4.4 BIOLOGICAL RESOURCES

4.4.1 Regulatory Setting

Statutes, regulations, and policies that are of particular relevance to Biological Resources include the following:

Federal Statutes, Regulations, and Policies

National Environmental Policy Act
Clean Water Act
Fish and Wildlife Coordination Act
Migratory Bird Treaty Act
Endangered Species Act
Regulatory Programs of the Corps of Engineers
EPA 404(b)(1) Guidelines
Executive Order 11988 - Floodplain Management
Executive Order 11990 - Protection of Wetlands

California Statutes, Regulations, and Policies

California Environmental Quality Act
California Endangered Species Act
Fish and Game Code Section 1601 - Streambed Alteration Agreement
Fish and Game Wildlife Habitat Mitigation Policy
California Wetlands Policy

Discussion of the above and the project's compliance with them is provided in section 3.3 of this document.

4.4.2 Existing Conditions

Vegetation

Methods

Vegetation surveys to characterize major habitat types and inventory trees were conducted by The Habitat Restoration Group in 1986, and 1989–1990. Additional baseline description of the project area was developed by the USFWS based on fieldwork conducted in March and August 1993 and November 1996, in collaboration with other project participants as part of the USFWS' Coordination Act Report (CAR), (USFWS 1997; Appendix D). An Environmental Working Paper prepared as part of the Corps' Feasibility Study (COE 1997) provided a summary of existing information and preliminary conclusions from the EIR/S as of October 1995. Baseline descriptions and analyses have been updated in the SCVWD's Draft EIR/S Biology section (Parsons Engineering Science 1997). That document and the Environmental Working Paper have been the primary sources of information for this EIR/S. To further confirm the adequacy of pre-existing data, a reconnaissance survey of the project area was also conducted by the Corps' contractor in late June 1996.

A list of all plants observed in the field was compiled (Appendix F). Searches were conducted for special-status plants; results are described below. Of the plant species observed within the project study area by The Habitat Restoration Group (see Appendix F), none are listed threatened or endangered species nor are there any that are proposed for listing or candidate species.

Generalized habitat types were mapped and digitized into a Geographic Information System (GIS) database (Parsons Engineering Science 1997). To assess project effects on riparian forest fragmentation, the EIR/S analysis also included calculations of riparian forest patch lengths and of the intervening gap lengths.

A tree inventory was conducted for the EIR/S, with all trees larger than 2 inches diameter at breast height (dbh) inventoried by species, size class, canopy closure class, and bank location. Trees which were at least 20 inches dbh were identified as "ordinance trees" for evaluation under the City of San Jose's tree ordinance.

Wetlands and other jurisdictional waters of the United States subject to regulation under Section 404 of the Clean Water Act were delineated by the SCVWD in June and July 1995. The delineation encompassed the project study area, as well as areas that are part of the SCVWD's proposed flood control project, including Reaches 6-13, Ross Creek, Canoas Creek, and a portion of Reach A. The delineation was reviewed and verified by the Corps in early 1996 (Parsons Engineering Science 1997).

Vegetation Communities. Six vegetated habitat types have been recognized within the project study area:

- riparian forest
- freshwater marsh
- ruderal herbaceous
- ruderal scrub
- upland landscaping
- urban forest

Three other types of unvegetated or sparsely vegetated habitats have been distinguished within the study area: (1) exposed earth with little or no vegetation and land covered by structures or pavement; (2) revetment (e.g., rock-filled gabions, concrete, or riprap) which serve to provide bank stabilization along the banks of the river and creek channels; and, (3) the low-flow, open-water river channel, which was full when aerial photographs were taken for habitat mapping.

The vegetated habitats are described below. The locations of the vegetated and unvegetated habitats within the project study area are shown in the maps provided in Appendix E. Habitat acreages are summarized in Table F-1, Appendix F.

RIPARIAN FOREST. Riparian forest, occupying about 30 acres along the river banks, is the most extensive and important vegetation community in the project area. The lower banks and sandbars are typified by Fremont cottonwood (*Populus fremontii*) and willows (*Salix* spp.). On middle and upper bank areas, the single most abundant tree is black locust (*Robinia pseudoacacia*), an invasive species that displaces native riparian forest trees. Native tree species in order of decreasing abundance include California black walnut (*Juglans hindsii*), blue elderberry (*Sambucus mexicana*), sycamore (*Platanus racemosa*), box elder (*Acer negundo* ssp. *californicum*), California buckeye (*Aesculus californica*), coast live oak (*Quercus agrifolia*), and valley oak (*Quercus lobata*). Other abundant non-native trees include fruit trees (especially *Prunus* spp.) blue gum (*Eucalyptus globulus*), and California pepper tree (*Schinus molle*). The understory may be quite shrubby in places and is composed of tree saplings as well as blackberry (*Rubus* spp.) and poison oak (*Toxicodendron diversilobum*) along with underlying herbaceous and grass species.

Parts of the riparian forest in the study area may be among the best remaining in the Santa Clara Valley. The riparian forest corridor is probably more narrow than its historic extent, currently ranging in width from about 30 feet to 275 feet wide (see Appendix E). In general, the riparian forest in the lower reaches of the study

area (Reaches 7–9) is still fairly continuous and dense, while in the upper reaches (Reaches 10–12) the riparian forest is more discontinuous and degraded as a result of past gravel mining, flood control projects, highway development, and other development in this area. Reach 9 contains the most abundant riparian forest, covering about 9 continuous acres (see Appendix F, Table F-1), and ranges between 30–200 feet wide. The widest band of riparian forest occurs along Reach 10 (Reach 10C), ranging between 100–275 feet wide. Ruderal herbaceous vegetation dominates the channels of Ross and Canoas creeks.

Additional data on the structure and composition of riparian forest, including reach-by-reach descriptions, are contained in the SCVWD's EIR/S (Parsons Engineering Science 1997). A reach-by-reach discussion of riparian habitats is also provided below in the wildlife section.

FRESHWATER MARSH. The freshwater marsh community occurs sporadically on wet soils and shallow waters in the channels of the Guadalupe River, Ross Creek, and Canoas Creek. Approximately 4 acres of freshwater marsh is present in the study area, with the largest areas being along Reach 10B and Reach 12. The marshes are dominated by cattail (*Typha* sp.), California bulrush or tule (*Scirpus californicus*), curly dock (*Rumex crispus*), sedges (*Cyperus* spp. and *Carex* spp.), bur-reed (*Sparganium eurycarpum*), creeping water-primrose (*Ludwigia peploides*), and other herb and grass species. Occasionally, cottonwoods and willows are found growing in among the marshes. Freshwater marsh accounts for most of the jurisdictional wetland habitat in Appendix F, Table F-1. Areas of non-persistent vegetation within the stream channel are included in the acreage of "River" habitat and "Other Waters" in Appendix F, Table F-1.

RUDERAL HERBACEOUS AND RUDERAL SCRUB. The ruderal communities are disturbed habitats consisting of native and introduced plants. These communities occupy about 27 acres on and above the banks of the study area streams, occurring as a distinct habitat and also often extending into the riparian forest as an understory layer. The ruderal herbaceous community is dominated by a number of non-native and native herbaceous species, including black mustard (*Brassica nigra*), field mustard (*B. campestris*), cocklebur (*Xanthium strumarium*), fennel (*Foeniculum vulgare*), horseweed (*Conyza canadensis*), Italian thistle (*Carduus pycnocephalus*), perennial peppergrass (*Lepidium latifolium*), prickly lettuce (*Lactuca serriola*), and white clover (*Melilotus albus*). Dominant grasses in the herbaceous ruderal habitat are Bermuda grass (*Cynodon dactylon*), ripgut brome (*Bromus diandrus*), soft chess (*Bromus mollis*), and wild oat (*Avena barbata*). The ruderal scrub communities are dominated by shrubs and viny plants such as coyote bush (*Baccharis pilularis*), blackberry (*Rubus ursinus*), Himalaya berry (*R. procerus*), castor-bean (*Ricinus communis*), and poison oak (*Toxicondendron diversilobum*).

UPLAND LANDSCAPING. Trees and shrubs which have been planted as landscaping can be found around the buildings and along the roads of the project study area. The landscaped areas occupy about 8 acres, over half of which is in Reach 10B, at the top of the bank, adjacent to and encroaching into the riparian forests. The most common planted trees are eucalyptus, California pepper tree, coast redwood (*Sequoia sempervirens*), olive (*Olea europea*), holly oak (*Quercus ilex*), tree-of-heaven (*Alianthus altissma*), and Monterey pine (*Pinus radiata*), none of which are native to the project area.

URBAN FOREST. The urban forest habitats are considered to be those trees and shrubs located in and around the residential and commercial lots which do not fit into the category of a riparian forest or upland landscaping habitat. They are mostly garden plants and street trees with the common species being elm, tree-of-heaven, and black acacia (*Acacia melanoxylon*), as well as lemon (*Citrus limon*), orange (*C. sinensis*), and other fruit trees (*Prunus* spp.). Urban forest is most extensive at the northern end of the study area and along Ross and Canoas creeks.

Tree Inventory Results (Species, Size Class, Canopy Closure Class, and Bank Location). The results of the tree inventory are provided in the SCVWD Public Draft EIR/S (Parsons Engineering Science 1997) and summarized in Tables F-2 through F-4, Appendix F. There are 7,375 trees larger than 2 inches dbh within the riparian corridors of the study area. Several hundred trees also occur within adjacent urban forest areas. The trees are fairly evenly distributed between the east and west banks of the Guadalupe River although there are more trees along the east bank of the river.

Most of the trees occur from the top of the slope down to the mid-slope area along the channel, with fewer trees in the area between the lower slope and the channel bottom. At the time of measurement, there were 601 trees qualifying as "ordinance trees" ($\geq$ 20 inches dbh). None of the trees within the project study area qualify as heritage trees (trees that have been specifically identified by the City Council to have special significance to the community), but there are three designated heritage trees within urban forest habitat that is outside of Reach 9.

Wetlands and Other Jurisdictional Waters of the United States. Waters of the United States, including wetlands and navigable waters, are subject to federal jurisdiction under the Clean Water Act. Wetlands are defined in federal regulation as:

> . . . those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support and that under normal conditions do support a prevalence of vegetation typically adapted for life in saturated soil conditions. (33 CFR Part 328.3[b])

Consistent with this definition, the identification and delineation of Corps jurisdictional wetlands is based on the presence, under normal conditions, of wetland hydrology, hydric soils, and hydrophytic vegetation, as defined in the Corps' 1987 wetland delineation manual (Environmental Laboratory 1987). When all three criteria are met, the soil is saturated for a sufficient period (at least 5-10 percent of the growing season) to cause anaerobic conditions and recognizable physical-chemical changes in the soil that, in turn, lead to the development of hydrophytic vegetation. The latter is recognized on the basis of the wetland indicator status of the dominant plants (e.g., see Appendix F).

Navigable waters include the open ocean, tidal bays, and large rivers and lakes. "Other waters" refers to waters of the United States other than wetlands or navigable waters. Other waters include streams and ponds, which are distinguished by the presence of an ordinary high water mark (OHWM); other waters are generally open water bodies and are not vegetated; they can be perennial or intermittent water bodies and waterways.

The Corps regulates other waters to the outward limit of the OHWM (33 CFR Part 328.4[c][1]). The OHWM on a non-tidal water is the "line on shore established by the fluctuations of water and indicated by physical characteristics such as a clear natural line impressed on the bank; shelving; changes in the character of soil; destruction of terrestrial vegetation; the presence of litter and debris; or other appropriate means that consider the characteristics of the surrounding areas" (33 CFR Part 328.3[e]). Streams should exhibit a defined channel, bed, and banks to be delineated as other waters.

Within Reaches 7 through 12 and along Ross and Canoas creeks, the SCVWD has identified 4.85 acres of Corps-jurisdictional wetlands and 33.15 acres of other jurisdictional waters (Table F-1, Appendix F). The wetland areas consist of freshwater marsh habitat and the lower-bank portions of the riparian habitat. Other jurisdictional waters comprise the non-wetland habitats within the limits of ordinary high water, including open water, stream channels, and the lower riverbanks that lack wetland vegetation.

The wetlands occur at the toe of slope and in relatively shallow, slow-moving parts of the stream, as well as on point bars within the river. Each of the reaches of the study area contain some wetlands, but the acreages vary from reach to reach (Table F-1, Appendix F). The dominant hydrophytic plants of the freshwater marsh wetlands are cattail, bur-reed, sedge, and creeping water-primrose. Dominant plants within the riparian wetlands are the willows and cottonwoods. In addition to supporting hydrophytic vegetation, the delineated wetlands also contain hydric soils that are seasonally saturated or inundated by river flows. Relatively small portions of the riparian habitat are classified as wetland because (1) water depths and/or velocities within most of the river channel are too great, at least periodically, to allow the development of wetland vegetation; and (2) the riparian areas on the upper banks are insufficiently flooded or saturated.

Fisheries

Methods

Information on fisheries is based on several previous studies (Parsons Engineering Science 1997; USFWS 1993; and COE 1992).

A survey to map stream habitat and sample fish populations within the upper Guadalupe River was performed by The Habitat Restoration Group between July and September 1986 and in June 1987. Additional fish sampling was conducted in November and December 1986 in the Guadalupe River upstream of the project study area, upstream of Blossom Hill Road. They also performed a field survey of salmonid spawning in 1992–1993. During the 1986–1987 field surveys, fish sampling was conducted using backpack electrofishing techniques. Sites sampled included pool, riffle, and run habitats to determine macrohabitat use by fish. Captured specimens were measured by size group and abundance ratings were determined for juvenile and adult fish. In addition to characterizing habitat conditions at each sample site, measurements of streamflow, water temperature, and dissolved oxygen were recorded.

In the summer of 1991, the USFWS conducted fish sampling by electrofishing techniques. In 1992, the California Department of Transportation (Caltrans) sponsored a fishery monitoring survey of Ross Creek. In 1994, the SCVWD completed the fifth year of a monitoring program for a summer dams fishery study.

