabilitation Project Floodplain Inundation Flow Determination Using 1.5 Year Flood as Inundation Index* (attached in this appendix). In that document the calculated bankfull flow for Hocker Flat is identified as 6,600 cfs. This bankfull flow is based on a dam release of 6,000 cfs and tributary accretion of approximately 600 cfs.

This flow is important in the design process because the river should inundate the floodplain relatively frequently. Having frequent water flows over the floodplain enhances the likelihood that the structural complexity, area, and quality of the riverine habitat will increase. Because the amount of tributary accretion is relatively small, and because it is highly desirable that the river have access to the floodplain, the designers chose not to rely on the presence of tributary accretion and based the designs at Hocker Flat on the 6,000 cfs ROD flow.

Flood Flow Condition

The 100-year flood flow is the flow that has a 1% chance of occurring in any one year. This 100-year discharge includes both dam releases and tributary inflow. The magnitude of this flood flow is identified in the Trinity County Flood Insurance Study as 46,000 cfs in Junction City upstream of Canyon Creek, but recent hydrologic studies elsewhere in the watershed suggest that this value might be too low.

For the Trinity River bridges projects, hydrologic investigations were performed by Reclamation and McBain and Trush. The flood magnitudes calculated in these investigations were significantly higher than the flood magnitudes identified in the Flood Insurance Study. The McBain and Trush investigation, described in the document titled *Estimation of 50-and 100-Year Tributary Accretion Floods Lewiston Dam to Treadwell Bridge, Trinity River, California* (attached in this appendix), calculated that the 100-year flood at Douglas City is approximately 56,000 cfs. This is a 45 percent increase over the 38,500 cfs value listed for Douglas City in the Flood Insurance Study.

For the Hocker Flat project, it is assumed that the Flood Insurance Study underestimates the flood magnitude in Junction City by the same amount that it is underestimated at Douglas City. Increasing the Flood Insurance Study value of 46,000 cfs by 45 percent yields 67,000 cfs. Adding in the Canyon Creek flood contribution of 13,000 cfs, the flood flow at Hocker Flat becomes 80,000 cfs. This is the estimate that will be used for this project at this time, but prior to revision of the flood maps, the detailed hydrologic analysis started for the bridges project will be carried downstream to include Hocker Flat. If the more detailed analysis shows that the flood flow at Hocker Flat is not 80,000 cfs, then the model will be rerun with the new flow.

This flow is important because both the existing ground and proposed ground surfaces need to be modeled with a flood flow to make sure that there are no adverse impacts expected as a result of the project.

Hydraulics

Hydraulic modeling at Hocker Flat was done using HEC-RAS. HEC-RAS is a software program developed by the Hydrologic Engineering Center for the Army Corps of Engineers and is used to perform one dimensional flow calculations. Two separate models were created, one for the low flow and bankfull conditions, and one for the flood condition. The channel geometry used in the models for the existing ground surface was created from surveyed cross sections and photogrammetry contours.

Low Flow Model
The low flow/bankfull flow model was calibrated based on water surface elevations surveyed at approximately 475 cfs and approximately 6,000 cfs. For the proposed ground surface, the existing ground surface was modified to reflect the changes that would occur as a result of constructing the various features that are proposed for the Hocker Flat project.

For the low flow and bankfull flow conditions, the general philosophy was to begin construction activities at the low flow waters edge, and work back from the river. Constructed floodplains are designed to be inundated by approximately six inches of water when 6,000 cfs is present in the river. During the design process, the proposed ground surface geometry was imported into HEC-RAS and the model was executed. If necessary, the proposed ground geometry was adjusted and the model rerun until the desired outcome was achieved.

Flood Flow Model
The flood flow model was developed in much the same way as the lower flow models, except the cross section orientation and locations had to change slightly to better represent the river at this high flow. One difference with this model is that it cannot be calibrated in the same way as the low flow model because there are no surveyed water elevations at Hocker Flat with 80,000 cfs in the river.

DWR chose not to attempt to re-run the FEMA Flood Insurance Study to compare the results to the water surface elevations on the Flood Insurance Rate Map. At Hocker Flat, the Flood Insurance Rate Map is based on surveyed cross sections and water profiles developed in 1976. Since that time the river channel has aggraded by several feet in some areas, there is no record of what amount of water was predicted to be added by Canyon Creek, and the geometry and roughness have changed due to riparian encroachment.

The January 1997 event can be used as a general guide for water elevations and calibration purposes. For example, it is known that the peak flow in January 1997 was about 35,000 cfs at Hocker Flat. At that time the water was at the toe of the tailings in Area R-2, water flowed through the gap between the two tailings piles southwest of area R-4, water flowed along the side of Highway 299 at Area U-4, and water flowed across the floodplain surface in Area R-8. These individual events are all predicted by the flood model used for the Hocker Flat project.

Figure 1 on the following page is a profile of the Trinity River through Hocker Flat. It shows the locations of the riverine project areas, the location of the cutoff between FEMA Zone AE and Zone A, and the predicted water surface elevations for the 80,000 cfs flood flow for the existing conditions and proposed project topography. It is important to note that the proposed project is predicted to lower the flood elevation in most areas, and will not increase the flood elevation by more than 12 inches in any location.

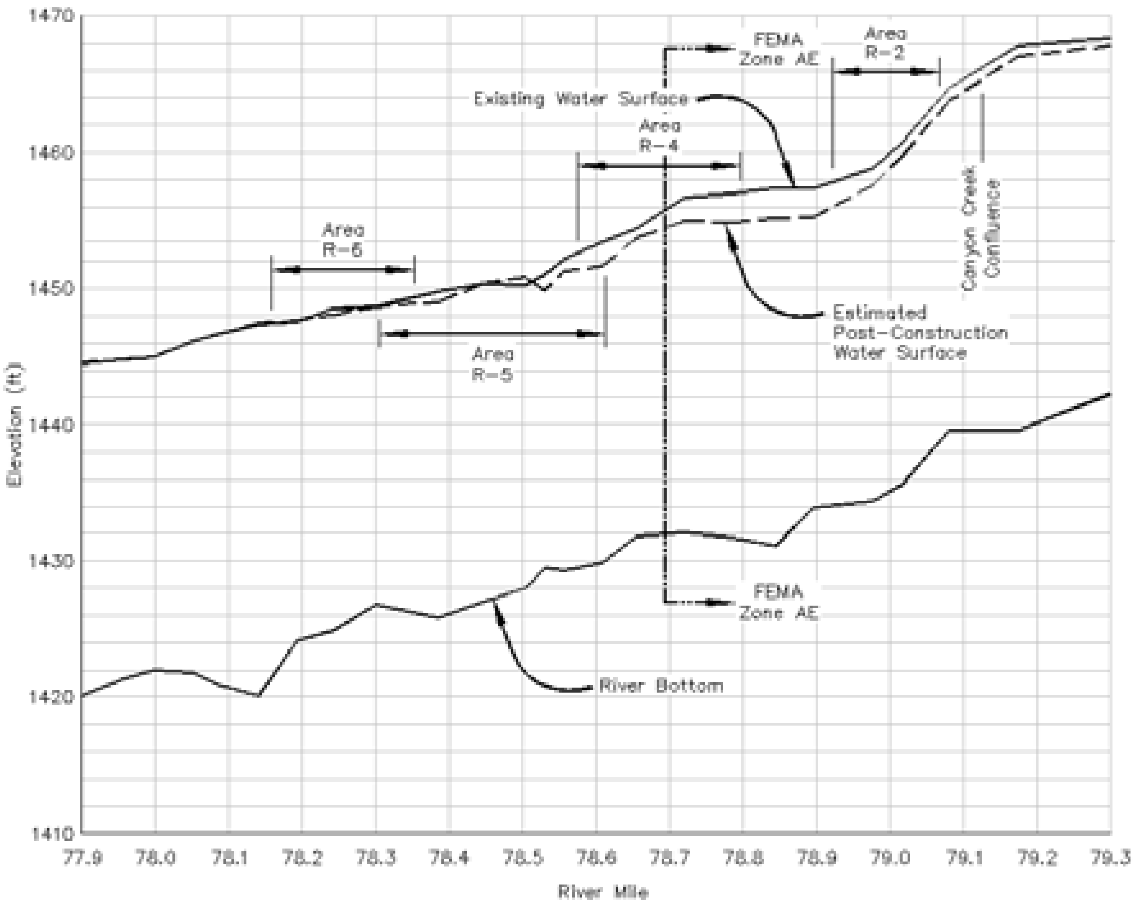


Figure 1. 80,000 cfs water surface profiles at Hocker Flat.

Trinity River Hocker Flat Bank rehabilitation project

Floodplain inundation flow determination using 1.5 year flood as inundation index

Prepared by:

Geoff Hales and Scott McBain
McBain and Trush, Inc.
January 20, 2004

The purpose of this memorandum is to develop criteria for designing the floodplain inundation flow at the Hocker Flat bank rehabilitation site, to be also used for other bank rehabilitation projects along the river. Floodplains are often designed to inundate by a 1.5 year flood in accordance with observations in unimpaired rivers. Estimating the 1.5 year flood on the Trinity River is difficult because of flow regulation from Trinity and Lewiston dams, tributary accretion downstream of the dams, and the short period of record for several key gaging stations.

The ROD release regime has a 1.5 year flood of approximately 6,000 cfs. At some distance downstream, the 1.5 year flood from tributary accretion surpasses that from the ROD release schedule. Therefore, the analysis below first estimates the 1.5 year flood from tributary accretion only (ignoring dam releases). Then, an analysis is performed that integrates the ROD releases and estimated tributary accretion to predict the 1.5 year flood at the Hocker Flat bank rehabilitation site. Lastly, this estimate is considered in light of floodplain restoration objectives to recommend a floodplain inundation flow design criteria for the Hocker Flat site.

We used a regional skew coefficient of -0.3 to calculate a weighted skewness for each gage (USGS, 1982), and we did not perform a sensitivity analyses on skew coefficients because skew plays virtually no role in predictions of common floods (e.g., 1.5-year flood). Similarly, frequency analyses were performed without weeding potential outliers, as outliers would not significantly influence predictions of common floods.

<u>TRIBUTARY ACCRETION FLOOD FREQUENCY ANALYSIS</u>

The results of the methods described below are summarized in Table 1.

1. **Plot of $Q_{1.5}$ unit runoff for n=19 gaging stations:** Unit runoff for instantaneous peak 1.5-year flows (cfs/mi^2) plotted as a function of drainage area (mi^2). A visual fit if these data suggest unit runoff for Hocker Flat (DA = 404 mi^2) is in the vicinity of 21 cfs/mi^2 ~ 8,480 cfs. Data point is plotted in green on Figure 1.
2. **Scaling Burnt Ranch FFA data (post-WY 1965):**
    a. Burnt Ranch post WY-1965 peak flows identified

b. The average of the Lewiston 3-day daily average flows (same day as Burnt Ranch peak and two days previous) were subtracted from Burnt Ranch peak flows, which removes dam release flows and thereby estimates tributary accretion from Lewiston Dam to Burnt Ranch. The 3 days used to compute the 3-day daily average flows at Lewiston are all very close in magnitude with exception of 1974, 1986, and 1996. The 3-day flows at Lewiston for each of these years are as follows:

    1974: 168 cfs, 192 cfs, 3,740 cfs, Average=1,367 cfs. Peak discharge at Burnt Ranch = 68,100 cfs, Estimated tributary accretion=66,733 cfs.

    1986: 421 cfs, 1,260 cfs, 1,750 cfs, Average=1,144 cfs. Peak discharge at Burnt Ranch = 37,500 cfs, Estimated tributary accretion=36,356 cfs.

    1996: 331 cfs, 339 cfs, 3,301 cfs, Average=1,324 cfs. Peak disharge at Burnt Ranch = 14,700 cfs, Estimated tributary accretion=13,376 cfs.

   Even though the above years do not have similar magnitude flows used to compute the 3-day average at Lewiston, averaging over a 3-day period conservatively accounts for routing time and provides a reasonable estimate of what to subtract from the Burnt Ranch peak in order to estimate tributary accretion minus the dam release. Additionally, even if the 3-day average were modified, it is very likely that because these particular peak flows at Burnt Ranch are large, any changes to the 3-day average would only provide a minor adjustment to the accretion estimate and not significantly affect our estimate of the 1.5-year flood.

c. Frequency analysis done on (Burnt Ranch – Lewiston) flows, $Q_{1.5}$ unit runoff = 14.0 cfs/mi^2. 14.0 cfs/mi^2 x DA Hocker Flat (404 mi^2) = 5,660 cfs. Data point is plotted in red on Figure 1.

3. **Unit runoff regression for gaging stations with n>20 years of record and DA>100 mi^2:** Using the same data set as Method #1 above, we narrowed the field by plotting peak 1.5-year unit runoff (cfs/mi^2) as a function of drainage area (mi^2) for gages that had 20 or more years of peak flow record and had a drainage area greater than 100 mi^2. Eight gages fit this criterion. Plotting the data showed a general trend, and based on fitting a trendline to the data (R^2 = 0.670), the predicted unit runoff for Hocker Flat (DA = 404 mi^2) is 22.5 cfs/mi^2 = 9,070 cfs. See Figure 2. All of the gages have a similar runoff pattern, having a mixture of rainfall dominated runoff with some rain-on-snow events.

4. **Unit runoff regression for mainstem Trinity River gaging stations only:** Using the same analysis as described for Method #3 above, n=4 gages were plotted and the regression (R^2 = 0.833), predicts the unit runoff for Hocker Flat = 19.6 cfs/mi^2 = 7,850 cfs. See Figure 3.

5. **Scaling Junction City FFA data:** Using the same scaling as Method #2 above (scaling peak flows by subtracting the Lewiston 3-day daily average to estimate tributary accretion), FFA of the Junction City data (n=7 years; WY 1996-2002, DA-339 mi^2) shows $Q_{1.5}$ unit runoff = 10.4 cfs/mi^2. For Hocker Flat (DA=404 mi^2), the $Q_{1.5}$ = 4,210 cfs.

   a. As a measure to evaluate the 1996–2002 record with respect to a longer record, we compared the above estimate ($Q_{1.5}$ unit runoff = 10.4 cfs/mi^2 = 4,210 cfs) with the same period of record for GVC (DA = 30.8 mi^2). FFA for GVC WY 1996-2002 period of record shows $Q_{1.5}$ unit runoff = 15.7 cfs/mi^2, however, using the entire period of record for GVC (n=26 years), the $Q_{1.5}$ unit runoff = 12.1 cfs/mi^2. This suggests that this seven year period is wetter than the long-term average.

b. As a second measure to evaluate the 1996–2002 record with respect to a longer record, we performed the same analysis as Method #5a above using the adjusted Burnt Ranch data (DA =719 mi^2; see Method #2). FFA for the adjusted Burnt Ranch WY 1996-2002 period of record shows $Q_{1.5}$ unit runoff = 14.8 cfs/mi^2. Using the entire period of record for the adjusted Burnt Ranch data (n=36 years), the $Q_{1.5}$ unit runoff = 14.0 cfs/mi^2 (this is the result of Method #2). This also suggests that this seven year period is wetter than the long-term average, but less so than the Grass Valley Creek comparison above.

The results of Method #5a show a 3.6 cfs/mi^2 difference between the 7-year and the 26-year period of record, suggesting that the 7-year period of record is wetter than the 26-year period, suggesting that the 1996-2002 estimate at Junction City may over-predict the longer-term $Q_{1.5}$ unit runoff at Hocker Flat. The results of Method #5b show a wetter period for 1996-2002, but the difference between the 7-year and the 36-year period of record (0.8 cfs/mi^2) is smaller than at Grass Valley Creek. We feel that the Burnt Ranch comparison may be more realistic comparison than Grass Valley Creek due to significant differences in watershed characteristics, and that the Hocker Flat site contains approximately half the watershed area of the Burnt Ranch gaging station watershed area. Regardless, the 1996-2002 Junction City flow data is used as a conservatively high estimate for the 1.5 year flood in subsequent analyses.

6. **Regional Regression Equations:** Using Young & Cruff (1967), Waananen & Crippen (1977) and Rantz (1982), $Q_{1.5}$ estimates range from 6,083 to 18,260 cfs (Y&C and Rantz), and Q_2 estimates (W&C) range from 17,560 to 19,070 cfs. These estimates use input parameters (fixed precipitation index = 62 inches, two elevation indices: 2.76 and 3.29) were used for other gages in the basin and can be modified if the site-specific indices are determined and used in the regional equations (although we don’t expect the site-specific indices to be significantly different from the ones used).

INTEGRATING ROD RELEASES WITH TRIBUTARY ACCRETION AT HOCKER FLAT BANK REHABILITATION SITE

Method 5b above suggests that the Junction City flow data, with Lewiston flow subtracted to estimate tributary accretion, provides a conservatively high estimate of long-term tributary flood frequency. Therefore, to estimate the 1.5 year flood at the Hocker Flat bank rehabilitation site, we followed the following steps:

1) Subtracted the average Lewiston 3-day daily average flow from the annual peaks at Junction City for each water year between 1996-2002 to estimate the annual peak flow at Junction City due to tributary accretion.
2) Estimated the corresponding flood peak at Hocker Flat by adding the Junction City peak flow with the Canyon Creek peak flow for each year. The Canyon Creek peak flow for each year was estimated by adjusting the Junction City peak by drainage area

[Qhocker=Qjc(AREAcc/AREAjc)], where the drainage area of Canyon Creek and Junction City is 64.6 mi^2 and 339 mi^2, respectively.

3) Assigning the ROD peak flow to each water year between 1996-2002 based on the water year class as predicted by inflows into Trinity Reservoir. For example, water year 2002 was a Normal year, so the corresponding ROD peak release would have been 6,000 cfs.

4) For each year, the hypothetical peak flow at Hocker Flat was computed by taking the larger of 2) and 3). For example, if the tributary accretion at Hocker Flat in 2002 was 4,500 cfs and the ROD release would have been 6,000 cfs, the 6,000 cfs value was chosen as the peak flow for that year. These values were used to generate a hypothetical annual peak data series for a standard flood frequency analysis, and partial duration flood peaks were not considered.

5) A flood frequency analysis was performed on the predicted peak flow data at Hocker Flat between 1996-2002 to estimate the 1.5 year flood only. No extrapolation to larger, less frequent floods was done given the small period of record of the data set.

The result of this analysis predicted that the 1.5 year flood at Hocker Flat would be 8,200 cfs. Again, this value should be considered conservatively high because the 1996-2002 period was wetter than the long-term average at both the Grass Valley Creek and Burnt Ranch gaging stations. Comparing this prediction with the tributary-only estimates of the 1.5 year flood shows that this estimate is close to that predicted by Method 1 and 4, larger than Method 2 and 5, and slightly lower than Method 3. The 1.5 year flood cannot be lower than 6,000 cfs due to ROD releases, so we effectively have the 1.5 flood bounded by 6,000 cfs (ROD releases) and 9,000 cfs (Method 3). Keeping in mind that a significant objective for performing this analysis was to verify that tributary generated floods were not dominating the ROD flow regime in the Junction City reach (e.g., 1.5 year flood estimates are not significantly larger than the ROD 1.5 year flood), and this analysis supports this conclusion.

As for choosing a design flood magnitude for floodplain inundation at Hocker Flat, we revert back to biological and geomorphic objectives of the floodplain construction. Geomorphic objectives for the floodplain include: (1) providing enough confinement to maintain bedload transport through the reach, (2) fine sediment deposition on the floodplains, and (3) larger floods providing some opportunities for infrequent scour and deposition to add topographic diversity. Key biological objectives include: (1) inundation of long enough duration during juvenile salmonid rearing periods to increase habitat and growth rates, (2) inundation of enough duration and gradual ramping rates during seed dispersal periods to periodically recruit native woody riparian vegetation on the floodplains. Floods on tributaries downstream of Lewiston Dam are dominated by rainfall and rain-on-snow precipitation events, and thus are typically of very short duration, have very steep ramping rates, and occur during the winter months prior to riparian seed dispersal period. These flood events may help achieve the geomorphic objectives above, but do not achieve the biological objectives as well as the ROD high flow releases. These late spring ROD releases are timed to take advantage of juvenile rearing and smolt outmigration, as well as riparian seed dispersal period. Additionally, the Normal, Wet, and Extremely Wet water years of the ROD have a 5-day bench of 6,000 cfs, followed by a gradually receding hydrograph that simulates the natural snowmelt recession limb. Wet and Extremely Wet years have higher flows, but they quickly ramp down to the 6,000 cfs bench. Therefore, the 6,000 cfs flow remains an important design criteria for floodplain construction. The average tributary accretion between Lewiston Dam and Junction City from May 7 to June 10 (time window when 6,000 cfs would be released under the ROD) for 1996-2002 was 500 cfs (1.5 cfs/ mi^2). Adding average accretion from Canyon Creek (DA=64.6 mi^2) of 95 cfs, would result in a target design inundation flow of approximately 6,600 cfs at Hocker Flat (6,000 cfs + 500 cfs + 95 cfs).

What are the tradeoffs for not designing the floodplain for 8,000 cfs or 9,000 cfs, which may better approximate the 1.5 year flood at Hocker Flat? Perhaps one would be that a 6,600 cfs floodplain may not provide enough confinement to route coarse sediment through the reach. However, the pre-ROD 1.5 year flood was most likely smaller than 6,600 cfs (see Methods 2 and 5), and the channel has been able to route its sediment load through the reach (even the large contribution from Canyon Creek). Therefore, sediment routing should not be a problem. What are the disadvantages of using a 8,000 cfs to 9,000 cfs floodplain? The floodplain would be inundated for very short periods of time, and often during times when it would provide no benefit to riparian regeneration. During those years where floodplain inundation releases coincide with riparian seed dispersal, ramping rates down to 6,000 would be much too steep for seedling root development to keep pace with the declining water table. What are the advantages of a 6,600 cfs floodplain? Longer and more frequent inundation, more potential deposition of fine sediment, more potential floodplain scour and deposition, and slower ramping rates during riparian seed dispersal period would all better achieve the objectives listed above. Therefore, we recommend that the floodplain be designed to inundate at approximately 6,600 cfs.

Table 1. Summary of Q1.5 flood magnitude estimates for differing methods.

Method No.	***Hocker Flat $Q_{1.5}$ estimate (cfs)***	***Pros***	***Cons***
1	8,480	Uses a large number of gaging stations with a well-distributed range of drainage areas	Results show large scatter, likely due to watershed precipitation and runoff differences (e.g., geology, topography, soils, vegetation, …)
2	5,660	Uses Trinity River-specific gaging records and is adjusted to exclude dam releases (reflecting actual tributary accretion on the river reach of interest)	Scaling from Burnt Ranch (Regulated DA = 719 mi^2) to Hocker Flat (Regulated DA = 404 mi^2) assumes uniform watershed runoff conditions between Lewiston and Burnt Ranch. Actual differences (if any of significance) have not been investigated.
3	9,070	Larger peak flow data set may reduce accuracy error from gages with short periods of record	Some gages located outside the watershed
4	7,850	Uses mainstem Trinity River-specific gaging records	Only uses 4 gages.
5	4,210	Estimate scaled from data measured immediately upstream, adjusted to exclude dam releases (reflecting actual tributary accretion on the river reach of interest)	Result based on only 7 years of data.
6	Ranges from 6,080 to 19,070.	Regression equations theoretically use the largest data set (many gages used to determine regional regression equations)	Needs more work. Coefficients (MAP, elevation index) estimated based on work done for other local tributaries. These should be calculated specifically for the Hocker Flat site. Regression equations are for a large region and may perform poorly at a given location.
Recommended design floodplain inundation elevation	6,600 cfs	Integrates ROD flow schedule, achieves more biological objectives while not sacrificing geomorphic objectives.	Is probably less than the future 1.5 year flood at the site.

FIGURE 1. Unit Runoff value regressions for local Trinity River gaging stations.

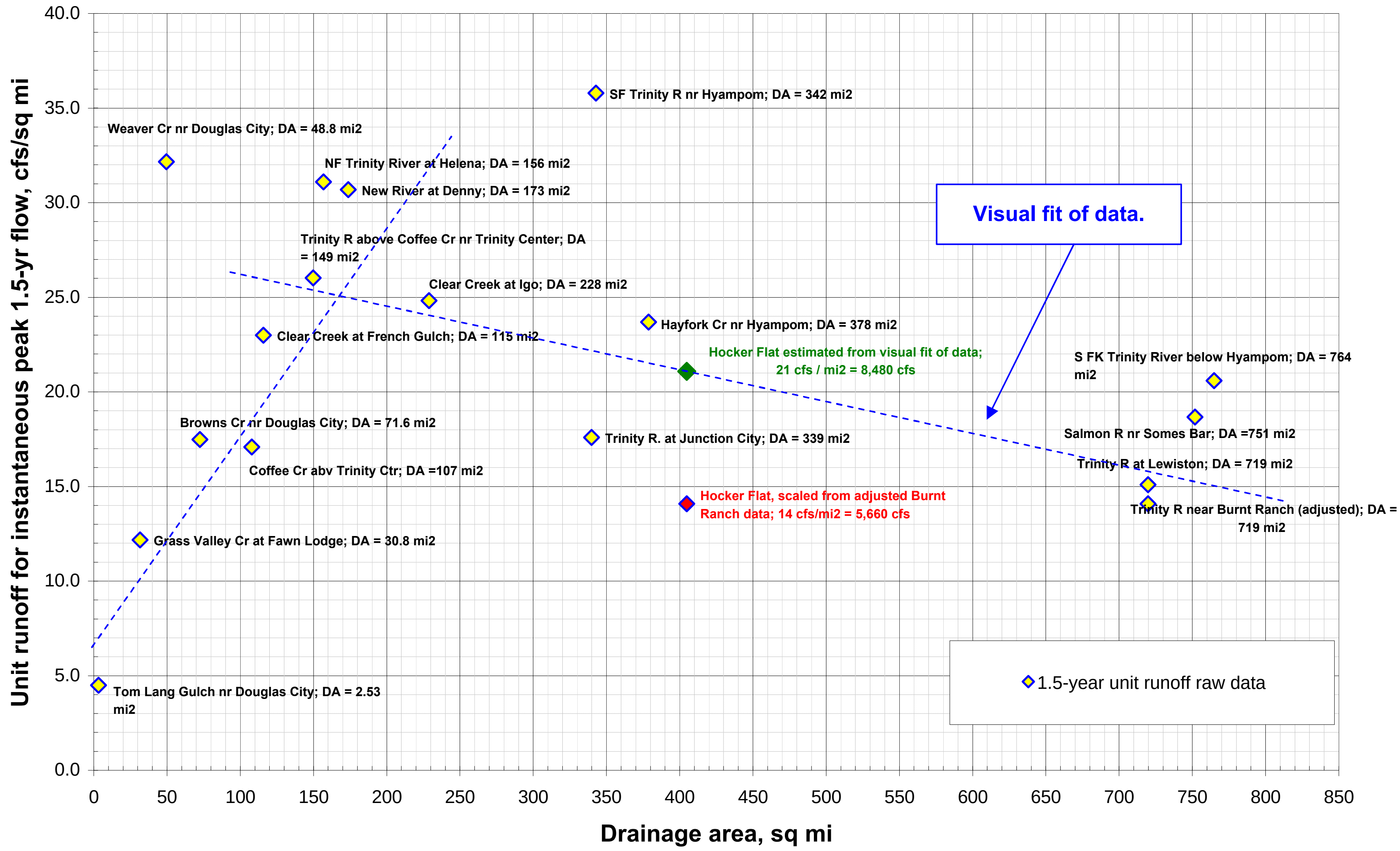


FIGURE 2. Unit Runoff value regressions for local Trinity River gaging stations using gages with > 20 years of record and drainage area > 100 mi^2.

