Vegetation, Wildlife, and Wetland Resources

Appendix C

Trinity River Mainstem
Fishery Restoration

October 1999

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Appendix C

1.0 VEGETATION, WILDLIFE, AND WETLAND RESOURCES

The operation of the Trinity River Division (TRD) has had direct effects on a variety of vegetation, wildlife, and wetland resources adjacent to the Trinity River, as well as on reservoir environments in the Trinity River Basin and the Central Valley. As described in the Geomorphic Environment section, geomorphic processes, including amount and timing of flows between year variability of hydrology and sediment movement throughout the system, contributed significantly to the vegetation, wildlife, and wetland resources that existed under pre-dam conditions. Changes in those geomorphic processes accompanying the operation of the TRD have resulted in changes in vegetation, wildlife, and wetland resources creating current conditions.

This section describes these resources and the potential effects of the alternatives on them based on existing information; no special surveys were conducted to assess presence or absence of plant and wildlife species. Tables C-1A, C-1B, and C-1C provide a summary of the impacts (compared to No Action) to vegetation, wildlife, and wetlands associated with each alternative.

Vegetation and wildlife resource categories were identified during the joint National Environmental Policy Act/California Environmental Quality Act (NEPA/CEQA) scoping meetings, as well as by public agencies that manage these resources within the Trinity River Basin, the Central Valley, and the Lower Klamath River Basin/Coastal Area. These resource categories are riparian vegetation, wetlands, and associated special-status species.

1.1 VEGETATION

1.1.1 Affected Environment

1.1.1.1 Trinity River Basin

Prior to dam construction the natural hydrograph of the Trinity River was characterized by high winter flows and spring flows followed by greatly reduced summer flows (with great inter-year variability). Large winter and spring floods maintained multi-age woody riparian vegetation through channel scouring and periodic channel migration. The pre-dam high water flows moved rocks through the channelbed, scouring recently established vegetation off gravel bars and distributing seeds over the entire floodplain as flows decreased. Fine sediments were flushed through the system and deposited on the upper floodplains. The result was a mosaic of early-successional (a relatively young vegetation community) willow-scrub vegetation combined with patches of more mature willow-alder and alder-dominated

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Table C-1A
Vegetation Impacts Compared to the No Action Alternative

Attribute	No Action	Maximum Flow	Flow Evaluation	Percent Inflow	Mechanical Restoration	State Permit
Overall ranking of riparian health (derived from the Geomorphic Environment section)	5	1 (Best)	2	3	4	6 (Worst)
Riparian community with all stages of successional development	Continued degradation compared to pre-dam condition	Substantial improvement	Improvement	Slight improvement	Same as No Action	Additional degradation
No loss of riparian habitat following channel migration	No channel migration	Substantial improvement	Improvement	Slight improvement	Same as No Action	Additional degradation
Discourage riparian plant germination on alternate bars by inundation during seed dispersion	Some inundation of alternate bars during seed dispersion	Improvement	Improvement	Substantial improvement	Slight improvement	Additional degradation
Lower rates of riparian encroachment by scouring shallow-rooted 1- to 2-year old seedlings	Continued degradation compared to pre-dam condition	Substantial improvement	Substantial improvement	Improvement	Slight improvement	Additional degradation
Re-establishment of dynamic riparian plant stands in various stages of succession on higher elevations of alternate bars	Continued degradation compared to pre-dam condition	Improvement	Substantial improvement	Slight improvement	Same as No Action	Additional degradation
Mortality of 3- to 4-year old saplings on alternate bar surfaces to discourage riparian plant encroachment and berm formation	Continued degradation compared to pre-dam condition	Improvement	Substantial improvement	Slight improvement	Same as No Action	Additional degradation
Reduce riparian berm establishment to improve channel dynamics	Continued degradation compared to pre-dam condition	Substantial improvement	Improvement	Slight improvement	Same as No Action	Additional degradation

Table C-1A
Vegetation Impacts Compared to the No Action Alternative

Attribute	No Action	Maximum Flow	Flow Evaluation	Percent Inflow	Mechanical Restoration	State Permit
Multi-age class structure in stands of cottonwood and other species dependent on channel migration	Continued degradation compared to pre-dam condition	Substantial improvement	Improvement	Slight improvement	Same as No Action	Additional degradation
Periodic elimination of mature vegetation along channel	Continued degradation compared to pre-dam condition	Substantial improvement	Improvement	Slight improvement	Same as No Action	Additional degradation
Control populations of 3- to 4-year old saplings on alternate bar surfaces close to channel center, and scour stands of mature riparian vegetation	Continued degradation compared to pre-dam condition	Substantial improvement	Improvement	Slight improvement	Slight improvement	Additional degradation
Convert mature, less productive riparian habitats to highly productive, early-successional stages	Continued degradation compared to pre-dam condition	Substantial improvement	Improvement	Slight improvement	Slight improvement	Additional degradation
Increase woody riparian overstory and understory species diversity	Continued degradation compared to pre-dam condition	Substantial improvement	Improvement	Slight improvement	Slight improvement	Additional degradation
Promote rehabilitation of channel dynamics	Continued degradation compared to pre-dam condition	Substantial improvement	Improvement	Slight improvement	Slight improvement	Additional degradation
High diversity of habitat types within the entire river corridor	Some inundation of wetland areas on floodplain	Substantial improvement	Improvement	Improvement	Slight improvement	Additional degradation

Table C-1B
Wildlife Impacts Compared to the No Action Alternative

Attribute	No Action	Maximum Flow	Flow Evaluation	Percent Inflow	Mechanical Restoration	State Permit
Foothill yellow-legged frog						
Gravel bar habitat suitable for breeding	Continued degradation compared to pre-dam condition	Substantial improvement	Substantial improvement	Slight improvement	Slight improvement	Additional degradation
Pool habitat suitable for adult life stages	Continued degradation compared to pre-dam condition	Substantial improvement	Substantial improvement	Slight improvement	Slight improvement	Additional degradation
Size of snowmelt recession matches natural hydrograph	Snowmelt recession a small fraction of natural recession	Substantial improvement	Improvement	Improvement	Same as No Action	Additional degradation
Timing of snowmelt recession matches natural hydrograph	May not be in sync with snowmelt recession	Improvement	Improvement	Substantial improvement	Same as No Action	Additional degradation
Western pond turtle						
Pool habitat suitable for adults	Continued degradation compared to pre-dam condition	Substantial improvement	Substantial improvement	Improvement	Slight improvement	Additional degradation
Summer water temperatures at natural levels	Summer water temperatures usually below natural levels	Slight improvement	Same as No Action	Improvement	Same as No Action	Improvement
Bald eagle						
Trinity River forage base	Salmon populations would be .08 of TRRP goals	Substantial improvement	Improvement	Slight improvement	Marginal improvement	Decline
Reproduction at Trinity and Lewiston Reservoirs	About 1 eagle chick per occupied nest	Negligible change	Negligible change	Negligible change	Same as No Action	Negligible change
Modeled young per occupied nest based on Shasta Reservoir water levels	1.10	1.06	1.08	1.09	Same as No Action	1.11
Willow flycatcher						
Early-successional willow habitat	Continued reduction of habitat compared to pre-dam condition	Substantial improvement	Improvement	Slight improvement	Slight improvement	Additional reduction in habitat
Low-flow foraging habitat	Continued reduction of habitat compared to pre-dam condition	Substantial improvement	Improvement	Slight improvement	Slight improvement	Additional reduction in habitat
Egg laying in relation to peak flows	Continued reduction of habitat compared to pre-dam condition	Potential adverse	Slight possibility of adverse	Slight possibility of adverse	Potential adverse	Increased safety

Table C-1C
Wetland Impacts Compared to the No Action Alternative

Attribute	No Action	Maximum Flow	Flow Evaluation	Percent Inflow	Mechanical Restoration	Harvest Management	State Permit
Formation of wetlands on the floodplains	Maintenance of existing remnant wetland acreage	Substantial improvement	Substantial improvement	Improvement	Potential loss of some fringe wetlands	Same as No Action	Additional degradation

vegetation. Pre-dam aerial photographs show that approximately 300 acres of diverse riparian vegetation occurred between Lewiston Dam and the North Fork of the Trinity River (North Fork).

Along the margins of Trinity and Lewiston Reservoirs, vegetation associated with the active river channel has been replaced by vegetation more common to a reservoir environment. Plant species in the Trinity and Lewiston Reservoirs comprise those typically found in standing or low-flow water, and include floating species, rooted aquatic species, and emergent wetland species. Emergent wetland and riparian vegetation is constrained by fluctuating reservoir water levels and steep banks.

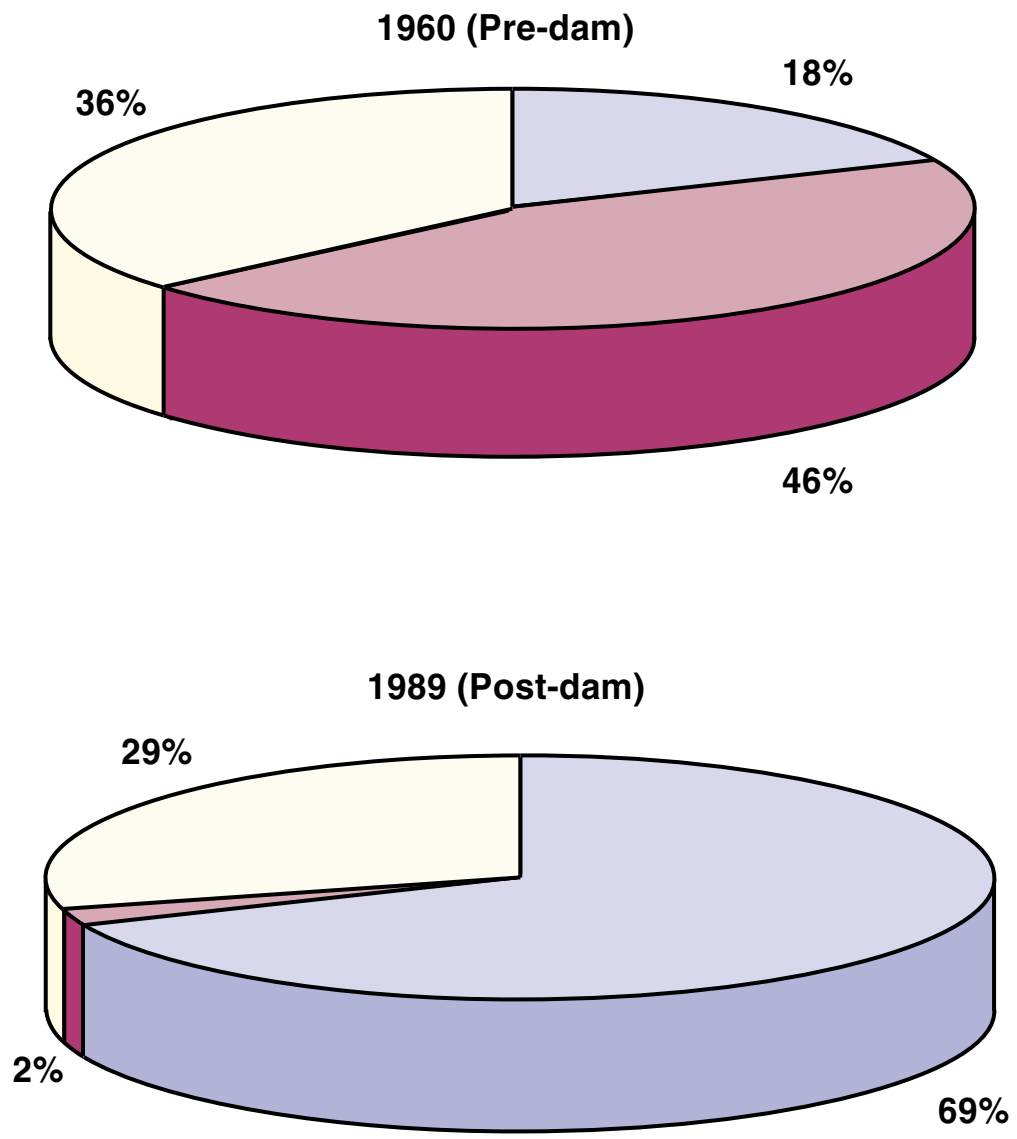
Construction of the TRD directly affected the downstream environment by exporting flows out of the basin, reducing the magnitude of peak flows, obstructing coarse sediment input from above the dam, and allowing fine sediment to accumulate on channel features that had previously been regularly scoured by flood flows. Riparian vegetation has encroached into areas that had previously been scoured by flood flows and has increased in an area by almost 300 percent to approximately 900 acres (Figure C-1). This has resulted in the formation of a riparian berm that effectively armors and anchors the river banks, preventing the river from meandering within the channel. The establishment of these berms further exacerbates the encroachment and maturation of woody vegetation.