A survey of the aquatic habitat in the project study area was conducted in March, July, and August 1993 by biologists from the USFWS, CFDG, Jones & Stokes Associates, and The Habitat Restoration Group. The purpose of this survey was to verify habitat conditions and evaluate shaded riverine aquatic (SRA) habitat. Habitat features were mapped onto aerial photographs and habitat data from 98 randomly selected band transects were recorded. Habitat variables included instream and overhanging vegetation, instream woody debris and aquatic vegetation, natural undercut banks, bank stabilization structures (i.e., gabions, revetments, concrete linings), substrate composition, and channel width. This information was used to determine habitat quality for each side of the river (east and west banks) in each study reach. Aquatic habitat features of Ross and Canoas creeks have not been quantified, but the affected reach of each stream lacks SRA cover and microhabitat features important to salmonids, and neither stream provides appropriate spawning and rearing habitat upstream (Parsons Engineering Science 1997).

Fish Populations

The populations of native fishes in the southern San Francisco Bay streams began to decline around the turn of the century, as agricultural development and other activities increased, and later after World War II when urbanization became more significant. The advent of urban encroachment flood control structures, water diversions, urban discharges, and other activities have resulted in limitation on available habitat, reduced flood

flows, and a decline in water quality, some or all of which may have reduced the native populations. Today, 15 species of fish are known to occur in the Upper Guadalupe River area (Table F-5, Appendix F). Additional species are likely to occur downstream in brackish/estuarine habitats, and in upstream tributaries. Fishes of the study area include eight native species and seven non-native species. The populations are composed of three anadromous species (fish that spend their adult life in the ocean and migrate up freshwater streams to spawn) and 12 resident species. Rainbow trout (*Oncorhynchus mykiss*) is a resident species that spawns in the watershed upstream of the project study area. The introduced species are abundant in the river and have a competitive advantage over the anadromous salmonids; they consume large quantities of macroinvertebrate prey species and are predators of juvenile salmonids. It is noted that although fishing is allowed in the river, CDFG recommends that fish not be consumed due to concerns over mercury contamination.

Two anadromous salmonids, chinook (king) salmon (*Oncorhyncus tshawytscha*) and steelhead trout (*O. mykiss*), occur in the study area. Despit anecdotal reports (USFWS 1977), there is no confirmed documentation that coho salmon have occurred historically (San Francisco Estuary Project 1997) or occur at present in the Guadalupe River, which generally lacks suitable habitat for this species. Historically, the Guadalupe River probably supported self-sustaining populations of steelhead trout (Leidy 1984). Chinook salmon were probably not native to the streams of south San Francisco Bay but are now present in the Guadalupe River. This may be due to smolt releases into the bay and delta by CDFG. Small runs of adult chinook salmon and steelhead trout persist in the Guadalupe River; however, the extent to which these are self-sustaining populations or strays from other rivers is not well-documented. Most chinook salmon spawning in the Guadalupe River occurs downstream of the project study area, below I-280; none occurs above Reach 13 (beyond the study area) because of a barrier to fish passage above Blossom Hill Road. Resident (non-anadromous) rainbow trout spawn in the river upstream of this barrier. Salmonids may occasionally migrate up Ross Creek, although the quality of spawning and rearing habitat is marginal. Canoas Creek has poor access due to the height of the culvert above the river, but CDFG has indicated that this stream does not affford suitable spawning and rearing habitat, and so fish passage should not be improved. The populations of salmonids in the river probably fluctuate in response to moderate-to-high precipitation years that create suitable environmental conditions for upstream migration of adults, adult spawning, and possible juvenile survival.

There is good documentation for chinook salmon spawning attempts in the project area, but successful reproduction is limited to the capture of two juveniles. Adult salmonids are seen annually in the Guadalupe River in the reaches downstream of the project study area. Chinook salmon and their redds have been observed at various locations along the Guadalupe River, especially in the downtown reach of the river (Parsons Engineering Science 1997). Chinook salmon were observed spawning in the Guadalupe River near Willow Glen Way (Reaches 8 and 9) in November of both 1986 and 1987, and numerous salmon were observed in Los Gatos Creek in 1996 at several locations (downstream of the project study area). The presence of adult chinook salmon was documented in the Guadalupe River in December 1993 and January 1994. Unidentified juvenile salmonids were caught at the confluence of Canoas Creek and Guadalupe River (Reach 10) in March 1994. In March 1996, two positively identified juvenile chinook salmon were captured under the Branham Lane bridge, immediately downstream of where redds had been found earlier in the winter (personal communication, N. Kogut 1997). While salmonid redds have been observed in the study area, summer water temperatures within this portion of the river system are often too high for steelhead/rainbow trout, and migration barriers preclude access by steelhead trout to better habitat upstream (Parsons Engineering Science 1997).

STEELHEAD TROUT. The National Marine Fisheries Service (NMFS) has completed a comprehensive status review of West Coast steelhead trout populations within California, Idaho, Oregon, and Washington and has identified 15 Evolutionary Significant Units (ESUs) within this range. Five of these ESUs were proposed for

listing as threatened or endangered under the federal Endangered Species Act (61 FR 41541-41561, August 9, 1996). One of the five ESUs proposed for listing as threatened, the Central California Coast ESU, includes river basins from the Russian River (Sonoma County) to Soquel Creek (Santa Cruz County), and the drainages of the San Francisco and San Pablo bays. This ESU was listed as threatened in August 1997. Life-history information is generalized from Shapovalov and Taft (1954); little is known about the Guadalupe River population. Steelhead trout are sea-run rainbow trout. Steelhead trout migration and spawning coincides with the winter rainy season (Table F-6, Appendix F). Spawning typically occurs at the head of riffles, in the tail of pools, and in shallow runs. Females construct redds in habitats containing clean, loose gravel of small to medium size, average water velocities of 1–3 feet per second, and water depths of 0.75–3 feet. Eggs incubate in the redds for about 1 month and the newly hatched fry remain in the gravel for 2–6 weeks. The fry emerge from the nests to feed on small invertebrates in quiet, shallow waters. During their juvenile stage, the steelhead trout typically remain in freshwater for at least one year before migrating to the ocean during the spring. Most adult steelhead trout survive spawning and return to the ocean; this is presumably the case, although unconfirmed, in the Guadalupe River. Because juvenile steelhead trout rear in the river over a full year, adequate streamflows and water temperatures are required, especially during the low-flow summer season. Optimal conditions for juvenile rearing occur when water temperatures range from 43° to 65°F. The upper lethal limit for steelhead trout is 77°F.

It is not known whether steelhead trout juveniles are able to survive summer conditions in those portions of the river that are accessible to spawning adults. Juvenile survival may be limited by warm water temperatures and predatory fishes such as largemouth bass and green sunfish. Three juvenile trout were found in Reaches 9 and 10 in April and May 1995 (The Habitat Restoration Group 1995), but it is not known if these were juvenile steelhead trout, or rainbow trout washed downstream by high winter flows. In recent years, steelhead trout have been observed attempting to jump the drop structure at Blossom Hill Road; these fish could have been spawned upstream.

Although adult steelhead trout are known to migrate up the Guadalupe River, and numerous salmonid redds have been noted, confirmed steelhead trout redds and possible juveniles have been few. It is not known whether these fish represent a self-sustaining population of steelhead trout. It is possible that rainbow trout upstream of the study area could provide a source for adult steelhead migrants.

CHINOOK SALMON. The life history for chinook salmon is different from that of the steelhead trout. Adult chinook salmon will enter the Guadalupe River to spawn as early as June (see Table F-6, Appendix F). The adults typically spawn in the lower reaches of the Guadalupe River, in habitats of coarse gravel riffles. All adults die after spawning. To successfully incubate, the eggs need about 45 days of stable flows at a velocity of about 2.5 feet per second and a depth of at least 1.5 feet over the head of the riffle. The eggs hatch between late winter and spring (January to April). The young chinook salmon typically migrate to the ocean soon after emergence, although some remain in freshwater and migrate to the ocean as yearlings. Water temperatures less than 64°F are preferred for adult migration and spawning. The upper lethal limit for chinook salmon is at about 77°F; they can only tolerate brief exposure to this temperature, and optimal temperatures for growth and survival are much lower.

It is of interest to know the genetic affinities of local salmonid populations such as the chinook salmon of the Guadalupe River because such data can establish the uniqueness of local populations, their relationship to legally protected populations (e.g., winter-run chinooks of the Sacramento River), and their significance under CEQA and NEPA. A preliminary study of the genetic structure of 29 Guadalupe River chinook salmon indicated that 21 of the 29 were probably derived from known Merced and Feather River hatchery stocks, whereas the other 8 could represent either a native population or strays from another hatchery that has not yet been sampled (Nielson 1995, cited in Parsons Engineering Science 1997). As noted above, juvenile chinook

salmon have recently been collected in the upper Guadalupe River. One specimen has been frozen for investigation of its genetic affinities (personal communication, N. Kogut 1997).

Fishery Habitat Conditions

Factors that most greatly influence fisheries habitat in a stream include streamflow, water quality, occurrence of fish migration barriers, available spawning sites, and streambed and shaded riverine aquatic (SRA) cover. The conditions of each of these factors in the upper Guadalupe River, as they relate to anadromous salmonid habitat suitability, are described below.

Anadromous fish utilize the Guadalupe River under present conditions. Although the physical conditions of the study area provide some favorable habitat attributes, the value of these reaches for spawning and rearing is limited by poor substrate conditions, seasonal flows, and partial migration barriers (all of which occur in portions of the river), as well as excessive summer water temperatures along much of the river (SCVWD 1997). Habitat quality varies within and between reaches.

The streambed and SRA cover in Reaches 7 through 10A of the study area provide some suitable habitat features for juvenile salmonid rearing, with an overhanging riparian forest canopy, undercut banks, exposed roots, and pools. However, much of the length of these reaches has a muddy channel bottom and little habitat diversity (USFWS 1997). These reaches generally lack suitable spawning gravel, so the spawning habitat is poor. Chinook salmon and steelhead trout juveniles may use this area for rearing, most likely in the spring. The potential value of this area as rearing habitat diminishes in the summer when water temperatures generally exceed optimal growth and survival (Parsons Engineering Science 1997), although it is possible that, at lease in some years, there are shaded pools along the river where temperatures remain cool enough for salmonids to survive during the summer.

Reaches 10B through 12 have a lower potential as rearing habitat because the channel is wider and more shallow, the riparian forest canopy is less well developed or even absent, undercut banks are scarce, water temperatures are probably higher, and flows are often minimal or absent during the summer months. However, portions of these upper reaches do provide suitable spawning gravel.

The portions of Ross and Canoas creeks within the study area have been channelized, lack woody vegetation and habitat diversity, and have minimal aquatic habitat value. Neither stream provides good spawning and rearing habitat for salmonids although some spawning probably occurs in Ross Creek (Parsons Engineering Science 1997). Access to both creeks is limited by drop structures where they join the Guadalupe River.

Suitable habitat for steelhead trout exists to varying degrees in the headwater tributaries to the river, upstream of the study area, but fish migration up to these reaches is generally prevented by existing barriers. The headwater tributaries below the dams represent a total of approximately 16 miles, portions of which contain potentially suitable steelhead spawning and rearing habitat that is not presently available (Parsons Engineering Science 1997). Habitat quality upstream varies; some areas are degraded but can still be traversed, and they could be restored in the future. For example, the lower part of Guadalupe Creek currently has poor habitat which would be restored as part of the downtown project's mitigation. Upstream areas have good habitat for trout. The presence of resident (rainbow) trout in upstream tributaries indicates that suitable conditions exist for steelhead, if these areas can be made accessible. Downstream of the study area, spawning and rearing habitat for chinook salmon in the Guadalupe River is present and accessible to adults migrating upstream.

STREAMFLOW. Winter flow regimes in the upper Guadalupe River are regulated somewhat by the three reservoirs (Calero, Almaden, and Guadalupe) in the headwater tributaries. There is perennial flow in the

Guadalupe River downstream to the percolation ponds in Reach 12. Water has historically been percolated in these ponds and in the river channel behind gravel dams for groundwater recharge; the SCVWD plans to resume use of these ponds for recharge in the future.

In dry years, low water flows combined with partial barriers to migration may in some cases completely prevent adult salmonids from migrating through the study area reaches. During some summers, flows in the river can cease between Branham Lane and Canoas Creek. Records from a stream gauge in the Guadalupe River upstream of Canoas Creek at the upper end of Reach 10B (Gauge Station No. 23B) reveal that periods of no flow in this reach have occurred in every month of the year (although they are unusual during the winter months) and often exceed 50 percent of the time during the summer. These records indicate that the low flows are typically less than 5 cfs when there is flow.

Flows in the lower reaches (7 through 10A) are more reliable during summer months. From 1983 through 1991, streamflows in these reaches were augmented by groundwater pumping releases as part of a toxic waste cleanup program at the IBM and Fairchild Semiconductor properties along Canoas Creek. This program of discharges sustained relatively good year-round flows in the Canoas Creek and these lower reaches for several years and may have helped salmonid populations persist during the drought. However, discharges from the cleanup program have been greatly reduced in recent years and are now minimal.

Ross Creek is not regulated by a reservoir and is an intermittent stream. Some groundwater percolation is also performed in the Ross Creek channel (with water released into Ross Creek from pipelines operated by the SCVWD). Downstream of the study area, Los Gatos Creek is a major tributary to the Guadalupe River; winter flows on this stream are also regulated by reservoirs and instream flows are augmented for percolation in the summer.

WATER QUALITY. Water temperature, oxygen levels, and turbidity are critical elements of a stream's suitability as a fishery. Water temperatures and turbidity levels in the upper Guadalupe River are problematic for anadromous salmonid spawning and rearing. Oxygen levels typically are near saturation and do not appear to be a limiting factor (Parsons Engineering Science 1997). Water temperature is largely influenced by ambient air temperatures, streamflow, and the amount of shade over the water surface. Relatively low flows (compared to watersheds with more favorable precipitation and base flow characteristics) and areas of reduced or minimal shading by vegetation within the project study area reaches result in high water temperatures that are less than optimal to support spawning and rearing of salmonids. Excessive water temperatures can negatively influence the growth rate, swimming ability, and disease resistance of salmonids, leading to increased mortality of juveniles. Acceptable water temperatures would need to be maintained year-round for the river to support juvenile steelhead trout. Summer water temperatures within the project study area can reach 80°F (Parsons Engineering Science 1997), which can be lethal to juvenile salmonids. Water temperatures during the fall may exceed 57°F and preclude spawning migrations of adult chinook salmon. Summertime temperatures in the water maintained behind gravel dams in the percolation ponds of Reach 12 can range up to 77°F at the surface and would likely exceed the acceptable range for rearing steelhead trout. There is probably microhabitat variation along the river, resulting in shaded pools where cooler temperatures exist during the summer, at least in some years. Juvenile chinook salmon may be less affected by rearing conditions than steelhead trout because most chinook salmon may migrate out of the river in the spring before water temperatures become critical. Turbidity levels can also be undesirably high. The high turbidity can result from sediments in the stream from bank erosion, or could be related to inputs of fine sediment and nutrients from urban runoff.