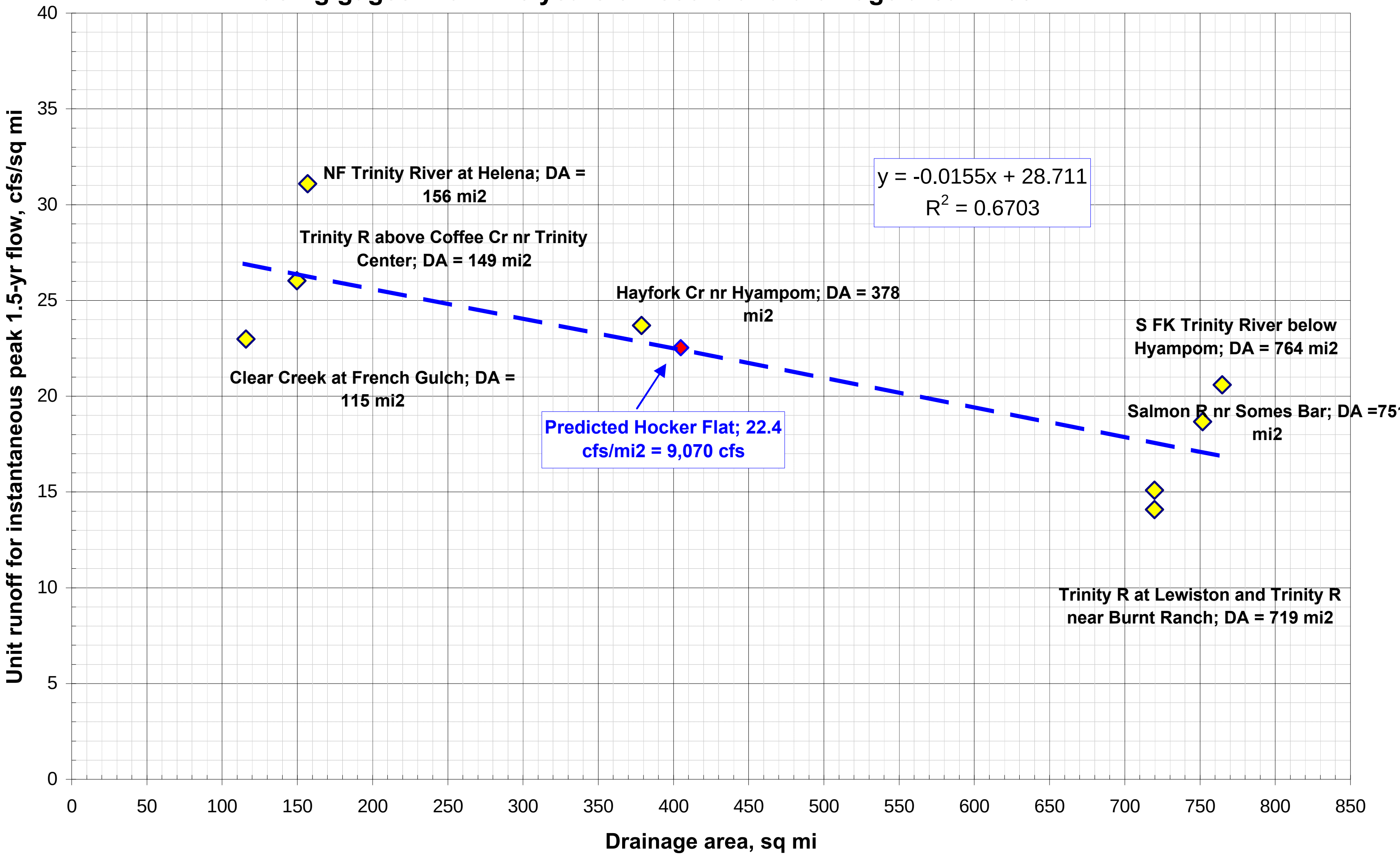
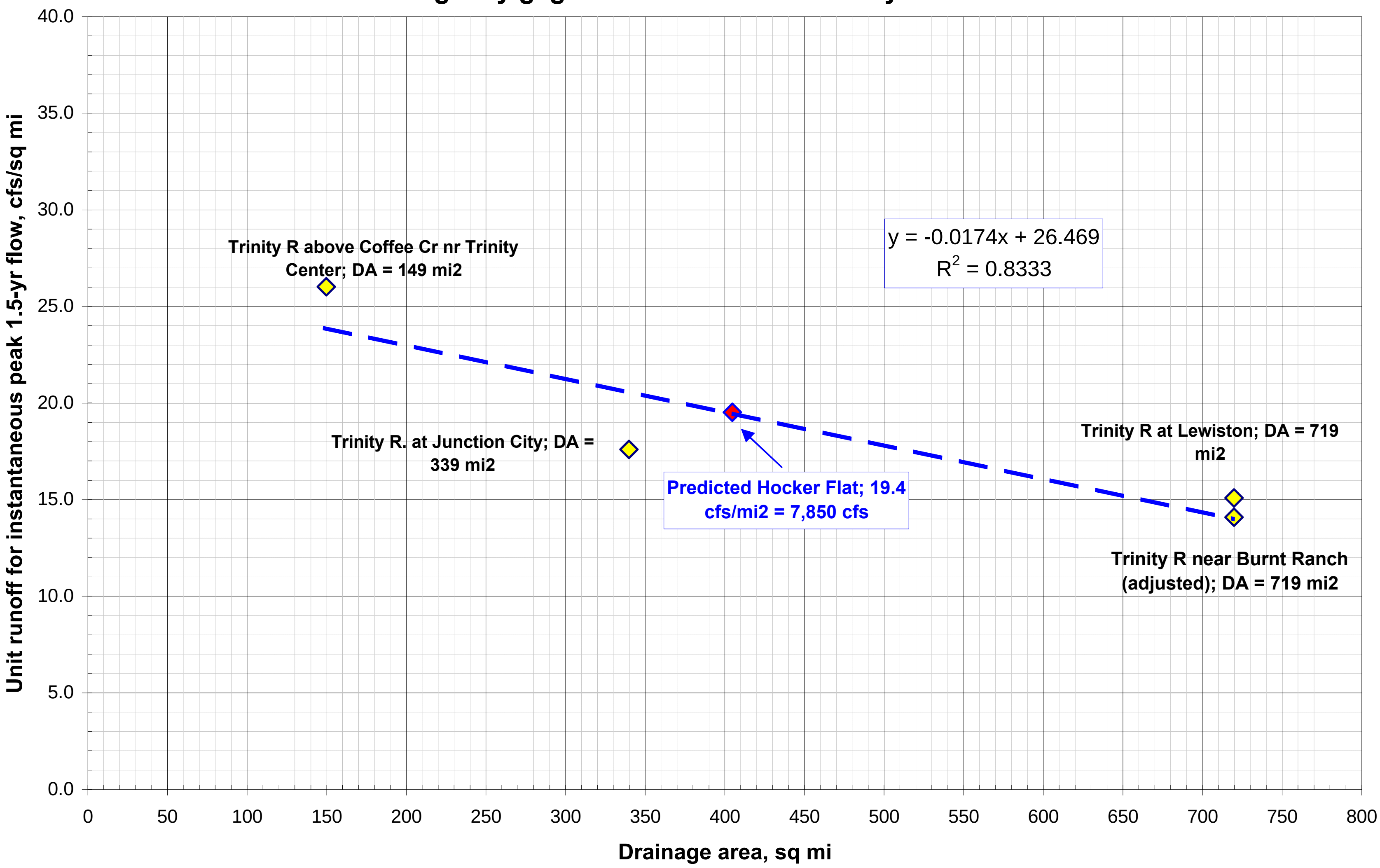


FIGURE 3. Unit Runoff value regressions for local Trinity River gaging stations using only gages on the mainstem Trinity River.



Estimation of 50-and 100-Year Tributary Accretion Floods Lewiston Dam to Treadwell Bridge, Trinity River, California

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April 30, 2002

1. INTRODUCTION

The Trinity River, located in the northwest portion of California (Figure 1), has been the focus of study over the past 30 years in an effort to restore salmon populations. This effort culminated in 2001 with the signing of the Secretarial Record of Decision for the Trinity River Restoration Program. An important component of this Record of Decision is to increase instream flow releases from Lewiston Dam up to 11,000 cfs during Extremely Wet water years. However, these higher flow releases from Lewiston Dam is only one of several sources of high flows downstream of Lewiston Dam. In the winter months during large storm events, tributaries between Lewiston Dam (RM 112) and Treadwell Bridge (RM 97.4) can cumulatively cause mainstem Trinity River flows to approach or exceed 11,000 cfs on top of releases from Trinity and Lewiston Dams (McBain and Trush, in press). Additionally, Safety of Dam releases have historically exceeded 11,000 cfs twice since Trinity and Lewiston dams were completed in 1964, and while changed reservoir operations have certainly reduced the magnitude and frequency of Safety of Dams releases, this scale of release could potentially occur again. There are four bridges downstream of Lewiston Dam that are vulnerable to higher flows (Figure 2), with at least one that is impacted by flows as low as 6,000 cfs to 8,500 cfs. All four bridges downstream of Lewiston Dam currently do not have the capacity to convey flows up to 11,000 cfs, and observations during the 1997 flood showed that many of these bridges were overtopped. In response to these new higher flow recommendations up to 11,000 cfs mandated by the 2001 Record of Decision, the Bureau of Reclamation is developing designs to raise or reconstruct these four bridges to safely convey higher flows. The design flow for these bridges will consider several factors, including the Record of Decision flows, Safety of Dams releases, expected tributary accretion on top of dam releases, and desired flood magnitude and frequency that the bridges should safely pass (e.g., 50 or 100 year flood). Several studies have been conducted to estimate downstream flood magnitude due to tributary accretion (e.g., DWR, 1996; ACOE, 1976; McBain and Trush, 1997) using varying techniques. The purpose of this memorandum is to estimate 50 and 100-year tributary flood magnitude at the four bridge sites under the winter flood season (November-March) and the snowmelt runoff season (May-June). These flood magnitude estimates will help develop bridge design criteria.

2. OBJECTIVE

There are three populations of floods that need to be considered in the bridge designs: 1) future Safety of Dams releases, 2) Record of Decision releases, and 3) tributary flow

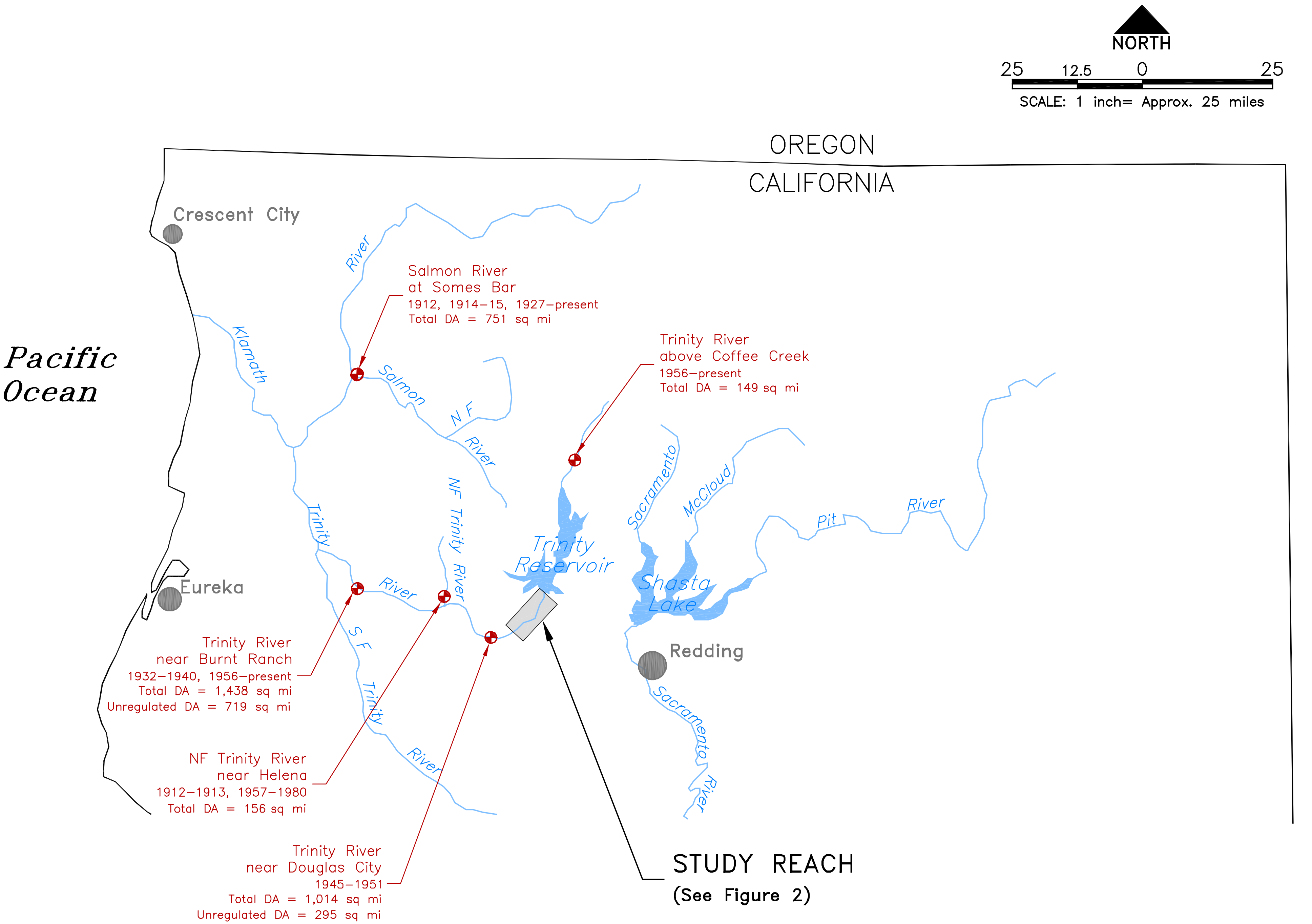

FIGURE 1. LOCATION OF REGIONAL GAGING STATIONS NEAR THE TRINITY RIVER

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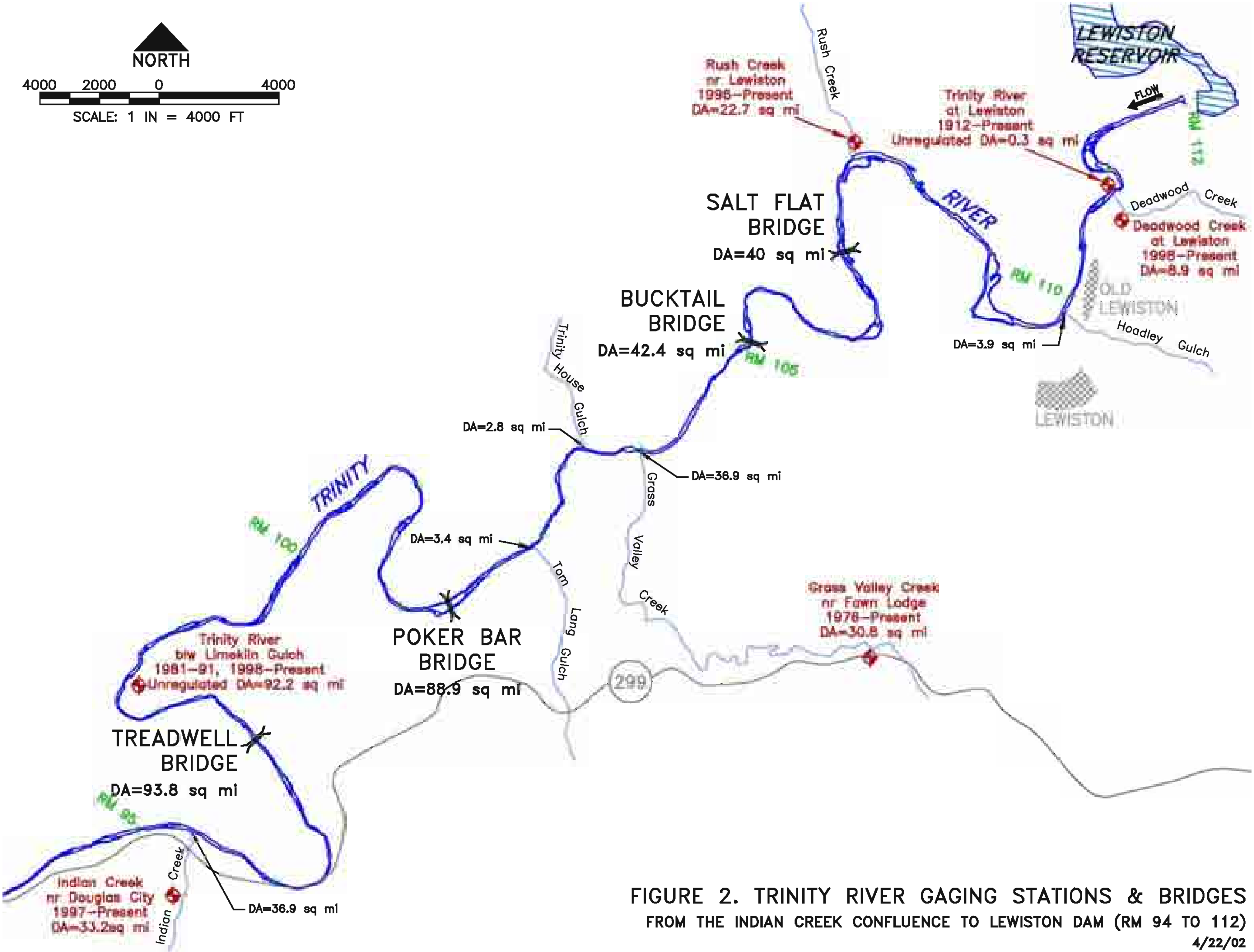

FIGURE 2. TRINITY RIVER GAGING STATIONS & BRIDGES
FROM THE INDIAN CREEK CONFLUENCE TO LEWISTON DAM (RM 94 TO 112)
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accretion on top of 1 and 2. The magnitude of tributary accretion depends on the time of year (winter flood period from November-March, or snowmelt runoff period in May-June) and the longitudinal location on the mainstem (tributary accretion increases with distance downstream. The objective of this paper is to facilitate bridge design flow estimates under the following design scenarios:

WINTER FLOOD SEASON (NOVEMBER-MARCH)

A. 300 cfs Record of Decision baseflow release from Lewiston Dam plus 50 and 100-year flood flow accretion from tributaries. The 300 cfs baseflow release would occur between October 15 and the beginning of high flow releases in May.
B. 6,000 cfs Safety of Dams release from Lewiston Dam plus 50 and 100-year flood flow accretion from tributaries. 6,000 cfs is the present-day maximum Safety of Dams release, and can occur between November 1 and March 31 when cumulative storms and/or snowmelt runoff encroaches into the Safety of Dams storage.

SPRING SNOWMELT RUNOFF SEASON (MAY-JUNE)

C. 11,000 cfs Record of Decision release for Extremely Wet water year from Lewiston Dam plus 50 and 100 year May-June snowmelt runoff flow accretion from tributaries.
D. 13,750 cfs Safety of Dams release from Lewiston Dam plus 50 and 100 year May-June snowmelt runoff flow accretion from tributaries.

We need to develop these estimates longitudinally along the river from Lewiston Dam to Treadwell Bridge by estimating tributary flood accretion for the 50 and 100-year flood recurrences during the winter flood season (November-March) and during the snowmelt runoff season (May-June). Concurrently, Reclamation is evaluating whether anticipated future Safety of Dam releases from Lewiston Dam are larger than 50 and 100-year tributary floods.

3. DATA SOURCES

Estimating flood frequency at the bridges required an analysis that estimated flood magnitudes from tributaries between Lewiston Dam and Treadwell Bridge during the two seasons listed above. Flood frequency analyses for these two seasons used two different data sources. Floods generated during the winter season are generated from high intensity rainfall or rain-on-snow events, and are almost always the largest flood peaks of the year; therefore, annual instantaneous peak flows were used for the 50 and 100-year winter flood season analysis. Higher flows generated during the May-June period are primarily snowmelt runoff events, which are usually more gradual and much smaller than the winter floods. Therefore, we used the maximum daily average flow during the May-June period, and adjusted the daily average flow to an estimated instantaneous peak flow to estimate the 50 and 100-year peak spring snowmelt runoff season flow magnitude. The pertinent gaging stations providing data used in various analyses in this report are listed in Table 1. Regional gaging stations are shown on Figure 1, and the study reach with local gages, tributaries, and the four bridges are shown in Figure 2.

Table 1. Gaging stations used in various analyses contained in this report.

Gaging Station	Gage #	Trinity River Mile	Drainage Area	Operator	Period of Record	Years of Record [total] (regulated)
Trinity River at Lewiston	11-525500	110.9	719 mi^2	USGS[a]	1911-present	[89] (36)
Deadwood Creek near Lewiston	N/A	N/A	8.9 mi^2	HVT[b]	1998-present	[4]
Rush Creek near Lewiston [d]	N/A	N/A	22.7 mi^2	HVT[b]	1997-present	[5]
Grass Valley Creek near Fawn Lodge	11-525600	N/A	30.8 mi^2	USGS[a]	1976-present	[26]
Trinity River near Limekiln Gulch [d]	11-525650	98.3	810 mi^2	USGS[a]/HVT[b]	1981-1991, 1998-present	[15] (15)
Indian Creek near Douglas City [d]	N/A	N/A	33.2 mi^2	HVT[b]	1997-present	[5]
Weaver Creek near Douglas City	11-525800	N/A	48.4 mi^2	DWR[c]	1959-1969	[11]
Browns Creek near Douglas City	11-525900	N/A	71.6 mi^2	DWR[c]	1957-1967	[11]
Trinity River near Douglas City	11-526000	87.7	1,014[d] mi^2	USGS[a]	1945-1951	[7]
Trinity River near Burnt Ranch	11-527000	48.6	1,438[e] mi^2	USGS[a]	1932-1940, 1956-present	[55] (36)
Trinity River above Coffee Creek	11-523200	146	149 mi^2	USGS[a]	1956-present	[45]
North Fork Trinity River near Helena	11-526500	N/A	156 mi^2	DWR[c]	1912-1913, 1957-1980	[26]
Salmon River at Somes Bar	11-522500	N/A	751 mi^2	USGS[a]	1912, 1914-15, 1927-present	[77]

[a] U.S. Geological Survey
[b] Hoopa Valley Tribe Fisheries Department
[c] State of California Department of Water Resources
[d] 295 mi^2 unregulated
[e] 719 mi^2 unregulated

4. WINTER FLOOD SEASON

The following four methods were used to estimate tributary flood magnitude for the 50 and 100-year floods at the four bridges:

1) Regional Regression Equation method
2) Additive Tributary model
3) Unit Runoff method
4) Regional Flood Frequency Analysis method

The four methods are used to develop a range of estimates; benefits and drawbacks for each method are discussed and considered when making a final recommendation on best flood magnitude to use at the bridge locations. Many of the methods below use the Log Pearson III flood frequency distribution to compute flood magnitudes on gaged streams. Previous work has estimated generalized skew factors of -0.1 from the map in Bulletin 17B (USGS, 1982); however, Reclamation compiled regional skew factors from nearby gaging stations and weighted them by the period of record. This analysis suggested that a generalized skew factor of -0.3 is more appropriate for the Trinity River basin, thus is used the following analyses.

4.1. Regional Regression Equation method

The regional regression equation method is based on the multivariate statistical analysis of North Coast California gaging stations performed by Waananen and Crippen (1977), and is used in Jennings, et al. (1994). For the North Coast of California, the regional regression equations for the 50- and 100-year floods are as follows:

$$Q_{50} = 8.57\,(A)^{0.87}\,(P)^{0.96}\,(E)^{-0.08}$$
$$Q_{100} = 9.23\,(A)^{0.87}\,(P)^{0.97}\,(E)^{0.00}$$

where A= drainage area, P= average annual precipitation, and E = elevation index. To compute the 50- and 100-year flood estimates at the Salt Flat Bridge and Bucktail Bridge, we added the computed 50- and 100-year flood estimates for Rush Creek and the Trinity River between Lewiston Dam and the bridge of interest. To compute the 50- and 100-year flood estimates at the Poker Bar Bridge and Treadwell Bridge, we added the computed 50- and 100-year flood estimates for Rush Creek, Grass Valley Creek, and the Trinity River between Lewiston Dam and the bridge of interest. We used the regional regression equations to compute the 50- and 100-year flood magnitude for Rush Creek and the mainstem Trinity River, and used the Log-Pearson III flood frequency prediction for Grass Valley Creek at Fawn Lodge ($A=30.8\ mi^2$). The 50-year and 100-year flood prediction at the Grass Valley Creek at Fawn Lodge is 4,802 cfs and 6,022 cfs, respectively (Figure 3).

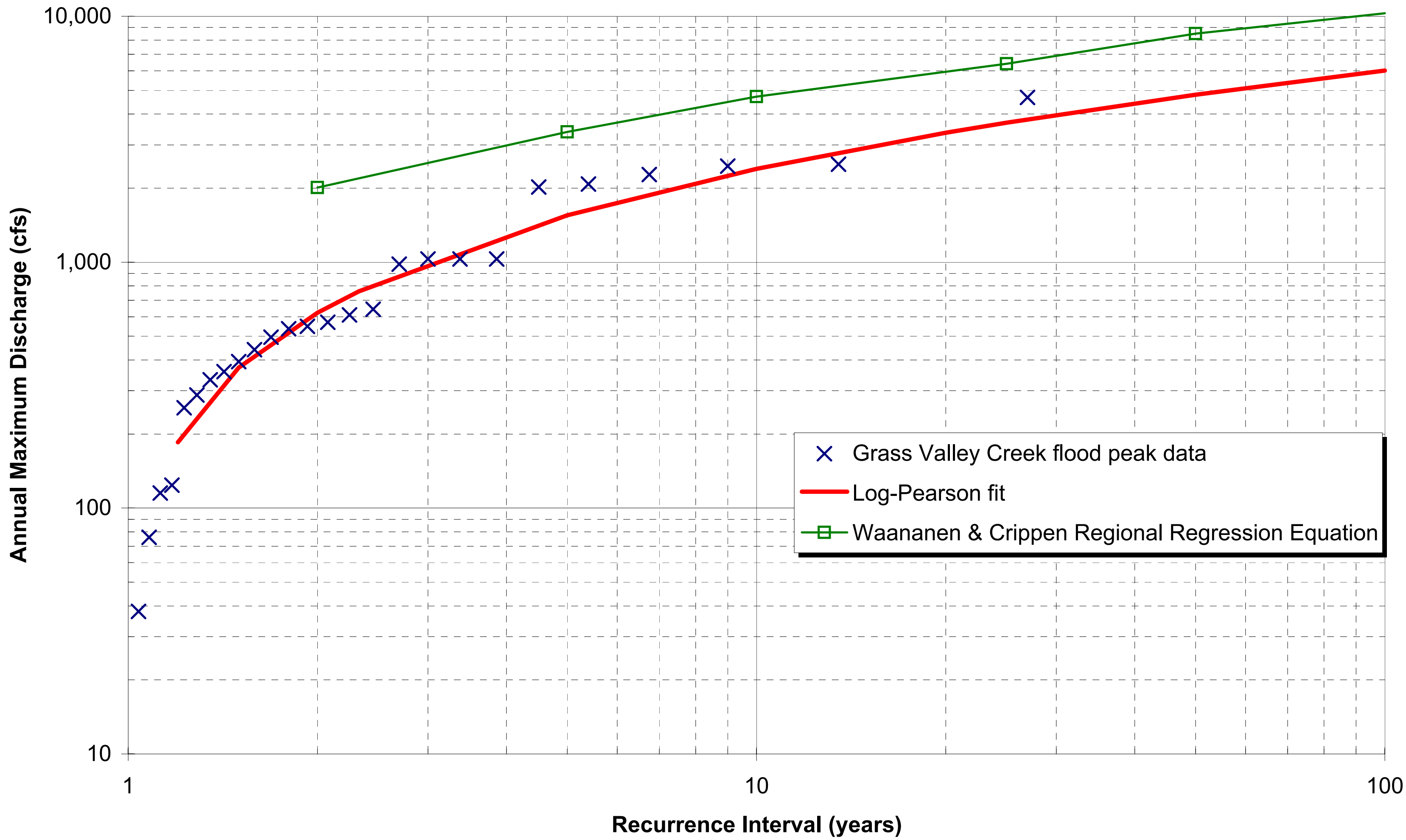
For comparison, we compared the Log-Pearson III 50 and 100-yr flood magnitude estimates from the Grass Valley Creek gaging station to that predicted by the regional regression equations using $A = 30.8\ mi^2$, $P = 64$ inches, $E = 2.54$ (Table 2, Figure 3).

Table 2. Comparison of 50- and 100-year flood magnitude predictions at Grass Valley Creek using the Waananen and Crippen (1977) regional regression equations and the Log-Pearson III predictions.

Flood frequency	Regional Regression Equation Prediction	Log-Pearson III prediction from gaging data	Percent over-prediction
50-year flood	8,503 cfs	4,802 cfs	77 %
100-year flood	10,286 cfs	6,022 cfs	71 %

The Grass Valley Creek gaging station is upstream from the confluence with the Trinity River, so we adjusted the flood magnitude predictions to account for the additional drainage area at the mouth ($Q_{mouth}=Q_{gage}*(A_{mouth}/A_{gage})^{0.87}$, where the exponent was taken

Figure 3. Grass Valley Creek at Fawn Lodge (USGS gage #11-5256; 1976-2001) flood frequency curve



from the regional regression equations. Using A_{mouth}=37.0 mi^2, A_{gage}=30.8 mi^2, and Q_{gage}= 4,802 cfs and 6,022 cfs for the 50 and 100-year flood, the resulting flood magnitude predictions that incorporate the additional drainage area between the Grass Valley Creek gaging station and the Trinity River confluence results in a 50-year flood estimate of 5,633 cfs and a 100-year flood estimate of 7,063 cfs. Results of applying the Waananen and Crippen (1977) regional regression equations to Rush Creek and the cumulative small tributaries along the mainstem Trinity River are shown in Table 3, as are the resulting estimates of 50- and 100-year flood magnitudes at the four bridges using this method.