The change to post-dam riparian vegetation is most prevalent from the Lewiston Dam to the confluence with the North Fork. This reach includes approximately 330 acres of early-successional willow-dominated vegetation, 174 acres of more mature later-successional alder-dominated vegetation, and 380 acres of willow-alder mix. Between the North Fork and the South Fork, the Trinity River channel is restricted by canyon walls, limiting riparian vegetation to a narrow band. Between the South Fork and the Klamath River, the Trinity River alternates between confined reaches with little riparian vegetation to alluvial reaches with vegetation similar to pre-dam conditions in the reach between Lewiston Dam and the North Fork.

Special-status species are those listed as threatened or endangered pursuant to the state or federal Endangered Species Act (ESA), or as candidates for such listing. In addition, special-status species are species considered rare by the state of California and species on lists 1 through 4 of the California Native Plant Society (CNPS). Nine special-status plant species in the Trinity Basin were identified from the CNPS Electronic Inventory database and through communications with agency biologists (Table C-2). All of these species potentially occur in the project area in association with streambank habitats. None of the species are protected by federal or state endangered species acts.

1.1.1.2 Lower Klamath River Basin/Coastal Area

Vegetation on the lower Klamath River is largely determined by a more natural hydrograph than it is on the Trinity. Partly as a result, a greater diversity of riparian and riverine habitats occur. However, plant species composition changes with proximity to the ocean as the river slows, water temperatures increase, and tidal influence affects salinity.



Comparison of riparian vegetation, gravel bar, and open water habitat between 1960 (pre-dam) and 1989 (post-dam) in the upper (upstream of the confluence with the North Fork) Trinity River (Wilson, 1993).

FIGURE C-1
HABITAT CHANGE PRE-DAM vs. POST-DAM
TRINITY RIVER MAINSTEM FISHERY RESTORATION EIS/EIR

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Nine special-status plant species that occur or potentially occur in river, riparian, and wetland environments in the Lower Klamath River Basin/Coastal Area are listed in Table C-2.

Table C-2
Special-status Plant Species Occurring or Potentially Occurring in Riparian, Wetland, and Riverine Habitat along the Trinity and Lower Klamath Rivers

Common Name	Scientific Name	Status		
		CNPS	CA	Federal
Rattan's milk-vetch[a]	*Astragalus rattanii* var. *rattanii*	4	—	—
Bottlebrush sedge[a]	*Carex histricina*	2	—	—
Fox sedge	*Carex vulpinoidea*	2	—	—
California lady's-slipper[a]	*Cypripedium californicum*	4	—	—
Clustered lady's-slipper[a]	*Cypripedium fasciculatum*	4	—	FSC
Heckner's lewisia[a]	*Lewisia cotyledon* var. *heckneri*	1B	—	FSC
Showy raillardella[a]	*Raillardella pringlei*	1B	—	FSC
Great burnet[a]	*Sanguisorba officinalis*	2	—	—
English peak greenbriar[a]	*Smilax jamesii*	1B	—	—

[a]Known to occur in the general area of the project.
Status Definitions:
CNPS California Native Plant Society
1B Plants considered rare, threatened, or endangered throughout their range
2 Plants considered rate, threatened, or endangered in California
4 Plants of limited distribution
FSC Federal Species of Concern

1.1.1.3 Central Valley

Reservoirs created for water storage usually are surrounded above the high watermark by vegetation that occurred prior to creation of the reservoir. Common vegetation types found above reservoir watermarks in the Central Valley include valley foothill hardwood and chaparral.

The dominant riverine and riparian vegetation types that occur in these areas are valley foothill riparian and, to a much lesser degree, fresh and saline emergent wetlands. Valley foothill riparian is represented by several plant associations, including willow scrub, willow-cottonwood stands, mature cottonwood forest, mixed riparian herb/scrub, alder-willow forest, riparian forest, and valley oak riparian forest. Wildlife refuges served by the Central Valley Project (CVP) include typical wetland vegetation.

Willow scrub can colonize gravel bars in river channels and at river edges only to be destroyed by seasonal high flows, or may develop into more mature willow-cottonwood stands. On low terrace habitats adjacent to watercourses, mature cottonwood forest, mixed riparian herb/scrub, and alder-willow forest may occur, depending on the level of disturbance of the vegetation and the physical characteristics of the watercourse. On higher terraces these plant associations mature, resulting in mixed riparian forest and valley oak riparian forest with comparatively high species and structural diversity.

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Fresh emergent wetlands are represented by a range of plant associations including perennial grasses, hydrophytic grasses, and sedges. Saline emergent wetlands are represented by salt or brackish grasses, sedges, and forbs.

Eleven special-status plant species occurring or potentially occurring in river, riparian, and wetland environments in the Central Valley are listed in Table C-3.

Table C-3
Special-status Plant Species Potentially Occurring in the Central Valley

Common Name	Scientific Name	Status		
		CNPS	CA	Federal
Suisun marsh aster	*Aster lentus*	1B	—	FSC
Fox sedge	*Carex vulpinoidea*	2	—	—
Suisun thistle	*Cirsium hydrophilum* var. *hydrophilum*	1B	—	FE
Soft bird's beak	*Cordylanthus mollis* ssp. *mollis*	1B	CR	FE
Silky cryptantha	*Crypthantha crinita*	1B	—	FE
Rose-mallow	*Hibiscus lasiocarpus*	2	—	—
Northern California black walnut	*Juglans californica* var. *hindsii*	1B	—	FSC
Mason's lilaeopsis	*Lilaeopsis masonii*	1B	CR	FSC
Delta mudwort	*Limosella subulata*	2	—	—
Eel-grass pondweed	*Potamogeton zosteriformes*	2	—	—
Sandford's arrowhead	*Sagittaria sanfordii*	1B	—	FSC

Status Definitions:
- FE Listed and endangered under federal Endangered Species Act
- FSC Federal Species of Concern
- CR Considered as rare by the state of California
- CNPS California Native Plant Society
  - 1B List 1B species: rare, threatened, or endangered in California throughout their range
  - 2 List 2 species: rare, threatened, or endangered in California, but more common elsewhere

1.1.2 Environmental Consequences

1.1.2.1 Methodology

The analysis of project impacts to vegetation, wildlife, and wetlands focused on the ability of each alternative to restore ecological function to the mainstem Trinity River. For this analysis, ecological function consists of the processes that result in "healthy" attributes, as defined in the Geomorphic Environment section (3.2). This section focuses on those characteristics necessary to restore the river towards pre-dam riparian condition as described in McBain and Trush (1997). As noted in that section, most attributes are assessed according to a threshold flow magnitude and frequency. Many of these frequencies are based on periodic flows every few years, as would occur in a natural flood-drought cycle. For this reason alternatives are not assessed by wet or dry year class. Instead, they are assessed across year-classes in terms of long-term frequencies. Table C-4 lists the relevant attributes and the associated riparian

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characteristics used in this analysis. Departure from pre-dam conditions is termed "degradation" for purposes of this analysis.

Table C-4
Healthy River Attributes and Associated Riparian Characteristics

Attribute		Characteristic
1.	Spatially complex channel geomorphology	Riparian community with all stages of successional development No net loss of riparian habitat following channel migration
2.	Flows and water quality are predictably unpredictable	Discourage riparian plant germination on alternate bars by inundation during seed dispersion
3.	Frequently mobilized channelbed surface	Lower rates of riparian encroachment by scouring shallow-rooted 1- to 2-year old seedlings
4.	Periodic channelbed scour and fill	Re-establishment of dynamic riparian plant stands in various stages of succession on higher elevations of alternate bars Mortality of 3- to 4-year old saplings on alternate bar surfaces to discourage riparian plant encroachment and berm formation
5.	Balance fine and coarse sediment budgets	Reduce riparian berm fossilization to improve channel dynamics and salmonid habitat Maintain physical complexity by sustaining alternate bar geomorphology
6.	Periodic channel migration	Multi-age class structure in stands of cottonwood and other species dependent on channel migration
7.	A functional floodplain	None used
8.	Infrequent channel resetting floods	Create dynamic riparian stands in various stages of succession on higher elevation of alternate bars Control populations of 3- to 4-year old saplings on alternate bar surfaces close to channel center, and scour stands of mature riparian vegetation Convert mature, less productive riparian habitats to highly productive, early-successional stages
9.	Self-sustaining diverse riparian plant communities	Increase woody riparian overstory and understory species diversity Increase wood riparian age diversity Promote rehabilitation of channel dynamics
10.	Naturally fluctuating groundwater table	High diversity of habitat types within the entire river corridor

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With particular reference to restoration of the processes that sustain healthy riparian systems, the following would be indicative of conditions leading to a healthy dynamic floodplain riparian community (adapted from McBain and Trush, 1997).