MIGRATION BARRIERS. Several barriers to fish passage are present within the Guadalupe River channel and in the upstream tributaries (Figure 4.4-1). The most significant barrier to fish passage is a 13-foot-high drop-structure (Alamitos drop structure) in the river located above Blossom Hill Road at the upper end of Reach

13 (upstream of the study area). This unladdered drop-structure effectively prevents any appreciable upstream migration of anadromous salmonids, although steelhead trout may be able to surmount the barrier during very high flows. The drop-structure was built to control the bottom profile of the river bed and reduce velocities to protect the stream banks and it is used to divert flows into the groundwater percolation ponds. Other partial barriers within the project study area include an apron and weir structure at Hillsdale Avenue (Reach 10C), and an abandoned vehicle crossing downstream of Ross Creek (Reach 11). These partial barriers appear to mainly be a problem for fish passage during low flows.

In Ross Creek, excessive water velocities and shallow water depths in a 200-foot-long culvert located under Almaden Expressway may exceed fish swimming capabilities when the water surface elevation in the Guadalupe River is lower than the culvert invert. A steep-sloped, concrete lined channel immediately downstream of the culvert invert may also act as a vertical barrier. Fish passage into Ross Creek may be possible when the creek is inundated by a backwater effect from the Guadalupe River, which is predicted to occur when flows approach 925 cfs (a 2-year event).

In Canoas Creek, the channel invert at the mouth is over 5 feet above the Guadalupe River channel but fish passage into Canoas Creek may also be possible during backwater effects from the Guadalupe River when flows approach 1,754 cfs (also a 2-year event). However, the CDFG has indicated that Canoas Creek is not favorable for salmonid production and that fish passage into the creek should be discouraged.

Figure 4.4-1 Identified Barriers to Fish Migration on Alamitos, Guadalupe, and Arroyo Calero Creeks

SPAWNING SITES. Spawning sites are determined by the locations of adequate gravels and shallow, riffle habitats in the stream channel. The reservoirs in the headwater tributaries act as sediment traps and reduce gravels supplies downstream, contributing to changes in the abundance, quality, and relative composition of gravels in the upper Guadalupe River. Natural gravels are very scarce downstream of Reach 10B, with the exception of a few gravel bars in Reach 9. The riffle substrate of most reaches is considered poor, consisting of relatively large pieces of concrete. Still, some suitable spawning sites do occur within the study area. During a 1987 survey by The Habitat Restoration Group, 13 potential spawning sites were identified from West Virginia Street upstream to Malone Road, with as many as 31 redds observed at these sites. In 1995 and 1996, SCVWD biologists surveyed the river from the Montague Expressway (downstream of downtown San Jose) upstream to the Alamitos drop structure. Of the 57 redds located, 10 were located within the study area (Parsons Engineering Science 1997). Suitable spawning sites are present in the headwater tributaries, above the study area, but are not accessible due to existing barriers.

Steelhead trout have in recent years been observed attempting to jump the drop structure at Blossom Hill Road. It is not known whether these fish were attempting to return to spawning and rearing areas farther upstream.

STREAMBED AND SHADED RIVERINE AQUATIC (SRA) COVER. The streambed and SRA cover characteristics of the upper Guadalupe River identified during the 1993 aquatic surveys are summarized in Table F-7, Appendix F. These data provide information on the condition of the fishery habitat of the river. The project study area reaches are predominantly pool habitats with a riffle:pool ratio ranging from 0.73:1 for Reach 8 to 0.06:1 for Reach 10 and a ratio of 0.24:1 for the entire study area. This is below the optimal ratio for an anadromous salmonid fishery, which should have a 1:1 ratio for spawning and rearing habitat. Only about 6 percent (1,784 feet) of the river is run habitat. About 29 percent (17,692 feet) out of the 61,520 feet of the stream bank length is shaded by overhanging riparian vegetation. Slightly more of the west bank is shaded than the east bank in all reaches except Reaches 10 and 12. In terms of surface area, about 16 percent (2.7 acres) of the 16.7 acres of total stream area is shaded, but this ranges from over 48 percent shaded area in Reach 9 to less than 0.1 percent shading in Reach 12 (SCVWD and COE 1994; Parsons Engineering Science 1997).

Undercut banks occur along 18 percent of the stream banks, again with more of the west bank undercut than the east bank. The shaded stream channel and undercut banks help to keep water temperatures down and provide cover for salmonids. These habitat features are virtually absent along the 25 percent (15,380 feet) of the total bank length that has already been modified by manmade structures for bridge abutments (2,350 feet; 4 percent) and bank protection (13,030 feet; 21 percent) using riprap, sacked concrete, rock-filled gabions, and concrete linings (SCVWD and COE 1994; Parsons Engineering Science 1997).

Wildlife

Methods

The USFWS and consultants to the SCVWD have conducted wildlife assessments of the project study area. The studies entailed habitat evaluations, systematic species surveys, and qualitative observations of wildlife use and habitat values. The results of these studies are contained in the following documents described in the Vegetation section.

The wildlife information and data that were presented in Appendices W-D, W-E, and W-F of *Draft Environmental Impact Report/Statement for the Guadalupe River Flood Control Project* (Parsons Engineering Science 1997) have also been used for this discussion.

Wildlife habitats were identified and characterized based upon the vegetation communities of the project study area (see section 2.2.3). In 1991, a Habitat Evaluation Procedure (HEP) analysis was performed by a team of biologists from The Habitat Restoration Group and BioSystems Analysis, Inc., in consultation with the USFWS and CDFG. HEP is an impact assessment methodology developed by the USFWS that documents the quality and quantity of available habitat for selected wildlife species. The six evaluation species selected for the first HEP analysis were: northern oriole, Pacific-slope flycatcher, rufous-sided towhee, belted kingfisher, yellow warbler, and downy woodpecker. The HEP was designed to describe the baseline riparian wildlife habitat conditions and determine riparian habitat values for the evaluation species.

A USFWS-led HEP analysis to address project impacts on SRA cover was prepared in 1993 (USFWS 1993). CDFG and SCVWD staff and consultant (Jones & Stokes) participated with USFWS in the field mapping of overhead shade with respect to the estimated mean high water channel along the affected reaches of the river. That analysis was updated in November 1996 to address the impacts of the bypass channel and channel widening plans (USFWS 1997; Appendix D).

In November 1996, a new HEP analysis to address the impacts of the channel widening and bypass channel plans on terrestrial habitats was initiated by the Corps and USFWS. Habitat attributes were measured in plots in Reaches 7 through 11, in locations impacted by the construction of one or both alternatives. Results of the new HEP analysis are included in the USFWS Revised Draft CAR (1997; Appendix D).

A year-long wildlife monitoring study, sponsored by the SCVWD, was conducted in the upper Guadalupe River from January 1986 to January 1987. The effort focused on bird populations, with less intensive sampling of mammal, reptile, and amphibian populations. The survey also focused on sampling within the riparian habitats of the project study area.

Bird surveys were conducted at 49 sample plots within the riparian habitats of the project study area (Parsons Engineering Science 1997, Appendices W-A and W-B). The habitat at each sample plot was further classified by size and cover of dominant vegetation according to the classification scheme in the CDFG's Wildlife Habitat Relationships (WHR) program. There were no sample plots in Reach 8, because of access limitations, nor in Ross or Canoas creeks, because they lack riparian habitat. Sampling entailed visual and aural observations recorded in 10-minute intervals between dawn and 9:30 A.M., with approximately four plots be sampled per day and each plot sampled about twice a month.

A small mammal trapping program was conducted over 560 trap-nights at various locations. At eight sites over 16 trap-nights, reptile and amphibian sampling was conducted by specific searches of suitable habitats and by a trapping program using drift nets and funnel nets.

In addition to the wildlife observations recorded during the 1986–1987 wildlife monitoring study, reconnaissance-level surveys of wildlife resources were performed in November and December 1989; January, April, May, and June 1990; and March and October 1992.

The SCVWD conducted wildlife surveys focusing on burrowing owls, other birds, and southwestern pond turtles along Reach 12 on June 20 and 27, and July 6 and 13, 1995. Habitat suitability for the California red-legged frog was also evaluated during the 1995 surveys (Parsons Engineering Science 1997). Surveys for red-legged frogs have subsequently been conducted in the study area, as discussed below under "Special Status Animals." Additional burrowing owl surveys may be conducted as requested by CDFG.

Wildlife Habitats

The riparian habitats of the Santa Clara Valley support some of the most important habitat for wildlife species in this county. The riparian habitats in general, and riparian forest in particular, provide sites for water, food, cover, and breeding to birds, mammals, reptiles, and amphibians. A CDFG estimate of wildlife species regularly occurring in Santa Clara County indicates that approximately 69 percent of the species (218 out of 314 species) use riparian habitats. It has been reported that densities of birds in riparian habitats can be more than 10 times those in adjacent habitats, and that up to 43 percent of all California bird species reach their maximum densities in the state's Central Valley riparian habitats. Biodiversity is generally highest in riparian forests.

Agriculture and urban development in the Santa Clara Valley has eliminated most of the riparian forest in the region. The riparian forest along the Guadalupe River and Los Gatos, Coyote, Llagas, and Stevens creeks constitute the last remaining areas of significant riparian forest in the valley. Along the upper Guadalupe River, the remaining riparian habitat has been reduced and degraded by channelization, gravel mining, and development along the banks of the river. The numerous road and railroad crossings have created breaks in the riparian corridor, as have flood and erosion control structures constructed along the river banks. In the upper reaches of the river (Reaches 11 and 12), much of the riparian forest has been totally eliminated by past gravel mining and development of percolation ponds. Despite the fragmented condition of its forest, the Guadalupe River is still an important area for wildlife. It supports a wide diversity of wildlife species, including some species that do not occur in adjacent habitats. The river also serves as a linear reserve, providing a refuge for wildlife in an urban environment, and a corridor for wildlife movement between the foothills and San Francisco Bay.

The wildlife habitats of the upper Guadalupe River coincide with and are distinguished by the vegetation communities that have been recognized within the project study area:

- riparian forest
- freshwater marsh
- ruderal herbaceous
- ruderal scrub
- upland landscaping
- urban forest
- unvegetated areas

The aquatic habitat of the river channel is also an important wildlife resource for certain species, as it is associated with the freshwater marshes in the channel and other communities along the river banks.

Riparian forests are considered to be among the most productive habitats for wildlife in California and these habitats support the most dense and diverse wildlife communities in the Santa Clara Valley. In mature riparian forests, the complex vegetation structure creates multiple layers and a variety of microhabitats within the riparian forest that provide niches for a diverse array of wildlife species. Large canopy trees, such as mature cottonwoods and willows, offer roost and nest sites for many bird species. Dead trees or snags, which occur in some areas along the upper Guadalupe River, provide nest and den sites for a variety of birds and small mammals.

The edge effects created by the juxtaposition of aquatic, riparian forest, and adjacent upland communities generally afford high levels of wildlife use, although linear configuration of these habitats is more favorable to species that utilize edge habitats, as opposed to forest interior inhabitants. The plants making up the riparian community, such as oak trees and some of the non-native species, supply important forage items of wildlife.

Riparian forests tend to supply in close proximity many of the resources that are required by a great many wildlife species, not the least of which is water. This concentration of resources presumably allows species to acquire their needs with a lower output of energy. Additionally, riparian forests offer the shelter and cover to function as important passages for wildlife movement.

The other habitat types within the project study area are somewhat less productive and diverse than the riparian forest, but they still support significant wildlife resources. The freshwater marshes provide drinking water, forage items, and cover. Generally, freshwater marshes are important sites for amphibians, reptiles, waterfowl, and other birds, but the limited extent and distribution of freshwater marshes in the upper Guadalupe River reduces the value of this habitat. The ruderal herbaceous and ruderal scrub habitats support primarily granivorous (feeding on seeds or grain) and insectivorous wildlife that use available food items, and some raptors regularly hunt for small mammals in these habitats. Overall, there are fewer wildlife species in the ruderal habitats than in adjacent riparian and marsh habitats. Upland landscaping is of somewhat lower habitat value, primarily because it often consists of non-native vegetation, but native birds and other wildlife do use these areas to some extent for cover and food. In addition, some landscape vegetation is planted to attract birds, particularly around homes. The urban forest areas which are adjacent to riparian communities may provide moderate value for wildlife. Urban forest areas with large trees and understory plantings of shrubs are somewhat productive for wildlife, and habitat values are highest where native trees are present. Most wildlife species using the urban forest habitats are common residents or migrants that remain for short periods of time. Unvegetated sites are usually considered to have low wildlife habitat value because they lack cover or forage items; however, some wildlife species, such as ground squirrels and burrowing owls, make use of these open habitats.

The habitat conditions of the study area reaches are described below. Table F-1, Appendix F provides acreages by reach. Additional discussion is provided in the SCVWD EIR/S (Parsons Engineering Science 1997).

REACH 7. Reach 7 has a narrow (30–175 feet wide) but fairly continuous and dense riparian corridor that is dominated by native tree species. Within the riparian habitat, there are 74 trees > 20 inches dbh (Parsons Engineering Science 1997) and the habitat supports good understory cover. The corridor is interrupted in places by three road crossings, several areas of ruderal habitat, and bank stabilization revetments. Two areas of upland landscaping habitat along the west bank somewhat extend the corridor of trees. About 60 urban forest trees are scattered on the east side of the river. There is no freshwater marsh in the aquatic habitat of the reach. Past land uses have degraded much of the habitat on the east bank in this reach. The west side is residential development.

REACH 8. As with Reach 7, the riparian forest of Reach 8 is fairly continuous but is interrupted in several places by bank stabilization revetments, and one small area of ruderal herbaceous habitat. There are 85 trees > 20 inches dbh in the narrow riparian corridor (50–100 feet wide). Urban forest habitat occurs outside of the riparian zone in the residential development on the east side of the river. Residential development lines the west side of the river. There is no freshwater marsh in the aquatic habitat of the reach.