Table 3. Summary of 50- and 100-year flood magnitude predictions at the four bridges using the Waananen and Crippen (1977) regional regression equations.

SALT FLAT BRIDGE		Area	Precipitation	Elev. index	Q_{50}	Q_{100}
	Rush Creek	22.7 mi^2	43 inches[1]	3.230	4,366 cfs	5,363 cfs
	Trinity R. & minor tribs	16 mi^2	45 inches [2]	1.803	3,773 cfs	4,425 cfs
	Sum at bridge location	**38.7 mi^2**			**8,139 cfs**	**9,788 cfs**
BUCKTAIL BRIDGE		**Area**	**Precipitation**	**Elev. index**	**Q_{50}**	**Q_{100}**
	Rush Creek	22.7 mi^2	43 inches[1]	3.230	4,366 cfs	5,363 cfs
	Trinity R. & minor tribs	18.4 mi^2	45 inches [2]	1.784	4,228 cfs	4,955 cfs
	Sum at bridge location	**41.1 mi^2**			**8,594 cfs**	**10,318 cfs**
POKER BAR BRIDGE		**Area**	**Precipitation**	**Elev. index**	**Q_{50}**	**Q_{100}**
	Rush Creek	22.7 mi^2	43 inches[1]	3.23	4,366 cfs	5,363 cfs
	Grass Valley Creek	37.0 mi^2		N/A	5,633 cfs	7,063 cfs
	Trinity R. & minor tribs	27.9 mi^2	45 inches [2]	1.765	5,960 cfs	6,978 cfs
	Sum at bridge location	**87.6 mi^2**			**15,959 cfs**	**19,404 cfs**
TREADWELL BRIDGE		**Area**	**Precipitation**	**Elev. index**	**Q_{50}**	**Q_{100}**
	Rush Creek	22.7 mi^2	43 inches[1]	3.23	4,366 cfs	5,363 cfs
	Grass Valley Creek	37.0 mi^2		N/A	5,633 cfs	7,063 cfs
	Trinity R. & minor tribs	32.8 mi^2	45 inches [2]	1.738	6,829 cfs	7,986 cfs
	Sum at bridge location	**92.5 mi^2**			**16,828 cfs**	**20,412 cfs**
DOUGLAS CITY GAGE		**Area**	**Precipitation**	**Elev. index**	**Q_{50}**	**Q_{100}**
	Rush Creek	22.7 mi^2	43 inches[1]	3.23	4,366 cfs	5,363 cfs
	Grass Valley Creek	37.0 mi^2		N/A	5,633 cfs	7,063 cfs
	Indian Creek	33.2 mi^2	61 inches[1]	2.76	8,610 cfs	10,480 cfs
	Weaver Creek	49.1 mi^2		N/A	4,930cfs	5,386 cfs
	Reading Creek	30.4 mi^2	63 inches[1]	2.90	8,193 cfs	10,015 cfs
	Browns Creek	74.1 mi^2		N/A	5,098 cfs	5,804 cfs
	Trinity R. & minor tribs	47.2 mi^2	45 inches [2]	1.674	9,307 cfs	10,850 cfs
	Sum at Douglas City	**293.7 mi^2**			**46,137 cfs**	**54,961 cfs**
	FEMA 1996 Estimate at Douglas City					**38,500 cfs**

[1] Based on average precipitation map in Rantz (1969)

[2]Based on Tom Lang Gulch gage precipitation in Waananen and Crippen (1977)

4.2. ***Additive Model for Tributary 50 and 100-year flood***

Our objective with the Additive Model was to predict mainstem streamflow as a function of distance downstream from Lewiston Dam, using a simple additive model for flood magnitude at common recurrence intervals (Figure 4). This additive model uses the Trinity River near Burnt Ranch gaging station as a calibration point, so we analyzed tributaries larger than 10 mi^2. Flood frequency curves were developed for tributaries larger than 10 mi^2 between Lewiston Dam and the North Fork Trinity River. The 50 and 100 year flood magnitude for each tributary was computed by a combination of Log-Pearson III flood frequency analyses for the gaged streams, and regional flood frequency regression equations for the ungaged streams (Table 4). For those gaging stations that were not at the mouths of the tributaries, the flood magnitudes were adjusted by the additional drainage area at the mouth as done at the bottom of page 6.

Figure 4. Simple additive model for estimating longitudinal 50 and 100-yr annual peak flood magnitudes on the mainstem Trinity River downstream of Lewiston Dam.

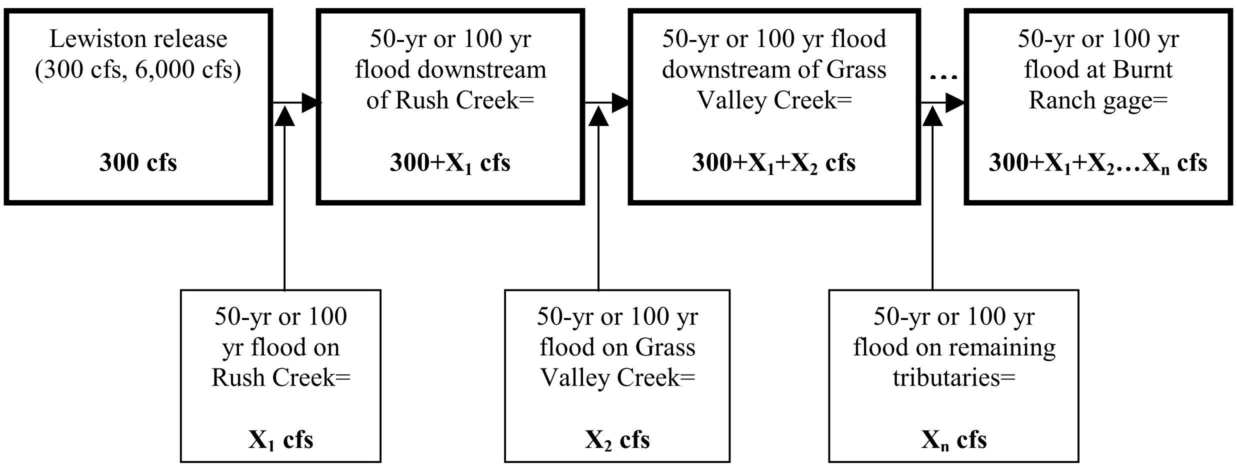


Table 4. Summary of methods used to estimate 50 and 100-year tributary flood magnitude for additive model.

Tributary	Flood Frequency Method
Rush Creek	Waananen and Crippen (1977) regional regression equation adjusted to the NF Trinity River
Grass Valley Creek	Log Pearson III flood frequency analysis
Indian Creek	Waananen and Crippen (1977) regional regression equation adjusted to the NF Trinity River
Weaver Creek	Log Pearson III flood frequency analysis
Reading Creek	Waananen and Crippen (1977) regional regression equation adjusted to the NF Trinity River
Browns Creek	Log Pearson III flood frequency analysis
Canyon Creek	Waananen and Crippen (1977) regional regression equation adjusted to the NF Trinity River
North Fork Trinity River	Log Pearson III flood frequency analysis

Tributaries with drainage areas less than 10 mi^2 were not analyzed. The flow contribution of each tributary to the mainstem Trinity River greater than 10 mi^2 was added for a given flood frequency (Figure 4). This additive model was continued downstream to the Trinity River near Burnt Ranch gaging station (Figure 1), where predicted flood magnitudes from the model were compared to that measured at the gaging station. This gaging station was chosen because it is the first station downstream of the study reach with a sufficiently long post-dam period of record (36 years) adequate to calibrate the model. The deviation of model predictions to that measured at the Trinity River near Burnt Ranch gaging station was then used as a correction factor to all the tributary contributions upstream such that the predicted results at the Burnt Ranch gaging station matched measured values. This simple additive model has many assumptions, including:

(1) flood routing is not considered (no lag or attenuation between gaging nodes).
(2) a flood of a given recurrence occurs on all watersheds during the same storm event (no regional differences).
(3) tributaries <10 mi^2 are ignored (not allowed to contribute to flood peaks in model).
(4) the gaging stations accurately measure discharge.
(5) the period of record used typifies the long-term average.
(6) The cumulative drainage area between the North Fork Trinity River and the Burnt Ranch gage is ignored because the individual streams are less than 10 mi^2 each.

Error inherent to assumptions (1), (3), and (6) are offsetting to a degree. The above methods were used to develop an overall longitudinal flood magnitude prediction along the mainstem Trinity River from Lewiston Dam (RM 112) to the Burnt Ranch gaging station (RM 48.6). From this longitudinal perspective assessing many tributaries, we focus most of our results on the 50 and 100-year flood flows on Rush Creek and Grass Valley Creek (X_1 and X_2 in Figure 4), since they are the primary tributaries affecting the four bridges (Table 4).

For Grass Valley Creek, a Log Pearson III flood frequency analysis using the 26 years of annual peak flow data was performed (Figure 3), which predicted a 50-year flood magnitude of approximately 4,802 cfs and 100-year flood magnitude of approximately 6,022 cfs at the gaging station (drainage area = 30.8 mi^2). These flood magnitudes were adjusted for watershed area at the mouth (37 mi^2) as done at the bottom of page 6, resulting in 50- and 100-year flood magnitude predictions of 5,633 cfs and 7,063 cfs.

Table 4. Summary of bridge location and tributaries contributing to flood hydrology at each bridge.

Bridge	River Mile	Contributing tributaries
Salt Flat Bridge	106.9	Rush Creek
Browns Mtn Bridge	105.0	Rush Creek
Poker Bar Bridge	102.2	Rush Creek and Grass Valley Creek
Treadwell Bridge	97.4	Rush Creek and Grass Valley Creek

Predictions from Rush Creek required a different approach due to limited flood peak data at that station. Therefore, we first used regional regression equations from Waananen and

Crippen (1977) for streams in north coastal California. These regional regression equations predicted the following 50- and 100-year flood magnitudes for Rush Creek:

$Q_{50RUSH} = 8.57\ (A_{RUSH})^{0.87}\ (P_{RUSH})^{0.96}\ (E_{RUSH})^{-0.08} = 4{,}366$ cfs
$Q_{100RUSH} = 9.23\ (A_{RUSH})^{0.87}\ (P_{RUSH})^{0.97}\ (E_{RUSH})^{0.0} = 5{,}363$ cfs

where A_{RUSH}= Rush Creek drainage area (22.7 mi^2), P_{RUSH}= Rush Creek average annual precipitation (43 inches), and E_{RUSH} is a Rush Creek elevation index (3.23). We then attempted to improve these regression equations by using a unit-area, unit-precipitation, unit-elevation adjustment with measured flood frequencies at the North Fork Trinity River gaging station (as shown in Waananen and Crippen, 1977). The North Fork Trinity River was used because it is unregulated, drains a similar portion of the Trinity Alps, and drains a similar elevation of the Trinity Alps. The adjustment was done as follows:

$Q_{50RUSH} = Q_{50NF}\ (A_{RUSH}/A_{NF})^{0.87}\ (P_{RUSH}/P_{NF})^{0.96}\ (E_{RUSH}/E_{NF})^{-0.08}$
$Q_{100RUSH} = Q_{100NF}\ (A_{RUSH}/A_{NF})^{0.87}\ (P_{RUSH}/P_{NF})^{0.97}$

Where A_{RUSH}= 22.7 mi^2, P_{RUSH}=43 inches, E_{RUSH}=3.23, A_{NF}=156 mi^2, P_{NF}=66 inches, E_{NF}=2.51, Q_{50NF}= 26,766 cfs Q_{100NF}= 31,141 cfs, such that the new equations and predicted flood magnitudes for Rush Creek are (Figure 5):

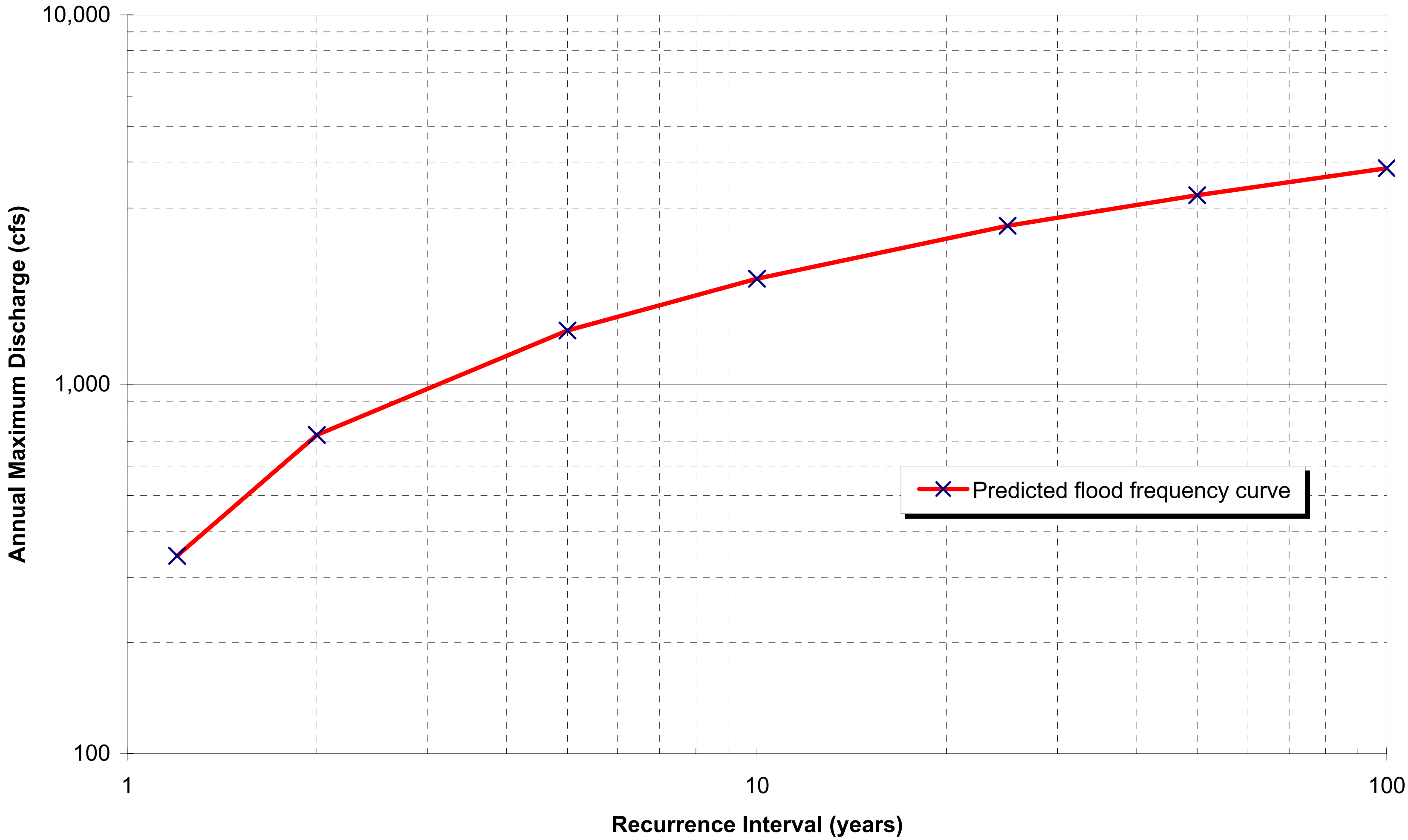
$Q_{50RUSH} = 26{,}766\ (22.4/156)^{0.87}\ (43/66P)^{0.96}\ (3.24/2.51)^{-0.08} = 3{,}249$ cfs
$Q_{100RUSH} = 31{,}141\ (22.4/156)^{0.87}\ (43/66)^{0.97} = 3{,}842$ cfs

Flood magnitudes were computed using Log Pearson III distribution for Weaver Creek and Browns Creek (11 years of data each), as well as the North Fork Trinity River (26 years of data). The unit-adjusted regional regression equations were used to predict the remaining flood magnitudes for Reading Creek (30.2 mi^2) and Canyon Creek (64.5 mi^2). Post-dam flood magnitudes were then computed at the Trinity River near Burnt Ranch gaging station to compare with the additive flood magnitudes downstream of the North Fork Trinity River (Table 5). Comparing the predictions from this simple model with predicted flood frequency estimates at the USGS Burnt Ranch gaging station showed that model predictions did a reasonable job at predicting flood magnitudes at the gaging station at larger recurrence interval floods (Table 5). Our simple model predicted discharges for each recurrence interval at the Burnt Ranch gaging station slightly smaller than “measured” at the Burnt Ranch gaging station, so a correction factor was applied to the flood magnitudes of each tributary at each recurrence interval to satisfy the constraint that predicted flood magnitude at the Burnt Ranch gage must equal the modeled flood frequency curve.

Table 5. Comparison of predicted versus “measured” flood magnitudes at the Burnt Ranch gaging station.

Flood Recurrence	Model prediction at Burnt Ranch gage	“Measured” value at Burnt Ranch gage	Correction Factor
50-yr	69,942 cfs	71,929 cfs	1.028
100-yr	81,831 cfs	86,710 cfs	1.060

Figure 5. Rush Creek near Lewiston flood frequency curve derived from Unit-correction of Waananen and Crippen (1977) regional regression equations.



The predicted 50- and 100-year flood magnitudes on Rush Creek (3,249 cfs and 3,842 cfs, respectively) were multiplied by the Table 5 correction factors (1.028 and 1.060, respectively) to result in predicted 50- and 100-year flood magnitudes of 3,342 cfs and 4,071 cfs. The Log-Pearson III predictions for the 50 and 100-year flood magnitudes at the mouth of Grass Valley Creek (5,633 cfs and 7,063 cfs, respectively) were also multiplied by the same correction factors to resulting predicted 50 and 100-year flood magnitudes of 5,793 cfs and 7,485 cfs. This correction factor adjustment based on the Burnt Ranch gaging station attempts to accommodate sources of error associated with the assumptions listed on page 10.

The flood magnitudes for Grass Valley Creek and Rush Creek 50- and 100-year flood magnitudes were then added to evaluate cumulative tributary contribution at the four bridge sites (Table 6).

Table 6. Summary of predicted 50- and 100-year tributary derived flows at pertinent bridges using the Additive Tributary Model.

Location	Predicted 50-yr flood magnitude: Additive Tributary Model	Predicted 100-yr flood magnitude: Additive Tributary Model
Salt Flat Bridge	3,342 cfs*	4,071 cfs*
Bucktail Bridge	3,342 cfs*	4,071 cfs*
Poker Bar Bridge	9,135 cfs*	11,556 cfs*
Treadwell Bridge	9,135 cfs*	11,556 cfs*

*Assumes 0 cfs release from Lewiston Dam

4.3. <u>Unit Runoff method</u>

The unit runoff method computes the flood magnitude at an ungaged location (e.g., tributary or mainstem Trinity River location) by multiplying a unit runoff magnitude (cfs/mi^2) developed from a nearby gaged stream to the unregulated drainage area at that ungaged location. Unregulated is defined as the drainage area downstream of Lewiston Dam, thus not subject to flow regulation from the Trinity River Division. In our application, we would multiply the unit runoff value for the 50- and 100-year flood with the unregulated drainage area at each bridge (Table 7).

Table 7. Unregulated drainage areas at each of the four bridges.

Location	Unregulated drainage area
Salt Flat Bridge	40.0 mi^2
Bucktail Bridge	42.4 mi^2
Poker Bar Bridge	88.9 mi^2
Treadwell Bridge	93.8 mi^2

Gaging stations used for this analysis should have a long period of record in order to accurately estimate the magnitude of the 50- and 100-year flood magnitudes. Because the unit runoff of a stream is a function of the drainage area (e.g., smaller watersheds have a higher unit runoff than comparable larger watersheds), as well as elevation and geography, gaging stations of similar watershed area, elevation, precipitation, and runoff patterns are preferable. The unit runoff method was done for two groups of gaging stations: 1) three very local gaging stations with drainage areas less than 160 mi^2 and period of record longer than 25 years, and 2) five local gaging stations with drainage areas less than 751 mi^2 and period of record longer than 25 years. For each gaging station, we computed the 50 and 100-year flood magnitude from Log-Pearson III distribution. One outlier occurred at the Salmon River at Somes Bar gaging station in WY 1965, where a landslide-induced dam break caused a much larger unit-runoff peak flow than that experienced on other nearby streams (133,000 cfs, or 177 cfs/mi^2). To estimate the flood peak at this gaging station, we plotted the unit runoff value for the December 22, 1964 flood at regional gaging stations against drainage area (Figure 6). The data suggest that a more reasonable unit runoff value of 100 cfs/mi^2 for the Salmon River at Somes Bar, resulting in a non-dam break peak flow estimate of 75,100 cfs. This value was substituted into the annual peak flow data and analyzed in the Log Pearson III flood magnitude predictions. The unit runoff values for these gages are summarized in Table 8, and linear regression equations were fitted to the data for each of these two groups of gaging stations (Figure 7).

Table 8. Summary of unit runoff values for the five gaging stations used in the Unit Runoff method.

Gaging Station	**Drainage Area**	**Years of Record**	**50-year flood**	**Unit 50-year flood**	**100-year flood**	**Unit 100-year flood**
Grass Valley Creek near Fawn Lodge	30.8 mi^2	26	4,802 cfs	156 cfs/mi^2	6,022 cfs	195 cfs/mi^2
Trinity River above Coffee Creek	149 mi^2	44	24,022 cfs	161 cfs/mi^2	28,798 cfs	193 cfs/mi^2
North Fork Trinity River near Helena	156 mi^2	26	26,766 cfs	172 cfs/mi^2	31,141 cfs	200 cfs/mi^2
Trinity River at Lewiston	719 mi^2	49	61,521 cfs	86 cfs/mi^2	73,792 cfs	103 cfs/mi^2
Salmon River at Somes Bar	751 mi^2	76	73,200 cfs	97 cfs/mi^2	84,770 cfs	113 cfs/mi^2

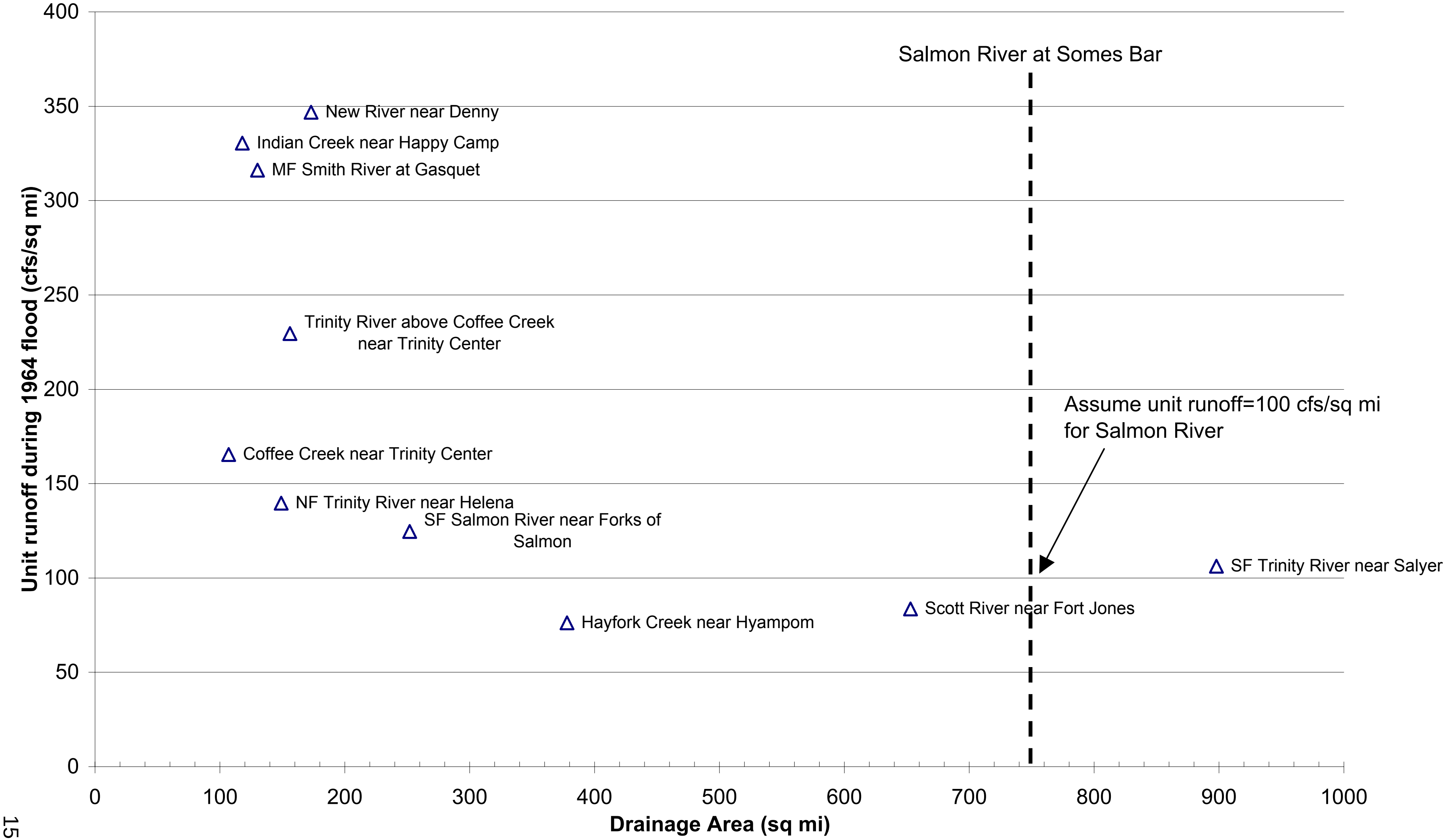
The regression equations enabled a prediction of the unit runoff value at each bridge based on the unregulated drainage area at each bridge. The unregulated drainage area, along with the 50- and 100-yr flood magnitude predictions at each bridge is listed in Table 9.

Table 9. Summary of 50- and 100-year flood magnitude predictions at the four bridges using regression based unit-runoff values from: a) three small local gaging stations with drainage areas < 156 mi^2, and b) five local gaging stations with drainage areas < 751 mi^2. Regression equations are shown in Figure 7.

		Using three small local gages < 156 mi^2		Using five local gages < 751 mi^2	
Location	Unregulated drainage	Predicted 50-yr flood	Predicted 100-yr flood	Predicted 50-yr flood	Predicted 100-yr flood
Salt Flat Br	40.0 mi^2	6,258 cfs	7,817 cfs	6,785 cfs	8,207 cfs
Bucktail Br	42.4 mi^2	6,643 cfs	8,287 cfs	7,180 cfs	8,685 cfs
Poker Bar Br	88.9 mi^2	14,299 cfs	17,416 cfs	14,601 cfs	17,639 cfs
Treadwell Br	93.8 mi^2	15,128 cfs	18,381 cfs	15,356 cfs	18,547 cfs
Douglas City	295 mi^2	52,895 cfs	58,399 cfs	41,777 cfs	50,129 cfs

Assumes 0 cfs release from Lewiston Dam

Figure 6. Comparison of regional estimates for unit-runoff during Dec 22, 1964 flood to estimate peak flow on Salmon River at Somes Bar gaging station



Theoretically, applying the unit runoff method avoids the flood routing assumption and incorporates all the smaller tributaries, providing a better estimator of local flood magnitude for the 50- and 100-year flood than the Additive Tributary Model. Within the unit runoff method, the prediction using the three gages are probably better estimates for the four bridges than predictions using the 5 gages because the drainage area for all four bridges is under 94 mi^2, which is very close to the three gages. Douglas City is included as a means to compare to the FEMA 100-year flood estimates. The estimates using the five gages is probably a better estimate for the Douglas City location, as the Douglas City location is midway between the three small gages and the remaining two larger gages (Figure 7).