1. ***Removal of berms***. Berms resulting from accumulated sediments as a consequence of regulation of peak flows have led to channel downcutting, reduced river meanders, and reduced floodplain groundwater recharge. Flows sufficient for removal of the berms also would remove mature woody vegetation, allowing for development of different age classes of riparian vegetation.

2. ***Surface bed mobilization***. Flows sufficient to mobilize the channelbed materials are needed every 2-3 years. This process scours young seedlings from the active channel and prevents encroachment of riparian vegetation into the channel.

3. ***Overbank flooding with scour and deposition***. Flow sufficient to initiate floodplain erosion and subsequent deposition are needed every 3-5 years. These flows provide substrate and nutrient inputs for vegetation in the floodplain. These flows would also promote construction and maintenance of natural scour channels that provide suitable conditions for emergent vegetation. Larger flows every 5-10 years would cause deep channelbed and floodplain scour that removes saplings and mature trees and promotes natural erosion and deposition.

4. ***Development of alternating bars with back-scour channels***. Creation of alternating bars and back scour channels results from flows that exceed the 3-5 year maximum flood event. Alternative bars are completely scoured and redeposited every 10-20 years, providing new substrate for early successional woody plant communities and wetlands.

5. ***Development of natural flow variability***. Variable flows patterned similarly to those that occur naturally provide several functions leading to early successional stage riparian conditions indicative of a healthy, dynamic river system. Seasonal inundation of bar surfaces and channel margins reduces germination of woody plant seeds, maintaining open gravel bar surfaces and reducing riparian encroachment in the active channel. Rapid drops in water elevations following snow melt desiccates seedlings on high alluvial surfaces, further preventing riparian encroachment.

Alternatives were qualitatively compared to the No Action Alternative based on their ability to create the characteristics described in Table C-4 through combinations of flow schedules and/or mechanical rehabilitation. Scheduled releases from Lewiston Dam, and the frequency of releases, were used as the basis of comparison for each alternative against the healthy river attributes. Comparisons of individual characteristics were then compiled into a composite ranking comparing the alternative's overall ability to restore healthy river attributes and improve associated riparian characteristics to pre-dam conditions.

Detailed field surveys were not conducted because of uncertainty regarding the timing of implementation of any of the alternatives. Appropriately timed field surveys, conducted according to established agency protocols, would be necessary prior to implementation of

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any of the alternatives to determine the presence of special-status species in the specific reaches of the affected environment.

Flow reductions in the Sacramento River predicted for each of the project alternatives are not expected to have a significant adverse impact on riparian vegetation in the Central Valley for the following reasons:

- In the Sacramento River downstream of Red Bluff, inflow from tributary streams increases and has an increasingly greater influence on flows in the Sacramento River than Keswick releases. Thus, changes in Keswick releases predicted for the project alternatives would not be expected to substantially change the hydrologic dynamics that shape and support riparian communities in the Sacramento River downstream from Red Bluff. This conclusion is supported by modeled changes in stage (i.e., water surface elevation) predicted at the Verona gage for the project alternatives. The Maximum Flow Alternative showed the greatest decrease in water surface elevation relative to the No Action Alternative of any of the alternatives. The greatest predicted decrease in stage is 1.5 feet and occurs in November of a wet year. All other months, water-year classes, and alternatives show a smaller decrease in stage relative to the No Action Alternative. The project alternatives show the smallest change in stage relative to the No Action Alternative over the dry period. The greatest predicted decrease in stage in the dry period is 0.6 feet in July under the Maximum Flow Alternative. Predicted differences in water surface elevations between the project alter-natives and existing conditions are similar. The small change in water surface elevation, particularly in dry years, would not be expected to substantially change water availability for riparian vegetation and, therefore, would not be expected to result in changes in the riparian community.

- Flow levels in the section of the Sacramento River between Keswick Dam and Red Bluff are largely determined by Keswick releases. This section of the river has a bedrock geomorphology (The Resources Agency, 1989) that acts to restrict riparian vegetation to higher terraces that are only inundated at very high flow levels. Depth to the water table is a strong determinant of the composition, growth, and survival of riparian communities (Stromberg, 1995). As distance from the water channel increases, the importance of groundwater to sustaining riparian vegetation increases (Stromberg and Patten, 1996). Many streams in the Sacramento Valley have historically been gaining streams, a condition where groundwater is discharged into the stream. Even during drought periods, groundwater levels in the Sacramento Valley basin have historically declined only moderately, recovering to pre-drought levels in subsequent wetter periods. These observations suggest that groundwater plays a substantial role in sustaining riparian vegetation between Keswick and Red Bluff, with flow levels in the river having a lesser role.

- Although groundwater is likely to have a greater influence on the persistence of riparian vegetation in the Sacramento River above Red Bluff, river flows may also contribute. The elevation of the water surface is more important in determining the availability of water to riparian vegetation than river flows. Under the project alternatives, predicted water surface elevations at Keswick would not change substantially relative to the No Action Alternative. The Maximum Flow Alternative shows the greatest change in stage of all alternatives. The maximum decrease in stage under this alternative relative to the

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No Action Alternative predicted at Keswick is 2.6 feet in November of a wet year. Predicted differences in dry years when water availability would be more limited for riparian vegetation are less than 0.9 feet in all months relative to the No Action Alternative for all project alternatives. Predicted differences between water surface elevations under all alternatives and existing conditions are similar. These small changes in water surface elevations would not be expected to substantially change water availability for riparian vegetation and, therefore, would not be expected to result in changes in the composition, distribution, or extent of riparian vegetation in the Sacramento River above Red Bluff.

- In the Delta, riparian vegetation persists as narrow strands along waterways and also as isolated stands in interior portions behind berms. Much of the Delta is 10-20 feet below msl and the water table is at or near ground level (Dennis et al., 1984). As a result of this high water table, (Dennis et al., 1984). With the high water table and reduced direct influence of Keswick releases on river stages in the Delta, the project alternatives would not be expected to result in a substantial change in the composition or extent of riparian vegetation.

Similarly, vegetation along the Klamath River would not be appreciably affected by any of the alternatives as the confluence with the Trinity is approximately 100 miles downstream of Lewiston Dam.

1.1.2.2 Significance Criteria

Significance criteria were developed in coordination with the Vegetation and Wildlife Technical Team and with input provided during public scoping meetings. The significance criteria employed for this analysis are based on CEQA and NEPA guidelines. Impacts on vegetation would be significant if project implementation would result in any of the following:

- Potential for reductions in the number, or restrictions of the range, of an endangered or threatened plant species or a plant species that is a candidate for state listing or proposed for federal listing as endangered or threatened
- Potential for substantial reductions in the habitat of any native plant species including those that are listed as endangered or threatened or are candidates (CESA) or proposed (ESA) for endangered or threatened status
- Potential for causing a native plant population to drop below self-sustaining levels
- Potential to eliminate a native plant community
- Substantial adverse effect, either directly or through habitat modifications, on any plant identified as a sensitive or special-status species in local or regional plans, policies, or regulations
- Substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations

- Substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means
- A conflict with any local policies or ordinances protecting vegetation resources
- A conflict with, or violation of, the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, state, or federal habitat conservation plan relating to the protection of plant resources

Results of the impacts analysis for vegetation resources for all seven alternatives based on these significance criteria are summarized in Table C-1A.

1.1.2.3 No Action

The No Action Alternative would continue the current flow regime. The riparian encroachment process commenced immediately following dam construction, when the annual releases were 120,500 acre-feet (af). Current annual releases of 340,000 af are insufficient to counteract this vegetation encroachment. Overall, this alternative is expected to continue the deterioration of riparian vegetation compared to the pre-dam condition. This alternative ranked fifth relative to other alternatives in its ability to restore healthy river attributes and associated riparian characteristics to the pre-dam condition.

1.1.2.4 Maximum Flow

This alternative was designed to use flow as the primary tool for restoration to the pre-dam condition. The notable flow event is a scheduled release of 30,000 cubic feet per second (cfs) in extremely wet years that would move the channel and scour riparian berms and associated mature vegetation in discrete locations between Lewiston Dam and the North Fork. The high flows are expected to result in an increase in early-successional vegetation similar to that found in pre-dam conditions. However, loss of berms and riparian vegetation could result in the loss of special-status plant populations that may have established in these discrete areas. Comparatively lower flows were designed to maintain the channel characteristics created in extremely wet years. Because flows are the primary restoration tool, restoration would occur along the entire upper river continuum, rather than just at specific, pre-selected rehabilitation sites, as is the case under other alternatives. Using characteristics presented in Table C-4, this alternative ranks first overall in its ability to restore healthy river attributes and associated riparian characteristics to the pre-dam condition (see Table C-1A).

The Maximum Flow Alternative requires modifications to Trinity Dam that would require use of a staging area for construction. This area is located just downstream from the existing dam, including about 6 acres adjacent to the river. The area is highly disturbed, consisting of an old parking area and surroundings. A narrow strip of riparian vegetation occupies a lower elevation between the staging area and the river. No adverse impacts are anticipated from the use of this staging area.

1.1.2.5 Flow Evaluation

This alternative was designed to use flow as a tool for maintaining 47 proposed channel rehabilitation projects. This alternative would result in the removal of mature riparian vegetation, but would emphasize restoration using mechanical, rather than hydraulic, means. Notably, this alternative would be more effective than the Maximum Flow Alternative at controlling vegetation on medium elevation features because it uses longer-duration medium flows than Maximum Flow. However, because the restoration is limited to 47 discrete sites along the river, and the flows would be most effective only at these rehabilitation sites (versus along the river continuum), this alternative ranks below the Maximum Flow Alternative in effectiveness in maintaining pre-dam riparian vegetation (see Table C-1A). As was the case for the Maximum Flow Alternative, removal of mature riparian vegetation could result in loss of special-status plant populations that have established in these areas. This alternative ranked second overall in its ability to restore healthy river attributes and associated riparian vegetation characteristics to pre-dam conditions (see Table C-1A).

1.1.2.6 Percent Inflow

This alternative would release 40 percent of the previous week's inflow to Trinity Reservoir and would include 47 rehabilitation projects. This alternative is unique in that timing of flows mimics real conditions. Peak flows would be lower than Maximum Flow and Flow Evaluation, but actual flows would be dependent on year-to-year hydrologic conditions. Peak flow would tend to be higher than No Action, but summer flows would tend to be lower; and yearly flows could be higher or lower, depending on the inflows to Trinity Reservoir. Mechanical removal of berms and mature riparian vegetation would occur for this alternative (similar to the Flow Evaluation Alternative). Loss of these berms and mature riparian vegetation could result in loss of special-status plant populations that may have established in these areas. Overall, this alternative ranked third in its ability to restore healthy river attributes and associated riparian vegetation characteristics to pre-dam conditions (see Table C-1A).