REACH 9. Reach 9 generally has the highest value for riparian wildlife of any portion of the project study area. The riparian corridor supports a dense canopy, multi-layered canopy that is up to 200 feet wide in some places. The understory is particularly dense in those areas near the river's edge that have not been disturbed. The riparian habitat is dominated by mature, native trees with 190 trees > 20 inches dbh, including 18 cottonwoods > 40 inches dbh. The tree canopy overhangs and shades a significant portion (48 percent) of the aquatic habitat in the river, the most of all the reaches. The riparian forest is interrupted by the Malone Street crossing, several relatively large sections of bank revetment, and two areas of ruderal habitat. Areas of urban

forest occur outside of the riparian corridor, in the residential development on the east side of the river. Residential development also lines the west side of the river. There is no freshwater marsh in this reach but it does contain one of the few large gravel bars.

REACH 10. Overall, the wildlife habitat value of Reach 10 is moderate to low because of significant interruptions in the riparian corridor and the value of the riparian habitat is reduced in some areas where forest is sparse and narrow. Reach 10 is divided into three subreaches (10A, 10B, and 10C) with distinct habitat conditions. Subreach 10A (Curtner Avenue to Canoas Creek) supports a 40- to 200-foot wide riparian corridor of mostly native trees that is interrupted by the Almaden Expressway (southbound) crossing and some areas of ruderal habitat. The subreach is bordered by commercial development on the east side and residential development along the west side of the river.

Subreach 10B (Canoas Creek to Stream Gauge Station No. 23B) has been extensively modified by a continuous stretch of rock-filled gabions on the west bank and a low bench cut into the east bank. This subreach now supports large areas of ruderal herbaceous, ruderal scrub, and upland landscaping habitat with one area of freshwater marsh and only a few patches of riparian forest. During the channel modifications, the bank soils were highly compacted, making seedling establishment and wildlife burrowing activity difficult. The east bank bench has been planted with native trees and should support higher wildlife habitat values in the future. The subreach is bordered by a mix of residential and commercial development and the Almaden Expressway.

The riparian corridor along subreach 10C (Stream Gauge Station No. 23B to Capitol Expressway) is largely intact and relatively wide, thus maintaining relatively high wildlife habitat values. The riparian habitat includes groves of large, old sycamore trees along high up the banks on both sides. The corridor is interrupted by ruderal and landscaping habitats, particularly in the upstream portion. An orchard along the lower east side of the river enhances the wildlife habitat value. Old Almaden Road and commercial developments line the west side of the river. There are 83 trees > 20 inches dbh throughout Reach 10, 35 of which are in 10A and 35 in 10C.

REACH 11. Reach 11 supports riparian forest that has generally high wildlife values, due in part to the presence of native coast live oaks and valley oaks, both of which are more common in Reach 11 than in any other reach. This reach also contains substantial amounts of non-native black locust, however, that may be gradually displacing the oaks and other native trees. A relatively dense understory also contributes to the high wildlife values of this reach, which has good habitat conditions for oak woodland wildlife species. The riparian forest is more extensive on the east bank and is interrupted by patches of ruderal scrub, ruderal herbaceous, and upland landscaping habitats. There is a also very small area of freshwater marsh at the upstream end of the reach.

Like Reach 10, Reach 11 has been divided into three subreaches (11A, 11B, and 11C) but the habitat conditions are not as distinct between the three subreaches of Reach 11 as they are in Reach 10. There are 130 trees > 20 inches dbh throughout Reach 11, with 61, 47, and 22 in subreaches 11A, 11B, and 11C, respectively. A mix of residential and commercial developments and roadways line the river along both banks. Almaden Expressway runs along the top of bank on west side of the river through most of this reach, limiting wildlife use along that side of the river. During 1996, an active red-tailed hawk nest was sighted in a tall eucalyptus tree just east of the riparian corridor in subreach 11B.

REACH 12. Reach 12 has the most distinctive habitat of all the river reaches because of channel modifications that have resulted from past gravel mining and the development of percolation ponds. Ruderal scrub, ruderal herbaceous, open water, and freshwater marsh habitats are the dominant wildlife features of this reach. It has low riparian habitat value, with the lowest percentage of riparian forest, but it offers the most freshwater

marsh habitat. It is the most open habitat with very few trees and no areas of continuous canopy cover. A large agricultural field, mapped as ruderal herbaceous habitat, is located on the west side of the river in the downstream portion of this reach. Residential development is situated across from the agricultural field with commercial development and the percolation ponds located in the upstream portion of the reach. State Route 85 has recently been constructed across the river, clearing all of the vegetation in the construction area. A future road crossing (Chynoweth Avenue) is also planned.

ROSS AND CANOAS CREEKS. Both creeks are narrow, channelized streams bordered by dense residential development. Their wildlife habitat values are very low and the most significant feature is the aquatic habitat. The creek banks support ruderal herbaceous habitats that are nearly continuous, except for some areas of bank revetment. Trees in the back yards of the adjacent residential developments form strips of urban forest habitat that run along the tops of the banks. There is no riparian forest or freshwater marsh habitat along the creeks.

Wildlife Species

Wildlife species data that were collected during the 1986–1987 wildlife monitoring study and the 1989–1992 reconnaissance surveys are presented in the SCVWD EIR/S (Parsons Engineering Science 1997). Information on special-status wildlife species is presented below.

The CDFG's WHR database predicts that 314 wildlife species (211 species of birds, 60 species of mammals, and 43 species of reptiles and amphibians) regularly occur within Santa Clara County and many more bird species are found on an occasional basis. Most of these species use the riparian habitats in Santa Clara County.

The number of bird species observed within each of the study area reaches (between 49 and 75 different species observed in the reaches) far exceeds the number of species of mammals (4–9), reptiles (1–2), and amphibians (1–3) combined. While the numbers of species within each reach varies, this variation is not that great and there appears to be an overall consistency in the diversity of species occurring within the different river reaches. However, this does not mean that the diversity represents the same species in all reaches. Species diversity along Ross and Canoas creeks is less than the diversity along the river itself (Parsons Engineering Science 1997).

BIRDS. A total of 121 bird species and 17,979 individual birds were recorded during the 1986–1987 wildlife monitoring study (Parsons Engineering Science 1997). Of these 121 species, 11 were observed only once and 16 species of waterfowl were observed only at the percolation ponds in Reach 12. At least 90 percent of the species observed were seen in riparian forest. The ten species observed in the greatest numbers were: house finch, bushtit, mallard, white-crowned sparrow, Anna's hummingbird, California towhee, yellow-rumped warbler, song sparrow, black phoebe, and cedar waxwing. Reach 9 probably supports the greatest diversity of breeding birds but overall, the Guadalupe River has a lower number of breeding bird species than similar, less urbanized streams in the region. This may be in part due to the relatively narrow width of the riparian corridor, competition for nest sites, or nest parasitism. Nonetheless, the avifauna of the Guadalupe River is undoubtedly much more abundant and diverse than similar-sized rivers that have been more fully channelized and cleared. In the context of a heavily urbanized area such as San Jose, the USFWS considers the existing wildlife corridor of the Guadalupe River to be a relatively scarce and valuable resource.

MAMMALS. A total of 16 mammal species were observed within the project study area, including opossum, mole, rabbit, hare, squirrel (3 species), gopher, mice (3 species), muskrat, rat, raccoon, cat (both feral and domestic), and domestic dog (Parsons Engineering Science 1997). This array of small mammals persist within the river and its riparian areas. Mammal use of the other habitat types is less and limited to fewer species, primarily rodents. Several species of bats potentially occur in the project study area but were not observed.

Habitat for small mammals is of poor quality due to little undergrowth, compacted soils, limited areas of adjacent undeveloped land, vector control operations, and predation by dogs and cats.

REPTILES AND AMPHIBIANS. There were only 3 species of reptiles and 3 species of amphibians observed within the project study area: western fence lizard, ringneck snake, gopher snake, western toad, Pacific treefrog, and bullfrog (Parsons Engineering Science 1997). All of these are common species. The reptiles generally use the riparian forest and other terrestrial habitats while the amphibians are restricted to aquatic habitats of the river and freshwater marsh for at least part of their lifecycle. Other species may occur within the project study area but none were recorded during the wildlife surveys. The only species commonly observed was the western toad which was seen in large numbers during the summer. A large number of unidentified tadpoles were also observed. The same factors limiting mammal abundance, along with the presence of pollutants, are probably also limiting herptile abundance. In addition, portions of the river can frequently dry out prior to the breeding season, limiting suitable breeding sites, and there is little litter or ground cover along many sections of the river.

Rare, Threatened, and Endangered Species

Methods

Information on the occurrence of special-status plant and animal species is compiled from the documents described in the Vegetation section, and from communication with SCVWD Biologist Doug Padley (1996). In fulfillment of Section 7 of the Endangered Species Act, the Corps is preparing a Biological Assessment describing the occurrence of, and project effects on, federally listed, proposed, and candidate species, as well as state-listed species and federal and state species of concern. Appendix K contains the draft Biological Assessment.

Surveys that were conducted to investigate occurrences of plant and animal species in the project study area are described in these two documents and are summarized in the vegetation, fisheries, and wildlife sections of this report.

The term "special-status" refers to following categories of species:

- species *listed* as threatened or endangered under either the federal Endangered Species Act or the California Endangered Species Act;
- species *proposed* for federal or state listing as threatened or endangered;
- species that are *candidates* for federal listing;
- species that are former candidates for federal listing that continue to be federally recognized "species of concern;" and
- species that may meet the definition of rare or endangered under the California Environmental Quality Act (CEQA), including animals listed as *species of special concern* or as *fully protected* by the CDFG, and plants listed by the California Native Plant Society.

Special-Status Plants

Of the plant species observed within the project study area (see Appendix E), none are federal or state listed threatened or endangered species or federal species of concern and none are proposed for listing or candidate species. None of the special-status species known from the region are likely to occur owing to the absence of suitable habitat (Appendix K, draft Biological Assessment).

Special-Status Animals

The Central California Coast Evolutionarily Significant Unit (ESU) of the steelhead trout, which includes the fish that occur in the upper Guadalupe River, has been listed as threatened by the National Marine Fisheries Service (NMFS). This species was discussed previously under "Fisheries."

The Sacramento River winter-run chinook salmon is a federally listed endangered population but this does not include chinook salmon in the Guadalupe River. In February 1995, a petition was made for a coast-wide status review of all chinook populations. That status review is currently being conducted by NMFS.

Although not presently known to occur on the Guadalupe River, the California red-legged frog (*Rana aurora draytoni*), a federally listed threatened species, is known from two locations in the Guadalupe River watershed: 1) at the head of Lexington Reservoir on Los Gatos Creek, about 11 miles upstream of the confluence of Los Gatos Creek with the Guadalupe River, which is about 2 miles downstream of the study area; and 2) 1.5 miles downstream of Guadalupe Reservoir on Guadalupe Creek, about 5 miles upstream of the study area (USFWS 1997). In June 1996, habitats within the upper Guadalupe River were assessed by SCVWD biologists and SAIC biologists as to their suitability to support California red-legged frogs. A one-night spotlighting survey was conducted in the river by the SCVWD biologists on June 27, 1996. The upper Guadalupe River does provide potentially suitable habitat for California red-legged frogs with deep pools, vegetated slopes, and undercut banks in some sections. However, numerous predatory fishes such as bluegill and bass occur in the river, and the one-night survey revealed a dense population of bullfrogs. Bullfrogs and predatory fishes are known to eat tadpoles and young California red-legged frogs, and the abundance of these exotic predators greatly reduces the potential for red-legged frogs to occur here. No red-legged frogs were observed during the reconnaissance survey (not intended as USFWS protocol surveys). Five nights of surveys following the USFWS draft recommended protocol dated January 13, 1995 were conducted by SCVWD biologists in the lower Guadalupe River during the spring and summer of 1996 and no California red-legged frogs were found. Bullfrogs were observed but were not as numerous as was found in the upper Guadalupe River (Doug Padley 1996, personal communication). Surveys were done in the affected reaches of the study area by SCVWD biologists in 1997 according to USFWS protocol, resulting in no sightings of red-legged frogs.

Areas far upstream reportedly support California red-legged frogs and could serve as a source of future immigration into the project area if conditions are improved. Based on the abundance of bullfrogs in the study area and the strong tendency for bullfrogs to displace and eliminate red-legged frogs from otherwise suitable habitat, as well as the deleterious impact of exotic predatory fish (USFWS 1996), it is very unlikely that this species occurs in the study area.

Special-status wildlife species known to or likely to occur within the vicinity of project study area are listed in Table F-8, Appendix F.[1] No federal-listed, threatened, or endangered wildlife species, or proposed species, are known to inhabit the project study area. The federal-listed endangered peregrine falcon (*Falco peregrinus*) and several wildlife species that are federal species of concern have potential to occur within the study area.

[1] Note that it is the determination of the USFWS that these species may occur in the vicinity of the study area; this determination is an indication of which special status species may occur in the county (or a portion of the county) in which the project is located; therefore, this list may include some taxa that may not reasonably be expected to occur within the specific project area.

These are discussed in more detail in the impacts section below and in the draft Biological Assessment (Appendix K).

Six state-identified "species of special concern" have been observed within the project study area: burrowing owl (*Speotyto canicularia;* also identified as a non-game bird of management concern by USFWS [Parsons Engineering Science 1997]); yellow warbler (*Dendroica petechia*); merlin (*Falco columbarius*); sharp-shinned hawk (*Accipiter striatus*); and Cooper's hawk (*Accipiter cooperii*). The white-tailed kite (*Elanus caeruleus*), a state fully protected species, was also observed. A number of other state special-status wildlife species have potential to occur in the study area.

Burrowing owls have been observed in Reach 12. Between 1988 and 1991, at least one pair was a resident on the banks of the Guadalupe River and percolation ponds of Reach 12. Nesting was not confirmed, but was suspected due to the continued presence of the burrowing owls. In the early summer of 1995, burrowing owl surveys (four) in Reaches A and 12 were conducted by biologists from Jones & Stokes, with no owls sighted.

Yellow warblers were found nesting in the riparian forest habitat of Reach 6 through 11, placing their nests in shrubs and low trees. The nesting yellow warblers consisted of a small population of approximately 10 to 20 pairs. Reaches 10B, 12, Ross Creek, and Canoas Creek are not suitable habitat for nesting yellow warblers. The remaining five state species of special concern and the white-tailed kite are uncommon migrants and transient visitors to the project study area. These birds use a variety of the habitats and some forage in the percolation ponds of Reach 12. None are known to use the project study area habitats for nesting. Most, but not all, of the federal and state special-status species that could occur would be associated with the aquatic habitat of the Guadalupe River and/or the corridor of riparian forest habitat.