4.4. Regional Flood Frequency Analysis

This analysis was performed by Reclamation's Technical Service Center, Denver CO. This method originally analyzed four groups of gages of varying locality, drainage area, and period of record. Ultimately we used the following three groups of regional gages because they were most appropriate for use at the Trinity River bridge sites:

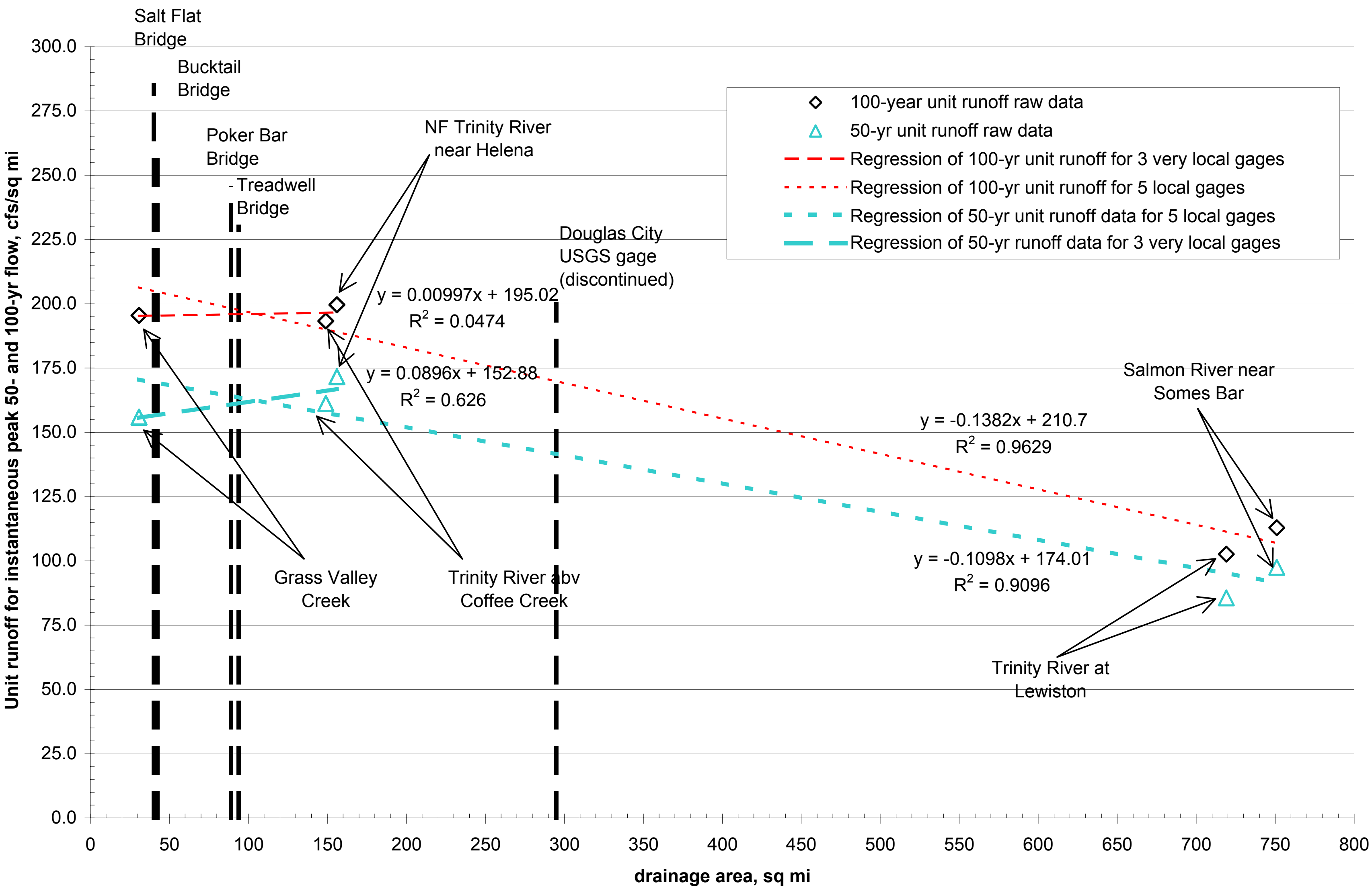
- Three small local gages < 156 mi^2 (Grass Valley Creek, Trinity River above Coffee Creek, NF Trinity River)
- Five local gages < 751 mi^2 (above three streams plus pre-dam Trinity River at Lewiston and Salmon River near Somes Bar)
- Nine regional gages < 764 mi^2 (above five plus SF Trinity River, Clear Creek near French Gulch, Sacramento River at Delta, SF Salmon River)

For each of the three groups of gages, the analysis was done in the following steps:

1. the annual instantaneous peak values were compiled and log-transformed, with the mean, standard deviation, and skew computed for each gage;
2. The mean for each gage ($X_{meanlog}$) was plotted as a function of drainage area, and based on the unregulated drainage area computed at each bridge, the mean log was estimated at each of the four individual bridge sites ($X_{meanlogbridge\text{-}i}$). This was also done for the Douglas City gage location in order to compare results to the 100-year flood magnitude predicted by FEMA (1996).
3. The standard deviation (SD) and skew of the log transformed peak flow values were weighted by the period of record for each gage to develop a weighted mean skew value for that group of gaging stations. The effective period of record was also computed as the sum of years of record for all gages divided by the number of gages.
4. Based on the weighted skew obtained in 3), the Pearson Type III deviate (K) was obtained for the 50- and 100-year flood (p=0.02 and p=0.01) from Bulletin 17B (USGS 1982). We used 2 significant figures on the skew values, therefore, we linearly interpolated between values in the Bulletin 17B K-value table.
5. The estimate of the 50-and 100-year flood magnitude for each bridge was computed from the following equation (USGS 1982):

$$Q_{50}=10^{(Xmeanlogbridge\text{-}i\ +(SDmean*K_{0.02})}$$
$$Q_{100}=10^{(Xmeanlogbridge\text{-}i\ +(SDmean*K_{0.01})}$$

Figure 7. Unit Runoff value regressions for local Trinity River gaging stations



The parameters generated from this approach are shown in Table 10, and the predicted flood magnitudes at each bridge (and Douglas City) are summarized in Table 11.

Table 10. Summary of parameters used in Regional Flood Frequency method.

	Effective period of record	**Weighted mean log SD**	**Weighted mean Skew**	**(50 yr) $K_{0.02}$**	**(100 yr) $K_{0.01}$**
Three gages	42	0.347	-0.65	1.867	2.074
Five gages	44	0.35	-0.31	1.884	2.096
Nine gages	32	0.38	-0.34	1.689	1.839

Table 11. Summary of 50- and 100-year flood magnitude predictions at the four bridges using Regional Flood Frequency method.

	Three gages		Five gages		Nine gages	
Location	Predicted 50-yr flood	Predicted 100-yr flood	Predicted 50-yr flood	Predicted 100-yr flood	Predicted 50-yr flood	Predicted 100-yr flood
Salt Flat Br	4,311 cfs	5,178 cfs	4,864 cfs	5,776 cfs	4,147 cfs	4,678 cfs
Bucktail Br	4,700 cfs	5,645 cfs	5,159 cfs	6,125 cfs	4,405 cfs	4,969 cfs
Poker Bar Br	14,085 cfs	16,918 cfs	10,877 cfs	12,915 cfs	9,465 cfs	10,677 cfs
Treadwell Br	15,251 cfs	18,319 cfs	11,481 cfs	13,633 cfs	10,005 cfs	11,286 cfs
Douglas City	83,374 cfs	100,141 cfs	36,424 cfs	43,250 cfs	32,685 cfs	36,870 cfs

Assumes 0 cfs release from Lewiston Dam

5. DISCUSSION OF WINTER FLOOD RESULTS (NOV 1 – MAR 31)

The compiled prediction of 50- and 100-year flood magnitude due to tributary accretion using all methods above are summarized in Table 12. Table 12 assumes zero release from Lewiston Dam. The two Winter Flood options described on page 4 were then evaluated by adding in Lewiston Dam releases of 300 cfs (winter baseflow) and 6,000 cfs (Safety of Dams). Results are shown in Tables 13-14.

5.1. Discussion and comparison with previous studies

A short description and assessment of each of the four methods summarized in Tables 12-14 follow below. Each method is given a qualitative ranking (low, moderate, high) based on the expected accuracy of the flood magnitude prediction. The ranking is based on the quality of data, length of data, applicability of data, and applicability of analysis.

5.1.1. Method 1: Regional Regression Equations

The predictions using the Waananen and Crippen (1977) regional regression equations should be ranked low because: 1) the were developed using data only through 1973, such that the 27 years of additional data up to the present-day is not used in the equation development, and 2) the equations were developed over a broad "North Coast" area, rather than specifically to the Trinity River basin. Flashy rainfall-dominated coastal streams are lumped together with less flashy snowmelt dominated streams, such that this aggregate effect reduces the precision of the estimated flood magnitude at a specific

Table 12. Summary of 50- and 100-year flood magnitudes at Trinity River bridges using a variety of methods

Assumes Lewiston Dam release of 0 cfs

WINTER FLOOD SEASON

Method 1: Regional Regression Equations to predict 50- and 100-year flood magnitude during Winter Flood season

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	8,139 cfs	8,594 cfs	15,959 cfs	16,828 cfs	46,137 cfs
100 yr	9,788 cfs	10,318 cfs	19,404 cfs	20,412 cfs	54,961 cfs

Method 2: Additive Tributary Model method to predict 50- and 100-year flood magnitude during Winter Flood season

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	3,342 cfs	3,342 cfs	9,135 cfs	9,135 cfs	32,313 cfs
100 yr	4,071 cfs	4,071 cfs	11,556 cfs	11,556 cfs	38,971 cfs

Method 3a: Unit Runoff method to predict 50- and 100-year flood magnitude during Winter Flood season - 3 LOCAL SMALL GAGES

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	6,258 cfs	6,643 cfs	14,299 cfs	15,128 cfs	52,895 cfs
100 yr	7,817 cfs	8,287 cfs	17,416 cfs	18,381 cfs	58,399 cfs

Method 3b: Unit Runoff method to predict 50- and 100-year flood magnitude during Winter Flood season - 5 LOCAL GAGES

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	6,785 cfs	7,180 cfs	14,601 cfs	15,356 cfs	41,777 cfs
100 yr	8,207 cfs	8,685 cfs	17,639 cfs	18,547 cfs	50,129 cfs

Method 4a: Regional Flood Frequency method to predict 50- and 100-year flood magnitude during Winter Flood season - 3 LOCAL SMALL GAGES

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	4,311 cfs	4,700 cfs	14,085 cfs	15,251 cfs	83,374 cfs
100 yr	5,178 cfs	5,645 cfs	16,918 cfs	18,319 cfs	100,141 cfs

Method 4b: Regional Flood Frequency method to predict 50- and 100-year flood magnitude during Winter Flood season - 5 LOCAL GAGES

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	4,864 cfs	5,159 cfs	10,877 cfs	11,481 cfs	36,424 cfs
100 yr	5,776 cfs	6,125 cfs	12,915 cfs	13,633 cfs	43,250 cfs

Table 13. Summary of OPTION A: 50- and 100-year flood magnitudes at Trinity River bridges assuming 300 cfs release from Lewiston Dam

WINTER FLOOD SEASON

Method 1: Regional Regression Equations to predict 50- and 100-year flood magnitude during Winter Flood season

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	8,439 cfs	8,894 cfs	16,259 cfs	17,128 cfs	46,437 cfs
100 yr	10,088 cfs	10,618 cfs	19,704 cfs	20,712 cfs	55,261 cfs

Method 2: Additive Tributary Model method to predict 50- and 100-year flood magnitude during Winter Flood season

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	3,642 cfs	3,942 cfs	9,435 cfs	9,735 cfs	32,613 cfs
100 yr	4,371 cfs	4,671 cfs	11,856 cfs	12,156 cfs	39,271 cfs

Method 3a: Unit Runoff method to predict 50- and 100-year flood magnitude during Winter Flood season - 3 LOCAL SMALL GAGES

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	6,558 cfs	6,943 cfs	14,599 cfs	15,428 cfs	53,195 cfs
100 yr	8,117 cfs	8,587 cfs	17,716 cfs	18,681 cfs	58,699 cfs

Method 3b: Unit Runoff method to predict 50- and 100-year flood magnitude during Winter Flood season - 5 LOCAL GAGES

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	7,085 cfs	7,480 cfs	14,901 cfs	15,656 cfs	42,077 cfs
100 yr	8,507 cfs	8,985 cfs	17,939 cfs	18,847 cfs	50,429 cfs

Method 4a: Regional Flood Frequency method to predict 50- and 100-year flood magnitude during Winter Flood season - 3 LOCAL SMALL GAGES

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	4,611 cfs	5,000 cfs	14,385 cfs	15,551 cfs	83,674 cfs
100 yr	5,478 cfs	5,945 cfs	17,218 cfs	18,619 cfs	100,441 cfs

Method 4b: Regional Flood Frequency method to predict 50- and 100-year flood magnitude during Winter Flood season - 5 LOCAL GAGES

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	5,164 cfs	5,459 cfs	11,177 cfs	11,781 cfs	36,724 cfs
100 yr	6,076 cfs	6,425 cfs	13,215 cfs	13,933 cfs	43,550 cfs

Table 14. Summary of OPTION B: 50- and 100-year flood magnitudes at Trinity River bridges assuming 6000 cfs SOD release from Lewiston Dam

WINTER FLOOD SEASON

Method 1: Regional Regression Equations to predict 50- and 100-year flood magnitude during Winter Flood season

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	14,139 cfs	14,594 cfs	21,959 cfs	22,828 cfs	52,137 cfs
100 yr	15,788 cfs	16,318 cfs	25,404 cfs	26,412 cfs	60,961 cfs

Method 2: Additive Tributary Model method to predict 50- and 100-year flood magnitude during Winter Flood season

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	9,342 cfs	15,342 cfs	15,135 cfs	21,135 cfs	38,313 cfs
100 yr	10,071 cfs	16,071 cfs	17,556 cfs	23,556 cfs	44,971 cfs

Method 3a: Unit Runoff method to predict 50- and 100-year flood magnitude during Winter Flood season - 3 LOCAL SMALL GAGES

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	12,258 cfs	12,643 cfs	20,299 cfs	21,128 cfs	58,895 cfs
100 yr	13,817 cfs	14,287 cfs	23,416 cfs	24,381 cfs	64,399 cfs

Method 3b: Unit Runoff method to predict 50- and 100-year flood magnitude during Winter Flood season - 5 LOCAL GAGES

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	12,785 cfs	13,180 cfs	20,601 cfs	21,356 cfs	47,777 cfs
100 yr	14,207 cfs	14,685 cfs	23,639 cfs	24,547 cfs	56,129 cfs

Method 4a: Regional Flood Frequency method to predict 50- and 100-year flood magnitude during Winter Flood season - 3 LOCAL SMALL GAGES

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	10,311 cfs	10,700 cfs	20,085 cfs	21,251 cfs	89,374 cfs
100 yr	11,178 cfs	11,645 cfs	22,918 cfs	24,319 cfs	106,141 cfs

Method 4b: Regional Flood Frequency method to predict 50- and 100-year flood magnitude during Winter Flood season - 5 LOCAL GAGES

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	10,864 cfs	11,159 cfs	16,877 cfs	17,481 cfs	42,424 cfs
100 yr	11,776 cfs	12,125 cfs	18,915 cfs	19,633 cfs	49,250 cfs

location. As a means to evaluate the predictive accuracy of the regional regression equations to local streams, we applied the regional regression equations for the North Coast to the Grass Valley Creek near Fawn Lodge flood frequency curve (Figure 3) and the Trinity River above Coffee Creek flood frequency curve (Figure 8). This comparison suggests that the regional regression equations over predict flood magnitude at all flood recurrence intervals at these two "measured" locations, particularly at the Grass Valley Creek gaging station. Additionally, the method gives very large flood magnitude predictions at the Salt Flat and Bucktail bridges compared to the other methods, suggesting the bias described above is the source of these overly large predictions. Therefore, we give the flood magnitude predictions from this method a low ranking.

5.1.2. Method 2: Additive Tributary Model

The Additive Tributary Model method is not a standard approach, and the substantial list of simplifying assumptions reduces the confidence in the flood magnitude predictions. Ignoring flood routing, small tributary contributions, and alignment of flood peaks are the primary sources of uncertainty. Using the Trinity River near Burnt Ranch gaging station as a calibration point is useful in concept, but is so far downstream from our reach that the value of the calibration is dubious. Therefore, we give the flood magnitude predictions from this method a low-moderate ranking.

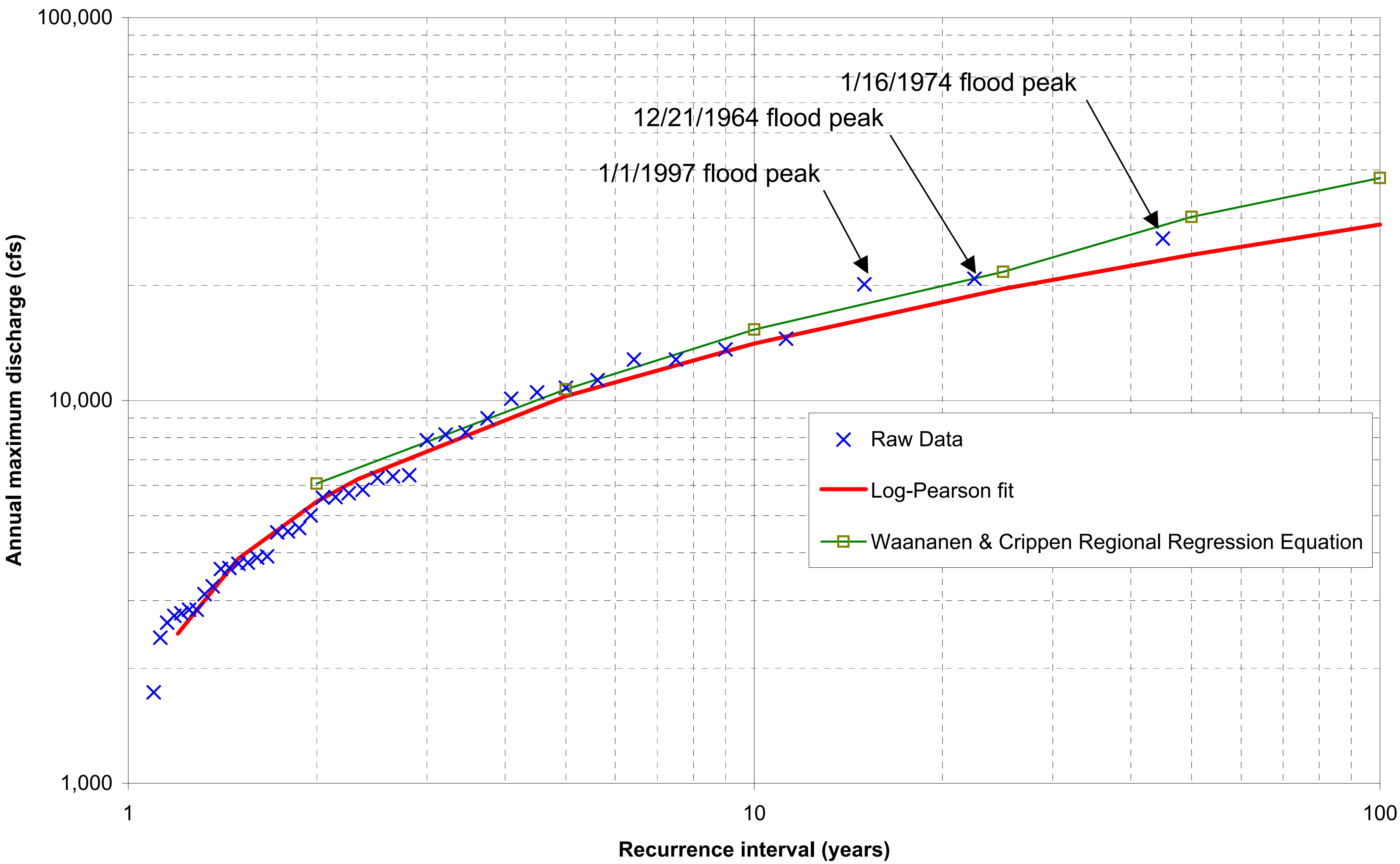
5.1.3. Method 3: Unit Runoff Method

The Unit Runoff method using the three smaller gaging stations provides good flood magnitude predictions because the gages are nearby, have long periods of record, have similar precipitation and runoff patterns, and have similar drainage areas as the four bridge locations. Adding the two additional gages provide additional period of record, but they are much larger watersheds and are not as local as the three smaller gages. These two additional gages cause the regression equation to predict a higher unit-runoff value than just using the three smaller gages alone. A weakness in the Unit Runoff method is that watershed elevation and precipitation is not an explicit variable, and must be accounted for in choosing appropriate local gages with similar elevation and precipitation. The choice of Grass Valley Creek, Trinity River above Coffee Creek, and the North Fork Trinity River near Helena bracket the drainage areas at the bridges, and provide consistent unit runoff values for the 50- and 100-year flood. The Unit Runoff method accounts for all watershed area at the bridge locations, and routing mechanisms are accounted for in the unit-runoff predictions. Therefore, we prefer the three-gage approach, and give the flood magnitude predictions from this method a high ranking.

5.1.4. Method 4: Regional Flood Frequency Method

The Regional Flood Frequency method uses regional drainage area-to-mean flood peak magnitude relationships to modify variables in the Log Pearson III flood frequency computation. As with the Unit Runoff method, groups of local and regional gages are used to develop the drainage area-to-mean flood peak magnitude relationships, so there are tradeoffs between low numbers of very local gages to expanding to larger numbers of more regional gages. The effective period of record shown in Table 10, combined with the "localness" of the gages used, can guide which group provides a better flood

Figure 8. Trinity River above Coffee Creek (USGS Gage #11-523200) flood frequency analysis



magnitude estimate. Based on this possible criterion, the three gage and five gage groups are preferable. Going beyond this delineation is more difficult because we do not have extensive experience using this method. In comparing with the Unit Runoff method, the deviation in predicted log mean values as a function of drainage area appears to be much larger (factor of 2) than the deviation in predicted unit runoff as a function of drainage area (appx 6% maximum), which would add uncertainty to flood magnitude predictions. The predicted 100-year flood magnitude predictions using the three gages (Table 12) are 33% smaller than the Unit Runoff Method predictions for the two upstream bridges; however, for the two downstream bridges, the 100-year predictions are functionally exactly the same as those predicted by the Unit Runoff Method predictions. Therefore, we give the flood magnitude predictions from this method a moderate to high ranking.

5.2. Comparison of 3-gage unit runoff prediction with ACOE (1976) study

The predicted 100-year flood magnitudes from this report are compared with those predicted in FEMA (1996). The FEMA 100-year flood magnitudes on Grass Valley Creek and along the Trinity River are listed in Table 14. The FEMA 100-year flood due to tributary accretion is estimated by subtracting 8,200 cfs as shown in Table 15, and can be compared to the varying modeling predictions summarized in Table 13. Using the Unit Runoff method with 3-gages as a preliminary preferred method, we compared the results with that predicted by the Corp of Engineers (Table 15). The longitudinal flood frequency estimates are quite different, and deserve some attention. Unfortunately, the FEMA flood estimate computations are unavailable and cannot be duplicated. A primary limitation in their analysis, assuming that they used regional gaging stations in their flood magnitude estimates, is the short period of record available (only up through 1973 if they used the regional regression equations) and the absence of the 26 years of record at the Grass Valley Creek gaging station (1976-2001).

Table 15. 100-year flood magnitude estimates based on FEMA (1996).

Location	FEMA 100-yr Flood Flow Estimate	FEMA 100-yr Flood Flow Estimate assuming Lewiston Release=300 cfs	Predicted 100-yr Flood Flow Estimate using 3-gage Unit Runoff method
Lewiston Dam	8,500 cfs	300 cfs	300 cfs
Salt Flat/Bucktail Bridges	20,500 cfs	12,300 cfs	8,587 cfs @ Bucktail
Grass Valley Creek	12,000 cfs	N/A	N/A
Poker Bar/Treadwell Bridge	32,500 cfs	24,300 cfs	18,681 cfs @ Treadwell
Douglas City (downstream of Browns Creek)	38,500 cfs	30,300 cfs	58,699 cfs

Our 100-year flood magnitude estimates are substantially lower than the FEMA numbers at the bridge locations, then larger at the discontinued USGS Douglas City gaging station. First observe the longitudinal trend of the FEMA estimates. The only sizable tributaries contributing flow to the Salt Flat and Bucktail bridges are Deadwood Creek (DA=8.9 mi^2), Hoadley Gulch (DA= 3.8 mi^2), and Rush Creek (DA=22.7 mi^2). The total unregulated drainage area from Lewiston Dam to the Salt Flat Bridge is 40 mi^2 (including minor tributaries), such that the FEMA 100-year flood contribution would be 300 cfs/mi^2. By comparison, the 100-yr flood estimate for the Trinity River above Coffee Creek

(DA=149 mi^2, n=44 years) is 28,800 cfs, for a unit-runoff of only 193 cfs/mi^2, and Grass Valley Creek only has a unit runoff of 195 cfs/mi^2 for the 100-year flood. It seems unlikely that Rush Creek and smaller tributaries could contribute 300 cfs/mi^2 during a 100-yr flood due to their small drainage areas. If the FEMA flood magnitudes at Salt Flat and Bucktail bridges are conservatively large, then they would also be conservatively large at the Poker Bar and Treadwell bridges. The 12,000 cfs accumulation between these two locations from Grass Valley Creek is also large for the drainage area. The drainage area between the Salt Flat Bridge and the Poker Treadwell Bridge is 53 mi^2, such that the FEMA 100-year flood contribution is 226 cfs/mi^2. While this unit-runoff value is more reasonable, it still seems too high. The largest increase in drainage area occurs between the Treadwell Bridge location and Douglas City gage as Indian Creek, Weaver Creek, Reading Creek, and Browns Creek all contribute to mainstem Trinity River flood flows. The 100-year flood magnitude contributed by the watershed between Treadwell Bridge and the Douglas City site (6,000 cfs) seems very small compared to the substantial increase in drainage area (201 mi^2 for a unit runoff of only 30 cfs/mi^2). Therefore, the FEMA flood magnitude estimates probably need revisiting to incorporate the additional gaging period of record, availability of the Grass Valley Creek gage, and the distribution of drainage area contribution to the mainstem Trinity River.

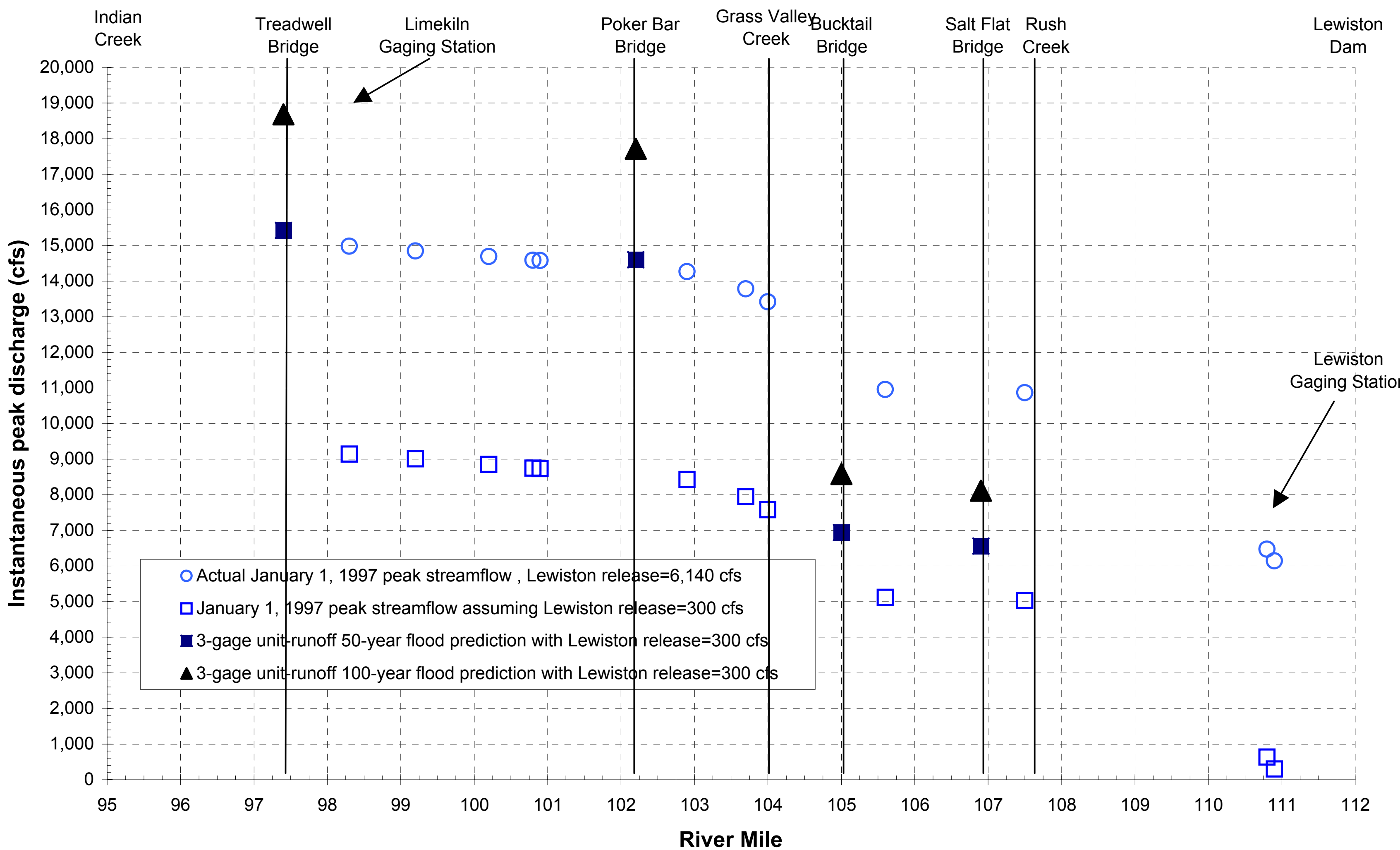
5.3. <u>Comparison of 3-gage unit runoff prediction with the January 1997 flood</u>

The January 1997 flood was a moderate intensity, warm, rain-on-snow flood that caused large flows on the higher elevation watersheds and moderate floods on the lower elevation rainfall dominated watersheds. The peak of the flood on Rush Creek occurred almost exactly on midnight of January 1, 1997, and the peak on Grass Valley Creek occurred at approximately the same time. The corresponding mainstem release at Lewiston Dam was approximately 6,140 cfs. We evaluated the longitudinal magnitude of the 1997 flood using a series of gaging stations and site-specific hydraulic estimates (Figure 9), resulting in estimated flood peak of approximately 11,000 cfs at the Salt Flat Bridge and Bucktail Bridge, and approximately 15,000 cfs at the Poker Bar Bridge and Treadwell Bridge.