1.1.2.7 Mechanical Restoration

This alternative uses mechanical means to accomplish restoration. As noted for Flow Evaluation, the discrete nature of rehabilitation sites would preclude this alternative from restoring conditions along the river continuum. The same amount of berms and mature riparian vegetation would be removed for this alternative as for the Flow Evaluation and Percent Inflow Alternatives, but these areas would be periodically mechanically maintained. The loss of berms and mature riparian vegetation could result in the loss of special-status populations that could occur in these areas. Mechanical Restoration would do little to restore healthy river attributes and associated riparian vegetation characteristics because it does not restore the processes associated with flows that support these attributes and characteristics. This alternative ranked fourth in its ability to achieve restoration of healthy river attributes and riparian vegetation characteristics (see Table C-1A).

1.1.2.8 State Permit

The State Permit would reduce annual flows to 120,000 af, the level at which much of the current degradation occurred. This alternative would result in further degradation of riparian habitat, and an even greater degree of riparian encroachment compared to the No Action Alternative. State Permit ranked last among the alternatives in its ability to restore healthy river attributes and associated riparian vegetation characteristics to pre-dam conditions (see Table C-1A).

1.1.2.9 Existing Conditions versus Preferred Alternative

The Preferred Alternative would substantially improve vegetation along the Trinity River compared to existing conditions (in terms of restoring to pre-dam conditions). The degree and nature of the change would be similar to the difference between the Flow Evaluation and No Action Alternatives; however, existing conditions may not be as severe as conditions under the No Action Alternative (i.e., year 2020) because of the continuing degradation of the river.

1.1.3 Mitigation

No mitigation is required in regard to flow-related actions. The following mitigation should be implemented to ensure potential significant adverse impacts as a result of mechanical ground-disturbing activities are reduced to a less than significant level:

- Conduct site-specific environmental reviews prior to channel rehabilitation projects, spawning gravel placement, watershed protection work, and other activities not specifically covered by this document (i.e., the non-flow activities). Such reviews shall, when appropriate, include surveys for federal and state endangered, threatened, and proposed species, or for other species if required by permitting agencies (e.g., U.S. Forest Service [USFS]). If such species are present, actions shall be taken to avoid impacts.

- Develop and implement a revegetation plan for all ground-disturbing activities (excluding channel rehabilitation sites). Revegetation shall use plant species found either adjacent to the area to be impacted or along a similar area (e.g., tributary), subject to landowner and/or agency concurrence. Replacement ratios and monitoring plans, if determined necessary, would be developed in cooperation with the U.S. Army Corps of Engineers (Corps), U.S. Fish and Wildlife Service (Service), and California Department of Fish and Game (CDFG).

1.2 WILDLIFE

1.2.1 Affected Environment

1.2.1.1 Trinity River Basin

Wildlife species inhabiting river and riparian habitats prior to dam construction included many of the species that currently occupy these habitats. The area inundated by Trinity and Lewiston Reservoirs was important winter range for a herd of 4,000-6,000 black-tailed deer (Frederiksen, Kamine, and Associates, 1980). Pre-dam conditions downstream of Lewiston, however, favored species that prefer extensive shallow water and the vegetation and invertebrate fauna associated with such conditions. Species that prefer early-successional stages or require greater riverine structural diversity likely occupied a greater proportion of the channel and floodplain than under existing conditions. Common species that may have occupied these areas prior to dam construction likely include rough-skinned newt, Pacific coast aquatic garter snake, western pond turtle, foothill yellow-legged frog, and American dipper. Wildlife species that foraged on the abundant salmon and steelhead runs (e.g., black bear, bald eagle, and other scavengers) were also common along the pre-dam Trinity.

Wildlife species occupying the existing reservoirs differ somewhat from those occupying pre-dam riverine conditions. Impounded water in reservoirs attracts resting and foraging waterfowl and other species that favor slow-moving water rather than species that occur in riverine habitats and fast-moving water. Reservoirs also provide important foraging habitat for eagles and other raptors that prey on fish and waterfowl.

The current flow regime has established conditions favoring upland habitat at the expense of wetland and aquatic habitat. The shift in habitat types is likely the causative factor in the current depressed populations of aquatic, semi-aquatic, and wetland wildlife species compared to terrestrial species. Species such as the western pond turtle, an example of a semi-aquatic species, likely have declined since completion of the dams in response to diminishing instream habitat. For a discussion of water temperature changes following construction of the TRD, see Water Resources section. Species that favor mature, late-successional riparian habitats such as northern goshawk and black salamander prefer the current mature conditions and likely did not occupy pre-dam riparian habitats. Species preferring early-successional riparian vegetation, such as the willow flycatcher and the spotted sandpiper, likely occur in fewer numbers or no longer occur. Predators such as raccoon and mink may be more abundant under current conditions than under pre-dam conditions. Increase of the predators can exacerbate the decline of species that prefer pre-dam conditions.

State or federal special-status species that are known to be present, or potentially present, in areas affected by the project are listed in Table C-5. Agency concerns, expert opinion, available data, and the results of impacts analyses identified four special-status species that could be affected by the project. These four species are those for which data on population status and trends are available for the project area and include foothill yellow-legged frog,

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Table C-5
Special-status Wildlife Species Occurring or Potentially Occurring in Riparian and Riverine Habitat in the Trinity River Basin

Common Name	Scientific Name	Status	
		CA	Federal
Amphibians			
Southern torrent salamander[a]	*Rhyacotriton variegatus*	CFP, CSSC	FSC
Tailed frog[a]	*Ascaphus truei*	CFP, CSSC	
California red-legged frog[a,b]	*Rana aurora draytonii*	CSSC	FT
Cascades frog	*Rana cascadae*	CFP, CSSC	FSC, FSS
Foothill yellow-legged frog[a]	*Rana boylii*	CFP, CSSC	FSC, FSS
Reptiles			
Western pond turtle[a]	*Clemmys marmorata*	CSSC	FSS
Birds			
Barrow's goldeneye[a]	*Bucephala islandica*	CSSC	
Osprey[a]	*Pandion haliaetus*	CSSC	
Bald eagle[a]	*Haliaeetus leucocephalus*	CE, CFP	FT
Northern harrier	*Circus cyaneus*	CSSC	
Sharp-shinned hawk[a]	*Accipiter striatus*	CSSC	
Cooper's hawk[a]	*Accipiter cooperii*	CSSC	
Northern goshawk[a]	*Accipiter gentilis*	CSSC	FSC, FSS
Golden eagle[a]	*Aquila chrysaetos*	CFP, CSSC	BLMS
Merlin[a]	*Falco columbarius*	CSSC	
Peregrine falcon[a]	*Falco peregrinus anatum*	CE, CFP	None, delisted 8/25/99
Prairie falcon[a]	*Falco mexicanus*	CSSC	
Ruffed grouse[a]	*Bonasa umbellus*	CSSC	
California gull[a]	*Larus californicus*	CSSC	FSS
Northern spotted owl[a]	*Strix occidentalis caurina*	CSSC	
Long-eared owl[a]	*Asio otus*	CSSC	
Short-eared owl	*Asio flammeus*	CSSC	
Black swift[a]	*Cypoeseloides niger*	CSSC	
Vaux's swift[a]	*Chaetura vauxi*	CSSC	FSS
Willow flycatcher[a]	*Empidonax traillii*	CE	
Purple martin	*Progne subis*	CSSC	
Black-capped chickadee[a]	*Parus atricapillus*	CSSC	FSC
Loggerhead shrike	*Lanius ludovicianus*	CSSC	
Yellow warbler[a]	*Dendroica petechia brewsteri*	CSSC	
Yellow-breasted chat[a]	*Icteria virens*	CSSC	
Mammals			
Little brown myotis	*Myotis lucifugus occultus*	CSSC	FSC
Townsend's Western big-eared bat	*Plecotus townsendii townsendii*	CSSC	FSC
Pallid bat	*Antrozous pallidus*	CSSC	
Snowshoe hare	*Lepus americanus*	CSSC	
Mountain beaver	*Aplodontia rufa*	CSSC	
Northern flying squirrel[a]	*Glaucomys sabrinus californicus*	CSSC	FSC

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Table C-5
Special-status Wildlife Species Occurring or Potentially Occurring in Riparian and Riverine Habitat in the Trinity River Basin

Common Name	Scientific Name	Status	
		CA	Federal
Ringtail[a]	*Bassariscus astutus*	CFP	FSC
Marten[a]	*Martes americana*	CSSC	FSC, FSS
Pacific fisher[a]	*Martes pennanti pacifica*	CSSC	FSC, FSS
Wolverine[a]	*Gulo gulo letus*	CT, CFP	FSC
Badger	*Taxidea taxus*	CSSC	

[a]Known to occur in the general area of the project.
[b]In this part of its range, the California red-legged frog is a federal Species of Concern.

Status Definitions:

BLMS	Bureau of Land Management Sensitive
FC	Federal Candidate for listing
CE	Listed as endangered under the California Endangered Species Act
CSSC	California Species of Special Concern
FE	Listed and endangered under federal Endangered Species Act
FT	Listed as threatened under federal Endangered Species Act
FSC	Federal Species of Concern
FSS	Forest Service Sensitive
CFP	California Fully Protected

western pond turtle, bald eagle, and willow flycatcher. The frog, turtle, and flycatcher serve as indicator species for impacts to Trinity River wildlife.

The foothill yellow-legged frog breeds in low-velocity, shallow water near sparsley vegetated gravel bars (Figure C-2). These areas have been reduced 95 percent compared to pre-dam conditions, greatly reducing breeding habitat for this species. Almost no frogs have been found in the 12 river miles below Lewiston Dam due to the lack of breeding habitat. Pool habitat that can be used by adults to escape from predators also has been reduced by low flows, fine sediment accumulation, and riparian encroachment.

The natural recession in flows following snowmelt is believed to be a cue for egg deposition for this species. Prior to dam construction, snowmelt flows peaked sometime in the spring and gradually tailed off towards summer. However, dam releases have not always included a spring recession, or the recession has been greatly weakened and/or out of sync with tributary flows, thereby negating an important breeding cue for frogs. Release schedules that do not match the natural snowmelt recession may result in reduced reproductive success for the foothill yellow-legged frog. For example, a scheduled peak release may wash away eggs that were deposited in response to earlier tributary recessions. Conversely, a late snowmelt peak from the tributaries may harm eggs deposited because of the artificial recession of dam releases.