Another state and federal species of concern that is also of local interest is the southwestern pond turtle (*Clemmys marmorata pallida*). This species is known from south of the study area (Appendix K), and its occurrence has been reported in a comment letter from the Western Waters Canoe Club (Appendix M). It is unlikely that suitable breeding habitat exists or that the project area supports a large number of individuals, given the fact that the species has not otherwise been reported.

4.4.3 Environmental Effects

Impact Significance Criteria

Impact significance criteria used in this analysis are consistent with those used by the SCVWD (1996). Generally, long-term net losses of populations, habitat areas, or ecological functions that are of recognized significance by local, state, or federal agencies are considered significant. In the present case, examples include the removal of riparian forest, urban forest, or freshwater marsh habitat, the loss of SRA cover, the loss of locally recognized heritage trees, barriers to fish and wildlife migration, and the loss of local populations of sensitive species.

Channel Widening Plan

Vegetation Impacts

CONSTRUCTION IMPACTS. Construction impacts would result from removal of riparian and upland vegetation, stress or injury to vegetation adjacent to construction areas, and filling or removal of jurisdictional wetlands and other waters of the United States. These would be significant in the short-to-medium term, but could be mitigated to insignificance in the long term. Feasible mitigation for these impacts by restoring disturbed

vegetation areas is briefly described below and discussed in more detail in section 4.4.4. Plates in Appendix E show impact areas overlying existing habitats.

The following assumptions were made regarding construction-related impacts on vegetation.

- All existing vegetation would be eliminated along the banks of the river in areas that are graded to provide a wider channel. Restoration and natural recovery of freshwater wetland and riparian forest would occur along the floodway bench outside of the maintenance road corridor. Since the bench height is only 3 feet above the channel invert, it is reasonable to expect the successful reestablishment of riparian forest. Bank slopes above the maintenance road would be fairly steep (1.5H:1V) and not assumed to be restorable to riparian forest. They would be seeded for stabilization and would likely support ruderal-riparian scrub vegetation in the long term. Floodwalls are assumed to require a 10-foot wide clearing. Although low-bank vegetation would be reestablished on the benches, mitigation for middle and upper bank forest losses would occur, along with additional low-bank plantings at mitigation/compensation sites in non-impacted areas along the river (see maps in Appendix E).

- Some of the vegetation outside but adjacent to grading and construction areas may be injured or stressed by collisions with heavy equipment, sidecasting of graded material, or compaction of soil if no specific measures are taken to avoid such impacts. These impacts would be mitigated by avoidance or, if not avoided, be mitigated in the long term by restoration.

- Some existing wetlands and other waters of the United States would be filled, and additional areas would be cleared or excavated by grading. On-site mitigation vegetation replacement would occur along the outer part of the newly constructed benches.

- Cofferdams would likely be needed for most construction activities. Coffer dams are temporary structures necessary to dewater the creek and allow access across the creek during construction. The total volume of earthen fill for the coffer dams that would be placed in Section 404 jurisdictional waters as part of the Channel Widening plan is 3,700 cubic yards. Typically, a driving hammer and crane would be operated from the banks of the creek to place the fill. A bypass pipe would be used to maintain downstream flows. Materials and the method of placement would be selected to prevent erosion or an increase in creek water turbidity. Upon completion of construction, all material used for the cofferdams would be removed and the bed and banks would be returned to preconstruction contours. Delineated wetlands would be avoided as coffer dam sites. The California Construction Best Management Practice (BMP) would be implemented.

  Relatively open locations would be selected for placement of the cofferdams. As a result, overall impact should be minor. The other waters of the United States in the project area would be significantly impacted during short-term construction of the cofferdams. Since the cofferdams would be removed after construction, no long-term effects on biological resources would occur. The locations of cofferdams for the Channel Widening Plan would be determined during final design.

- No impacts on listed or proposed threatened or endangered plants would occur because no such plants occur in the project area.

- Erosion control and maintenance activities would be done by the SCVWD (see below).

OPERATIONAL IMPACTS. Operational impacts could result from changes in maintenance activities, such as periodic vegetation removal, trimming, or herbicide use that is more extensive or frequent than present practices. For both project alternatives, it is expected that in-channel maintenance would be reduced, although a wider area adjacent to the existing channel would be subject to maintenance, e.g., as required alongside maintenance roads.

The following assumptions were made regarding operational impacts on vegetation:

- Existing channel maintenance tasks include: removing accumulated sediment; cleaning debris from in-channel structures; controlling erosion by placing riprap, sacked concrete, or other materials where needed; using pre-emergent and postemergent herbicides on maintenance roads and floodways and selectively in revegetation areas; removing trash and debris; inspecting and monitoring conditions; removing dead trees and pruning live trees that could be hazardous in floods; trimming brush that could impede flood flows and maintenance access points; mowing or discing weeds; using herbicides on invasive weeds, noxious plants, and woody plants that could obstruct flood flows or cause structural damage; manual trimming of branches overhanging roadways; manual trimming or herbicide application in areas inaccessible to mechanical equipment; maintaining access roads; and repairing fences.

- Existing channel maintenance activities that affect native vegetation have been approved and monitored through Memoranda of Understanding (MOU) between the SCVWD and CDFG. Under the Channel Widening plan, a new maintenance program, modelled after the one proposed by the SCVWD for the Bypass Channel plan (Parsons Engineering Science 1997), would be developed to supersede the existing MOU. Differences between existing and proposed channel maintenance procedures are expected to be minor, including newly constructed roads and ramps that would be treated with pre-emergent and postemergent herbicides in accordance with applicable regulations; maintenance for new irrigation systems and mitigation plantings; and less mechanical and chemical vegetation control.

Acreage of impacts on vegetation are summarized for each habitat by reach in Table F-9, Appendix F.

Less-than-Significant Impacts

Less than significant impacts include the following:

PERIODIC REMOVAL OF VEGETATION FOR MAINTENANCE PURPOSES. The Channel Widening Plan would result in maintaining a larger area (including bypass channels and floodway benches) than is currently subject to maintenance but much of the additional area would have little or no vegetation. The maintenance program would incorporate several measures that would protect and enhance the riparian system, removing non-native trees and shrubs completely to increase the ratio of native to non-native vegetation. In addition, native vegetation would no longer be cleared from river channel banks unless absolutely necessary for bank erosion maintenance.

This impact is considered less than significant because the project would reduce the removal of native vegetation over preproject practices. No mitigation is required.

REMOVAL OF NONFOREST UPLAND VEGETATION. The Channel Widening Plan, including mitigation areas that would be converted to riparian forest, would eliminate up to approximately 4.80 acres of ruderal

herbaceous vegetation, 2.60 acres of ruderal scrub, and 2.10 acres of upland landscaping (Appendix F, Table F-9). This impact is considered less than significant because: (1) most of the vegetation affected is not native, (2) all three habitats are locally and regionally common, (3) most areas of temporary disturbance (approximately half of the total impact) would recover naturally within a few years; and (4) to a limited extent, scrub vegetation would be allowed to grow naturally along the cut slopes of the widened channel. No mitigation is required.

As discussed by USFWS (1997) in Appendix D of this document, the ruderal scrub vegetation contributes to overall riparian habitat values, and is included by USFWS in the calculation of riparian habitat impacts and mitigation needs. The Corps accepts the inclusion of this vegetation type in the USFWS HEP analysis (Appendix D) for the purpose of defining a level of mitigation that avoids net losses of riparian values.

REMOVAL OF SMALL PATCHES OF URBAN FOREST. Small areas of urban forest may be impacted where it is necessary to trim or remove individual trees to install floodwalls or modify levees along the tops of banks. Tree losses have not been quantified but are expected to be less than significant as canopy growth by adjacent unaffected trees should rapidly fill in isolated gaps.

Significant Impacts

POTENTIAL LONG-TERM EFFECTS ON RIPARIAN FOREST FROM REMOVAL OF ADJACENT FOREST. With mitigation plantings as proposed (section 4.4.4), this impact would be rapidly diminished, with no long-term loss of riparian forest habitat or associated functions and values. However, in the short term, the removal of substantial amounts of adjacent riparian forest could lead to decreased shading, changes in soil moisture, changes in air temperature and wind exposure, and changes in the velocity and depth of flooding along adjacent or opposite banks. These significant effects could influence the growth and recruitment of constituent species, some positively, others negatively, with possible long-term effects on forest composition and structure. Removal of riparian forest habitat would in many cases narrow the existing forest and remove screening vegetation along the edge of the forest. Increased fragmentation of the riparian forest and the loss of interior forest habitat would be significant impacts that would be mitigated to insignificance in the long term with revegetation.

REMOVAL OF 6.5 ACRES OF RIPARIAN FOREST. The Channel Widening plan would result in the direct removal of approximately 6.5 acres of existing riparian forest by construction activities, such as grading and excavation. Impacts would occur along one bank, leaving the opposite bank intact, and would impact most or all of reaches 7, 10a, 10c, 11b and 11c. The structure and composition of riparian forest vegetation would be altered along the impacted banks. Over time, a band of low-bank vegetation would be reestablished on the toe of the floodway bench, but the mid- and upper-bank forest along these segments would be eliminated.

This impact is considered significant because: (1) riparian corridors support high levels of plant and wildlife diversity, (2) the ecological functions of riparian corridors are degraded by vegetation removal, and (3) much riparian vegetation has already been lost in Santa Clara Valley and throughout the San Francisco Bay region in recent decades. Impacts would be mitigated to insignificance in the long term by on- and off-site replacement plantings (section 4.4.4).

The acreage initially removed represents approximately 20 percent of the 34 acres of existing riparian forest mapped in the study area. Although revegetation is proposed along the outer edges of the benches, additional areas of riparian forest restoration are needed to avoid a net loss of this habitat. Included in this impact would be the loss of approximately 1,700 trees greater than 2 inches DBH (roughly 22 percent of existing trees). Roughly half of the trees to be removed are of species that are not native to the Guadalupe River. A rough

estimate is that 10-12 valley oaks would be removed. The impact would be mitigated to insignificance by implementing a revegetation plan that assures no net loss of habitat.

REMOVAL OF 100-150 TREES PROTECTED BY CITY TREE ORDINANCE. Project construction would result in the removal of an estimated 100-150 trees that are large enough (over 18 inches DBH) to qualify for protection under the City's tree ordinance. Trees that are not on SCVWD property would require a tree removal permit and compensation.

This impact is considered significant because the impact represents about 12 percent of existing trees in this size class and because the SCVWD must comply with the City's tree ordinance. Impacts would be mitigated to insignificance in the long term by off-site replacement plantings (section 4.4.4).

DISTURBANCE OF RIPARIAN FOREST ADJACENT TO CONSTRUCTION AREAS. In the absence of preventive measures (which would be part of the BMPs implemented during construction), constructing the Channel Widening plan could result in substantial inadvertent injury to or mortality of riparian forest plants outside but adjacent to grading and construction areas (e.g., in lower bank sites between the channel bottom and excavated floodway benches). Without physical barriers between construction areas and protected vegetation, impacts resulting from collisions with heavy equipment, sidecasting of graded material, soil compaction, materials storage, and other factors can be expected. This impact is considered significant because, although the number and severity of inadvertent injuries cannot be predicted, they could conceivably affect a substantial number of trees and shrubs that would otherwise remain healthy. This impact is mitigable by avoidance and, if not avoided, would be mitigated to insignificance in the long term by on-site restoration.

EXCAVATION OR FILLING OF 0.28 ACRE OF JURISDICTIONAL WETLANDS AND 2.64 ACRES OF OTHER WATERS OF THE UNITED STATES. The Channel Widening Plan would result in the excavation or filling of approximately 0.28 acre of jurisdictional wetlands and temporary disturbance of 2.64 acres of Other Waters of the United States (Table F-9, Appendix F). This significant impact would be completely mitigated in the long term. Affected habitats would include areas of riparian forest, scrub, and ruderal vegetation along river banks at those locations where bank excavation would reach below the ordinary high water mark. The deposition of fill may occur incidental to excavation, but no direct filling is proposed in connection with bank widening. In any case, where jurisdictional wetlands along the river banks would be removed for construction of a bench, the bench itself would become a jurisdictional wetland, especially in cases where riparian forest mitigation plantings would be placed on the bench (which would be along the vast majority of the total length of the benches). The disruption of these habitats in the short term is considered significant because wetlands and other waters of the United States support high levels of plant and wildlife diversity and many such areas have been lost in Santa Clara Valley and throughout the San Francisco Bay region in recent decades. Wetland replantings would mitigate this impact to insignificance.

Fisheries Impacts

CONSTRUCTION IMPACTS. Construction activities associated with the Channel Widening plan that would result in adverse and beneficial impacts on fisheries include floodway improvements, bank stabilization measures, and removal of existing barriers to fish passage.

The following assumptions were made regarding construction-related impacts on fishery resources:

- Proposed channel modifications, including the removal or modification of partial and complete fish barriers, would result in a long-term benefit to fisheries resources, particularly steelhead trout, which would benefit from improved access to upstream spawning and rearing habitat. Presently, the tributary streams (i.e., Alamitos, Calero, and Guadalupe Creeks), at least along

some stretches, contain better conditions for steelhead spawning and rearing than does the Guadalupe River. A beneficial impact for chinook salmon is less likely, but possible to the extent that individuals dispersing from downstream spawning and rearing areas may find additional suitable habitat upstream.

- Permanent loss of riparian vegetation from channel widening and bank stabilization activities would result in significant short- and long-term loss of physical habitat features (e.g., loss of vegetative cover and undercut banks), possibly increasing mean water temperature from loss of shade and reducing habitat complexity. Mitigation plantings on benches and in currently barren areas (section 4.4.4) would offset this impact in the long term.

- In-channel construction activities would be limited to the summer low precipitation period (April 15-October 15), with the condition that construction requiring stream dewatering or work in the channel invert not commence until May 1, provided that stream monitoring criteria are satisfied. Should stream monitoring criteria not be met, channel invert work and stream dewatering would not be allowed to commence until June 1. Additionally, the contractor would be required to implement an erosion control plan. These actions would minimize impacts of temporary increases in turbidity and suspended particles resulting from in-channel construction and nonpoint-source runoff to the river to less than significant. Limiting in-channel construction activities to the summer low-precipitation period would also minimize impacts on juvenile salmonids and adult fish migrating to upstream spawning areas, especially adult anadromous species such as chinook salmon and steelhead trout to less than significant.