In order to estimate the magnitude of the 1997 flow at the bridges if flow releaes were 300 cfs instead of the actual 6,140 cfs release from Lewiston Dam, we subtract 5,840 cfs from each longitudinal node (subtract 6,140 cfs Safety of Dam release and add 300 cfs typical baseflow release). Resulting flows due to tributary contributions only would be approximately 5,100 cfs at the Salt Flat Bridge and Bucktail Bridge and 9,000 cfs at the Poker Bar Bridge and Treadwell Bridge (Figure 9). Comparing these 1997 tributary derived flood magnitudes with the Unit Runoff method predictions suggests that the 1997 flood was approximately 65% of the 100-year flood prediction at the Salt Flat Bridge, 62% at the Bucktail Bridge, 52% at the Poker Bar Bridge, and 49% at the Treadwell Bridge. The percentages likely decrease in the downstream direction because the 1997 flood on Grass Valley Creek was only a 10-year recurrence event, causing the deviation between the 1997 flood and predicted 100-year event magnitude to increase.

To put the 1997 flood into perspective, we evaluated the magnitude of the flood at nearby regional gaging stations. Regional flood frequency estimates of the 1997 flood vary with

Figure 9. Predicted Trinity River 50-year and 100-year annual maximum flood magnitude assuming Lewiston Dam 300 cfs release and 3-Gage Unit-Runoff method.



the watershed. Using a re-constructed 145-year period of record of 1-day volume based on mean daily flows (pre-dam values from USGS gaging station, post-dam values from USBR inflow computations), the 1997 flood was greater than a 100-year flood (Reclamation, in press). However, using the shorter 26-year period of record at the rainfall runoff dominated Grass Valley Creek, the 1997 flood was only a 10-year flood using the annual instantaneous maximum values. The same flood frequency analysis of was performed on two snowmelt-dominated streams that drain the Trinity Alps. At the Trinity River above Coffee Creek (gage elev. = 2,537 ft, n = 44 years), the predicted frequency of the 1997 flood was approximately a 27-year flood (Figure 8), while at the Salmon River at Somes Bar (gage elev. = 483 ft, n = 76 years), the predicted frequency of the 1997 flood was approximately a 40-year flood (Figure 10). The predicted recurrence intervals of the 1997 flood (10 to 40-year recurrence) are all much less than that predicted by the flood frequency analysis of daily average inflows at Lewiston (> 100 years, Reclamation, in press), although the period of record at the Lewiston measurement point is longer (84 years) than any of the tributary stations (Table 16). Therefore, designing the bridges to accommodate cumulative predicted 100-year tributary flood magnitudes from Rush Creek and Grass Valley Creek should provide protection well above that observed during the 1997 flood.

Table 16. Comparison of 1997 flood on regional streams with 50 and 100-year flood magnitudes.

Tributary	1997 peak	Estimated 1997 flood recurrence	50-yr flood	100-yr flood
Grass Valley Creek	2,460 cfs	10 year[a]	4,800 cfs[a]	6,022 cfs[a]
Trinity River abv Coffee Creek	20,100 cfs	27 year	24,000 cfs[a]	28,800 cfs[a]
Salmon River at Somes Bar	70,800 cfs	40 year	73,200 cfs[b]	84,800 cfs[b]
Rush Creek	4,400 cfs	>100 year[c]	3,200 cfs[c]	3,800 cfs[c]
Trinity River at Lewiston	75,765 cfs	143 year	56,800 cfs[d]	68,000 cfs[d]

[a] from Log-Pearson III fit of USGS annual instantaneous peak discharge values
[b] from Log-Pearson III fit of USGS annual instantaneous peak discharge values, Dec 1964 flood adjusted
[c] from Unit-conversion of regional regression equations; a 100-yr event if using Unit-Runoff method
[d] from USBR (in press) Log-Pearson III fit of USGS and USBR annual maximum daily average discharge values

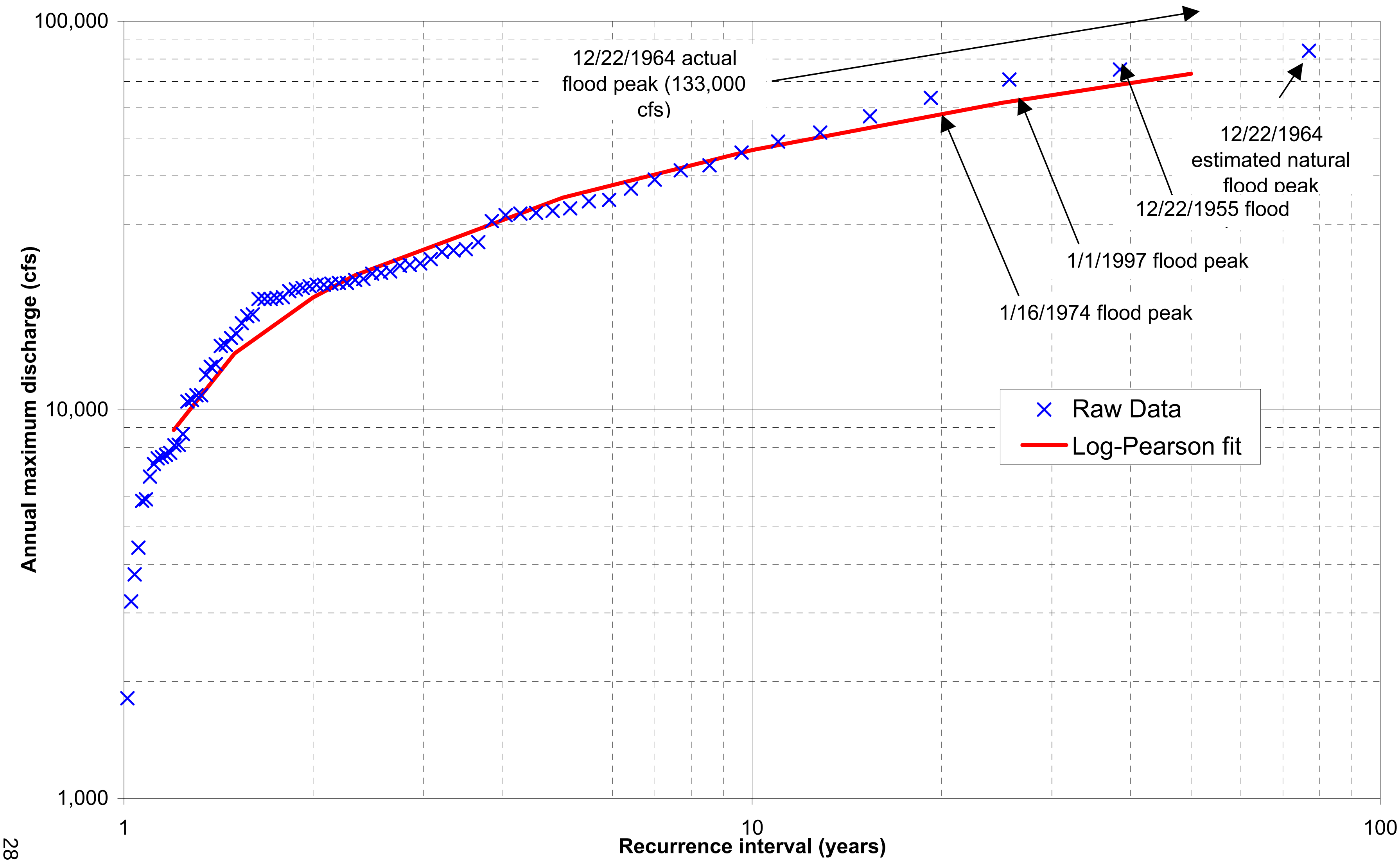
5.3.1. Summary

We recommend using the 50 and 100-year flood magnitude results predicted by the three-gage Unit-Area Method. These results are summarized in Table 17.

Table 17. Recommended 50 and 100-year flood magnitude estimates at the four bridges using the three-gage Unit Area Method (results have been rounded from Table 13 and Table 14).

Location	50-yr flood, Lewiston release=300 cfs	100-yr flood, Lewiston release=300 cfs	50-yr flood, Lewiston release=6,000 cfs	100-yr flood, Lewiston release=6,000 cfs
Salt Flat Bridge	6,550 cfs	8,120 cfs	12,250 cfs	13,820 cfs
Bucktail Bridge	6,950 cfs	8,590 cfs	12,650 cfs	14,290 cfs
Poker Bar Bridge	14,600 cfs	17,700 cfs	20,300 cfs	23,400 cfs
Treadwell Bridge	15,400 cfs	18,700 cfs	21,100 cfs	24,400 cfs

Figure 10. Salmon River at Somes Bar (USGS Gage #11-522500) flood frequency analysis



6. SNOWMELT RUNOFF SEASON

As done for the winter flood season, we applied the Unit Runoff of 50- and 100-year tributary accretion at each of the bridges, but only for the May-June snowmelt runoff season. USGS does not publish peak values during the snowmelt runoff season, so we initially used maximum daily average value for the May-June period for each year, then adjusted this daily value to represent a peak value for that day. Kamman (1999) evaluated differences between daily averages and daily peak values on Grass Valley Creek during the snowmelt season, and suggests using an average conversion value of 1.33. We computed the 50- and 100-year flood magnitude for Rush Creek, Grass Valley Creek, and the remaining drainage area between Lewiston Dam and the bridge of interest using the Unit Runoff method, and then add the three flow magnitudes together to get an estimate at each bridge. This assumes that peak snowmelt flows occur at the same time, are additive, and there is no flood peak attenuation. However, comparing recent annual hydrographs between Rush Creek and Grass Valley Creek shows that there are still significant deviations in the timing of the maximum daily flow during this period due to regional differences (Figure 11 and 12).

While Rush Creek has been gaged since 1996, the period of record is too short to extrapolate to the 50- and 100-year flood magnitude estimates. The period of record at Grass Valley Creek is longer (26 years), but still short enough to make it difficult to predict a 50 or 100-year flood with a high level of confidence. Regardless, Grass Valley Creek is our best data source, and was used. We first tabulated the maximum daily average flow for the May-June period, multiplied by 1.33 to convert to daily peak value, and fit the data to the Log Pearson III distribution to predict the 50- and 100-year flood magnitude. We were concerned about applying the generalized skew value used in the annual peak flow analysis to the distribution of snowmelt high flow events, so we investigated the May-June maximum daily average value skew of nearby gages. The skew at the pre-dam Trinity River at Lewiston station was –1.05, at Grass Valley Creek near Fawn Lodge was +0.99, and at the NF Trinity River near Helena was +0.13. This large range provided no trend in appropriate generalized skew to use in the Log Pearson III computations, so we chose to apply the same generalized skew as used in the annual maximum flood frequency computations (-0.30). Applying this method results in a 50-year May-June flow magnitude of 499 cfs, and a 100-year May-June flow magnitude of 637 cfs (Table 18).

To test the sensitivity of the generalized skew value to predictions, we computed the 50 and 100-year May-June flow predictions assuming the measured skew at the Grass Valley Creek gage (+0.99) is a more appropriate skew estimate for the population of data. This increased predicted 50 and 100-year May-June flow to 636 cfs and 902 cfs, respectively. Carrying this through to the downstream tributaries results in a 50- and 100-year flow prediction of 1,613 cfs and 2,219 cfs at the Treadwell Bridge, which can be compared to corresponding predictions of 1,370 cfs and 1,746 cfs using a generalized skew of -0.30 (Table 18). These flood magnitudes could be used as a conservative estimate; however, a substantial safety factor is already built into the computations of flow magnitude at the bridges because we assume that the maximum peak flow occurs at the same time for all tributaries, and occurs at the same time as a Record of Decision flow

Figure 11. Rush Creek Annual Hydrograph for Water Year 1998 (Extremely Wet).

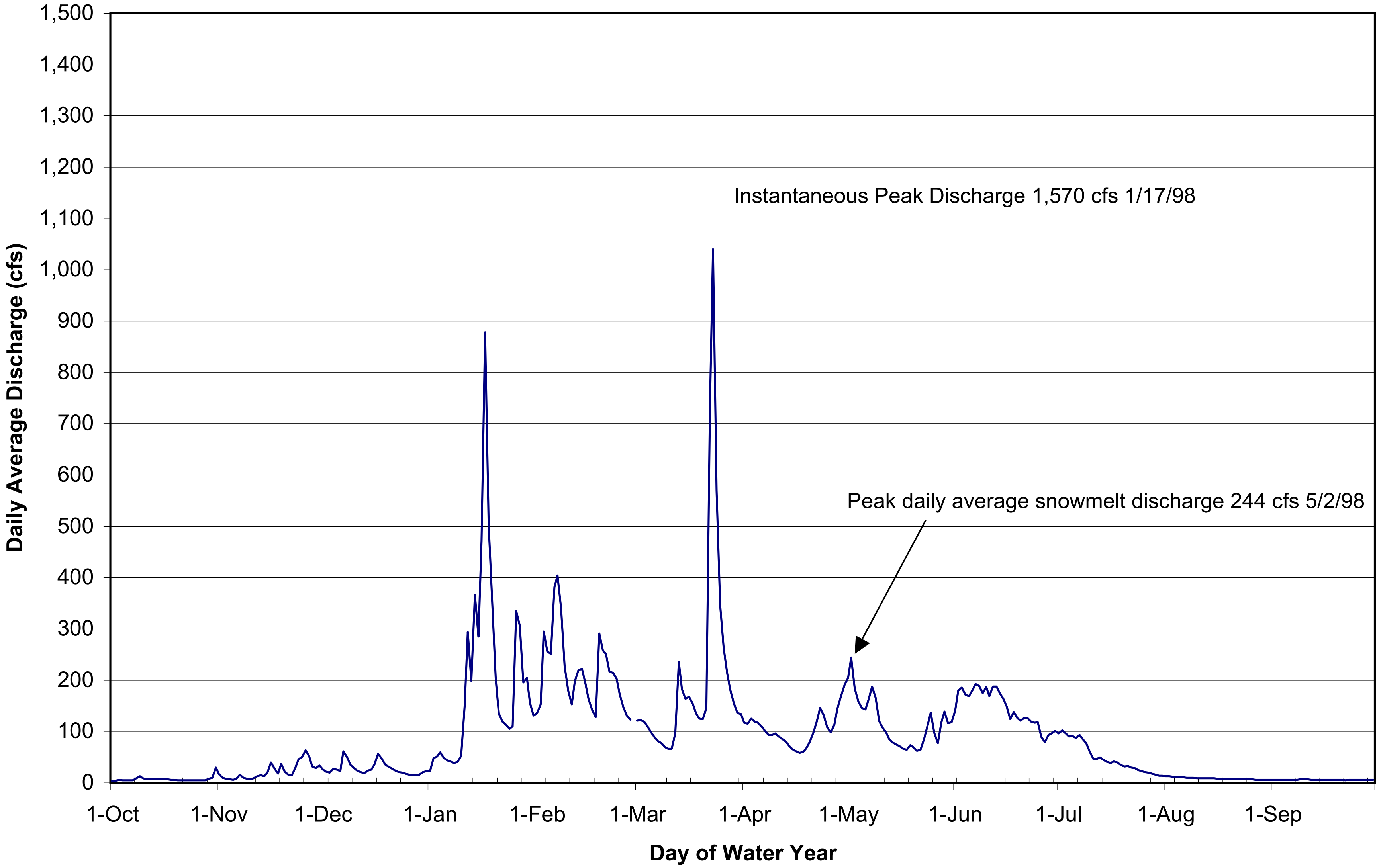
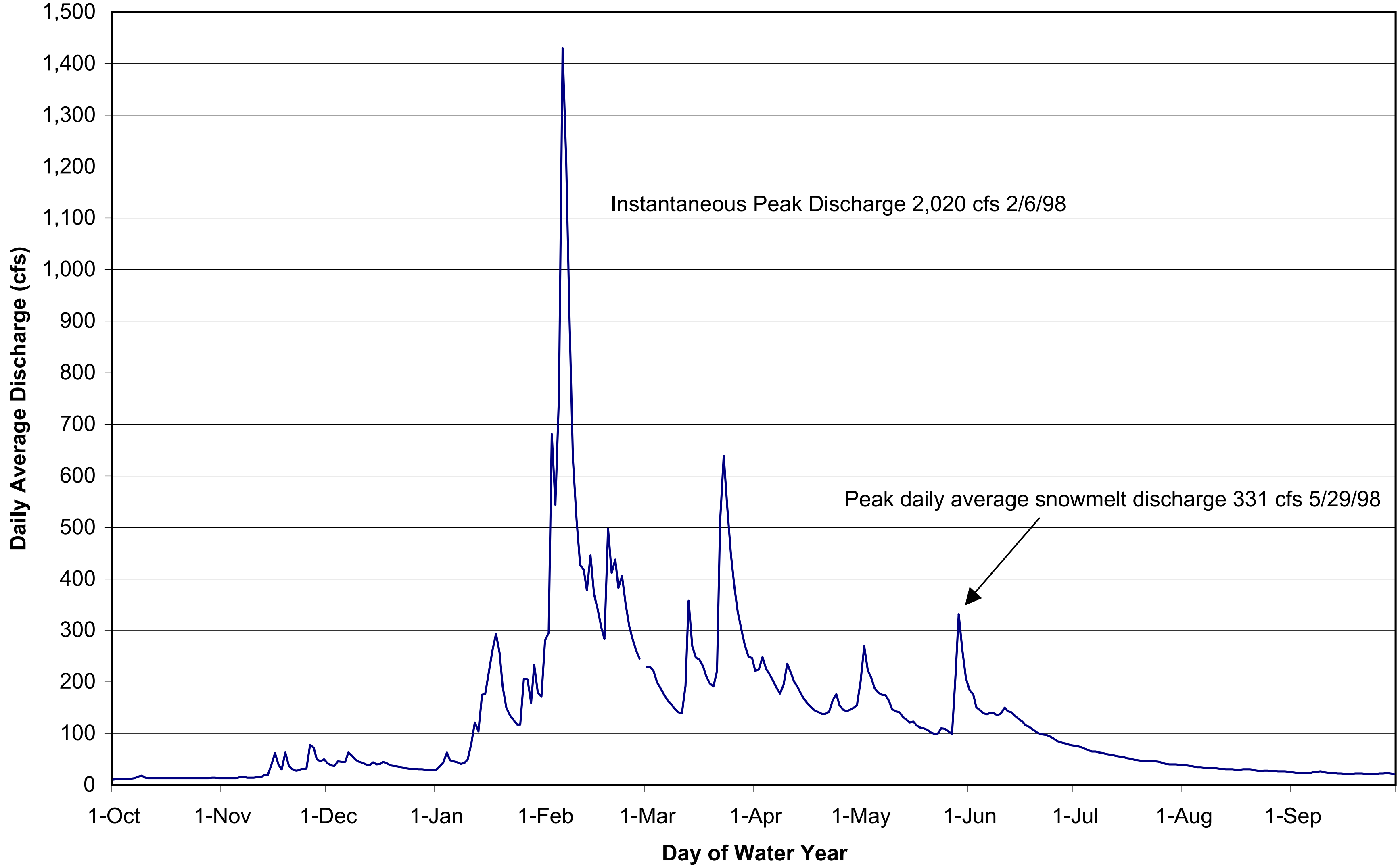


Figure 12. Grass Valley Creek at Fawn Lodge (USGS Station # 11525600)
Annual Hydrograph for Water Year 1998 (Extremely Wet)



release. As shown in the 1998 hydrographs in Figures 11 and 12 (Extremely Wet year, largest May-June peak flow over 27 years of record at the Grass Valley Creek gage), the peaks were approximately four weeks apart. Therefore, we used the predicted May-June flow values as shown in Table 18.

Table 18. Predicted maximum peak flow values for bridges during the May-June snowmelt runoff season using -0.30 generalized skew (assumes Lewiston Dam release = 0 cfs).

		50-year May-June peak flow magnitude	100-year May-June peak flow magnitude
SALT FLAT BRIDGE			
	Rush Creek	336 cfs	428 cfs
	Cumulative smaller tributaries	256 cfs	326 cfs
	TOTAL AT SALT FLAT BRIDGE:	**592 cfs**	**754 cfs**
BUCKTAIL BRIDGE			
	Rush Creek	336 cfs	428 cfs
	Cumulative smaller tributaries	291 cfs	464 cfs
	TOTAL AT BUCKTAIL BRIDGE:	**627 cfs**	**800 cfs**
POKER BAR BRIDGE			
	Rush Creek	336 cfs	428 cfs
	Grass Valley Creek	547 cfs	698 cfs
	Cumulative smaller tributaries	432 cfs	551 cfs
	TOTAL AT POKER BAR BRIDGE:	**1,315 cfs**	**1,676 cfs**
TREADWELL BRIDGE			
	Rush Creek	336 cfs	428 cfs
	Grass Valley Creek	547 cfs	698 cfs
	Cumulative smaller tributaries	504 cfs	643 cfs
	TOTAL AT TREADWELL BRIDGE:	**1,387 cfs**	**1,769 cfs**

Rather than using regional regression curves to Rush Creek (a mis-application since we are assessing May-June flows rather than annual instantaneous peak flows), we simply performed a unit area drainage area adjustment from the Grass Valley Creek 50 and 100-year flood magnitudes to estimate 50 and 100-year flood magnitudes on Rush Creek:

$$Q_{50rushmayjune} = Q_{50gvcmayjune} * (A_{rush}/A_{gvc})^{1.0}$$
$$Q_{100rushmayjune} = Q_{100gvcmayjune} * (A_{rush}/A_{gvc})^{1.0}$$

Where $A_{rush} = 22.7$ mi^2 and $A_{gvc} = 30.8$ mi^2. An exponent of 1.0 is used instead of 0.87 (used for annual peak analysis) because we do not know if the 0.87 value is applicable for the snowmelt runoff flows. The drainage area at each bridge not accounted for in the Grass Valley Creek and Rush Creek watersheds were also multiplied by the unit runoff values:

$$Q_{50tribsmayjune} = Q_{50gvcmayjune} * (A_{tribs}/A_{gvc})^{1.0}$$
$$Q_{100tribsmayjune} = Q_{100gvcmayjune} * (A_{tribs}/A_{gvc})^{1.0}$$

The resulting 50- and 100-year May-June peak flow estimates for Rush Creek and the additional smaller tributaries are shown in Table 18, as are the resulting flow estimates at each bridge location.

These flow magnitudes were added to the two May-June Lewiston Dam release scenarios, and results are shown in Table 19. If Lewiston Dam is releasing 11,000 cfs for an Extremely Wet year at a time when a 100-year snowmelt runoff is peaking (a conservative assumption), the corresponding mainstem flows would be 11,754 cfs at the Salt Flat Bridge, 11,800 cfs at the Bucktail Bridge, 12,676 cfs at the Poker Bar Bridge, and 12,769 cfs at the Treadwell Bridge. If Lewiston Dam is releasing 13,750 cfs for a Safety of Dams release at a time when a 100-year snowmelt runoff is peaking (again, a conservative assumption), the corresponding mainstem flows would be 14,504 cfs at the Salt Flat Bridge, 14,550 cfs at the Bucktail Bridge, 15,426 cfs at the Poker Bar Bridge, and 15,519 cfs at the Treadwell Bridge.

6.1. Comparing the 1998 snowmelt runoff with flood frequency analysis results

We again used a recent high flow year to ground truth our 50 and 100-year flood estimates. For the snowmelt runoff period, we used 1998 because it was the second largest water year in record for the Trinity River (n=88 years, 1912-1999), and we had daily average discharge records for both Grass Valley Creek and Rush Creek for 1998. The maximum daily average discharge in 1998 for Rush Creek was 244 cfs on May 2 (Figure 11), and was 331 cfs for Grass Valley Creek May 29 (Figure 12). Multiplying these daily average values by 1.33 results in estimated peak values of 325 cfs for Rush Creek, and 441 cfs for Grass Valley Creek. These estimates are much smaller than the 50-year flood prediction shown in Table 18.

To further evaluate the predicted 50 and 100 year flood magnitudes shown in Table 18, we evaluated additional 1998 indices of Trinity Reservoir inflows (period of record = 88 years): Maximum daily average, Maximum volume over the May-June period, and Maximum yearly inflow. Results of the 1998 inflows were as follows: 1) the maximum May-June daily average flow for WY 1998 was the fifth largest (15,400 cfs), with an approximate flood recurrence of 17 years, 2) the runoff volume over the May-June period for WY 1998 was the second largest (922,300 acre-ft), with an approximate 50 year recurrence interval, and 3) the total water yield for WY 1998 was also the second largest (2,701,000 acre ft), with an approximate 50 year recurrence interval. These results suggest that our estimates of the 50- and 100-year May-June snowmelt runoff magnitudes on Rush Creek and Grass Valley Creek are conservatively large; designing the bridges to convey the predicted 50- and 100-year May-June flow peaks will most likely provide a moderate safety factor.