While the western pond turtle still occupies some locations in the river, elimination of microhabitats, particularly pools, has reduced the population of this species in the basin. "The

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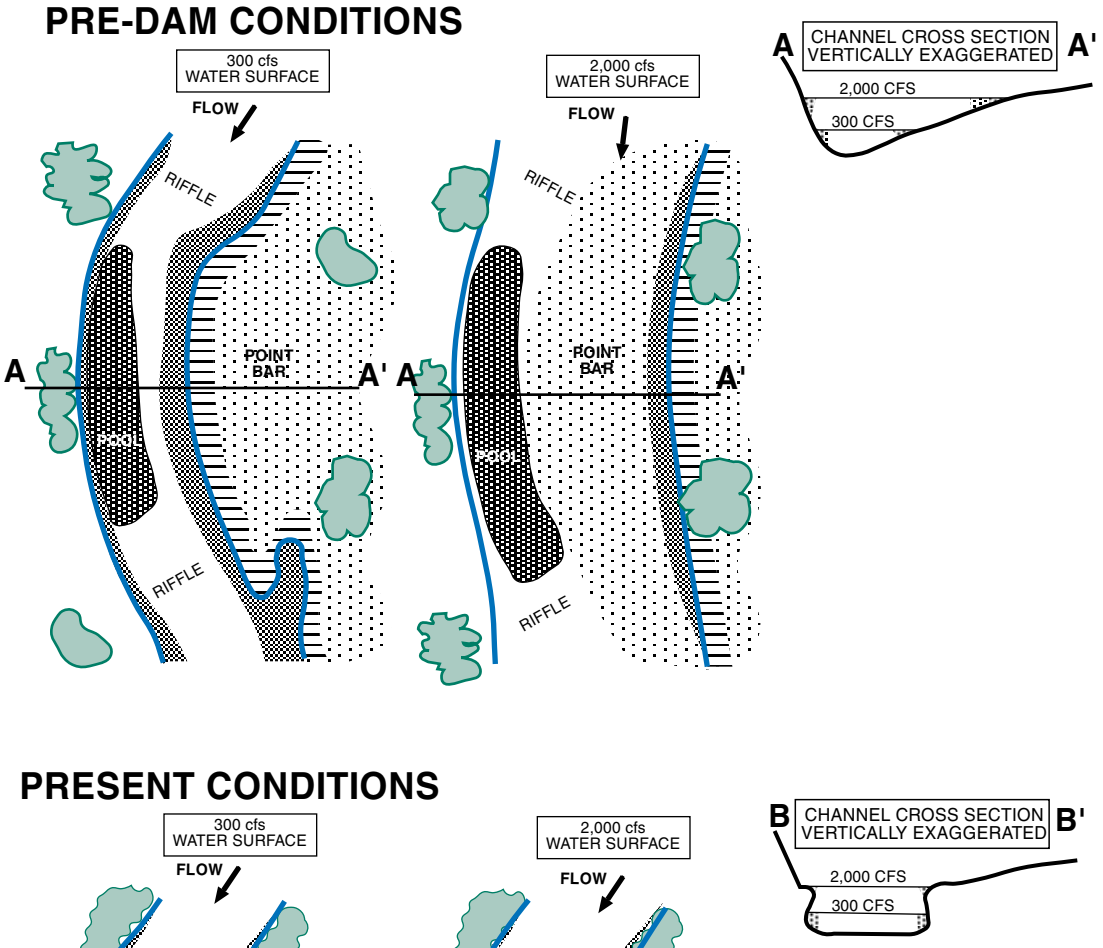

FIGURE C-2
HABITAT FOR RIVERINE WILDLIFE SPECIES, PRE-DAM AND PRESENT CONDITIONS
TRINITY RIVER MAINSTEM FISHERY RESTORATION EIS/EIR

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alterations of channel morphology and flows regimes association with damming (have decreased the) habitat suitability" for the western pond turtle (Reese and Welsh, 1998). Instream pools used by western pond turtles for cover and protection from predators, largely have been lost as a consequence of channelizing of the river (Figure C-2). This habitat has been replaced to some extent by undercut banks with slow-moving water that is used by adults (K. Schlick, D. Aston, and A. Lind, 1997, personal communication). Areas that historically provided low water velocities during high flows (side channels and gravel bars) have also been reduced, resulting in increased mortality to hatchling and juvenile turtles. Additionally, coldwater flows during summer (summer water temperatures were higher under pre-dam conditions) appear to have reduced growth rate in this species, resulting in small individuals in the Trinity (D. Mead, 1995, personal communication), which may have an adverse effect on reproductive success. These summer coldwater flows could influence development in early life stages and behavior in all life stages (A. Lind, 1994, personal communication), which could have a negative impact on the local population. The turtle (and many other species) no longer has the temperature choices it had in pre-dam conditions.

The bald eagle has experienced a reduction in Trinity River forage because of the declining salmon escapements, a result of the construction and operation of Trinity and Lewiston Dams. However, the eagle adapts well to reservoirs where it forages on fish and waterfowl.

Eight bald eagle pairs are known to exist in the areas surrounding Trinity and Lewiston Reservoirs, and 15 nests were active around Shasta Reservoir in 1997. One study demonstrated a positive correlation between the number of bald eagle chicks per occupied nest versus Shasta Reservoir water levels (U.S. Bureau of Reclamation, 1992). However, a subsequent study suggested that the presence of boats caused decreased reproduction, whereas lower water levels did not (Kristan and Golightly, 1995). The U.S. Bureau of Reclamation (Reclamation) study did not find a correlation between reproduction and water levels for bald eagles nesting near Trinity and Lewiston Reservoirs.

Reproductive success of eagles near Trinity and Lewiston Reservoirs has generally exceeded the recovery goal of 1.0 young per occupied nest (as established in the Pacific Region recovery plan: U.S. Fish and Wildlife Service, 1986); however, success near Shasta Reservoir has failed to meet the goal in recent years. Bald eagle use of the reservoirs increases dramatically in some winters.

Willow flycatcher is a summer resident in California, breeding in riparian willow thickets, often in association with wetlands. This habitat type is considered early-successional and likely was more abundant in the pre-dam floodplain than it is currently, having been displaced by channelization of the river and later-successional mature riparian vegetation. Approximately a dozen willow flycatchers were recorded annually from the Trinity River in 1990-92; however, no breeding birds were detected (Wilson, 1995). The lack of standing water and flying insects—a result of channelization of the river—was speculated as a possible factor limiting flycatcher breeding. The survey detected birds repeatedly at the site of a newly constructed side-channel rehabilitation project.

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1.2.1.2 Lower Klamath River Basin/Coastal Area

Lower Klamath River wildlife species are very similar to those found in the Trinity River Basin. However, the distribution and abundance in the lower Klamath River likely is more similar to the pre-dam Trinity River conditions than the post-dam conditions.

1.2.1.3 Central Valley

Migratory waterfowl and shorebirds comprise a large portion of the vertebrate wildlife species occupying riverine riparian and reservoir habitats along the Sacramento River and in the San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta). Habitats surrounding reservoirs generally support wildlife species that would occupy these habitats in the absence of the reservoir. Proximity to water might enhance habitat value for some vertebrate species that occupy the regions surrounding the reservoirs. Reservoirs themselves provide only marginal habitat for many wildlife species because fluctuating water levels prevent establishment of riparian, wetland, and submergent vegetation used by wildlife for foraging, resting, breeding, and nesting. Reservoirs are used by migrating waterfowl and, to a limited extent, shorebirds.

Approximately 55 percent of the waterfowl that winter in the Central Valley use Sacramento Valley wetlands (Central Valley Habitat Joint Venture, 1993). A number of National Wildlife Refuges (NWR) served by the CVP provide wetland habitat for these species and some terrestrial species including giant garter snake and receive water from Sacramento River and the Trinity River.

Special-status wildlife species occurring or potentially occurring in riverine, riparian, and reservoir habitats in the Central Valley are shown in Table C-6.

1.2.2 Environmental Consequences

1.2.2.1 Methodology

Each alternative's flow and non-flow components were evaluated according to their potential effects on the four special-status species. These special-status species include: foothill yellow-legged frog, western pond turtle, bald eagle, and willow flycatcher. For the foothill yellow-legged frog, western pond turtle, and willow flycatcher these analyses were limited to the Trinity River Basin below Lewiston Reservoir. For the bald eagle the analysis also included Shasta Reservoir. Impacts on bald eagle reproduction in Shasta Reservoir were assessed using modeled long-term average water elevations in April-July and Reclamation's eagle reproduction model (U.S. Bureau of Reclamation, 1992). Because of the uncertainty about cause-and-effect, the results of the model should be viewed cautiously. Impacts of Trinity and Lewiston Reservoir water elevations on bald eagle reproductive success were assessed qualitatively using the assumption that dramatically lower water elevations would lead to lower reproductive success. The assessment of Trinity River water temperature impacts (relevant to the frog and turtle) did not incorporate potential mitigating actions to meet state water temperature objectives (see Water Quality section).

Table C-6
Special-status Wildlife Species Occurring or Potentially Occurring in the Central Valley

Common Name	Scientific Name	Status	
		CA	Federal
Insects			
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	—	FT
Amphibians			
California red-legged frog	*Rana aurora draytonii*	CSSC	FT
Reptiles			
Western pond turtle	*Clemmys marmorata*	CSSC	FSC
Giant garter snake	*Thamnophis gigas*	CT	FT
Birds			
Bald eagle	*Haliaeetus leucocephalus*	CE, CFP	FT
American peregrine falcon	*Falco peregrinus anatum*	CE, CFP	FE
Swainson's hawk	*Buteo swainsoni*	CT	—
California black rail	*Laterallus jamaicensis coturniculus*	CT	FSC
California clapper rail	*Rallus longirostris obsoletus*	CE	FE
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	CE	—
Bank swallow	*Riparia riparia*	CT	—
Tricolored blackbird	*Agelaius tricolor*	—	FSC
Saltmarsh common yellow throat	*Geothlypis trichas sinuosa*	—	FSC
Greater sandhill crane	*Grus canadensis tabida*	CFP	—
White-tailed kite	*Elanus leucurus*	CFP	—
Mammals			
Suisun shrew	*Sorex ornatus sinuosa*	CSSC	FSC
Saltmarsh wandering shrew	*Sorex vagrans halicoetes*	—	FSC
Saltmarsh harvest mouse	*Reithrodontomys raviventris*	CFP	FE

Status Definitions:

- FT Listed as threatened under federal Endangered Species Act
- FE Listed and endangered under federal Endangered Species Act
- FSC Federal Species of Concern
- CE Listed as endangered under the California Endangered Species Act
- CT Listed as threatened under the California Endangered Species Act
- CSSC California Species of Special Concern
- CFP California Fully Protected

Factors critical to the long-term viability of local populations were identified for the frog, turtle, and flycatcher (see the Attribute column in Table C-1B). These factors were compared to the attributes of the healthy alluvial river model (Table C-7). Each alternative was assessed for impacts to attributes that could affect factors critical to the species. As noted under Vegetation, assessment of these attributes is based on long-term frequencies rather than individual water-year classes. Each alternative was assessed for impacts to attributes that could affect factors critical to the species. Scheduled releases from Lewiston Dam, and the frequency of releases, were used as the basis of comparison for each alternative against the healthy river attributes.