- The construction contractor would be required to implement a hazardous materials control and response plan to minimize impacts from accidental spills of petroleum-based products associated with the operation of heavy machinery to less than significant.

OPERATIONAL IMPACTS. As is the case for the Bypass Channel plan, a new maintenance program would be written and implemented for the Channel Widening plan. The maintenance program would include site-specific actions, guidelines, and specifications and would be finalized through an MOU between the SCVWD and the CDFG. The Channel Widening plan's maintenance program would be based on the program that is currently proposed for the Bypass Channel plan (Parsons Engineering Science 1997, Appendix C), modified where required by differences between the two plans or the Corps' engineering requirements. Under either plan, maintenance would be done by the SCVWD, and the same erosion control methods and maintenance standards proposed for the Bypass Channel plan are likely to be applied for the Channel Widening plan as well.

As a result of increased channel capacity, maintenance requirements would be reduced. Operational impacts are considered less than significant.

Beneficial Impacts

INCREASE IN HABITAT AVAILABILITY FOR MIGRATING STEELHEAD TROUT AND CHINOOK SALMON RESULTING FROM REMOVING PARTIAL FISH BARRIERS. Proposed channel modifications include removing an abandoned stream gauge, consisting of a concrete apron and weir, at Hillsdale Avenue (Reach 10C) and a low-flow vehicle crossing (ford) downstream of Ross Creek (Reach 11B). Both structures are impediments to upstream migration by adult salmon and steelhead trout and require high flows (over 200 cfs at Hillsdale Avenue and 50-100 cfs at the ford) for successful fish passage. Only during peak urban storm runoff or prolonged watershed runoff do existing flows allow successful fish passage. Removing the barriers would enable access for migrating fish from the San Francisco Bay upstream to the drop structure above Blossom

Hill Road at flows of approximately 10-15 cfs. These structures would be replaced with vortex rock weirs to maintain grade control while enabling fish passage.

The weir at stream gauge Station No. 23B partially inhibited fish migration because of the design of the structure. Water did not crest over the weir directly into the plunge pool, reducing the effectiveness of the plunge pool. Boulders below the water surface near the weir further reduced passage capabilities by reducing pool depth and passage corridors. The SCVWD has modified the weir and deepened the pool downstream of the weir thereby creating favorable hydraulic conditions for successful fish passage.

Less-than-Significant Impacts

FISH PASSAGE IN LOWER ROSS CREEK. Under existing conditions, Guadalupe River flows of approximately 530 cfs (a 1.5-year event) at the confluence with Ross Creek are necessary to inundate the upstream end of the RCB culvert (under the Almaden Expressway) on Ross Creek to a depth of 0.6 feet. Proposed improvements in the Guadalupe River channel would reduce water surface elevations during flooding events (Parsons Engineering Science 1997). These reductions would reduce the incidence and duration of backwater events that inundate the reinforced concrete box (RCB) culvert in lower Ross Creek and could result in reduced fish passage opportunities. The Channel Widening Plan would construct a fish ladder at the mouth of the creek to eliminate any potential adverse effects on steelhead access to upstream areas. The fish ladder will be operated as prescribed by the NMFS and CDFG. The overall impact is considered less than significant.

FISH PASSAGE IN LOWER CANOAS CREEK. The Channel Widening plan would reduce the likelihood of anadromous fish migration to upstream areas in Canoas Creek. These impacts are considered less than significant because the DFG has determined that this creek does not provide suitable spawning habitat and that upstream migration should, therefore be discouraged (Parsons Engineering Science 1997). Fish passage into the creek from the Guadalupe River would be reduced as a result of lowered water surface elevations during flood episodes, reducing the frequency and duration with which the culvert at the mouth of the creek is inundated. Quantification of this effect for the Channel Widening plan is not available, but the reduction should be less than what would occur under the Bypass Channel plan (see Parsons Engineering Science for details). Fisheries habitat along the creek could be affected by channel modifications to improve flood conveyance, but these impacts are also less than significant because of the poor quality of the habitat.

ACUTE AND CHRONIC TOXICITY TO FISHERIES AND REDUCED FISH PRODUCTIVITY RESULTING FROM CONSTRUCTION-RELATED ACTIVITIES. In the absence of preventive measures, activities associated with excavation, channel widening, and bridge replacement, floodwalls, maintenance roads, and access ramps could increase erosion processes, thereby increasing sedimentation and turbidity in downstream waterways. Excessive sediment quantities deposited in or near stream channels can degrade aquatic habitats. Sediments can smother developing eggs, degrade spawning habitat, and decrease food production. Increased turbidity can increase fish mortality; reduce feeding opportunities for fish, including rearing steelhead trout and chinook salmon; and cause fish to avoid biologically important habitat. These significant impacts would be avoided through the implementation of a Stormwater Pollution Prevention Plan, as described below.

Construction materials, such as concrete, sealants, oil and paint, could adversely affect water quality if accidental spills occurred during project construction. Increased pollutant concentrations could limit fish production, abundance, and distribution by reducing fish egg survival and causing direct mortality of fish. Steelhead trout and chinook salmon inhabiting the Guadalupe River require relatively clean, cold, well-oxygenated water for successful growth, reproduction, and survival and are not well adapted to survive in degraded aquatic habitats. These significant impacts would also be avoided (see below).

The construction contractor would be required to implement a Stormwater Pollution Prevention Plan to minimize the potential for sedimentation of aquatic habitats, including potential steelhead trout and chinook salmon spawning and rearing habitats. Measures in the plan would include but would not be limited to:

- Conducting all construction work according to site-specific construction plans that minimize the potential for sedimentation of aquatic habitat;
- Identifying all areas requiring clearing, grading, revegetation, and recontouring and minimizing the areas to be cleared and graded;
- Grading spoil sites to minimize surface erosion;
- Avoiding riparian and wetland vegetation, whenever reasonably possible, and identifying and fencing specific trees for riparian habitat maintenance (see Mitigation Measure V-4 in the "Vegetation" section);
- Covering bare areas with mulches and revegetating all cleared areas with native species;
- Preventing equipment operation in flowing water when performing in-channel activities by constructing cofferdams and diverting all streamflows around construction sites; and
- Constructing sediment catch basins across the stream channel immediately below the project site when performing in-channel construction to prevent silt- and sediment-laden water from traveling downstream and periodically removing accumulated sediments from the catch basin.

The construction contractor would be required to implement a hazardous materials control and spill response plan to reduce impacts on the aquatic ecosystem in general, as well as on spawning, rearing, and egg incubation stages of anadromous salmonids. The plan would control the use of hazardous materials, such as petroleum-based products used in heavy equipment and other toxic materials used during construction, and would mitigate impacts to insignificance. Measures would include but would not be limited to:

- Preventing raw cement, concrete or concrete washings, asphalt, paint or other coating material, oil or other petroleum products, or any other substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses;
- Establishing a spill prevention and countermeasure plan before project construction that includes strict on-site handling rules to keep construction and maintenance materials out of drainages and waterways;
- Cleaning up all spills immediately according to the spill prevention and countermeasure plan and notifying CDFG immediately of any spills and cleanup procedures;
- Providing staging and storage areas located outside the stream's normal high-water area for equipment, materials, fuels, lubricants, solvents, and other possible contaminants;
- Removing vehicles from the normal high-water area of the stream before refueling and lubricating; and

- Preventing operation of equipment in flowing water.

The contractor would submit this plan to CDFG with its application for a streambed alteration agreement pursuant to Section 1601-1607 of the California Fish and Game Code before construction begins.

POTENTIAL IMPACTS ON FISH MIGRATION AND SPAWNING DUE TO CHANNEL CONSTRUCTION. To further reduce the likelihood of construction impacts on fish, construction would be limited to the April 15 to October 15 period. Construction in the channel invert or other construction activities requiring stream dewatering, heavy equipment operation in the channel, or stream crossings would be limited to the May 1 to October 15 period with the stipulation that such activities can commence before June 1 only if field surveys (consisting of a minimum of 3 days of sampling) indicate that no juvenile salmonids are present in the project vicinity and that average daily water temperatures have exceeded 64°F for a minimum of 3 days in a row (generally, conditions for steelhead trout and chinook salmon decline when water temperatures exceed 64°F in spring).

By limiting construction to the April 15 to October 15 period, two goals would be achieved: limiting construction to periods when migrating and spawning chinook salmon and steelhead trout are less likely to be affected; and maximizing the construction period, thereby reducing the number of years required to construct the project (and, specifically, the number of years that potential impacts on all fishery resources would occur).

The proposed construction period, which focuses on protecting migrating and spawning adult chinook salmon in fall and rearing steelhead trout and chinook salmon juveniles in spring, was developed by comparing the known life history and habitat requirements for these species with available streamflow and water temperature data for the Guadalupe River. As stated earlier under "Existing Fisheries Resources," adult chinook salmon enter the lower Guadalupe River as early as August and have been observed in the upper reaches of the river (i.e., the project area) as early as November, when seasonal rains and cooler weather result in improved stream conditions. Measured streamflows and water temperature data further substantiate that optimal conditions for chinook salmon migration and spawning typically do not occur in the project area until November (Parsons Engineering Science 1997). Consequently, proposed in-channel construction activities occurring up through October 15 would not affect adult chinook salmon migration and spawning.

Although construction activities in October would not affect adult steelhead trout migration (adults would not enter the river until December, at the earliest), construction activities occurring in spring could adversely affect steelhead trout migration and spawning, as well as juvenile steelhead trout and chinook salmon rearing and outmigration. Adult steelhead trout begin migrating up coastal streams in December and continue into May, although the majority of adults typically migrate prior to mid-April (Shapovalov and Taft 1954). Raleigh et al. (1984) report that optimal conditions for adult migration occur when average maximum water temperatures are between 37.5°F and 64.5°F. Optimal conditions for steelhead trout embryos and smolts occur at water temperatures below 55°F (Raleigh et al. 1984). For chinook salmon juveniles, optimal conditions for smoltification occur when average maximum water temperatures are between 53.6°F and 64.5°F (Raleigh et al. 1986). In general, conditions for steelhead trout and chinook salmon decline when water temperatures exceed 64°F in spring.

A review of available water temperature data for the Guadalupe River indicates that mean monthly water temperatures for April 1994 and 1995 averaged 61.5°F (H.T. Harvey & Associates temperature data [personal communication, T. Neudorf]). Based on these data, the optimal water temperatures for juveniles were exceeded in 1994 and 1995 by late-April to early-May. Mean water temperatures warmed to 66°F (73°F was the maximum water temperature recorded for the month) in May, despite the higher streamflow conditions and cooler weather that prevailed in spring 1995. These limited data suggest that water temperatures can

exceed the acceptable range for salmonid eggs and embryos in March and April, and may create suboptimal conditions for smolts by late-April and early May.

Because of the variability in environmental conditions from year to year and the lack of a long-term database on Guadalupe River fisheries and water temperature data, it is difficult to accurately predict when conditions in the Guadalupe River become less than favorable for salmonids for any given year. Consequently, the construction period of April 15 to October 15 includes the conditional statements discussed above for in-channel construction activities affecting the channel invert during the April 15 to May 31 period. Adherence to these measures would minimize to less than significant adverse impacts on steelhead trout and chinook salmon populations, while also reducing the number of years required to construct the project. This impact is therefore less than significant, and no mitigation is required.

Significant Impacts

REDUCED FISH MIGRATION AND SPAWNING SUCCESS IN THE GUADALUPE RIVER RESULTING FROM CHANGES IN HYDRAULIC CHARACTERISTICS. The Channel Widening Plan would reduce current velocities and water depths, in Reaches 7, 10, and 11 during flood events. The modification of channel geometry may also affect gravel quality because of the reduction in the incidence and magnitude of channel maintenance and gravel flushing and sediment transport flows. The net consequences of these changes are uncertain, but any negative impacts on gravel availability that may occur are expected to be offset by improved habitat access for anadromous fish due to removal of, and modification of, barriers to migration. If this alternative is selected, then additional sediment modeling would be appropriate to determine the likely impacts on gravel characteristics in the river. Additional discussion is provided below.

Channel maintenance flows and gravel flushing flows are necessary to maintain stream channel and gravel quality (Milhous and Bovee 1977, Rosgen et al. 1986). Changes in sediment load or discharge can result in changes in channel shape, loss of spawning habitat, and loss of cover (Milhous and Bovee 1977). Increases in the width-to-depth ratio of stream channels can degrade fish habitat, such as spawning habitat, and create fish passage problems for migrating species such as chinook salmon and steelhead trout.

Significant reductions of peak flows can also cause sedimentation problems because the size of the substrate material that can be transported through the system is reduced. As flows are reduced, the size of the substrate material that is deposited is also reduced. Fine sediments, such as sand-, silt-, and clay-sized particles, can adversely affect redd construction, egg survival, fry emergence, and food production by filling in the pore spaces in cobble and gravel beds.

Construction of the Channel Widening Plan would widen the existing channel, thereby reducing current velocities and water depths in all or portions of Reaches 7, 10, and 11 during most flood events. The modification of channel geometry may also affect the quality and quantity of spawning gravels because of the reduction in the incidence and magnitude of channel maintenance flows, gravel flushing flows, and sediment transport flows in general.
The Guadalupe River is generally deficient in sediment due to upstream dams that intercept sediment from the upper watershed. A sediment modeling study (Philip Williams and Associates 1996) has determined that neither the Channel Widening Plan nor the Bypass Channel Plan would result in appreciable sedimentation due to this sediment-starved condition. Therefore, neither of these plans is likely to significantly increase sedimentation in salmonid habitats, as reductions in water velocity would not be sufficient to cause sediment loads to exceed the sediment carrying capacity of the river.

Field surveys show that the river is deficient in gravel downstream from Canoas Creek (Reaches 7-10a). Gravel transport could be reduced in some areas by the Channel Widening Plan, as the low bench height would allow relatively low flows to overflow onto the bench, reducing the velocity and gravel carrying capacity of these flows. However, the capacity of much larger flows to move gravel would be unchanged. In any event, the remaining low flow channel in widened areas would tend to create an area of relatively fast flows (relative to the largely vegetated bench) that would encourage gravel transport in this part of the channel during highflow events.