Table 19. Summary of OPTION C and D: 50- and 100-year flood magnitudes at Trinity River bridges assuming an 11,000 cfs and 13,750 cfs ROD release from Lewiston Dam

MAY/JUNE SNOWMELT RUNOFF SEASON

Option C: Release 11,000 cfs ROD flow on top of 50- and 100-year flood magnitude during May-June snowmelt runoff season

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	11,592 cfs	11,627 cfs	12,315 cfs	12,387 cfs	Not Computed
100 yr	11,754 cfs	11,800 cfs	12,676 cfs	12,769 cfs	Not Computed

Option D: Release 13,750 cfs SOD or ROD flow on top of 50- and 100-year flood magnitude during May-June snowmelt runoff season

Recurrence Interval	Flow at Salt Flat Bridge	Flow at Bucktail Bridge	Flow at Poker Bar Bridge	Flow at Treadwell Bridge	Flow at Douglas City
50 yr	14,342 cfs	14,377 cfs	15,065 cfs	15,137 cfs	Not Computed
100 yr	14,504 cfs	14,550 cfs	15,426 cfs	15,519 cfs	Not Computed

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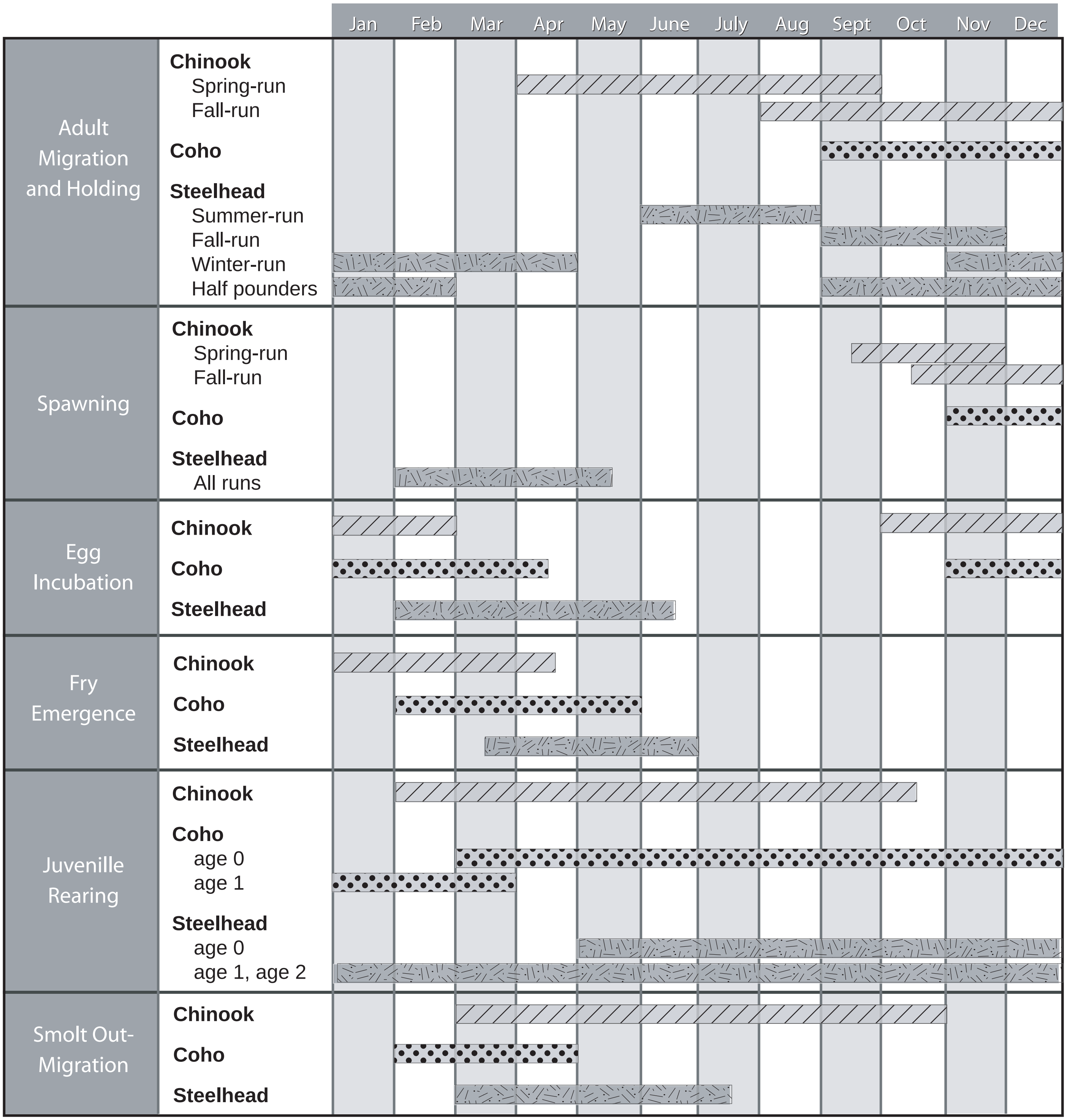

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Salmonid Growth and Migration Patterns

LIFE HISTORY AND HABITAT NEEDS FOR ANADROMOUS SALMONID FISH IN THE TRINITY RIVER BASIN

Species	Migration	Spawning	Rearing	Habitat Requirements
Spring-run Chinook	Spring – Summer	Early Fall	Winter, Spring, Summer	Adults oversummer in deep, cool river pools. Spawns and rears in mainstem river and tributaries. Requires cool, swift water; clean, loose gravel for spawning; and shallow, slow-moving waters adjacent to higher water velocities for rearing and feeding.
Fall-run Chinook	Fall	Fall	Spring	Spawns and rears in mainstem river and tributaries. Requires cool, swift water; clean, loose gravel for spawning; and shallow, slow-moving waters adjacent to higher water velocities for rearing and feeding.
Winter-run Steelhead	Fall – Winter	February – April	Year-round	Spawns and rears in mainstem river and its tributaries. Requires cool, swift water; clean, loose gravel for spawning; runs and suitable pools in which to rear and over-summer; and clean cobble for refuge from high velocities. Juveniles overwinter for 1–2 or more years.
Summer-run Steelhead	Spring – Summer	February – April	Year-round	Adults ascend river and hold over in deep pools/runs through fall months. Spawns and rears in mainstem river and its tributaries. Requires cool, swift water; clean, loose gravel for spawning; suitable pools and riffles in which to rear and over-summer; and clean cobble for refuge from high velocities. Juveniles overwinter for 1–2 or more years.
Coho	October – December	November – December	Year-round	Spawns and rears in mainstem river and tributaries. Requires cool, swift water; clean, loose gravel for spawning; and suitable pools/runs in which to rear and over-summer. Juveniles prefer backwater/ slackwater areas and pool margins; juveniles overwinter for 1 year.

Source: Leidy and Leidy 1984, Hassler 1987, U.S. Fish and Wildlife Service et al. 2000, Moyle 2002

LIFE HISTORY AND HABITAT NEEDS FOR NON-SALMONID NATIVE ANADROMOUS FISH IN THE TRINITY RIVER BASIN

Species	Migration	Spawning	Rearing	Habitat Requirements
Pacific Lamprey	April – July	Spring – Early Summer	Year-round	Spawns and rears in the mainstem and tributaries. Requires cool streams with clean, gravelly bottom for spawning. Developing larvae burrow into silty river-bottom, where they remain for 4–5 years before metamorphosing and emigrating to the ocean.
Green Sturgeon White Sturgeon	February – July	March – July	Year-round	Adults spawn in large, mainstem river channels with cool water. Juveniles inhabit estuarine environments for 4–6 years before emigrating to the open ocean.
Eulachon	March – April	March – April	--	Adults run up into the lower reaches of coastal streams to spawn. Adhesive eggs stick to small gravel/sand/detrital bottom until hatched; larvae are quickly transported downstream to ocean.

Source: U.S. Fish and Wildlife Service et al. 2000, Moyle 2002

SPECIAL-STATUS FISH SPECIES CONSIDERED FOR ANALYSIS

Common Name (Scientific Name)	Status FED/ST	General Habitat	Comments
Green sturgeon (*Acipenser medirostris*)	SSC/SC	Known to spawn in Sacramento, Feather, and Klamath rivers, and juveniles may occur in estuaries. Occurs in San Francisco, San Pablo, and Suisun bays and in the Delta. Prefers to spawn in large cobble; eggs fertilized in relatively high water.	The species may be found in the lower Trinity River, but is not known to inhabit the upper Trinity River. **Project boundaries are outside the known range of the species.**
Pacific lamprey (*Lampetra tridentata*)	NW/--	Spawn in freshwater rivers and streams with juveniles found in slow-moving current, silty bottom habitats; metamorphosed juveniles migrate through estuaries to the ocean.	Observed to spawn in tributaries of the upper river (Deibel 1988); Ammoecetes abundant during spring near the project reach. **The species may occur at the Canyon Creek Rehabilitation sites.**
Southern Oregon/ Northern California Coasts ESU coho salmon (*Oncorhynchus kisutch*) Designated critical habitat	T/T	Juveniles prefer deep ($\geq$1 m) pools with dense overhead cover and clear water. Found over a range of substrates from silt to bedrock (Moyle et al. 1995). Trinity River is designated critical habitat and essential fish habitat for the species.	Suitable spawning, rearing, and/or migration corridor habitat exists at the Canyon Creek project sites. **The Canyon Creek sites are within designated critical habitat. The species is known to occur at the Canyon Creek Rehabilitation sites.**

SPECIAL-STATUS FISH SPECIES CONSIDERED FOR ANALYSIS

Common Name (Scientific Name)	**Status FED/ST**	**General Habitat**	**Comments**
Klamath Mts. Province ESU steelhead (*Oncorhynchus mykiss irideus*) (summer/fall- and winter-run races)	NW/SSC	Freshwater rivers and streams (Trinity and Klamath Rivers and their tributaries). Steelhead require cool, swift, shallow water; clean, loose gravel for spawning; and suitable large pools in which to spend the summers (CNDDB, 2002).	Summer-run race is a state species of special concern. Suitable spawning, rearing, and/or migration corridor habitat exists at or near the project sites. **The species is known to occur at the Canyon Creek Rehabilitation sites.**
Upper Klamath-Trinity Rivers ESU Chinook salmon (*Oncorhynchus tshawytscha*) (spring- and fall-run races)	NW/SSC	Freshwater rivers and streams. (Trinity and Klamath Rivers and their tributaries). Chinook salmon require cool streams with deep pools and riffles and gravel or cobble substrate. Trinity River is designated essential fish habitat for the species.	Spring-run race is a state species of special concern. Suitable over-summering, spawning, rearing, and migration corridor habitat exists at or near the Canyon Creek sites. **The species is known to occur at the Canyon Creek Rehabilitation sites.**

Notes:

Federal (FED) and State (ST) Status Codes:

E = Endangered; T = Threatened; C = Candidate Species; NW = Not Warranted for Listing; SC = Species of Concern; SSC = Species of Special Concern

Results for quads centered on DEDRICK Quad (4012371) - 84 elements selected

Record	QUAD NAME	SCINAME	COMNAME	FED STATUS	CAL STATUS	CDFG	CNPS LIST
1	Dedrick	Rana boylii	foothill yellow-legged frog	None	None	SC	
2	Dedrick	Oncorhynchus tshawytscha spring-run	spring-run chinook salmon	Threatened	Threatened		
3	Dedrick	Oncorhynchus mykiss irideus	summer-run steelhead trout	None	None	SC	
4	Dedrick	Martes americana	American (=pine) marten	None	None		
5	Dedrick	Martes pennanti pacifica	Pacific fisher	Candidate	None	SC	
6	Dedrick	Emys (=Clemmys) marmorata marmorata	northwestern pond turtle	None	None	SC	
7	Dedrick	Ancotrema voyanum	Hooded lancetooth	None	None		
8	Dedrick	Helminthoglypta talmadgei	Trinity Shoulderband	None	None		
9	Dedrick	Mielichhoferia elongata	elongate copper-moss	None	None		2
10	Dedrick	Atractylocarpus flagellaceus	flagella-like atractylocarpus	None	None		2
11	Dedrick	Lewisia cotyledon var. heckneri	Heckner's lewisia	None	None		1B
12	Hayfork Bally	Ascaphus truei	western tailed frog	None	None	SC	
13	Hayfork Bally	Lepus americanus klamathensis	Oregon snowshoe hare	None	None	SC	
14	Hayfork Bally	Martes americana humboldtensis	Humboldt marten	None	None	SC	
15	Hayfork Bally	Martes pennanti pacifica	Pacific fisher	Candidate	None	SC	
16	Hayfork Bally	Taxidea taxus	American badger	None	None	SC	
17	Hayfork Bally	Ancotrema voyanum	Hooded lancetooth	None	None		
18	Hayfork Bally	Vespericola pressleyi	Big Bar Hesperian	None	None		
19	Hayfork Bally	Helminthoglypta talmadgei	Trinity Shoulderband	None	None		
20	Hayfork Bally	Monadenia setosa	Trinity bristle snail	None	Threatened		
21	Hayfork Bally	Lewisia cotyledon var. heckneri	Heckner's lewisia	None	None		1B
22	Helena	Rana boylii	foothill yellow-legged frog	None	None	SC	
23	Helena	Oncorhynchus tshawytscha spring-run	spring-run chinook salmon	Threatened	Threatened		
24	Helena	Oncorhynchus mykiss irideus	summer-run steelhead trout	None	None	SC	

25	Helena	Martes pennanti pacifica	Pacific fisher	Candidate	None	SC	
26	Helena	Taxidea taxus	American badger	None	None	SC	
27	Helena	Emys (=Clemmys) marmorata marmorata	northwestern pond turtle	None	None	SC	
28	Helena	Vespericola pressleyi	Big Bar Hesperian	None	None		
29	Helena	Monadenia setosa	Trinity bristle snail	None	Threatened		
30	Helena	Mielichhoferia elongata	elongate copper-moss	None	None		2
31	Helena	Atractylocarpus flagellaceus	flagella-like atractylocarpus	None	None		2
32	Junction City	Rana boylii	foothill yellow-legged frog	None	None	SC	
33	Junction City	Oncorhynchus tshawytscha spring-run	spring-run chinook salmon	Threatened	Threatened		
34	Junction City	Martes pennanti pacifica	Pacific fisher	Candidate	None	SC	
35	Junction City	Emys (=Clemmys) marmorata marmorata	northwestern pond turtle	None	None	SC	
36	Junction City	Helminthoglypta talmadgei	Trinity Shoulderband	None	None		
37	Junction City	Lewisia cotyledon var. heckneri	Heckner's lewisia	None	None		1B
38	Mt. Hilton	Rana cascadae	cascades frog	None	None	SC	
39	Mt. Hilton	Oncorhynchus mykiss irideus	summer-run steelhead trout	None	None	SC	
40	Mt. Hilton	Martes americana	American (=pine) marten	None	None		
41	Mt. Hilton	Martes pennanti pacifica	Pacific fisher	Candidate	None	SC	
42	Mt. Hilton	Ancotrema voyanum	Hooded lancetooth	None	None		
43	Mt. Hilton	Tonestus lyallii	Lyall's tonestus	None	None		2
44	Mt. Hilton	Campanula wilkinsiana	Wilkin's harebell	None	None		1B
45	Mt. Hilton	Sedum paradisum	Canyon Creek stonecrop	None	None		1B
46	Mt. Hilton	Iliamna bakeri	Baker's globe mallow	None	None		1B
47	Mt. Hilton	Lewisia cotyledon var. heckneri	Heckner's lewisia	None	None		1B
48	Mt. Hilton	Penstemon tracyi	Tracy's beardtongue	None	None		1B
49	Mt. Hilton	Smilax jamesii	English Peak greenbriar	None	None		1B
50	Rush Creek Lakes	Martes americana	American (=pine) marten	None	None		
51	Rush Creek Lakes	Martes pennanti pacifica	Pacific fisher	Candidate	None	SC	
52	Rush Creek Lakes	Ancotrema voyanum	Hooded lancetooth	None	None		
53	Rush Creek	Punctum hannai	Trinity Spot	None	None		

	Lakes						
54	Rush Creek Lakes	Lewisia cotyledon var. heckneri	Heckner's lewisia	None	None		1B
55	Rush Creek Lakes	Penstemon filiformis	thread-leaved beardtongue	None	None		1B
56	Rush Creek Lakes	Juncus regelii	Regel's rush	None	None		2
57	Rush Creek Lakes	Smilax jamesii	English Peak greenbriar	None	None		1B
58	Siligo Peak	Rana cascadae	cascades frog	None	None	SC	
59	Siligo Peak	Martes americana	American (=pine) marten	None	None		
60	Siligo Peak	Martes pennanti pacifica	Pacific fisher	Candidate	None	SC	
61	Siligo Peak	Darlingtonia Seep	Darlingtonia Seep	None	None		
62	Siligo Peak	Nebria sahlbergii triad	Tinity Alps ground beetle	None	None		
63	Siligo Peak	Antennaria lanata	woolly pussy-toes	None	None		2
64	Siligo Peak	Raillardella pringlei	showy raillardella	None	None		1B
65	Siligo Peak	Tonestus lyallii	Lyall's tonestus	None	None		2
66	Siligo Peak	Campanula wilkinsiana	Wilkin's harebell	None	None		1B
67	Siligo Peak	Sedum paradisum	Canyon Creek stonecrop	None	None		1B
68	Siligo Peak	Epilobium oreganum	Oregon fireweed	None	None		1B
69	Siligo Peak	Epilobium siskiyouense	Siskiyou fireweed	None	None		1B
70	Siligo Peak	Lewisia cotyledon var. heckneri	Heckner's lewisia	None	None		1B
71	Siligo Peak	Penstemon filiformis	thread-leaved beardtongue	None	None		1B
72	Siligo Peak	Smilax jamesii	English Peak greenbriar	None	None		1B
73	Thurston Peaks	Oncorhynchus mykiss irideus	summer-run steelhead trout	None	None	SC	
74	Thurston Peaks	Chaenactis suffrutescens	Shasta chaenactis	None	None		1B
75	Thurston Peaks	Draba carnosula	Mt. Eddy draba	None	None		1B
76	Thurston Peaks	Lewisia cotyledon var. heckneri	Heckner's lewisia	None	None		1B
77	Thurston Peaks	Penstemon tracyi	Tracy's beardtongue	None	None		1B
78	Weaverville	Rana boylii	foothill yellow-legged frog	None	None	SC	
79	Weaverville	Aquila chrysaetos	golden eagle	None	None	SC	
80	Weaverville	Oncorhynchus tshawytscha spring-run	spring-run chinook salmon	Threatened	Threatened		
81	Weaverville	Lepus americanus klamathensis	Oregon snowshoe hare	None	None	SC	

82	Weaverville	Martes pennanti pacifica	Pacific fisher	Candidate	None	SC	
83	Weaverville	Emys (=Clemmys) marmorata marmorata	northwestern pond turtle	None	None	SC	
84	Weaverville	Juncus dudleyi	Dudley's rush	None	None		2

CNPS Inventory of Rare and Endangered Plants

Status: Plant Press Manager window with 19 items - Wed, Dec. 14, 2005 07:49 c
9 Quad Search Centered on Dedrick Quad
LOCATION REPORT

scientific	family	counties	quads	CNPS
Antennaria lanata	Asteraceae	Trinity (TRI), Oregon (OR), Washington (WA), (++)	Siligo Peak (667B) 4012288	List 2
Arctostaphylos klamathensis	Ericaceae	Shasta (SHA), Siskiyou (SIS), Trinity (TRI)	Siligo Peak (667B) 4012288, Seven Lakes Basin (682B) 4112224, Chicken Hawk Hill (682C) 4112214, Mumbo Basin (683A) 4112225, Whisky Bill Peak (683D) 4112215, Ycatapom Peak (684D) 4112217, Scott Mountain (700C) 4112236, South China Mountain (700D) 4112235	List 1B
Atractylocarpus flagellaceus	Dicranaceae	Trinity (TRI), (++)	Helena (668C) 4012372	List 2
Campanula wilkinsiana	Campanulaceae	Siskiyou (SIS), Tehama (TEH), Trinity (TRI)	Childs Meadows (625C) 4012134, Covington Mill (667A) 4012287, Siligo Peak (667B) 4012288, Mount Hilton (668A) 4012381, Caribou Lake (684C) 4112218, Ash Creek Butte (698A) 4112241, Mount Shasta (698B) 4112242, Mccloud (698C) 4112232	List 1B
Chaenactis suffrutescens	Asteraceae	Siskiyou (SIS), Trinity (TRI)	Thurston Peaks (668B) 4012382, Dunsmuir (682A) 4112223, Seven Lakes Basin (682B) 4112224, Tangle Blue Lake (683B) 4112226, Carrville (683C) 4112216, Caribou Lake (684C) 4112218, Cecilville (685B) 4112322, Cecil Lake (685C) 4112312, Mount Shasta (698B) 4112242, Mccloud (698C) 4112232, Weed (699B) 4112244, Mount Eddy (699C) 4112234, City Of Mount Shasta (699D) 4112233, China Mountain (700A) 4112245, South China Mountain (700D) 4112235, Etna (701B) 4112248, Solomons Temple (716A) 4112263, Gazelle (717D)? 4112255, Greenview (718C) 4112258, Fort Jones (718D) 4112257, Copco (733A) 4112283	List 1B
Draba carnosula	Brassicaceae	Del Norte (DNT), Siskiyou	Thurston Peaks (668B) 4012382, Caribou Lake (684C)	List

		(SIS), Trinity (TRI)	4112218, Mount Shasta (698B)? 4112242, Mount Eddy (699C) 4112234, City Of Mount Shasta (699D) 4112233, South China Mountain (700D) 4112235, Devils Punchbowl (738C) 4112376, Preston Peak (738D) 4112375	1B
Epilobium oreganum	Onagraceae	Del Norte (DNT), El Dorado (ELD), Glenn (GLE), Humboldt (HUM), Mendocino (MEN), Nevada (NEV), Shasta (SHA), Siskiyou (SIS), Tehama (TEH), Trinity (TRI), Oregon (OR)	Pyramid Peak (523C) 3812072, Echo Lake (523D) 3812071, Homewood (538C) 3912012, Hobart Mills (554B) 3912042, Plaskett Meadows (581A) 3912267, Mendocino Pass (597C) 3912278, Leech Lake Mountain (598A) 3912381, Dubakella Mountain 15' NE (632A) 4012341, Dubakella Mountain 15' SW (632C) 4012332, Dubakella Mountain 15' SE (632D) 4012331, Forest Glen (633D) 4012333, Black Lassic (634D) 4012335, Sims Mountain (652A) 4012365, Board Camp Mountain (652B) 4012366, Mad River Buttes (653A) 4012367, Iaqua Buttes (653B) 4012368, Trinity Center (666B) 4012286, Covington Mill (667A) 4012287, Siligo Peak (667B) 4012288, Denny (669B) 4012384, Ironside Mountain (669C) 4012374, Willow Creek (670B) 4012386, Grouse Mountain (670C) 4012376, Dunsmuir (682A) 4112223, Ycatapom Peak (684D) 4112217, Youngs Peak (686A) 4112323, Salmon Mountain (686B) 4112324, Trinity Mountain (686C) 4112314, Mount Eddy (699C) 4112234, City Of Mount Shasta (699D)* 4112233, Orleans Mountain (703C) 4112334, Ukonom Mountain (720C) 4112354, Ukonom Lake (720D) 4112353, Chimney Rock (721C) 4112356, Dillon Mountain (721D) 4112355, Buckhorn Bally (735A) 4112287, Shelly Creek Ridge (739A) 4112387	List 1B
Epilobium siskiyouense	Onagraceae	Siskiyou (SIS), Trinity (TRI), Oregon (OR)	Bully Choop Mountain (649D) 4012257, Covington Mill (667A) 4012287, Siligo Peak (667B) 4012288, Seven Lakes Basin (682B) 4112224, Billys Peak (684A) 4112227, Deadman Peak (684B) 4112228, Caribou Lake (684C) 4112218, Dees Peak (686D) 4112313, Mount Eddy (699C) 4112234, Scott Mountain (700C) 4112236, South China Mountain (700D) 4112235, Boulder Peak (719D) 4112351, Dutch Creek (736A) 4112381, Kangaroo Mountain (736B) 4112382, Preston Peak (738D) 4112375	List 1B
Iliamna bakeri	Malvaceae	Colusa (COL), Lake (LAK),	Fouts Springs (564C) 3912236, Sanhedrin Mountain (582D)	List

		Lassen (LAS), Mendocino (MEN), Modoc (MOD), Shasta (SHA), Siskiyou (SIS), Tehama (TEH), Trinity (TRI), Oregon (OR)	3912351, Devils Parade Ground (608C) 4012116, Fredonyer Peak (640A) 4012065, Gallatin Peak (640C) 4012056, Buckhorn Lake (656A) 4012081, Observation Peak (656C) 4012072, Termo (657C) 4012074, Grasshopper Valley (658C) 4012076, Bullard Lake (659C) 4012078, Murken Bench (661C) 4012174, Jellico (661D) 4012173, Rush Creek Lakes (667C) 4012278, Dedrick (668D) 4012371, Emerson Peak (673B) 4112022, Boot Lake (673C) 4112012, Little Hat Mountain (673D) 4112011, Jess Valley (674A) 4112023, Cold Spring Mountain (674D) 4112013, Ash Valley (675C) 4112016, Holbrook Canyon (675D) 4112015, Dana (679D) 4112115, Grizzly Peak (680B) 4112128, Shoeinhorse Mountain (681D) 4112211, Tombstone Mountain (682D) 4112213, Warren Peak (690B) 4112042, Eagle Peak (690C) 4112032, Shields Creek (691A) 4112043, Crank Mountain (694B) 4112142, Halls Canyon (694D) 4112131, Hambone (696C) 4112136, Indian Spring Mountain (696D) 4112135, China Mountain (700A) 4112245, Cedarville (707C) 4112052, Payne Peak (708D) 4112053, Dead Horse Reservoir (709A) 4112065, Boles Meadows West (710B) 4112068, Spaulding Butte (711C) 4112152, Caldwell Butte (712B) 4112164, Kephart (712D) 4112153, The Whaleback (715C) 4112252, Juniper Flat (716D) 4112253, Fort Bidwell (724C) 4112072, South Mountain (726C) 4112076, Mcginty Reservoir (726D) 4112075, Weed Valley (727A) 4112087	1B
Juncus dudleyi	Juncaceae	Lassen (LAS), Plumas (PLU), Siskiyou (SIS), Trinity (TRI), Arizona (AZ), Oregon (OR), (++)	Canyondam (606A) 4012121, Roop Mountain (623A) 4012047, Weaverville (649B) 4012268, Trinity Center (666B) 4012286, Rush Creek Lakes (667C) 4012278, Scott Mountain (700C) 4112236, Seiad Valley (736C) 4112372	List 2
Juncus regelii	Juncaceae	Siskiyou (SIS), Trinity (TRI), Oregon (OR), Washington (WA)+	Rush Creek Lakes (667C) 4012278, Devils Punchbowl (738C) 4112376, Preston Peak (738D) 4112375	List 2
Lewisia	Portulacaceae	Humboldt (HUM), Siskiyou	Junction City (650A) 4012361, Hayfork Bally (650B)	List

cotyledon **var. heckneri**		(SIS), Trinity (TRI)	4012362, Siligo Peak (667B) 4012288, Rush Creek Lakes (667C) 4012278, Mount Hilton (668A) 4012381, Thurston Peaks (668B) 4012382, Dedrick (668D) 4012371, Denny (669B) 4012384, Ironside Mountain (669C) 4012374, Carrville (683C) 4112216, Whisky Bill Peak (683D) 4112215, Caribou Lake (684C) 4112218, Thompson Peak (685D) 4112311, Orleans Mountain (703C) 4112334, Huckleberry Mountain (720A) 4112363, Deadman Point (737B) 4112384, Happy Camp (737C) 4112374, Preston Peak (738D) 4112375	1B
Mielichhoferia elongata	Bryaceae	Fresno (FRE), Humboldt (HUM), Lake (LAK), Mariposa (MPA), Nevada (NEV), Santa Cruz (SCR), Trinity (TRI), Tulare (TUL), (++)	Giant Forest (354D) 3611857, Wren Peak (375D) 3611877, Sacate Ridge (376B) 3611982, Trimmer (377A) 3611983, Ano Nuevo (409D) 3712213, El Portal (438A) 3711967, Kinsley (438B) 3711968, Whispering Pines (533C) 3812276, Nevada City (558D) 3912131, Helena (668C) 4012372, Weitchpec (687B) 4112326	List 2
Penstemon filiformis	Scrophulariaceae	Shasta (SHA), Siskiyou (SIS), Trinity (TRI)	Lamoine (665B) 4012284, Damnation Peak (666A) 4012285, Trinity Center (666B) 4012286, Covington Mill (667A) 4012287, Siligo Peak (667B) 4012288, Rush Creek Lakes (667C) 4012278, Trinity Dam (667D) 4012277, Dunsmuir (682A) 4112223, Seven Lakes Basin (682B) 4112224, Chicken Hawk Hill (682C) 4112214, Tombstone Mountain (682D) 4112213, Tangle Blue Lake (683B) 4112226, Carrville (683C) 4112216, Whisky Bill Peak (683D) 4112215	List 1B
Penstemon **tracyi**	Scrophulariaceae	Trinity (TRI)	Siligo Peak (667B) 4012288, Rush Creek Lakes (667C) 4012278, Mount Hilton (668A) 4012381, Thurston Peaks (668B) 4012382, Caribou Lake (684C) 4112218, Thompson Peak (685D) 4112311	List 1B
Raillardella pringlei	Asteraceae	Siskiyou (SIS), Trinity (TRI)	Covington Mill (667A) 4012287, Siligo Peak (667B) 4012288, Seven Lakes Basin (682B) 4112224, Mumbo Basin (683A) 4112225, Tangle Blue Lake (683B) 4112226, Billys Peak (684A) 4112227, Caribou Lake (684C) 4112218, Ycatapom Peak (684D) 4112217, Mount Eddy (699C) 4112234, China Mountain (700A) 4112245, South China Mountain (700D) 4112235, Dutch Creek (736A) 4112381	List 1B
Sedum	Crassulaceae	Shasta (SHA), Trinity (TRI)	Whiskeytown (648A) 4012265, Siligo Peak (667B) 4012288,	List

paradisum			Mount Hilton (668A) 4012381	1B
Smilax jamesii	Smilacaceae	Del Norte (DNT), Shasta (SHA), Siskiyou (SIS), Trinity (TRI)	Burney (662B) 4012186, Roaring Creek (663B) 4012188, Trinity Center (666B) 4012286, Covington Mill (667A) 4012287, Siligo Peak (667B) 4012288, Rush Creek Lakes (667C) 4012278, Mount Hilton (668A) 4012381, Pondosa (679B) 4112126, Dead Horse Summit (680A) 4112127, Big Bend (680C) 4112118, Tangle Blue Lake (683B) 4112226, Carrville (683C) 4112216, Whisky Bill Peak (683D) 4112215, Youngs Peak (686A) 4112323, English Peak (702B) 4112342, Sawyers Bar (702C) 4112332, Tanners Peak (702D) 4112331, Greenview (718C) 4112258, Marble Mountain (719C) 4112352, Chimney Rock (721C) 4112356	List 1B
Tonestus lyallii	Asteraceae	Siskiyou (SIS), Trinity (TRI), Oregon (OR), (++)	Siligo Peak (667B) 4012288, Mount Hilton (668A) 4012381, Thompson Peak (685D) 4112311	List 2