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Table C-7
Attributes of a Healthy Alluvial River System

Attributes	Physical Characteristics	Ecological Significance
Attribute 1. Spatially complex channel geomorphology: No single segment of channelbed provides habitat for all species or all life stages of a single species, but the sum of channel segments provides high-quality habitat for native species. A wide range of structurally complex physical environments supports diverse and productive biological communities.	• Restore alluvial channel (self-forming bed particle and bank dimensions). Threshold: Integration of attributes 3, 4, 5, 7, and 9. • Create and/or maintain structural complexity of alternate bar sequences. Threshold: Integration of attributes 2, 3, 4, 5, and 8. • Create and maintain functional floodplains. Threshold: Integration of attributes 2, 5, 6, 7, 8, and 9. • Increase diversity of channelbed particle size. Threshold: Integration of attributes 3, 4, 5, and 6. • Greater topographic complexity in side channels. Threshold: Integration of attributes 2, 4, 6, 7, 8, 9, and 10.	• Development of all stages of riparian community. • Maintenance of riparian habitat following channel migration. • Diverse salmonid habitat available for all life stages over a wide range of flows.
Attribute 2. Flows and water quality are predictably unpredictable: Interannual and seasonal flow regimes are broadly predictable, but specific flow magnitudes, timing, duration, and frequencies are unpredictable due to runoff patterns produced by storms and droughts. Seasonal water quality characteristics, especially water temperature, turbidity, and suspended sediment concentration, are similar to regional unregulated rivers and fluctuate seasonally. This temporal "predictable unpredictability" is a foundation of river ecosystem integrity.	• Provide inter- and intra-annual flow variation for summer baseflows. Threshold: Variable flow between 7/1 and 10/1. • Provide inter- and intra-annual flow variation for winter baseflows. Threshold: Variable flow between 1/1 and 4/1. • Provide inter- and intra-annual flow variation for winter floods. Threshold: Variable flow between 10/1 and 4/30. • Provide inter- and intra-annual flow variation for snowmelt peak periods. Threshold: Variable flow between 10/1 and 4/30. • Provide inter- and intra-annual flow variation for snowmelt recession. Threshold: Variable flow between snowmelt periods.	• Discourage riparian plant germination on alternate bars. • Spatially distributes spawning salmon and protects different life stages from high flows. • Creation of slack water areas for early life stages of salmonids and amphibians. • Stimulus for out-migrant salmon and variable macroinvertebrate habitat. • Rapid snowmelt recession dessicates developing riparian vegetation.

Table C-7
Attributes of a Healthy Alluvial River System

Attributes	Physical Characteristics	Ecological Significance
Attribute 3. Frequently mobilized channelbed surface: Channelbed framework particles of coarse alluvial surfaces are mobilized by the bankfull discharge, which on average occurs every 1-2 years.	• Achieve incipient motion for most of channelbed surface (riffles, face of point bars). Threshold: Flows greater than 6,000 cfs every 2 or 3 years. • Exceed incipient motion for mobile active channel alluvial features (median bars, pool tails, spawning gravel deposits). Threshold: Flows greater than 3,000 cfs every 2 or 3 years. • Exceed threshold for transporting sand through most pools. Threshold: Flows greater than 3,000 cfs every 2 or 3 years, or mechanical rehabilitation.	• Higher egg and alevin survival due to reduced fine sediment in redds. • Lower rates of riparian encroachment through removal of 1- to 2-year old seedlings. • Greater substrate complexity, increasing macroinvertebrate production, and creating deeper pool depths for adult fish cover and holding.
Attribute 4. Periodic channelbed scour and fill: Alternate bars are scoured deeper than the coarse surface layer by floods exceeding 3-5 year annual maximum flood recurrences. This scour is typically accompanied by redeposition, such that net change in channelbed topography following these scouring floods is usually minimal.	• Scour/redeposit faces of alternate bars (at least to D_{84}). Threshold: Flows greater than 8,500 cfs every 3-5 years. • Maintain scour channels on alternate bar surfaces. Threshold: Flows greater than 8,500 cfs every 3-5 years. • Scour/redeposit spawning gravel deposits (at least to D_{84}). Threshold: Flows greater than 6,000 cfs every 2 or 3 years. • Deposit fine sediment onto upper alternate bar and floodplain surfaces. Threshold: Flows greater than 6,000 cfs.	• Lower rates of riparian encroachment through removal of 2- to 4-year old seedlings on alternate bars, re-establishment of various stages of diverse riparian plant stands. • Anadromous spawning and rearing habitat. • Channelwide habitat complexity.
Attribute 5. Balanced fine and coarse sediment budgets: River reaches export fine and coarse sediment at rates approximately equal to sediment inputs. The amount and mode of sediment storage within a given reach fluctuates but sustains channel geomorphology in dynamic equilibrium when averaged over many years. A balanced coarse sediment budget implies bedload continuity: most particle sizes of the channelbed must be transported through the river reach.	• Reduce fine sediment storage in mainstem. Threshold: Qualitative based on fine sediment budget. • Maintain coarse sediment budget in the mainstem. Threshold: Qualitative based on coarse sediment budget. • Route mobilized D_{84} through alternate bar sequence. Threshold: 6,000 cfs every 2-3 years. • Prevent excessive aggradation of tributary-derived material in mainstem. Threshold: 6,000-14,000 cfs every 2-3 years, or mechanical rehabilitation.	• Improved spawning, rearing, and overwintering habitat. • Reduced riparian fossilization. • Maintenance of habitat complexity.

Table C-7
Attributes of a Healthy Alluvial River System

Attributes	Physical Characteristics	Ecological Significance
Attribute 6. Periodic channel migration: The channel migrates at variable rates and establishes wavelengths consistent with regional rivers with similar flow regimes, valley slopes, confinement, sediment supply, and sediment caliber.	• Create channel avulsions every 10 years. Threshold: 30,000 cfs every 10 years. • Channel migrates in alluvial reaches. Threshold: 6,000 cfs. • Maintain channel geometry as channel migrates. Threshold: 6,000 cfs.	• Multi-age structure of cottonwoods and other species dependent on channel migration. • Improved habitat for developing salmon. • Refugia from high-flow and high-temperature conditions.
Attribute 7. A functional floodplain: On average, floodplains are inundated once annually by high flows equaling or exceeding bankfull stage. Lower terraces are inundated by less frequent floods, with their expected inundation frequencies dependent on norms exhibited by similar, but unregulated river channels. These floods also deposit finer sediment onto the floodplain and low terraces.	• Encourage local floodplain surface scour and deposition by infrequent but larger floods. Threshold: 8,500 cfs every 3-5 years. • Inundate the floodplain. Threshold: 6,000 cfs every 2-3 years. • Floodplain construction keeps pace with floodplain loss on opposite bank. Threshold: 6,000 cfs.	• Increased woody riparian overstory and understory species diversity. • Physical processes conducive for early-successional riparian-dependent species, especially for birds and amphibians.
Attribute 8. Infrequent channel resetting floods: Single large floods (e.g. exceeding 10- to 20-year recurrences) cause channel avulsions, widespread rejuvenation of mature riparian stands to early-successional stages, side-channel formation and maintenance, and off-channel wetlands (e.g. oxbows). Resetting floods are as critical for creating and maintaining channel complexity as lesser magnitude floods.	• Major reorganization of alternate bar sequence. Threshold: 30,000 cfs every 10-20 years. • Infrequent deep scour on floodplain surfaces. Threshold: 24,000 cfs every 5-10 years. • Remove upstream bedload impedance by distributing tributary delta materials. Threshold: 14,000 cfs. • Deposit fine sediment on lower terrace surfaces. Threshold: 11,000-14,000 cfs. • Construct and maintain/rejuvenate side channels. Threshold: 11,000 cfs, or mechanical rehabilitation.	• Conversion of mature, less productive riparian habitats to highly productive, early-successional stages. • Control populations of 3- to 4- year old saplings and scour stands of mature riparian vegetation. • Creation of greater pool depths for adult fish cover and holding.

Table C-7
Attributes of a Healthy Alluvial River System

Attributes	Physical Characteristics	Ecological Significance
Attribute 9. Self-sustaining diverse riparian plant communities: Natural woody riparian plant establishment and mortality, based on species' life history strategies, culminate in early- and late-successional stand structures and species' diversities (canopy and understory) characteristic of self-sustaining riparian communities common to regional, unregulated river corridors.	• Periodic removal of individual mature riparian trees. Threshold: 14,000-30,000 cfs at least every 10 years. • Scour of most established seedlings (2- to 3-year old plants). Threshold: 8,500-14,000 cfs. • Scour of most initiating seedlings (0- to 1-year old plants). Threshold: 6,000 cfs, or mechanical rehabilitation. • Seed deposition on floodplains. Threshold: 5,000-6,000 cfs every 2-3 years. • Prevent seedling germination on lower bar surfaces. Threshold: 1,500-2,000 cfs.	• Increased wood riparian overstory and understory diversity. • Increased patchwork of riparian stands. • Increased diversity in age of riparian stands
Attribute 10. Naturally fluctuating groundwater table: Interannual and seasonal groundwater fluctuations in floodplains, terraces, sloughs, and adjacent wetlands occur, similar to regional, unregulated river corridors.	• Groundwater recharge of terraces and associated wetland habitats. Threshold: 10,000-14,000 cfs. • Groundwater recharge of floodplains and off-channel wetland habitats. Threshold: 6,000 cfs. • Groundwater recharge of gravel bars. Threshold: 1,500-2,000 cfs.	• High diversity of habitat types within the entire river corridor.

Three criteria were used to evaluate impacts to the foothill yellow-legged frog: gravel bar habitat available for breeding, pool or deeper water habitat available for other life stages, and the timing of peak flows in relation to the timing of natural hydrology. Alternatives were assessed on their ability to improve gravel bar and pool habitat. As discussed in the Affected Environment section, artificially timed peak flows can destroy or displace frog eggs masses in some years. This may occur when flow releases are not timed to match natural peak flows that may initiate breeding in this species. Alternatives were, therefore, evaluated based on the correlation between their peak flow and natural hydrology.

The alternatives' impacts on western pond turtles were evaluated according to two criteria: (1) the availability of pool habitat for breeding and adult life stages and (2) summer water temperature regimes that approximate pre-dam conditions. Pool habitat is critical for turtles because it benefits all of the turtle's life stages. Alternatives were assessed on their ability to improve pool habitat above No Action levels. Summer water temperatures have negatively affected the turtle by impairing growth, and has likely led to reduced reproductive success. Alternatives were assessed on their ability to return summer water temperatures to a pre-dam level.