Gravel transport would not be a problem in Reaches 7 through 10a. This portion of the river has almost no spawning habitat at present. The existing low flow channel would remain to provide fish passage. On the average, water in the low flow channel would reach a depth of 3 feet before spilling over onto the bench. Instream cover lost due to channel widening would be reestablished through mitigation plantings.

In Reach 10B, a new low flow channel would be created which would improve fish passage and spawning potential. Channel widening would initially have negative impacts on salmonid habitat in Reaches 10C and 11 as a result of the removal of streambank vegetation although, as with lower reaches, a low flow channel averaging 3 feet in depth would remain and would provide fish passage. It is not known if channel widening in portions of these reaches would affect gravel quantity and quality downstream in Reach 10B. Reach 12 would be unchanged from current conditions.

REDUCTION IN SHADED RIVERINE AQUATIC (SRA) COVER RESULTING FROM THE REMOVAL OF 4,034 LINEAR FEET OF OVERWATER VEGETATION AND 2,535 LINEAR FEET OF UNDERCUT BANK ALONG THE GUADALUPE RIVER. Based on the Revised Draft CAR (USFWS 1997), construction activities associated with grading and excavation of streambanks and bank protection activities would result in the direct removal of 4,034 linear feet of overhead cover in the form of overwater riparian vegetation and 2,535 linear feet of undercut banks. These features are expected to gradually reestablish over time along the modified channel, but the initial impact represents 26 percent of the total SRA cover and 29 percent of the total undercut bank habitat in Reaches 7-12 of the Guadalupe River. These losses could significantly affect salmonids in the Guadalupe River by reducing fish egg survival through increases in water temperature, increasing juvenile fish mortality through decreases in escape habitat, and reducing habitat complexity.

Canopy cover maintains shade for water temperature control. Approximately 50 percent to 75 percent midday shade provides optimal habitat in terms of productivity and thermal regulation for most trout streams (Raleigh et al. 1984). Limited shading can result in water temperatures exceeding the optimal range for salmonids (53°F to 66°F); too much shade can also limit primary productivity in streams. Chinook salmon and steelhead trout are coldwater species sensitive to temperature changes within and above optimal levels. Deleterious water temperatures during spawning, egg incubation, and early-rearing periods can reduce fish survival. Existing water temperatures often exceed optimal levels for chinook salmon and steelhead trout in the Guadalupe River as a result of limited canopy cover.

The loss of SRA cover is considered significant because the existing amount of stream shading is well below the range of 50 to 75 percent considered optimal for trout streams and existing water temperatures approach or exceed the upper limit of the optimal range for salmonid production. Additional decreases in stream shading would likely result in an increase in water temperatures and contribute to ongoing temperature-related impacts on fishery resources. The impact would be significant in the short and intermediate term until mitigation revegetation is established. Impacts would be gradually reduced and become less than significant in the long term. Based on the USFWS (1997) HEP, the mitigation plan for the Channel Widening alternative would create enough SRA cover to mitigate construction losses.

Wildlife Impacts

The same assumptions made regarding impacts on vegetation and fisheries are applicable to the wildlife impact analysis. Less than significant impacts include the removal of low-value wildlife habitat associated with ruderal scrub and herbaceous vegetation, and the impacts of floodwall installation on urban forest habitats in Reach 8 and along Ross and Canoas creeks. The urban forest impacts are considered less than significant because of the small areas that would be affected by installation of the low floodwalls, leaving these habitats essentially intact.

Construction of the recreation trail would not have any significant impacts on wildlife. The entire length of the trail would be located either on maintenance roads on project lands, or off-site on non-habitat lands. Wildlife may be temporarily disturbed by project construction; the minimal additional construction work associated with trail installation could cause minor and temporary additional impacts.

Operation of the trail (recreational use and maintenance) would not significantly affect wildlife. Riparian forest birds such as the yellow warbler are likely to experience some degree of disturbance from recreational use adjacent to portions of its habitat. Increasing human intrusion into forest habitat has been shown to have a negative impact on some breeding songbirds (Riffell et al. 1996), but it is unlikely that species breeding along the Guadalupe River would be similarly affected, given that local populations are probably acclimated to human disturbance under current conditions.

Significant impacts of the Channel Widening Plan on wildlife include the following:

REMOVAL AND FRAGMENTATION OF RIPARIAN WILDLIFE HABITAT. The Channel Widening Plan would result in the initial removal of about 6.5 acres of riparian forest that provides important wildlife habitat. Losses by reach were presented in Appendix F, Table F-9. Removal of long sections of forested habitat along the riverbanks increases habitat fragmentation and may reduce local species diversity (Terborgh and Winter 1980; Jensen et al. 1990). This impact would occur prior to riparian forest regrowth in mitigation areas, and is considered significant because of its magnitude, because of the importance of riparian forest as habitat for resident and migratory wildlife, including sensitive species (e.g., yellow warbler [state special concern species]), and because riparian forest has declined locally (Santa Clara Valley), regionally (Central Coast), and statewide.

DISTURBANCE OF RIPARIAN WILDLIFE HABITAT ADJACENT TO CONSTRUCTION AREAS. In the absence of preventive measures, constructing the Channel Widening plan could result in substantial loss of riparian wildlife habitat outside, but adjacent to, grading and construction areas. The loss of adjacent riparian wildlife habitat would be significant because of the local, regional, and statewide decline of riparian habitats. This impact would be mitigated to insignificance in the long term with revegetation.

REMOVAL OF WETLAND AND AQUATIC WILDLIFE HABITATS. Implementing the Channel Widening plan would result in the removal of approximately 0.28 acre of wetland. Approximately 2.64 acres of other waters of the United States (Table F-9, Appendix F) would be indirectly impacted by construction activities at the edge of the channel. The original vegetation, functions and values of these habitats are expected to reestablish naturally over time, but the short-term loss is still significant.

CONSTRUCTION DISTURBANCE TO WILDLIFE SPECIES ALONG THE GUADALUPE RIVER. Construction-related noise and activity could disturb foraging, breeding, and roosting wildlife along the Guadalupe River. This short-term impact is considered significant because of the high use of the Guadalupe River by water birds for foraging and roosting and because construction activity could disturb substantial numbers of breeding or roosting wildlife along the river.

Rare, Threatened and Endangered Species

FEDERALLY LISTED OR PROPOSED SPECIES. Pursuant to Section 7 of the Endangered Species Act, a Biological Assessment of the project's effects on endangered species has been prepared and is included as Appendix K. This document will be submitted to the USFWS and National Marine Fisheries Service (NMFS). Additional consultation between the Corps and these agencies will occur as required.

The Corps has reviewed the list provided by USFWS of federally listed, proposed and candidate species and species of concern that may occur in the project region. Based on review of species distributions and habitat requirements, the only federally listed species likely to occur in areas impacted by the project is the steelhead trout (recently listed as threatened). The California red-legged frog (also listed as threatened) has not been found in repeated surveys in the study area and, therefore, is considered unlikely to occur. Additional discussion is provided below and in the Biological Assessment (Appendix K). No other federally listed, proposed, or candidate species are known or expected to occur, except possibly as rare transients, or to otherwise be adversely affected by the project.

Steelhead Trout and Other Salmonids. Although the chinook salmon of the Guadalupe River are not currently listed as proposed for listing, they are of high concern to regulatory agencies and the public and so are included in this discussion. The Channel Widening plan would have short-term significant adverse impacts on salmonid habitat in the river due to the removal of streambank vegetation and loss of undercut banks. These habitat features would begin to reestablish along benches, and begin to be offset by mitigation plantings, during the first decade following construction. In the long term, SRA cover would exceed existing conditions as riparian vegetation reestablishes along benches and in mitigation areas.

Construction impacts would be mitigated to insignificance by limiting construction to the low-flow season (April 15-October 15), and by a variety of measures to avoid water quality impacts during construction (discussed in the previous section of this document). Impacts of vegetation removal would in addition be at least partially offset by the removal of barriers and incorporation of fish passage structures along the river.

As discussed previously, the Channel Widening plan would provide fish passage structures at the mouth of Ross Creek to avoid any reduction in access to upstream habitats that may be utilized by steelhead. Project impacts on salmonid access to poor-quality habitat in Canoas creeks are insignificant.

As discussed in the previous section of this document, hydrologic modifications of the channel, by reducing the depth and velocity of peak flows, may affect the distribution and quality of gravel along the river. The net effects are uncertain, but any negative effects should be offset by the enhancement of fish migration to more valuable habitats upstream. If this alternative is selected, additional sediment modeling would be appropriate to better determine its effects on gravel characteristics in the river.

California Red-Legged Frog (Rana aurora draytoni). The California red-legged frog is not known to occur along the affected reaches of the river, and is unlikely to occur, based on the completion of surveys consistent with USFWS protocols. The presence of bullfrogs and the sporadic occurrence of typical habitat for this species (freshwater marsh) along the river further diminish the suitability of habitat for red-legged frogs in the areas that would be affected by the project. At present, the project is considered unlikely to have adverse effects on this species. Survey results have been forwarded to the USFWS, and their response is pending.

FEDERAL SPECIES OF CONCERN. Federal species of concern include former candidates that could be reconsidered for listing in the future. The Corps' Biological Assessment evaluates potential project impacts

on all federal species of concern. Species for which suitable habitat exists in project impact areas, and which have either been observed in field surveys or have a reasonable likelihood of occurrence other than as rare transients, are as follows.

Bat Species of Concern. Three bat species that are federal species of concern, including small footed myotis (*Myotis ciliolabrum*), long-eared myotis (*Myotis evotis)*, and long-legged myotis (*Myotis volans*), could roost or forage along the Guadalupe River. Temporary disturbance and loss of riparian forest that provides some roosting and/or feeding habitat could result from project construction. Mitigation plantings, however, would eventually increase the total availability of habitat for these species.

San Francisco Dusky-Footed Woodrat (Neotoma fuscipes annectens). This large rodent inhabits forested and brushy habitats. Like other woodrats, it builds large nests of sticks and other debris. Woodrats have not been found during field surveys and trapping programs in the study area, nor have their nests been noted. However, they could exist in riparian forest or ruderal scrub habitats within the study area. Temporary disturbance, loss, and fragmentation of some habitat for this species could result from project construction, should it be present in the area. Mitigation plantings would eventually increase the total habitat available and reduce habitat fragmentation (Jones & Stokes 1997), if the area is utilized by this species.

Tricolored Blackbird (Agelaius tricolor). This bird inhabits freshwater marshes but also forages in fields. Field surveys did not note any individuals, but it could occur on an occasional basis in the study area, primarily in Reaches 10B and 12 during the spring months. Construction of planned mitigation areas in Reach 10B could have minor impacts on this species.

Burrowing Owl (Athene cunicularia hypugea). The Channel Widening alternative could result in the temporary disturbance of nesting burrowing owls, if they are present at the time of construction of mitigation areas in Reach 12. This impact would be considered significant because the CDFG includes the burrowing owl on its list of species of special concern and any disturbance of this species could contribute to its decline. This impact is mitigable to insignificance (see Mitigation Measures).

Contrary to its name, the burrowing owl does not actually dig its own burrows. Instead, it inhabits burrows abandoned by other animals such as ground squirrels. Unlike most owls, it is often active during the day. This species has been declining in the Pacific Coast region, possibly due to poisoning resulting from efforts to control rodents, as well as the expansion of agriculture.

Burrowing owls have been observed in Reach 12 in the past. Between 1988 and 1991, at least one pair was a resident on the banks of the Guadalupe River and percolation ponds of Reach 12. Nesting was not confirmed, but was suspected due to the continued presence of the burrowing owls. More recent surveys have failed to find any nesting in the area. However, this species could again utilize habitat this reach.

Little Willow Flycatcher (Empidonax traillii brewsteri). This bird favors riparian habitats, mainly in canyons. It is known to occur in the study area, and the channel widening plan would remove some habitat for this species. As this is one of the species used in the terrestrial HEP, project impacts would be fully mitigated by riparian forest plantings. Short-term habitat fragmentation would be mitigated by these plantings (Parsons Engineering Science 1997).

STATE-LISTED, PROPOSED, AND SPECIAL CONCERN SPECIES. Many of the species mentioned above are also listed by CDFG. The winter-run chinook salmon and willow flycatcher are state-listed endangered species. State special concern species include California red-legged frog, San Francisco dusky-footed woodrat, tricolored blackbird, and burrowing owl. Refer to the previous section for discussion of project effects on

these species. In addition, the yellow warbler, a state special concern species, is present and would be affected as discussed below. Additional discussion of state species of special concern is provided in the draft Biological Assessment (Appendix K).

Yellow Warbler (Dendroica petechia). The yellow warbler utilizes riparian forest throughout California. Yellow warblers were found nesting in the riparian forest habitat of Reach 7 through 11, placing their nests in shrubs and low trees. The nesting population consists of approximately 10 to 20 pairs. This species would experience some habitat loss and fragmentation under the channel widening plan. However, as it is used in the terrestrial HEP as a basis for determining mitigation needs for riparian forest, impacts are expected to be fully mitigated. Temporary habitat fragmentation would be mitigated though riparian forest plantings (Parsons Engineering Science 1997).

Bypass Channel Plan

Vegetation Impacts

The same assumptions stated previously for the Channel Widening Plan apply to the Bypass Channel Plan. The following impacts are specific to the Bypass Channel Plan. Acreages of impacts on vegetation are summarized for each habitat by reach in Table F-10, Appendix F. Plates in Appendix E show impact areas overlying existing habitats.

Earthen fill for the cofferdams under Section 404 jurisdiction is 7,000 cubic yards based on the Ordinary High Water line. The area of other waters of the United States to be filled temporarily by these structures is 1.06 acres. The potential locations of 25 cofferdams are shown on the engineering drawings for the Bypass Channel Plan (Parsons Engineering Science 1997).

No impacts on listed or proposed threatened or endangered plants would occur because no such plants occur in the project area. Impacts on valley oaks are discussed with impacts on riparian forest.

Operational impacts would be similar to those associated with the Channel Widening Plan except with regard to the additional maintenance of the bypass channel.

Less-than-Significant Impacts

As discussed previously, less-than-significant impacts include the periodic removal of vegetation for maintenance purposes; potential long-term decline in riparian forest integrity from removal of adjacent forest; and removal of nonforest upland vegetation.