PLANT SPECIES OBSERVED AT THE CONNER CREEK MECHANICAL CHANNEL REHABILITATION SITE (Field Visit Dates: July 15, 2002; May 15, June 11, and July 17, 2002)		
SCIENTIFIC NAME	**COMMON NAME**	**FAMILY NAME**
Ailanthus altissima	Tree of heaven	Simaroubaceae
Aira carophyllea	Silver European hairgrass	Poaceae
Alnus rhombifolia	White alder	Betulaceae
Amelanchier alnifolia	Serviceberry	Rosaceae
Amsinckia menziesii var. intermedia	Rancher's fireweed	Boraginaceae
Arbutus menziesii	Pacific madrone	Ericaceae
Arctostaphylos manzanita	Common manzanita	Ericaceae
Arctostaphylos viscida	Whiteleaf manzanita	Ericaceae
Artemisia douglasiana	Mugwort	Asteraceae
Asclepias fascicularis	Narrow-leaved milkweed	Asclepiadaceae
Avena fatua	Wild oat	Poaceae
Brassica nigra	Black mustard	Brassicaceae
Brickellia californica	California brickellbush	Asteraceae
Brodiaea elegans	Harvest brodiaea	Liliaceae
Bromus diandrus	Ripgut	Poaceae
Bromus hordeaceus	Softchess	Poaceae
Bromus tectorum	Cheatgrass	Poaceae
Calycadenia truncata	Rosin weed	Asteraceae
Carex nudata	Torrent sedge	Cyperaceae
Castilleja spp.	Indian paintbrush	Scrophulariaceae
Ceanothus cuneatus	Buck brush	Rhamnaceae
Ceanothus intergerrimus	Deer brush	Rhamnaceae
Centaurea solstitialis	Yellow star thistle	Asteraceae
Cercocarpus betuloides	Birchleaf mountain mahogany	Rosaceae
Claytonia perfoliata	Miner's lettuce	Portulaceae
Clematis ligusticifolia	Virgin’s bower	Ranunculaceae
Conium maculatum	Poison hemlock	Apiaceae
Cryptantha milobakeri	Milo Baker's cryptantha	Boraginaceae
Cynosurus echinatus	Hedgehog dogtail	Poaceae
Cyperus eriogrostus	Nutsedge	Cyperaceae
Cytisus scoparius	Scotch broom	Fabaceae
Dactylis glomerata	Orchard grass	Poaceae
Datisca glomerata	Durango root	Datiscaceae
Daucus carota	Queen Anne’s lace	Apiaceae
Dichelostemma capitatum	Blue dicks	Liliaceae
Elymus elymoides	Squirreltail	Poaceae
Elymus glaucus	Blue wild rye	Poaceae
Elymus multisetus	Big squirreltail	Poaceae
Epilobium ciliatum	Willow herb	Onagraceae
Eremocarpus setigerus	Dove weed	Euphorbiaceae
Eriogonum nudum	Naked buckwheat	Polygonaceae
Eriogonum vimineum	Wicker buckwheat	Polygonaceae
Eriophyllum lanatum	Woolly sunflower	Asteraceae
Erodium cicutarium	Storksbill	Geraniaceae

PLANT SPECIES OBSERVED AT THE CONNER CREEK MECHANICAL CHANNEL REHABILITATION SITE (Field Visit Dates: July 15, 2002; May 15, June 11, and July 17, 2002)		
SCIENTIFIC NAME	**COMMON NAME**	**FAMILY NAME**
Eschscholzia caespitosa	Foothill poppy	Papaveraceae
Fraxinus latifolia	Oregon ash	Oleaceae
Gnaphalium sp.	Cudweed	Asteraceae
Heteromeles arbutifolia	Toyon	Rosaceae
Heterotheca oregona	Oregon golden-aster	Asteraceae
Holcus lanatus	Velvet grass	Poaceae
Hypericum perforatum	Klamathweed	Hypericaceae
Hypochaeris radicata	Rough cat’s ears	Asteraceae
Juglans californica var. hindsii	Northern California black walnut	Juglandaceae
Keckiella corymbosa	Redwood keckiella	Scrophulariaceae
Lactuca serriola	Prickly lettuce	Asteraceae
Lathyrus latifolius	Perennial sweet pea	Fabaceae
Lepidium sp.	Pepperwort	Brassicaceae
Linaria genistifolia ssp. dalmatica	Dalmatian toadflax	Scrophulariaceae
Lotus humistratus	Foothill lotus	Fabaceae
Lotus oblongifolius	Bird’s-foot trefoil	Fabaceae
Lotus purshianus var. purshianus	Spanish lotus	Fabaceae
Lupinus albifrons	Silver bush lupine	Fabaceae
Lupinus bicolor	Bi-colored lupine	Fabaceae
Lupinus nanus	Lupine	Fabaceae
Madia spp.	Tarweed	Asteraceae
Melilotus alba	White sweetclover	Fabaceae
Mimulus cardinalis	Scarlet monkeyflower	Scrophulariaceae
Osmorhiza occidentalis	Sierran sweet-cicely	Apiaceae
Pentagramma triangularis	Goldenback fern	Pteridaceae
Petrorhagia dubia	Windmill pink	Caryophyllaceae
Phacelia hastata	Silverleaf phacelia	Hydrophyllaceae
Phacelia imbricata	Imbricated phacelia	Hydrophyllaceae
Pinus ponderosa	Ponderosa pine	Pinaceae
Pinus sabiniana	Grey pine	Pinaceae
Plantago lanceolata	English plantain	Plantaginaceae
Poa bulbosa	Bulbous bluegrass	Poaceae
Polygonum lapathifolium	Willow weed	Polygonaceae
Populus balsamifera ssp. trichocarpa	Black cottonwood	Salicaceae
Populus fremontii	Fremont cottonwood	Salicaceae
Potentilla spp.	Cinquefoil	Rosaceae
Prunus virginiana	Western choke-cherry	Rosaceae
Pseudotsuga menziesii var. menziesii	Douglas-fir	Pinaceae
Quercus chrysolepis	Canyon live oak	Fagaceae
Quercus kelloggii	Black oak	Fagaceae
Rhus trilobata	Skunkbrush	Anacardiaceae
Ribes divaricatum	Gooseberry	Grossulariaceae
Robinia pseudoacacia	Black locust	Fabaceae
Rosa californica	California rose	Rosaceae
Rubus discolor	Himalayan blackberry	Rosaceae

PLANT SPECIES OBSERVED AT THE CONNER CREEK MECHANICAL CHANNEL REHABILITATION SITE (Field Visit Dates: July 15, 2002; May 15, June 11, and July 17, 2002)		
SCIENTIFIC NAME	**COMMON NAME**	**FAMILY NAME**
Rubus laciniatus	Cut-leaved blackberry	Rosaceae
Rubus leucodermis	Blackcap raspberry	Rosaceae
Rubus ursinus	California blackberry	Rosaceae
Rumex acetosella	Sheep sorrel	Polygonaceae
Rumex crispus	Curly dock	Polygonaceae
Salix exigua	Narrow-leaved willow	Salicaceae
Salix gooddingii	Goodding's black willow	Salicaceae
Salix lasiolepis	Arroyo willow	Salicaceae
Salix lucida	Shining willow	Salicaceae
Sambucus mexicana	Blue elderberry	Caprifoliaceae
Saponaria officinalis	Bouncing bet	Caryophyllaceae
Scirpus acutus	Tule	Cyperaceae
Streptanthus tortuosus	Mountain jewelflower	Brassicaceae
Torilis arvensis	Hedge-parsley	Apiaceae
Toxicodendron diversilobum	Poison oak	Anacardiaceae
Tragopogon dubius	Western salsify	Asteraceae
Trichostemma lanceolatum	Vinegar weed	Lamiaceae
Trifolium arvense	Rabbitfoot clover	Fabaceae
Trifolium hirtum	Rose clover	Fabaceae
Trifolium pratense	Red clover	Fabaceae
Trifolium variegatum	White-tipped clover	Fabaceae
Trifolium willdenovii	Clover	Fabaceae
Tritelia hyacinthina	White brodiaea	Liliaceae
Verbascum blattaria	Moth mullein	Scrophulariaceae
Verbascum thapsus	Woolly mullein	Scrophulariaceae
Verbena lasiostachys	Common verbena	Verbenaceae
Vicia sativa	Vetch	Fabaceae
Vitis californica	California grape	Vitaceae

PLANT SPECIES OBSERVED AT THE ELKHORN MECHANICAL CHANNEL REHABILITATION SITE (Field Visit Dates: June 21, 2002; May 16, June 12, and July 17, 2003)		
Scientific Name	**Common Name**	**Family Name**
Acer macrophyllum	Bigleaf maple	Aceraceae
Achillea millifolium	Yarrow	Asteraceae
Achnatherum occidentalis	Needle grass	Poaceae
Agrostis exarata	Spiked bent grass	Poaceae
Aira carophyllea	Silver European hairgrass	Poaceae
Alnus rhombifolia	White alder	Betulaceae
Amelanchier alnifolia	Serviceberry	Rosaceae
Anaphalis margaritacea	Pearly everlasting	Asteraceae
Anthoxanthum odoratum	Sweet vernal grass	Poaceae
Apocynum androsaemifolium	Dogbane	Apocynaceae
Arabis drummondii	Drummond’s rock cress	Brassicaceae
Arbutus menziesii	Pacific madrone	Ericaceae
Arctostaphylos patula	Greenleaf manzanita	Ericaceae
Arctostaphylos viscida	Whiteleaf manzanita	Ericaceae
Artemisia douglasiana	Mugwort	Asteraceae
Asclepias fascicularis	Narrow-leaved milkweed	Asclepiadaceae
Asclepias speciosa	Showy milkweed	Asclepiadaceae
Asparagus officinalis ssp. officinalis	Asparagus	Liliaceae
Avena fatua	Wild oat	Poaceae
Brassica nigra	Black mustard	Brassicaceae
Brickellia californica	California brickellbush	Asteraceae
Brodiaea elegans ssp. elegans	Harvest brodiaea	Liliaceae
Bromus carinatus	California brome	Poaceae
Bromus diandrus	Ripgut grass	Poaceae
Bromus hordeaceous	Softchess	Poaceae
Bromus tectorum	Cheatgrass	Poaceae
Calochortus tolmiei	Mariposa tulip	Liliaceae
Calycadenia truncata	Rosin weed	Asteraceae
Carex barbarae	Santa Barbara sedge	Cyperaceae
Carex nudata	Torrent sedge	Cyperaceae
Castilleja spp.	Indian paint brush	Scrophulareaceae
Ceanothus cuneatus	Buck brush	Rhamnaceae
Ceanothus intergerrimus	Deer brush	Rhamnaceae
Centaurea solstitialis	Yellow star thistle	Asteraceae
Cerastium glomeratum	Mouse-ear chickweed	Caryophyllaceae
Cercis occidentalis	Redbud	Fabaceae
Cercocarpus betuloides	Birchleaf mountain mahogany	Rosaceae
Cheilanthes gracillima	Cheilanthes	Pteridaceae
Chenopodium pumilio	Tasmanian goosefoot	Chenopodiaceae
Cichorium intybus	Chicory	Asteraceae
Clarkia purpurea	Purple clarkia	Onagraceae
Claytonia perfoliata	Miner's lettuce	Portulaceae
Clematis ligusticifolia	Virgin’s bower	Ranunculaceae
Collomia heterophylla	Collomia	Polemoniaceae
Conium maculatum	Poison hemlock	Apiaceae

PLANT SPECIES OBSERVED AT THE ELKHORN MECHANICAL CHANNEL REHABILITATION SITE (Field Visit Dates: June 21, 2002; May 16, June 12, and July 17, 2003)		
Scientific Name	**Common Name**	**Family Name**
Cornus sericea	American dogwood	Cornaceae
Cryptantha milobakeri	Milo Baker's cryptantha	Boraginaceae
Cymopterus terbinthinus var. californicus	Cymopterus	Apiaceae
Cynodon dactylon	Bermuda grass	Poaceae
Cynosurus echinatus	Hedgehog dogtail	Poaceae
Dactylis glomerata	Orchard grass	Poaceae
Daucus carota	Queen Anne's lace	Apiaceae
Delphinium nudicaule	Canyon delphinium	Ranunculaceae
Deschampsia cespitosa	Tufted hairgrass	Poaceae
Dianthus armeria ssp. armeria	Grass pink	Caryophyllaceae
Dichelostemma capitatum	Blue dicks	Liliaceae
Elymus elymoides	Squirreltail	Poaceae
Elymus glaucus	Blue wild rye	Poaceae
Epilobium ciliatum	Willow herb	Onagraceae
Equisetum laevigatum	Smooth scouring rush	Equisetaceae
Eriodictyon californicum	Yerba santa	Hydrophyllaceae
Eriogonom compositum var. compositum	Wild buckwheat	Polygonaceae
Eriogonum nudum	Naked buckwheat	Polygonaceae
Eriophyllum lanatum	Woolly sunflower	Asteraceae
Eschscholzia californica	California poppy	Papaveraceae
Fraxinus latifolia	Oregon ash	Oleaceae
Galium aparine	Goose grass	Rubiaceae
Galium trifidum var. pacificum	Pacific bedstraw	Rubiaceae
Heteromeles arbutifolia	Toyon berry	Rosaceae
Heterotheca oregona	Oregon golden-aster	Asteraceae
Hieracium albiflorum	Hawkweed	Asteraceae
Holcus lanatus	Velvet grass	Poaceae
Hypericum perforatum	Klamathweed	Hypericaceae
Hypochaeris radicata	Rough cat's ears	Asteraceae
Juglans californica var. hindsii	Northern California black walnut	Juglandaceae
Lactuca serriola	Prickly lettuce	Asteraceae
Lathyrus latifolius	Perennial sweet pea	Fabaceae
Linaria genistifolia ssp. dalmatica	Dalmatian toadflax	Scrophulariaceae
Lomatium macrocarpum	Lomatium	Apiaceae
Lonicera hispidula var. vascillans	Honeysuckle	Caprifoliaceae
Lotus humistratus	Foothill lotus	Fabaceae
Lupinus albifrons	Silver bush lupine	Fabaceae
Lupinus bicolor	Bi-colored lupine	Fabaceae
Madia spp.	Tarweed	Asteraceae
Medicago polymorpha	California burclover	Fabaceae
Melilotus alba	White sweetclover	Fabaceae
Monardella sp.	Coyote-mint	Lamiaceae
Osmorhiza occidentalis	Sierran sweet-cicely	Apiaceae
Pentagramma triangularis	Goldenback fern	Pteridaceae
Petrorhagia dubia	Windmill pink	Caryophyllaceae
Phacelia hastata	Silverleaf phacelia	Hydrophyllaceae

PLANT SPECIES OBSERVED AT THE ELKHORN MECHANICAL CHANNEL REHABILITATION SITE (Field Visit Dates: June 21, 2002; May 16, June 12, and July 17, 2003)		
Scientific Name	**Common Name**	**Family Name**
Philadelphis lewisii	Wild mock orange	Philadelphaceae
Pinus ponderosa	Ponderosa pine	Pinaceae
Pinus sabiniana	Gray pine	Pinaceae
Plantago lanceolata	English plantain	Plantaginaceae
Poa bulbosa	Bulbous bluegrass	Poaceae
Poa pratensis	Kentucky bluegrass	Poaceae
Polygonum lapathifolium	Willow weed	Polygonaceae
Polypogon monspeliensis	Annual beard grass	Poaceae
Polystichum munitum	Sword fern	Dryopteridaceae
Populus balsamifera ssp. trichocarpa	Black cottonwood	Salicaceae
Prunus cerasifera	Cherry plum	Rosaceae
Pseudotsuga menziesii var. menziesii	Douglas-fir	Pinaceae
Pteridium aquilinum var. pubescens	Western bracken fern	Dennstaedtiaceae
Quercus chrysolepis	Canyon live oak	Fagaceae
Quercus garryana	Oregon white oak	Fagaceae
Quercus kelloggii	Black oak	Fagaceae
Rhus trilobata	Skunkbrush	Anacardiaceae
Ribes divaricatum	Gooseberry	Grossulariaceae
Robinia pseudoacacia	Black locust	Fabaceae
Rosa californica	California rose	Rosaceae
Rubus discolor	Himalayan blackberry	Rosaceae
Rubus leucodermis	Black cap raspberry	Rosaceae
Rubus ursinus	California blackberry	Rosaceae
Rumex crispus	Curly dock	Polygonaceae
Rumex salicifolius	Willow dock	Polygonaceae
Sagina decumbens	Pearlwort	Caryophyllaceae
Salix exigua	Narrow-leaved willow	Salicaceae
Salix lucida	Shining willow	Salicaceae
Salix melanopsis	Dusky willow	Salicaceae
Sambucus mexicana	Blue elderberry	Caprifoliaceae
Sedum spathulifolium	Pacific sedum	Crassulaceae
Silene campanulata	Bell catchfly	Caryophyllaceae
Symphoricarpus albus var. laevigatus	Snowberry	Caprifoliaceae
Torilis arvensis	Hedge-parsley	Apiaceae
Toxicodendron diversilobum	Poison oak	Anacardiaceae
Tragopogon dubius	Western salsify	Asteraceae
Trientalis latifolia	Starflower	Primulaceae
Trifolium arvense	Rabbitfoot clover	Fabaceae
Trifolium variegatum	White-tipped clover	Fabaceae
Verbascum thapsis	Wooly mullein	Scrophulareaceae
Verbena lasiostachys	Common verbena	Verbenaceae
Vicia sativa	Common vetch	Fabaceae
Vitis californica	California grape	Vitaceae

PLANT SPECIES OBSERVED AT THE VALDOR GULCH MECHANICAL CHANNEL REHABILITATION SITE (Field Visit Date: July 22 and August 19, 2002)		
SCIENTIFIC NAME	**COMMON NAME**	**FAMILY NAME**
Acer macrophyllum	Bigleaf maple	Aceraceae
Achillea millifolium	Yarrow	Asteraceae
Ailanthus altissima	Tree of heaven	Simaroubaceae
Aira carophyllea	Silver European hairgrass	Poaceae
Alisma plantago-aquatica	Water plantain	Alismataceae
Allium amplectens	Allium	Liliaceae
Alnus rhombifolia	White alder	Betulaceae
Amsinckia menziesii var. intermedia	Rancher's fireweed	Boraginaceae
Anaphalis margaritacea	Pearly everlasting	Asteraceae
Arbutus menziesii	Pacific madrone	Ericaceae
Arctostaphylos manzanita	Common manzanita	Ericaceae
Arctostaphylos viscida	Whiteleaf manzanita	Ericaceae
Artemisia douglasiana	Mugwort	Asteraceae
Asclepias fascicularis	Narrow-leaved milkweed	Asclepiadaceae
Asclepias speciosa	Showy milkweed	Asclepiadaceae
Avena fatua	Wild oat	Poaceae
Brassica nigra	Black mustard	Brassicaceae
Brickellia californica	California brickellbush	Asteraceae
Briza minor	Quaking grass	Poaceae
Brodiaea elegans	Harvest brodiaea	Liliaceae
Bromus diandrus	Ripgut grass	Poaceae
Bromus hordeaceous	Softchess	Poaceae
Bromus madritensis ssp. rubens	Red brome	Poaceae
Bromus tectorum	Cheatgrass	Poaceae
Calocedrus decurrens	Incense cedar	Cupressaceae
Calycadenia truncata	Rosin weed	Asteraceae
Camissonia contorta	Sun cup	Onagraceae
Carex nudata	Torrent sedge	Cyperaceae
Carex utriculata	Beaked sedge	Cyperaceae
Castilleja spp.	Indian paint brush	Scrophulareaceae
Ceanothus cuneatus	Buck brush	Rhamnaceae
Centaurea solstitialis	Yellow star thistle	Asteraceae
Cercis occidentalis	Redbud	Fabaceae
Cercocarpus betuloides	Birchleaf mountain mahogany	Rosaceae
Chenopodium botrys	Jerusalem oak	Chenopodiaceae
Cichorium intybus	Chicory	Asteraceae
Clarkia purpurea	Purple clarkia	Onagraceae
Claytonia perfoliata	Miner's lettuce	Portulaceae
Clematis ligusticifolia	Virgin’s bower	Ranunculaceae
Collomia heterophylla	Vari-leaf collomia	Polemoniaceae
Conium maculatum	Poison hemlock	Apiaceae
Cryptantha milobakeri	Milo Baker’s cryptantha	Boraginaceae
Cynodon dactylon	Bermuda grass	Poaceae
Cynosurus echinatus	Hedgehog dogtail	Poaceae
Cyperus eragrostis	Tall nutsedge	Cyperaceae
Cyperus strigosus	False nutsedge	Cyperaceae

PLANT SPECIES OBSERVED AT THE VALDOR GULCH MECHANICAL CHANNEL REHABILITATION SITE (Field Visit Date: July 22 and August 19, 2002)		
SCIENTIFIC NAME	**COMMON NAME**	**FAMILY NAME**
Cytisus scoparius	Scotch broom	Fabaceae
Dactylis glomerata	Orchard grass	Poaceae
Datisca glomerata	Durango root	Datiscaceae
Daucus carota	Queen Anne's lace	Apiaceae
Deschampsia cespitosa	Tufted hairgrass	Poaceae
Dianthus armeria ssp. armeria	Grass pink	Caryophyllaceae
Dichelostemma capitatum	Blue dicks	Liliaceae
Eleocharis acicularis var. acicularis	Needle spike rush	Cyperaceae
Elymus elymoides	Squirreltail	Poaceae
Elymus glaucus	Blue wild rye	Poaceae
Epilobium ciliatum	Willow herb	Onagraceae
Equisetum laevigatum	Smooth scouring rush	Equisetaceae
Eremocarpus setigerus	Dove weed	Euphorbiaceae
Eriodictyon californicum	Yerba santa	Hydrophyllaceae
Eriogonum nudum	Naked buckwheat	Polygonaceae
Eriogonum vimineum	Wicker buckwheat	Polygonaceae
Eriophyllum lanatum	Wooly sunflower	Asteraceae
Eschscholzia caespitosa	Foothill poppy	Papaveraceae
Eschscholzia californica	California poppy	Papaveraceae
Fraxinus latifolia	Oregon ash	Oleaceae
Galium trifidum var. pacificum	Pacific bedstraw	Rubiaceae
Helenium bigelovii	Bigelow's sneezeweed	Asteraceae
Heterotheca oregona	Oregon golden-aster	Asteraceae
Hypericum perforatum	Klamathweed	Hypericaceae
Hypochaeris radicata	Rough cat's ears	Asteraceae
Iris spp.	Iris cultivar	Iridaceae
Juncus bufonius	Toad rush	Juncaceae
Juncus ensifolius	Sword-leaved rush	Juncaceae
Juncus mexicanus	Mexican rush	Juncaceae
Lathyrus latifolius	Perennial sweet pea	Fabaceae
Leersia oryzoides	Rice cutgrass	Poaceae
Linaria genistifolia ssp. dalmatica	Dalmatian toadflax	Scrophulariaceae
Lotus humistratus	Foothill lotus	Fabaceae
Lotus oblongifolius	Bird's-foot trefoil	Fabaceae
Lotus purshianus var. purshianus	Spanish lotus	Fabaceae
Lupinus albifrons	Silver bush lupine	Fabaceae
Lupinus bicolor	Bi-colored lupine	Fabaceae
Lupinus succulentus	Arroyo lupine	Fabaceae
Madia spp.	Tarweed	Asteraceae
Medicago polymorpha	California burclover	Fabaceae
Melilotus alba	White sweetclover	Fabaceae
Mentha pelugium	Pennyroyal	Lamiaceae
Mentzelia laevicaulis	Blazing star	Loasaceae
Mimulus cardinalis	Scarlet monkeyflower	Scrophulariaceae
Mimulus moschatus	Musk monkeyflower	Scrophulariaceae
Osmorhiza occidentalis	Sierran sweet-cicely	Apiaceae

PLANT SPECIES OBSERVED AT THE VALDOR GULCH MECHANICAL CHANNEL REHABILITATION SITE (Field Visit Date: July 22 and August 19, 2002)		
SCIENTIFIC NAME	**COMMON NAME**	**FAMILY NAME**
Petrorhagia dubia	Windmill pink	Caryophyllaceae
Phacelia hastata	Silverleaf phacelia	Hydrophyllaceae
Phacelia imbricata	Imbricated phacelia	Hydrophyllaceae
Phalaris canariensis	Canary grass	Poaceae
Pinus ponderosa	Ponderosa pine	Pinaceae
Pinus sabiniana	Gray pine	Pinaceae
Plantago lanceolata	English plantain	Plantaginaceae
Poa bulbosa	Bulbous bluegrass	Poaceae
Polygonum lapathifolium	Willow weed	Polygonaceae
Polypogon monspeliensis	Annual beard grass	Poaceae
Polystichum munitum	Swordfern	Dryopteridaceae
Populus balsamifera ssp. trichocarpa	Black cottonwood	Salicaceae
Populus fremontii	Fremont cottonwood	Salicaceae
Potentilla glandulosa	Common cinquefoil	Rosaceae
Prunella vulgaris	Self-heal	Lamiaceae
Prunus virginiana	Western choke-cherry	Rosaceae
Pseudotsuga menziesii var. menziesii	Douglas-fir	Pinaceae
Pycnanthemum californicum	Sierra mint	Lamiaceae
Quercus chrysolepis	Canyon live oak	Fagaceae
Quercus garryana	Oregon white oak	Fagaceae
Quercus kelloggii	Black oak	Fagaceae
Rhus trilobata	Skunkbrush	Anacardiaceae
Ribes divaricatum	Gooseberry	Grossulariaceae
Robinia pseudoacacia	Black locust	Fabaceae
Rosa californica	California rose	Rosaceae
Rosa spithamea	Ground rose	Rosaceae
Rubus discolor	Himalayan blackberry	Rosaceae
Rubus ursinus	California blackberry	Rosaceae
Rumex acetosella	Sheep sorrel	Polygonaceae
Sagina decumbens ssp. occidentalis	Western pearlwort	Caryophyllaceae
Salix exigua	Narrow-leaved willow	Salicaceae
Salix gooddingii	Goodding's black willow	Salicaceae
Salix lasiolepis	Arroyo willow	Salicaceae
Salix lucida	Shining willow	Salicaceae
Sambucus mexicana	Blue elderberry	Caprifoliaceae
Saponaria officinalis	Bouncing bet	Caryophyllaceae
Scirpus acutus	Tule	Cyperaceae
Scirpus microcarpus	Small-fruited bulrush	Cyperaceae
Scutellaria siphocampyloides	Narrowleaf skullcap	Lamiaceae
Stachys ajugoides	Hedge nettle	Lamiaceae
Symphoricarpos albus var. laevigatus	Snowberry	Caprifoliaceae
Thysanoacarpus curvipes	Fringepod	Brassicaceae
Torilis arvensis	Hedge-parsley	Apiaceae
Toxicodendron diversilobum	Poison oak	Anacardiaceae
Tragopogon dubius	Western salsify	Asteraceae
Trifolium arvense	Rabbitfoot clover	Fabaceae

PLANT SPECIES OBSERVED AT THE VALDOR GULCH MECHANICAL CHANNEL REHABILITATION SITE (Field Visit Date: July 22 and August 19, 2002)		
SCIENTIFIC NAME	**COMMON NAME**	**FAMILY NAME**
Trifolium hirtum	Rose clover	Fabaceae
Trifolium willdenovii	Clover	Fabaceae
Tritelia hyacinthina	White brodiaea	Liliaceae
Typha angustifolia	Narrow-leaved cattail	Typhaceae
Verbascum thapsus	Woolly mullein	Scrophulariaceae
Verbena lasiostachys	Common verbena	Verbenaceae
Veronica anagallis-aquatica	Water speedwell	Scrophulariaceae
Veronica peregrina ssp. xalapensis	Purslane speedwell	Scrophulariaceae
Vitis californica	California grape	Vitaceae
Xanthium strumarium	Cocklebur	Asteraceae