Modeled reservoir levels were used for assessing impacts to the bald eagle for Shasta Reservoir only. Alternatives were assessed on the modeled reservoir elevations in June compared to reservoir elevations under the No Action Alternative.

The 1992 biological assessment for the Long-term Central Valley Project Operations Criteria and Plan identified a correlation (which does not imply cause and effect) between Shasta Reservoir levels and bald eagle reproductive success. Lower reservoir levels were correlated with lower nest success at Shasta Reservoir. No similar correlation was identified for the Trinity Reservoir population.

Evidence that nesting success in bald eagles is related to reservoir levels is circumstantial. No objective criteria can be developed based on available data to assess at what point reservoir level reduction may affect nest success or the mechanism by which it may affect nest success. Components of successful breeding in bald eagle are many and varied. Thus, a single correlation between reservoir levels and nesting success does not necessarily constitute substantial evidence that lower reservoir levels cause lower nesting success. We cannot, therefore, conclude that alternatives that would reduce Shasta Reservoir levels in some years necessarily result in significant adverse impacts to bald eagle.

Two criteria were used to evaluate impacts to willow flycatchers: (1) Early-successional willow habitat and (2) low-flow foraging habitat. Early-successional willow habitat is important for nesting. Alternatives were evaluated on their ability to provide early-successional willow habitat as predicted by the healthy alluvial river model. Low-flow portions of the channel and wetlands provide habitat for insects that are important food sources for the species.

As noted in the Vegetation section, flow reductions in the Sacramento River predicted for each of the project alternatives are not expected to have a significant adverse impact on riparian vegetation. Likewise, flow reductions are not expected to affect wildlife associated with riparian habitat along the river corridor. Diversions along the Sacramento River have in part (in addition to available groundwater in many areas) created pocket habitat along canals and near developed agriculture. As the quantity and quality of habitat along the river has been degraded due to flood control, urban encroachment, and agricultural conversion, these pocket habitats

have become more valuable ecologically. Some of these pocket habitats include designated habitat for endangered and threatened species such as the Pacific coast aquatic garter snake and the valley elderberry longhorn beetle. However, as discussed under the Water Management and Land Use sections, reductions in agricultural water deliveries in the Sacramento Basin are expected to be limited to agricultural water service contractors (primarily associated with the Tehama-Colusa Canal Authority). These reductions are not expected to be substantial enough to appreciably affect irrigation practices in the basin, and would therefore not affect pocket habitats or the wildlife resources associated with them.

Section 3406(d)(5) of the Central Valley Project Improvement Act (CVPIA) mandates that water supplies be increased to a number of national and state wildlife refuges throughout the Central Valley (U.S. Bureau of Reclamation, 1997). Reclamation is currently implementing this section of the CVPIA by constructing and designing new or improved facilities to ensure increased deliveries and reliability. Implementation of any of the alternatives proposed in this environmental impact statement/environmental impact report (EIS/EIR) would not affect the conveyance of additional supplies, as Reclamation is actively pursuing short- and long-term willing sellers to assist in meeting any potential gaps in supplies.

Wildlife along the Klamath River would not be appreciably affected by any of the alternatives as the confluence with the Trinity is approximately 100 miles downstream of Lewiston Dam. Tributary influence reduces the effects of the alternatives to insignificant levels, precluding analysis.

1.2.2.2 Significance Criteria

Significant impacts potentially resulting from each of the seven alternatives were identified by applying significance criteria to the anticipated consequences of each of the seven alternatives on vegetation and wildlife resources.

Significance criteria were developed in coordination with the Vegetation and Wildlife Technical Team and with input provided during public scoping meetings. The significance criteria employed for this analysis are based on CEQA and NEPA guidelines. Impacts on wildlife would be significant if project implementation would result in any of the following:

- Potential for reductions in the number, or restrictions of the range, of an endangered or threatened wildlife species or a wildlife species that is a candidate for state listing or proposed for federal listing as endangered or threatened
- Potential for substantial reductions in the habitat of any wildlife species including those that are listed as endangered or threatened or are candidates (CESA) or proposed (ESA) for endangered or threatened status
- Potential for causing a wildlife population to drop below self-sustaining levels
- Potential to eliminate an animal community
- Substantial adverse effect, either directly or through habitat modifications, on any wildlife species identified as a sensitive or special-status species in local or regional plans, policies, or regulations
- Substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations

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- Substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means
- A conflict with any local policies or ordinances protecting wildlife resources
- A conflict with, or violation of, the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, stat, or federal habitat conservation plan relating to the protection of wildlife species

Results of the impacts analysis for wildlife resources for all seven alternatives based on these significance criteria are summarized in Table C-1B.

1.2.2.3 No Action

Table C-1B discloses the effects of the No Action Alternative on the foothill yellow-legged frog, western pond turtle, bald eagle, and willow flycatcher. In general terms, riverine habitat conditions would remain poor for all species relative to pre-dam conditions. The bald eagle would continue to breed around Trinity, Lewiston, and Shasta Reservoirs at levels comparable to current conditions.

Foothill Yellow-legged Frog. The No Action Alternative would continue mechanical maintenance of the existing channel rehabilitation projects. These sites would be maintained using bulldozers, which may have temporary negative impacts on populations of frogs near the sites. However, once the channel rehabilitation sites are completed, the sites would provide additional habitat for yellow-legged frogs. Artificially timed peak releases would likely continue to contribute to poor reproductive success, leading to further population declines, with potential for local extinctions. The extensive mature riparian vegetation would continue to harbor high densities of mid-size predators (e.g., raccoons), to the detriment of the frog.

Western Pond Turtle. Pool habitat would remain poor due to the No Action flow schedule. Summer release temperatures would continue to be cooler than pre-dam conditions, potentially causing slower growth rates in young turtles and an increase basking time by all age groups (resulting in increased exposure to predators).

Bald Eagle. As modeled by the project simulation model (PROSIM), this alternative would result in an average Trinity Reservoir elevation of 2,307 feet on June 30. Average Shasta Reservoir elevation would be 1,040 feet. Forage levels for bald eagles would continue to be low in the Trinity River. No changes in Shasta and Trinity Reservoir levels are anticipated; thus, no impacts to the local nesting populations are anticipated. The reproductive rate of both populations would still exceed recovery goals.

Willow Flycatcher. Continued maturation of existing early-successional willow habitat would reduce suitable habitat for the species. The lack of wetlands and standing water would limit forage.

1.2.2.4 Maximum Flow

The Maximum Flow Alternative would re-establish an alternate bar sequence that would improve gravel bar and pool habitat compared to the No Action Alternative. Artificially timed peak flow events were designed to replicate the natural snowmelt recession, and would better

mimic natural conditions than would the No Action Alternative. Overall, this alternative would have a positive effect compared to the No Action Alternative.

Western Pond Turtle. Habitat would improve compared to the No Action Alternative because of the increase in structural diversity, especially in terms of pool habitat. The turtle would also benefit from increased water temperatures in the summer compared to the No Action Alternative. Temperature is discussed in the Water Quality section.

Bald Eagle. Average Trinity Reservoir June 30 levels were seen to drop substantially over the period of record compared to the No Action Alternative. Shasta Reservoir modeled elevation would decrease by 9 feet on June 30. Increases in anadromous fish populations anticipated from implementation of this alternative would provide an increased prey base for the bald eagle. This could benefit the local population to the extent that it is currently limited by food availability. Trinity and Shasta Reservoir elevations would decrease slightly on average over the analysis period. This small reduction is not likely to affect the bald eagle food supply, and thus is expected to have minimal effects on the local population.

Willow Flycatcher. This alternative would result in the greatest increase in early-successional willow habitat of all of the alternatives, increasing potential breeding habitat for this species. Presence of this habitat could benefit the species should it occur in the project area. Wetlands and standing water would also increase, resulting in increased forage. Although breeding has not been documented, and the peak flows would likely occur prior to initiation of egg laying, there is a slight but unanticipated possibility of mortality to young.

1.2.2.5 Flow Evaluation

The Flow Evaluation Alternative contains an adaptive management program. Such a program provides a mechanism to refine management actions for the benefit of the foothill yellow-legged frog, western pond turtle, bald eagle, willow flycatcher, and other wildlife species. Therefore, the impacts to these species need to be considered in the context of the program.

Foothill Yellow-legged Frog. Gravel bar habitat would be increased compared to the No Action Alternative. The combination of mechanical rehabilitation and increased flow is likely to re-establish an alternate bar geomorphology that would improve pool habitat. However, construction of rehabilitation projects could result in direct mortality of frogs or egg masses. This alternative includes peak flow releases that better mimic natural snowmelt recession than does the No Action Alternative; nevertheless, loss of egg masses is possible in some years because of the fixed release schedule. This alternative is expected to have an overall positive effect on frog populations as a result of improved habitat compared to the No Action Alternative.

Western Pond Turtle. Pool formation and other structural diversity would increase compared to the No Action Alternative. Summer release temperatures would be essentially the same as the No Action Alternative (to the detriment of the turtle); however, the increased structural diversity of the river would result in increased thermal diversity. Construction of rehabilitation sites could cause direct short-term morality of turtles or hatchlings. Overall, the Flow Evaluation Alternative is slightly more beneficial than No Action.

Bald Eagle. As modeled by PROSIM, this alternative would result in an average Trinity Reservoir elevation of 8 feet less than the No Action Alternative on June 30. Average Shasta

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Reservoir elevation would be 7 feet lower. Increases in anadromous fish populations anticipated from implementation of this alternative could provide an increased prey base for bald eagle. This could benefit the local population to the extent that it is currently limited by food availability. Reductions in Trinity and Shasta Reservoir water levels and resulting impacts to the local bald eagle population would be negligible.

Willow Flycatcher. Early-successional willow habitat would be increased by mechanical rehabilitation and increased flows, compared to the No Action Alternative. Wetlands and standing water would increase, resulting in increased forage. Although breeding has not been documented, and the peak flows would likely occur prior to initiation of egg laying, there is a slight possibility of mortality to young.

1.2.2.6 Percent Inflow

Foothill Yellow-legged Frog. Gravel bar habitat would be increased through mechanical means, and maintenance would be accomplished with flows. The flow schedule likely would include higher flows than the No Action Alternative, resulting in moderate improvements in alternate bar geomorphology and resultant pool formation. Timing of peak flows is completely dependent on timing of natural hydrology (with a 1-week lag), as was the case prior to the dam. Thus, this alternative would improve survival of egg masses compared to the No Action Alternative. Taken together, improved habitat and naturally timed peak flows make this the favored alternative for this species. However, construction of rehabilitation sites could result in direct short-term mortality of frogs or egg masses.