PLANT SPECIES OBSERVED AT THE PEAR TREE MECHANICAL CHANNEL REHABILITATION SITE (Field Visit Dates: July 15, 2002; May 16, June 12, and July 22, 2003)		
SCIENTIFIC NAME	**COMMON NAME**	**FAMILY NAME**
Aira carophyllea	Silver European hairgrass	Poaceae
Alnus rhombifolia	White alder	Betulaceae
Arbutus menziesii	Pacific madrone	Ericaceae
Arctostaphylos manzanita	Common manzanita	Ericaceae
Artemisia douglasiana	Mugwort	Asteraceae
Asclepias fascicularis	Narrow-leaved milkweed	Asclepiadaceae
Asclepias speciosa	Showy milkweed	Asclepiadaceae
Avena fatua	Wild oat	Poaceae
Brassica nigra	Black mustard	Brassicaceae
Brickellia californica	California brickellbush	Asteraceae
Briza minor	Quaking grass	Poaceae
Brodiaea elegans	Harvest brodiaea	Liliaceae
Bromus diandrus	Ripgut grass	Poaceae
Bromus hordeaceus	Softchess	Poaceae
Bromus tectorum	Cheatgrass	Poaceae
Calycadenia truncata	Rosin weed	Asteraceae
Carex nudata	Torrent sedge	Cyperaceae
Ceanothus cuneatus	Buck brush	Rhamnaceae
Ceanothus intergerrimus	Deer brush	Rhamnaceae
Centaurea solstitialis	Yellow star thistle	Asteraceae
Cercis occidentalis	Redbud	Fabaceae
Cercocarpus betuloides var. betuloides	Birch-leaf mountain-mahogany	Rosaceae
Chamaesyce maculata	Spotted spurge	Euphorbiaceae
Clarkia purpurea	Purple clarkia	Onagraceae
Conium maculatum	Poison hemlock	Apiaceae
Cynodon dactylon	Bermuda grass	Poaceae
Cynosurus echinatus	Hedgehog dogtail	Poaceae
Dactylis glomerata	Orchard grass	Poaceae
Daucus carota	Queen Anne's lace	Apiaceae
Daucus pusillus	Rattlesnake weed	Apiaceae
Dichelostemma multiflorum	Wild hyacinth	Liliaceae
Elymus glaucus	Blue wild rye	Poaceae
Epilobium ciliatum	Willow herb	Onagraceae
Equisetum laevigatum	Smooth scouring rush	Equisetaceae
Eremocarpus setigerus	Dove weed	Euphorbiaceae
Eriogonum nudum	Naked buckwheat	Polygonaceae
Eriogonum vimineum	Wicker buckwheat	Polygonaceae
Eriophyllum lanatum	Woolly sunflower	Asteraceae
Erodium botrys	Filaree	Geraniaceae
Fraxinus latifolia	Oregon ash	Oleaceae
Heterotheca oregona	Oregon golden-aster	Asteraceae
Holchus lanatus	Velvet grass	Poaceae
Hypericum perforatum	Klamathweed	Hypericaceae
Hypochaeris radicata	Rough cat's ears	Asteraceae

PLANT SPECIES OBSERVED AT THE PEAR TREE MECHANICAL CHANNEL REHABILITATION SITE (Field Visit Dates: July 15, 2002; May 16, June 12, and July 22, 2003)		
SCIENTIFIC NAME	**COMMON NAME**	**FAMILY NAME**
Keckiella lemmonii	Lemmon’s keckiella	Scrophulariaceae
Lactuca serriola	Prickly lettuce	Asteraceae
Linaria genistifolia ssp. dalmatica	Dalmatian toadflax	Scrophulariaceae
Lotus oblongifolius	Bird’s-foot trefoil	Fabaceae
Lotus purshianus var. purshianus	Spanish lotus	Fabaceae
Lupinus albifrons	Silver bush lupine	Fabaceae
Lupinus bicolor	Bi-colored lupine	Fabaceae
Lupinus microcarpus	Chick lupine	Fabaceae
Medicago polymorpha	California burclover	Fabaceae
Melilotus alba	White sweetclover	Fabaceae
Mentzelia laevicaulis	Blazing star	Loasaceae
Monardella villosa	Coyote-mint	Lamiaceae
Pellaea mucronata	Bird's-foot fern	Pteridaceae
Petrorhagia dubia	Windmill pink	Caryophyllaceae
Phacelia hastata	Silverleaf phacelia	Hydrophyllaceae
Pinus ponderosa	Ponderosa pine	Pinaceae
Pinus sabiniana	Gray pine	Pinaceae
Plantago lanceolata	English plantain	Plantaginaceae
Poa bulbosa	Bulbous bluegrass	Poaceae
Polygonum lapathifolium	Willow weed	Polygonaceae
Polystichum munitum	Swordfern	Dryopteridaceae
Pseudotsuga menziesii var. menziesii	Douglas-fir	Pinaceae
Quercus chrysolepis	Canyon live oak	Fagaceae
Quercus kelloggii	Black oak	Fagaceae
Rubus discolor	Himalayan blackberry	Rosaceae
Rubus ursinus	California blackberry	Rosaceae
Rumex crispus	Curly dock	Polygonaceae
Salix exigua	Narrow-leaved willow	Salicaceae
Salix lasiolepis	Arroyo willow	Salicaceae
Salix lucida	Shining willow	Salicaceae
Saponaria officinalis	Bouncing bet	Caryophyllaceae
Torilis arvensis	Hedge-parsley	Apiaceae
Toxicodendron diversilobum	Poison oak	Anacardiaceae
Trifolium arvense	Rabbitfoot clover	Fabaceae
Trifolium hirtum	Rose clover	Fabaceae
Trifolium willdenovii	Clover	Fabaceae
Verbascum thapsus	Woolly mullein	Scrophulariaceae
Vitis californica	California grape	Vitaceae

Federal or State Listed Species

Trinity Bristle Snail (*Monadenia setosa*). Federal status: Species of Concern; State Status: Threatened. The Trinity bristle snail lives in or near riparian corridors. Here, the snail is restricted to moist but well-drained, well-shaded canyon slopes or streamside benches covered with a layer of leaf litter. They feed on lichens, the petioles of violets, and the stalks of plants. The Trinity bristle snail is found only in the southern Klamath Mountains and appears to be sparsely distributed within this limited range. Suitable habitat for the Trinity bristle snail was not detected in work areas adjacent to the river, the species was not detected in a 2002 survey, and there have been no incidental observations.

American Peregrine Falcon (*Falco peregrinus anatum*). Federal status: Delisted; State status: Endangered, Fully Protected. The peregrine falcon is known as one of the fastest flying birds of prey, preying almost entirely on birds that they kill while in flight. These falcons nest primarily on high cliffs. However, they will also use human-made structures for nesting and occasionally tree cavities or the old nests of other raptors. Intensive efforts to protect peregrine falcons were initiated by biologists from the Santa Cruz Predatory Bird Research Group in 1975. These efforts led to over 120 pairs of peregrine falcons by 1992 (Thelander and Crabtree 1994). The USFWS removed the American peregrine falcon from the endangered species list in 1999, but the State of California has yet to do so.

In California, American peregrine falcons are known to nest along the coast north of Santa Barbara, the northern Coast and Cascade ranges, and the Sierra Nevada. During winter and periods of migration, they can be found throughout most of the state. However, they are most likely to be encountered near wetland or aquatic habitats. The sites lack nesting habitat for this species, however they may occur as foragers.

Bald Eagle (*Haliaeetus leucocephalus*). Federal status: Threatened (Proposed for Delisting); State status: Endangered. The bald eagle is a large soaring bird, second in size only to the California condor (*Gymnogyps californianus*) in North America. Most of the annual food requirements of a bald eagle is derived from or obtained around aquatic habitats. The type of food consumed most often consists of fish, water birds, and small to medium-sized mammals. Because of the dietary association, nesting territories are usually found near water. Perches are used primarily during the day for resting, preening, and hunting, and may include human-made structures such as power poles. Roosting areas contain a night communal roosting tree that is easily accessible to the large birds and tall enough to provide safety from threats from the ground. Bald eagle nests and roosts are usually found where human activity is infrequent and/or muted.

In California, breeding bald eagles are found mostly in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity counties (California Department of Fish and Game 2002). Bald eagles are not expected to nest at any of the sites due to the level of human disturbance. However, they may forage in the area.

Northern Spotted Owl (*Strix occidentalis caurina*). Federal status: Threatened; State status: None. Northern spotted owls prefer old-growth forest or forests with old growth characteristics. Preferred characteristics include a multi-story, multi-species, moderate to dense canopy dominated by large trees with a high incidence of cavities or broken tops for nesting, an accumulation of woody debris on the ground, and sufficient open space below the canopy for flight. Spotted owls subsist on a diet of small mammals, birds, amphibians, reptiles and insects. In California, the range of the northern spotted owl extends from the Coast Ranges to San Francisco Bay.

Little Willow Flycatcher (*Empidonax traillii brewsteri*). Federal status: Species of Concern; State status: Endangered. The little willow flycatcher is one of five subspecies of the willow flycatcher. It breeds in California from Tulare County north, along the western side of the Sierra Nevada and Cascades, extending to the coast in northern California (Craig and Williams 1998). In California, the little willow flycatcher it is a rare to locally uncommon summer resident in wet meadows and montane riparian habitats from 2,000-8,000 feet in elevation and a common spring and fall migrant at lower elevations, primarily in riparian habitats, throughout the state exclusive of the North coast (Zeiner et al. 1990b). This subspecies nests in dense riparian thickets and forages on insects, berries, and seeds. Suitable montane riparian habitat for the little willow flycatcher is present within all four sites, and willow flycatchers were detected in the Valdor Gulch site during 2003 (Miller, Ralph, and Herrera 2003). However, nests were not detected and breeding activity has not been confirmed. It is currently assumed that the observed birds were migrants.

California Wolverine (*Gulo gulo luteus*). Federal status: Species of Concern; State status: Threatened. The California wolverine is found in a variety of habitat types between 1,600 and 14,200 ft. However, habitat generally consists of open terrain above the timberline. They prefer areas with little human disturbance for denning, using caves, hollow logs, and cavities in cliffs and under rocks. California wolverines are both predators and scavengers, feeding on mammals, birds, and insects as well as foraging for berries. In California wolverines occur in the North Coast mountains and Sierra Nevada. Denning would not likely occur at the sites due to the moderate number of human residences. However, wolverines may on rare occasions utilize the Trinity River within the project areas as a travel corridor.

Pacific Fisher (*Martes pennanti pacifica*). Federal listing status: Candidate; State listing status: Species of Special Concern; BLM status: Sensitive. In California, fishers primarily inhabit mixed conifer forests composed of Douglas-fir and associated conifers, although they also are encountered frequently in higher elevation, fir and pine forests, and mixed evergreen/broad leaf forest. Fishers den in cavities near the tops of large trees, in hollow logs, and in crevices in rock outcrops and talus. Suitable habitat for the Pacific fisher occurs within all four sites and several occurrences have been recorded within 5 miles of the project area (California Department of Fish and Game 2005).

OTHER SPECIAL-STATUS SPECIES

Foothill yellow-legged frog (*Rana boylii*). Federal status: Species of Concern; State status: Species of Special Concern; BLM status: Sensitive. The foothill yellow-legged frog is found in or near rocky streams in a variety of habitats, including valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadow types. Adults often bask on exposed rock surfaces near streams. During periods of inactivity, especially during cold weather, individuals seek cover under rocks in the streams or on shore within a few meters of water. Unlike most other ranid frogs in California, this species is rarely encountered (even on rainy nights) far from permanent water. Tadpoles require water for at least three or four months while completing their aquatic development.

The species occurs in the Coast Ranges from the Oregon border south to the Transverse Mountains, in most of northern California west of the Cascade crest, and along the western flank of the Sierra south to Kern County. The riverine and riparian habitat within all four sites provides suitable habitat for the foothill yellow-legged frog. The species is known to occur in the Trinity River from Lewiston Dam to the north fork of the river (California Department of Fish and Game 2005), and it was detected at all four sites during surveys in 2003 (Welsh, Ashton, and Bettaso

2003). Further, evidence of breeding (egg masses) was found at the Conner Creek, Valdor Gulch, and Pear Tree Gulch sites (Welsh, Ashton, and Bettaso 2003).

Tailed Frog (*Ascaphus truei*). Federal status: Species of Concern; State status: Species of Special Concern. The tailed frog is found in perennial streams of low temperature in steep-walled valleys with conifer-dominated habitat. They are most often found in mature or old growth forests. Their elevational range extends from near sea level to 6,500 feet. Adults feed on both aquatic and terrestrial larval and adult insects, other arthropods, and snails. Tadpoles feed primarily on diatoms. Suitable habitat occurs in the project area, however, the species was not detected during surveys in 2003 (Welsh, Ashton, and Bettaso 2003).

Northwestern Pond Turtle (*Clemmys marmorata marmorata*). Federal status: None; State status: Species of Special Concern. The northwestern pond turtle occurs in a variety of riverine and wetland habitats. Pond turtles require basking sites, such as partially submerged logs, rocks, mats of floating vegetation, and open mud banks, but turtles slip from basking sites to underwater retreats at the approach of humans or potential predators. In colder areas, the turtles hibernate underwater in bottom mud (Zeiner et al. 1990c). This species is known to travel large distances upland for nesting and overwintering.

Today, the northwestern pond turtle occurs in 90 percent of its historic range in the Central Valley and west of the Sierra Nevada mountains but in greatly reduced numbers (Jennings and Hayes 1994). It occurs from the Oregon border south to the American River basin in the Central Valley, where it intergrades with the southwestern pond turtle (*Clemmys marmorata pallida*). The riverine and riparian habitat within all four sites provide suitable habitat for the species, and it was detected in the Conner Creek, Valdor Gulch, and Pear Tree Gulch sites during surveys in 2003 (Welsh, Ashton, and Bettaso 2003).

Black Swift (*Cypseloides niger*). Federal status: Species of Concern; State status: Species of Special Concern. In northern California, the black swift breeds only locally in the Sierra Nevada and Cascade Range. They nest in moist crevices or in caves on cliffs above the surf or near waterfalls. The black swift feeds exclusively on insects and forages over many habitats. Suitable nesting habitat for this species is absent from the project area; however, the species may forage over the sites during migration.

California Yellow Warbler (*Dendroica petechia*). Federal status: None; State status: Species of Special Concern. The yellow warbler is usually found in dense riparian deciduous habitats with cottonwoods, willows, alders, and other small trees and shrubs typical of open-canopy riparian woodlands. Forage patterns usually involve gleaning and hovering for insects and spiders. The yellow warbler occurs as a summer resident in northern California, however, the number of breeding pairs in the Sacramento Valley has declined dramatically in recent decades. The riparian habitat within all four sites provides suitable nesting and foraging habitat for this species and yellow warblers were detected at all four sites during the 2003 surveys (Miller, Ralph, and Herrera 2003).

Cooper's Hawk (*Accipiter cooperii*). Federal status: None; State status: Species of Special Concern. Cooper’s hawks prefer landscapes where wooded areas occur in patches and groves, which facilitate the ambush hunting tactics employed by this species. It preys upon medium-sized birds (e.g., jays, doves, and quail) and occasionally takes small mammals and reptiles. Breeding pairs in California prefer nest sites within dense stands of live oak woodland or riparian areas, and prey heavily on young birds during the nesting season. Cooper’s hawks are breeding residents throughout most of the wooded areas in California, but populations have declined in recent decades. Suitable nesting and foraging habitat for the Cooper’s hawk is present within all four sites.

Golden Eagle (*Aquila chrysaetos*). Federal status: None; State status: Species of Special Concern, Fully Protected. Golden eagles are most common in rugged, open country bisected by canyons where there are ample nesting sites and food. Golden eagles nest on cliffs of all sizes or in the tops of large trees. The nests are very large stick nests, sometimes exceeding 10 ft across (Zeiner et al. 1990b). The species forages on rabbits and larger rodents, but may also take birds and reptiles; some also feed on carrion. The golden eagle is a rare permanent resident or migrant throughout California but is more common in the foothills surrounding the Sierra Nevada and Coast Ranges and in the southern California deserts. Suitable nesting habitat for this species is not present within the sites. However, the species may occur on the sites as a forager.

Merlin (*Falco columbarius*). Federal listing status: None; State status; Species of Special Concern. The merlin is a small falcon that preys mostly on birds that it catches while in flight. The species frequents open habitats at low elevations near water and stands of trees. Merlins do not breed in California. However, they do occur uncommonly throughout most of the state as a winter migrant, and may forage at all four sites.

Northern Goshawk (*Accipiter gentiles*). Federal status: Species of Concern; State status: Species of Special Concern. The northern goshawk is found in dense, mature conifer and deciduous forests, interspersed with openings and riparian habitat. Nests are typically constructed on north-facing slopes near water. They prey mainly on birds and small mammals. In California, northern goshawks breed in the North Coast Ranges through Sierra Nevada, Klamath, Cascade, and Warner Mountains. Suitable breeding and foraging habitat for this species occurs within all four sites.

Osprey (*Pandion haliaetus*). Federal status: None; State status: Species of Special Concern. The osprey is associated with large, fish-bearing waters, primarily in ponderosa pine through mixed conifer habitats. It requires open, clear waters for foraging; it uses rivers, lakes, reservoirs, bays, estuaries, and surf zones. Large trees, snags, and dead-topped trees in open forest habitats are used for cover and nesting. The osprey breeds in northern California from the Cascade Range south to Lake Tahoe, and along the coast south to Marin County. Regular breeding sites include Shasta Lake, Eagle Lake, Lake Almanor, other inland lakes and reservoirs, and northwest river systems. Suitable nesting and foraging habitat for the osprey is present at all four sites, and the species was detected at the Conner Creek site during 2003 surveys (Miller, Ralph, and Herrera 2003). However, no nests are known to occur in the area.

Sharp-shinned Hawk (*Accipiter striatus*). Federal status: None; State status: Species of Special Concern. The sharp-shinned hawk is commonly found in dense woodland or riparian habitats bordering open areas. Sharp-shinned hawks typically pursue small birds in semi-open country, at the edges of open woodlands, in clearings, and along hedgerows, shorelines, or passerine migration corridors. Nest sites are usually near a water source and located in dense stands of even-aged trees on north-facing slopes. It is a fairly common migrant and winter resident throughout California, but is less common as a breeder. Suitable nesting and foraging habitat for the sharp-shinned hawk is present within all four sites.

Vaux's Swift (*Chaetura vauxi*). Federal status: Species of Concern; State status: Species of Special Concern. Vaux's swift is a summer resident of northern California that forages over most terrains and habitats, commonly at lower levels in forest openings, above burns, and above rivers. The species roosts in hollow trees and snags and occasionally in chimneys and buildings. Suitable nesting (e.g. Douglas-fir) and foraging habitat for this species is present within all four project sites.

Yellow-Breasted Chat (*Icteria virens*). Federal status: None; State status: Species of Special Concern. The yellow-breasted chat is an uncommon Neotropical migrant that occurs in riparian or marsh habitats throughout California. Yellow-breasted chats are found in valley foothill riparian habitat with thickets of dense willow and brushy tangles near watercourses. Foraging patterns usually involve gleaning insects, spiders, and berries from the foliage of shrubs and low trees. Nests are often in dense shrubs along streams. Yellow-breasted chats occur as summer breeding residents along the Sacramento River and its tributaries. The riparian habitat within all four sites provides suitable nesting and foraging habitat for this species, and the species was observed in all four sites during 2003 surveys (Miller, Ralph, and Herrera 2003).

Long-eared Myotis (*Myotis thysanodes*). Federal status: Species of Concern; State status: None; BLM status: Sensitive. The long-eared myotis occurs in a variety of brush, woodland, and forested habitats from sea level to at least 9000 ft. It forages for a variety of arthropods in open habitats, along habitat edges, and over water. Long-eared myotis bats roost singly or in small groups in buildings, crevices, under bark, and in snags. In California, the species is widespread but avoids the Central Valley and hot deserts. Suitable roosting and foraging habitat for the long-eared myotis is present at all four sites.

Ring-tailed Cat (*Bassariscus astutus*). Federal status: None; State status: Fully Protected Species. The ringtail is widely distributed in California, occurring in various riparian habitats and brush stands of most forest and shrub habitats. Nocturnal and primarily carnivorous, ringtails mainly eat small mammals but also feed on birds, reptiles, insects, and fruit. They forage on the ground, among rocks, and in trees, usually near water. Hollow trees and logs, cavities in rocky areas, and other recesses are used for cover. The montane riparian habitat within the sites provides suitable nesting and foraging habitat for this species.

Pallid Bat (*Antrozous pallidus)*. Federal listing status: None; State listing status: Species of Special Concern; USFS status: Sensitive. This medium-sized bat occurs throughout much of California. It prefers foraging on terrestrial arthropods in dry open grasslands near water and rocky outcroppings or old structures. It may also occur in oak woodlands and at the edge of redwood forests along the coast. Roosting typically occurs in groups. Roosts often occur in caves and mine tunnels but buildings and trees may be used for day roosts. More open, sites such as buildings, porches, garages, highway bridges, and mines may be used for night roosts. Pallid bats are sensitive to human disturbances at roost sites. Suitable roosting and foraging habitat is present within the project area.

Townsend's Western Big-eared Bat (*Corynorhinus townsendii*). Federal listing status: Species of Concern; State listing status: Species of Special Concern; BLM status: Sensitive. The Townsend's western big-eared bat is found in a variety of habitats. It captures its prey, principally small moths, while in flight as well as gleaning them from foliage. The pale Townsend's big-eared bat is a colonial species, and females aggregate in the spring at nursery sites known as maternity colonies. Although this species is usually cave-dwelling, many colonies are found in human-made structures, such as the attics of buildings or old abandoned mines. It is easily disturbed while roosting in buildings, and females are known to completely abandon their young when disturbed. The sites do not contain suitable roosting habitat for this species, however they may forage in the project area.

Yuma Myotis (*Myotis yumanensis*). Federal status: Species of Concern; State status: None; BLM status: Sensitive. The Yuma myotis is found in a wide variety of habitats from sea level to 11,000 ft; however, it prefers open woodlands and forests near water. It forages for insects over water sources and roosts in buildings, mines, caves, crevices, abandoned swallow nests, and under bridges. Yuma myotis are widespread throughout California. The sites do not contain suitable roosting habitat for this species, however they may forage in the project area.

Photo 1a. SR 299 - Upstream Unit.
View from SR 299, looking southwest across river.

Photo 1b. SR 299 - Upstream Unit.
View from SR 299, looking northwest towards river.

Photo 2a. McCartney's Pond Unit.
View from SR 299, looking southwest towards U-2.

Photo 2b. McCartney's Pond Unit.
View from SR 299, looking north towards pond.

Appendix M

Visual Assessment Unit (VAU) & Key Observation Point (KOP) Photographs

Photo 3a. McCartney's Pond Unit.
View from SR 299, looking
southwest across river.

Photo 3b. McCartney's Pond Unit.
View from SR 299, looking upstream.

Photo 4a. SR 299 - Downstream Unit.
View from SR 299, looking upstream.

Photo 4b. SR 299 - Downstream Unit.
View from SR 299, looking northwest
along right bank.

Appendix M
Visual Assessment Unit (VAU) & Key Observation Point (KOP) Photographs

Photo 5a. SR 299 - Downstream Unit.
View from Red Hill Road, looking east across river.

Photo 5b. SR 299 - Downstream Unit.
View from Red Hill Road, looking southeast across river towards McCartney's Pond and U-2.

Photo 6a. River Acres Unit.
View from Acorn Road, looking upstream.

Photo 6b. River Acres Unit.
View from Acorn Road, looking south across river.

R:Projects/10010 - Mechanical Channel Rehab Sites on Mainstem Trinity River/Canyon Creek Sites/Project/Graphics/Figure 3.14-3c_VAU_photos.ai 11-14-05 RJ

Appendix M

Visual Assessment Unit (VAU) & Key Observation Point (KOP) Photographs

Photo 6c. River Acres Unit.
View from Acorn Road, looking downstream.

Photo 7. River Acres Unit.
View from Valdor Lane, looking towards river.

Photo 8. River Acres Unit.
View from junction of Valdor Lane and SR 299, looking south towards the river.

Photo 9. River Acres Unit.
Representative view from homes bordering river.

R:Projects/10010 - Mechanical Channel Rehab Sites on Mainstem Trinity River/Canyon Creek Sites/Project/Graphics/Figure 3.14-3d_VAU_photos.ai 11-14-05 RJ

Appendix M
Visual Assessment Unit (VAU) & Key Observation Point (KOP) Photographs

Photo 10a. Acorn Lane Unit.
View from Bigfoot Campground, looking south towards river.

Photo 10b. Acorn Lane Unit.
View from Bigfoot Campground, looking west towards tailings pile.

Photo 11. Acorn Lane Unit.
View from Bigfoot campground, looking west towards tailings.

Photo 12. Cooper's Bar Unit.
View from SR 299, looking upstream towards R-2, R-4, R-5, R-8, and R-9.

R:Projects/10010 - Mechanical Channel Rehab Sites on Mainstem Trinity River/Canyon Creek Sites/Project/Graphics/Figure 3.14-3e_VAU_photos.ai 11-14-05 RJ

Appendix M

Visual Assessment Unit (VAU) & Key Observation Point (KOP) Photographs

Photo 13a. Cooper's Bar Unit.
View from SR 299, looking north.

Photo 13b. Cooper's Bar Unit.
View from SR 299, looking west.

Photo 14a. Cooper's Bar Unit.
View from Cooper's Bar (R-5), looking northwest.

Photo 14b. Cooper's Bar Unit.
View from Cooper's Bar (R-5), looking west.

R:Projects/10010 - Mechanical Channel Rehab Sites on Mainstem Trinity River/Canyon Creek Sites/Project/Graphics/Figure 3.14-3f_VAU_photos.ai 11-14-05 RJ

Photo 14c. Cooper's Bar Unit.
View from Cooper's Bar (R-5), looking east.

Photo 15a. Cooper's Bar Unit.
Representative view of Cooper's Bar area from adjacent homes.

Photo 15b. Cooper's Bar Unit.
View of Cooper's Bar area from adjacent private property.

Photo 16. Chimariko Road Upstream Unit.
View from Chimariko Road looking northeast.

R:Projects/10010 - Mechanical Channel Rehab Sites on Mainstem Trinity River/Canyon Creek Sites/Project/Graphics/Figure 3.14-3g_VAU_photos.ai 11-14-05 RJ

Photo 17a. Lime Point Unit.
View from Lime Point Road,
looking south.

Photo 17b. Lime Point Unit.
View from Lime Point Road, looking
west towards river.

Photo 17c. Lime Point Unit.
View from Lime Point Road, looking
north along right bank.

Photo 18a. Lime Point Unit.
View from Lime Point Road, looking
west towards river.

Photo 18b. Lime Point Unit.
View From Lime Point Road, looking southeast towards R-7.

Photo 19a. Chimariko Road Downstream Unit.
Looking northeast towards river and R-2.

Photo 19b. Chimariko Road Downstream Unit.
Looking southeast along left bank towards R-1 and R-2.

Photo 19c. Chimariko Road Downstream Unit
Looking northwest along left bank.

R:Projects/10010 - Mechanical Channel Rehab Sites on Mainstem Trinity River/Canyon Creek Sites/Project/Graphics/Figure 3.14-3i_VAU_photos.ai 11-14-05 RJ

Appendix M
Visual Assessment Unit (VAU) & Key Observation Point (KOP) Photographs

Photo 20a. Chimariko Road Downstream Unit.
Looking southwest from Trinity Canyon
Lodge picnic area towards R-4, R-5 and U-1.

Photo 20b. Chimariko Road Downstream Unit.
Looking west from Trinity Canyon
Lodge picnic area towards R-5.

Photo 21a. Chimariko Road Downstream Unit.
Looking north towards river.

Photo 21b. Chimariko Road Downstream Unit.
Looking west along left bank.

R:Projects/10010 - Mechanical Channel Rehab Sites on Mainstem Trinity River/Canyon Creek Sites/Project/Graphics/Figure 3.14-3j_VAU_photos.ai 11-14-05 RJ

Appendix M
Visual Assessment Unit (VAU) & Key Observation Point (KOP) Photographs

Photo 22a. Chimariko Road Downstream Unit.
View from SR 299, looking south towards river.

Photo 22b. Chimariko Road Downstream Unit.
View from SR 299, looking downstream.

Photo 22c. Chimariko Road Downstream Unit.
View from SR 299, looking upstream.

Photo 23a. Fly fishing Upstream Unit.
View from SR 299, looking downstream
along right bank.

R:Projects/10010 - Mechanical Channel Rehab Sites on Mainstem Trinity River/Canyon Creek Sites/Project/Graphics/Figure 3.14-3K_VAU_photos.ai 11-14-05 RJ

Photo 23b. Fly fishing Upstream Unit.
View from SR 299, looking south
towards river.

Photo 23c. Fly fishing Upstream Unit.
View from SR 299, looking
upstream along right bank.

Photo 24a. Fly fishing Downstream Unit.
View from SR 299, looking upstream
towards R-3 and U-1.

Photo 24b. Fly fishing Downstream Unit.
View from SR 299, looking south
towards R-1, R-3 and U-1.

Appendix M

Visual Assessment Unit (VAU) & Key Observation Point (KOP) Photographs

Photo 24c. Fly fishing Downstream Unit.
View from SR 299, looking downstream
towards U-1.

Photo 25a. Fly fishing Downstream Unit.
View from SR 299, looking
upstream along right bank.

Photo 25b. Fly fishing Downstream Unit.
View from SR 299, looking southwest
at river.

Photo 26. McCartney's Pond Unit.
View looking east across river.

R:Projects/10010 - Mechanical Channel Rehab Sites on Mainstem Trinity River/Canyon Creek Sites/Project/Graphics/Figure 3.14-3m_VAU_photos.ai 11-14-05 RJ

Appendix M
Visual Assessment Unit (VAU) & Key Observation Point (KOP) Photographs

Photo 27. River Acres Unit.
Representative view from homes bordering river.