Western Pond Turtle. As noted, pool formation and other structural diversity would moderately improve compared to the No Action Alternative, resulting in moderate improvements in turtle habitat. Summer water temperatures would move towards the pre-dam temperature regime, resulting in an improvement over No Action. Taken together, improved habitat and summer water temperature conditions make this the favored alternative for this species. Construction of rehabilitation sites could cause direct short-term mortality of turtles or hatchlings.

Bald Eagle. As modeled by PROSIM, this alternative would result in an average Trinity Reservoir elevation of 2,307 feet on June 30. Average Shasta Reservoir elevation would be 1,040 feet. Potential increases in anadromous fish populations in the project area could have a beneficial effect on the local bald eagle population to the extent that it is currently limited by food availability. Reductions in Trinity and Shasta Reservoir water levels and resulting impacts to the local bald eagle population would be negligible.

Willow Flycatcher. Early-successional willow habitat would be increased to some degree by mechanical rehabilitation and increased flows. Wetlands and standing water would increase, resulting in increased forage. Although breeding has not been documented, and the peak flows would likely occur prior to initiation of egg laying, there is a slight possibility of mortality to young.

1.2.2.7 Mechanical Restoration

Foothill Yellow-legged Frog. Timing and volume of releases would be the same as No Action, thus would not be beneficial to this species. The increased number of rehabilitation

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projects would provide improved breeding habitat for frogs. However, construction of the sites could result in short-term mortality of frogs or egg masses.

Western Pond Turtle. This alternative would dredge 10 pools in the Trinity River mainstem and construct 47 additional channel rehabilitation projects. Construction of the sites could cause direct short-term mortality; however, the activities would benefit the turtle in the long-run by creating additional habitat. Summer flow temperatures would be the same as No Action, and thus would not be beneficial to this species.

Bald Eagle. This alternative would slightly increase forage in the Trinity River. Reservoir elevations would be the same as those identified under the No Action Alternative; and therefore, impacts to reservoir populations would be similar to that alternative.

Willow Flycatcher. Early-successional willow habitat would be increased by the mechanical rehabilitation projects proposed under this alternative. Impacts to young could occur as a result of the channel rehabilitation projects.

1.2.2.8 State Permit

Foothill Yellow-legged Frog. Availability of gravel bar and pool habitat would likely decline under this alternative because no channel rehabilitation activities would occur and flows would be reduced. This could accelerate the rate of decline of the species, possibly leading to local extirpation. The benefits of increased water temperatures would be negated by the decrease in available habitat.

Western Pond Turtle. Availability of pool habitat would likely decrease under this alternative because of a lack of channel rehabilitation projects and reduced flows. Water temperatures would, however, increase compared to the No Action Alternative, resulting in a potential benefit. However, because of the lack of habitat, this alternative would be unlikely to have a substantial beneficial effect.

Bald Eagle. As modeled by PROSIM, this alternative would result in an average Trinity Reservoir elevation increase of 9 feet on June 30. Average Shasta Reservoir elevation would be unchanged. This alternative would decrease populations of anadromous fish, and thus would have an adverse impact on the local bald eagle population to the degree that it is affected by food availability. Shasta Reservoir elevation would increase slightly on average, which might result in increased prey availability with possible beneficial effects on the bald eagle population that nests at Shasta Reservoir.

Willow Flycatcher. Reductions in flows compared to the No Action Alternative would allow continued maturation of early-successional willow habitat. Additionally, no new early-successional habitat would be formed by rehabilitation projects. Wetlands and standing water would also decrease, resulting in decreased forage. This alternative would effectively degrade or eliminate any existing habitat for this species.

1.2.2.9 Existing Conditions versus Preferred Alternative

The Preferred Alternative would substantially improve conditions for many species of rare wildlife along the Trinity River compared to existing conditions. The degree and nature of the

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change would be similar to the difference between the Flow Evaluation and No Action Alternatives; however, No Action conditions would likely be even worse than existing conditions because of the continuing degradation of the river.

1.2.3 Mitigation

Flow-related impacts to the willow flycatcher (in the form of destroying nests) would be unmitigatable. The following mitigation should be implemented to ensure potential significant adverse impacts are reduced to a less than significant level:

- Conduct site-specific environmental reviews prior to channel rehabilitation projects, spawning gravel placement, watershed protection work, and other activities not specifically covered by this document (i.e., the non-flow activities). Such reviews shall, when appropriate, include surveys for federal and state endang-ered, threatened, and proposed species, or for other species if required by permitting agencies (e.g., USFS). If such species are present, actions shall be taken to avoid impacts (e.g., delay construction until after willow flycatcher chicks have fledged).

1.3 WETLANDS

1.3.1 Affected Environment

1.3.1.1 Trinity River Basin

At the time of dam construction, there were no Clean Water Act provisions regulating wetlands, so historical information on wetlands is sparse. However, pre-dam conditions likely included more areas that would qualify as wetlands under Section 404 of the Clean Water Act of 1972 than currently exist.

Filling of the reservoirs flooded areas that included meadows and riparian vegetation, areas that likely included wetlands. The distribution and abundance of wetlands downstream of the dams was likely highly variable and dependent on hydrologic conditions.

Wetland acreage has probably declined following dam construction because reduced flows now inundate less of the floodplain. Fringe strands of freshwater emergent vegetation, scrub-shrub, and forested wetlands now occur intermittently, where a wider belt of wetland likely existed under pre-dam conditions. Elimination of river meanders has reduced post-dam wetland acreage by curtailing formation of oxbows and other meander-related features.

1.3.1.2 Lower Klamath River Basin/Coastal Areas

The lower Klamath River is relatively broad and is able to meander within the floodplain. Accordingly, the Klamath River likely has wetland habitat characteristics similar to those on the

pre-dam Trinity. Wetland habitats along the lower Klamath River are dominated by cattails, tules, and a variety of sedges and rushes, with salt-tolerant species including cord grass and pickleweed increasing in abundance as the river nears the ocean.

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1.3.1.3 Central Valley

Wetland habitats along the Sacramento River and throughout much of the Bay-Delta consist of wetlands dominated by cattails, tules, and a variety of sedges and rushes, with salt-tolerant species including cord grass and pickleweed increasing in abundance with increasing salinity concentrations as the river nears the San Francisco Bay.

1.3.2 Environmental Consequences

1.3.2.1 Methodology

The healthy alluvial river model (Table C-7) was used to assess the ability of each alternative to inundate floodplains, and thereby, create and maintain wetlands. As noted in the Vegetation and Wildlife sections, flow reductions in the Sacramento River predicted for each of the project alternatives are not expected to have a significant adverse impact on riparian vegetation. Agricultural diversions are not expected to be substantially affected in the Sacramento Basin as a result of the alternatives. Likewise, pocket habitat created by agricultural diversions, including wetland habitat, would not be substantially affected by implementation of the alternatives. As was also noted in the Wildlife section, implementation of any of the alternatives proposed in this EIS/EIR would not affect the conveyance of additional supplies to meet national and state refuge area needs specified in CVPIA, as Reclamation is actively pursuing short- and long-term willing sellers to assist in meeting any potential gaps in supplies.

Wetlands along the lower Klamath River would not be appreciably affected by any of the alternatives as the confluence with the Trinity is approximately 100 miles downstream of Lewiston Dam. Tributary influence reduces the effects of the alternatives to insignificant levels, precluding analysis.

1.3.2.2 Significance Criteria

Significant impacts potentially resulting from each of the seven alternatives were identified by applying significance criteria to the anticipated consequences of each of the seven alternatives on vegetation and wildlife resources.

Significance criteria were developed in coordination with the Vegetation and Wildlife Technical Team and with input provided during public scoping meetings. The significance criteria employed for this analysis are based on CEQA and NEPA guidelines. Impacts on wetlands would be significant if they would result in any of the following:

- Substantial adverse effect on any riparian habitat
- Substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means
- A conflict with any local policies or ordinances protecting wetland and/or riparian resources

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- A conflict with, or violation of, the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, state, or federal habitat conservation plan relating to the protection of wetland resources

Results of the impacts analysis for wetlands resources for all seven alternatives based on these significance criteria are summarized in Table C-1C.

1.3.2.3 No Action

Under the No Action Alternative, existing wetlands would be unlikely to change (Table C-1C). This alternative includes a peak flow capable of partially inundating floodplains, thus maintaining remnant wetlands from the pre-dam period.

1.3.2.4 Maximum Flow

The Maximum Flow Alternative could result in the displacement of a small amount of remnant fringe wetlands that remain along some portions of the mainstem Trinity River. However, flows associated with this alternative would inundate wetlands in the floodplain over much larger areas than currently exist. The net impact compared to the No Action Alternative would be beneficial.

1.3.2.5 Flow Evaluation

The channel rehabilitation projects of the Flow Evaluation Alternative could result in the displacement of a small amount of remnant fringe wetlands that remain along some portions of the mainstem Trinity River. However, implementation of the alternative would result in flows capable of inundating wetlands in the floodplain over much larger areas than currently exist. Because these flows are scheduled for a greater duration than the Maximum Flow Alternative, this alternative might be slightly more effective in maintaining these floodplain wetlands. The long-term increase in wetland areas compared to No Action would be beneficial.

1.3.2.6 Percent Inflow

The channel rehabilitation projects of the Percent Inflow Alternative could result in the displacement of a small amount of remnant fringe wetlands that remain along some portions of the mainstem Trinity River. However, the alternative would inundate more of the flood-plain, on average, than the No Action Alternative. This would be a beneficial effect, although to a lesser degree than the Maximum Flow and Flow Evaluation Alternatives, because total flows would be less in most years.

1.3.2.7 Mechanical Restoration

The channel rehabilitation projects of the Mechanical Restoration Alternative could result in the displacement of a small amount of remnant fringe wetlands that remain along some portions of the mainstem Trinity River. Other than those losses, the impacts would be identical to the No Action Alternative.

1.3.2.8 State Permit

The reduced flows of the State Permit Alternative would reduce the amount of existing wetlands because it would likely create a narrower channel than currently exists. Flows would be insufficient to inundate the floodplain and maintain wetland areas. Wetlands would be reduced compared to the No Action Alternative, which would be a significant adverse impact.

1.3.2.9 Existing Conditions versus Preferred Alternative

The Preferred Alternative would increase wetland conditions along the Trinity River compared to existing conditions (in terms of restoring to pre-dam conditions). The degree and nature of the change would be similar to the difference between the Flow Evaluation and No Action Alternatives; however, existing conditions are likely to be less severe than No Action conditions (i.e., year 2020) because of the continuing degradation of the river.

1.3.3 Mitigation

There would be no significant adverse flow-related impacts to wetland resources; however, the mechanical channel rehabilitation projects and other ground-disturbing activities could impact wetland resources. The following mitigation should be implemented to ensure that potential significant adverse impacts are reduced to a less than significant level:

- Conduct pre-construction delineation of wetland areas at sites that may contain wetlands.
- Consult with the Corps on potential impacts to wetland resources.

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