Significant Impacts

REMOVAL OF 9 ACRES OF RIPARIAN FOREST. Implementing the Bypass Channel plan would result in direct removal of approximately 9 acres of existing riparian forest by construction activities, such as grading and excavation. This impact would be more than offset over time as riparian forest would develop in mitigation plantings along new channel banks. The acreage initially impacted represents approximately 30 percent of the existing riparian forest mapped in Reaches 7-12. At least half of the loss would be in graded sites not available for on-site replacement; at least a third of the loss would be in sites that could be used for revegetation. Included in this impact would be the loss of up to 3,100 trees greater than 2 inches DBH (up to 40 percent of existing trees). These numbers are known to be overestimated because project revisions since tree surveys were conducted in 1991 have reduced the number of trees that would be removed by an estimated 5-15

percent. Approximately 53 percent of the trees to be removed are of species that are not native to the Guadalupe River. Approximately 33 valley oaks could be removed.

The structure and composition of riparian forest vegetation would be altered along one bank of the river through most of the study area, but the nature of changes varies in different reaches. In reaches 7 and 8, little forest would be removed initially, and subsequent reforestation would create a wider forested corridor. In reach 9 through 10a, mid- to upper bank forest would be removed to create a wider channel; with limited replacement on the toe of the bench, the riparian forest corridor would be narrowed. In reaches 10c through 11, a bench would be created 5 to 8 feet above the channel invert, leaving lower bank vegetation intact, but mid- and upper bank vegetation removed initially, but at least partially reestablished on-site through revegetation. Additional details are presented in Parsons Engineering Science (1997).

This impact is considered significant because: (1) riparian corridors support high levels of plant and wildlife diversity, (2) the ecological functions of riparian corridors are degraded by vegetation removal, and (3) much riparian vegetation has already been lost in Santa Clara Valley and throughout the San Francisco Bay region. Mitigation replantings would mitigate this impact to insignificance in the long term.

REMOVAL OF 250 - 300 TREES PROTECTED BY CITY TREE ORDINANCE. Project construction would result in the removal of an estimated 250-300 trees that are large enough (over 18 inches DBH) to qualify for protection under the City's tree ordinance. This impact is considered significant because the impact represents about 30-36 percent of existing trees in this size class and because the SCVWD must comply with the City's tree ordinance. As the constructing agency, the Corps would be required to obtain a tree removal permit and provide compensation for ordinance trees. Mitigation replantings would mitigate this impact to insignificance in the long term.

DISTURBANCE OF RIPARIAN FOREST ADJACENT TO CONSTRUCTION AREAS. In the absence of preventive measures, constructing the Bypass Channel plan could result in substantial inadvertent injury to or mortality of riparian forest plants outside but adjacent to grading and construction areas (e.g., in lower bank sites between the channel bottom and excavated floodway benches). Without physical barriers between construction areas and protected vegetation, impacts resulting from collisions with heavy equipment, sidecasting of graded material, soil compaction, materials storage, and other factors can be expected. This impact is considered significant because, although the number and severity of inadvertent injuries cannot be predicted, they could affect a substantial number of trees and shrubs that would otherwise remain healthy. Mitigation replantings would mitigate this impact to insignificance in the long term.

DISTURBANCE OF RIPARIAN FOREST ASSOCIATED WITH EROSION REPAIR ACTIVITIES. Bank erosion that occurred in Reaches 7 and 9 during the floods of January and March 1995 would be repaired as part of the construction of the flood control project. Small amounts of the "existing" riparian forest area included in preproject habitat maps and tables has been removed already by the floods. Additional small areas could be removed or disturbed by movement of equipment and materials for the erosion repair work. The maximum combined area of flood-caused impacts and construction-caused impacts would be approximately 0.63 acre. This impact is considered significant. Replantings would mitigate this impact to insignificance in the long term.

REMOVAL OF 1.29 ACRES OF URBAN FOREST. Implementing the Bypass Channel plan would result in permanent removal of 1.29 acres of urban forest in Reaches 8 and 9, and Ross Creek (Table F-10, Appendix F). Some additional backyard trees could die or become severely stressed if their root systems were disturbed by floodwall construction or other permanent impacts on Ross and Canoas creeks or the Guadalupe River. Some of the acreage included in this impact occurs in or adjacent to construction staging areas where no removal of urban forests would occur.

EXCAVATION OR FILLING OF 0.9 ACRE OF JURISDICTIONAL WETLANDS AND 9.93 ACRES OF OTHER WATERS OF THE UNITED STATES. The Bypass Channel Plan would result in removal or temporary disturbance of approximately 0.9 acre of wetlands and 9.93 acres of other waters of the United States (Table F-10, Appendix F). This impact is considered significant because wetlands and other waters of the United States support high levels of plant and wildlife diversity and many such areas have been lost in Santa Clara Valley and throughout the San Francisco Bay region in recent decades. Most or all of the impacts on other waters of the United States would be temporary impacts during construction. Following construction, ordinary high waters would occupy equal or greater areas in every reach and would remain in essentially the same locations (except in the middle of Reach 10B, where the low flow channel will shift slightly eastward). Significant wetland losses would be replaced through mitigation plantings along the modified channel reducing impacts in the long term to less than significant.

A portion of the wetland impact would be the result of temporary disturbance or minor grading. Narrow strips of seasonal wetland affected in many such areas are expected to reestablish naturally, because natural recovery of seasonal wetland vegetation has been observed on some banks and bars on the lower Guadalupe River. Other portions of the wetland impact (particularly in Reaches 10B, and 12) would require mitigation replanting to be mitigated to insignificance.

Fisheries

CONSTRUCTION. Construction activities associated with the Bypass Channel plan that would result in adverse and beneficial impacts on fisheries include floodway improvements, bank stabilization measures, and removal of existing barriers to fish passage. The same assumptions stated previously for the Channel Widening Plan are applicable to the Bypass Channel Plan.

OPERATIONAL IMPACTS. Operational changes that would result in adverse and beneficial impacts on fisheries include operation of bypass channels and changes in vegetation maintenance activities.

The following assumptions were made regarding operational impacts on fisheries:

- The SCVWD would design bypass channels that would avoid impacts on fishery resources. Sloping the bypass channel invert toward the west bank would reduce the potential for fish entrapment by creating a low-flow channel that would provide fish with adequate water depths as flows recede. The SCVWD would not include design features (e.g., gradient-control structures) in bypass channels that could result in the formation of ponded water habitats that could entrap fish during receding flow events. To further reduce the potential for fish entrapment within constructed bypass channels, the SCVWD would submit final design plans for bypass channels to CDFG for review.

- The proposed maintenance program incorporates several measures that would protect and enhance the riparian system. This proposed program potentially would increase streamside vegetation coverage and densities, which could result in an increase in the areal coverage and density of SRA cover.

- The SCVWD currently operates in-stream percolation ponds in Reach 12 during summer. The Bypass Channel plan would include continued operation of seasonal graded percolation ponds during summer without substantial changes to existing conditions.

Beneficial Impacts

INCREASE IN HABITAT AVAILABILITY FOR MIGRATING STEELHEAD TROUT AND CHINOOK SALMON RESULTING FROM REMOVING PARTIAL FISH BARRIERS. Proposed channel modifications include removing an abandoned stream gauge, consisting of a concrete apron and weir, at Hillsdale Avenue (Reach 10C) and a low-flow vehicle crossing (ford) downstream of Ross Creek (Reach 11B). Both structures are potential barriers to upstream migration by adult salmon and steelhead trout and require high flows (over 200 cfs at Hillsdale Avenue and 50-100 cfs at the ford) for successful fish passage. Only during peak urban storm runoff or prolonged watershed runoff do existing flows allow successful fish passage. Removing the barriers would enable access for migrating fish from the San Francisco Bay upstream to the drop structure above Blossom Hill Road at flows of approximately 10-15 cfs and higher.

The weir at stream gauge Station No. 23B partially inhibited fish migration because of the design of the structure. Water did not crest over the weir directly into the plunge pool, reducing the effectiveness of the plunge pool. Boulders below the water surface near the weir further reduced passage capabilities by reducing pool depth and passage corridors. The SCVWD has modified the weir and deepened the pool downstream of the weir thereby creating favorable hydraulic conditions for successful fish passage.
Removal of the Alamitos drop structure at Blossom Hill Road in Reach 13 by the SCVWD is a separate action that will enhance fish passage in the Guadalupe River upstream of the study area (see Parsons Engineering Science 1997).

Less-than-Significant Impacts

FISH PASSAGE IN LOWER ROSS CREEK. Proposed channel modifications include widening the existing lower Ross Creek channel from Almaden Expressway to 700 feet upstream of Jarvis Avenue and installing RCB culverts at Almaden Expressway and Jarvis Avenue to increase flood conveyance capacity in lower Ross Creek. Proposed improvements in the Guadalupe River channel would reduce water surface elevations during flooding events. These reductions would reduce the incidence and duration of backwater events that inundate the reinforced concrete box (RCB) culvert in lower Ross Creek and could result in reduced fish passage opportunities (Parsons Engineering Science 1997). To avoid any reduction in fish passage opportunities for steelhead, a fish ladder would be constructed at the mouth of the creek, to be operated as prescribed by the NMFS and CDFG. As a result, impacts would be less than significant.

FISH PASSAGE IN LOWER CANOAS CREEK. The Bypass Channel plan would reduce the likelihood of anadromous fish migration to upstream areas in Canoas Creek. This impact is considered less than significant because the DFG has determined that Canoas Creek does not provide suitable spawning habitat and that upstream migration should, therefore be discouraged (Parsons Engineering Science 1997). Fish passage into the creek from the Guadalupe River would be reduced as a result of lowered water surface elevations during flood episodes, reducing the frequency and duration with which culvert at the mouth of the creek is inundated (see Parsons Engineering Science for details). Fisheries habitat within the creek would be affected by channel modifications to improve flood conveyance, but these impacts are also less than significant because of the poor quality of the habitat.

ACUTE AND CHRONIC TOXICITY TO FISHERIES AND REDUCED FISH PRODUCTIVITY RESULTING FROM CONSTRUCTION-RELATED ACTIVITIES. As discussed for the Channel Widening plan, temporary construction

impacts on water quality would have less-than-significant impacts on fisheries because of the implementation of a Stormwater Pollution Prevention Plan, as well as a hazardous materials control and spill response plan. These same measures described for the Channel Widening plan are part of the Bypass Channel plan (Parsons Engineering Science 1997), and no additional mitigation is required.

POTENTIAL IMPACTS ON FISH MIGRATION AND SPAWNING DUE TO CHANNEL CONSTRUCTION. As discussed for the Channel Widening plan, the Bypass Channel plan includes limitations on the timing of in-channel construction that would reduce potential impacts on fish migration and spawning to less-than-significant levels. These procedures are identical to those described for the Channel Widening plan and are part of the Bypass Channel plan (Parsons Engineering Science 1997).

ADVERSE EFFECTS ON FISHERY RESOURCES RESULTING FROM OPERATING BYPASS CHANNELS. Implementing the Bypass Channel plan would include constructing and operating a 5,400-foot-long bypass channel in Reaches 7-8 and two separate 500-foot-long bypass channels in Reach 9 (one at Pine Avenue and one upstream of Malone Road). HEC-2 modeling results indicate that the bypass channel in Reaches 7-8 would not begin operating until flows in the natural channel exceed 1,500 cfs. The Pine Avenue and Malone Road bypass channels in Reach 9 would become operational when flows exceed 1,600 cfs and 700 cfs, respectively (Bravo 1993). Although the Malone Road bypass channel would operate more frequently and for longer durations than the other bypass channels, operation of the Malone Road bypass channel would likely have minimal effects on fish spawning and migration because it is relatively short. Operation of the Pine Avenue bypass channel would have the least effect on fisheries of the proposed bypass channels because it is short and would operate less frequently and for shorter duration than the other two bypass channels. The following discussion focuses on the potential effects of operating the bypass channel in Reaches 7-8 because it has the greatest potential for impacts on fishery resources. Each of the following impacts are assessed below and determined to be less than significant:

- Fish entrapment or delays in migration resulting from operating bypass channels,
- Reduced fish migration and spawning success in the Guadalupe River resulting from changes in hydraulic characteristics, and
- Reduced channel maintenance flows and gravel flushing flows.

FISH ENTRAPMENT OR DELAYS IN MIGRATION RESULTING FROM OPERATING BYPASS CHANNELS. The proposed design would not be a significant cause of fish entrapment or delays in migration. The following discussion provides additional background and analysis relevant to this issue.

Possible delays in migration or entrapment of fish are dependent on a number of variables, such as the length and design of the bypass channel, the frequency and duration of bypass operation, the coincidence of bypass operation with the migration timing of adult and juvenile fish, and the behavior of adult and juvenile chinook salmon and steelhead trout. Unless an adequate connection to the River at the upstream end of the bypass is maintained, adult chinook salmon and steelhead trout could move into the bypass channel during high flows and experience delays in migration or, worse, become stranded by receding flows. Juvenile outmigrants could also move into the bypass channel during high-flow events in spring and be stranded by receding flows. The formation of isolated pool habitats could increase the potential for fish entrapment during receding flows. Delays in fish migration and fish entrapment would reduce chinook salmon and steelhead trout abundance by increasing fish mortality or lowering reproductive success. Based on the existing flow frequency data and known steelhead trout spawning and migration criteria from the scientific literature, most steelhead trout migration and spawning in the Guadalupe River occurs at flows less than 1,500 cfs.

Hydrologic data for water years 1972-1991 indicate that flows equaling or exceeding 1,500 cfs on the Guadalupe River at stream gauge Station No. 23B (Reach 10B) have occurred from November through April (Parsons Engineering Science 1997). During this period of record, flows equaled or exceeded 1,500 cfs on 45 days; February had the greatest number of days (14), followed by January (13 days), March (10 days), April and November (3 days), and December (2 days). Because the peak migration season for adult chinook salmon occurs from October through December, minimal effects on migrating adult chinook salmon from operation of the bypass channel would occur. During October through December, flows equaled or exceeded 1,500 cfs (i.e., the minimum flow necessary for bypass operation) on only 5 days combined out of 1,748 possible days (i.e., 92 days in October through December over 19 years).

Although bypass channel operation is more likely to occur in winter during the adult steelhead trout migration period (i.e., December through April), effects on migrating adult steelhead trout would be minimal because bypass operation would occur infrequently and for short durations. An analysis of daily peak flows determined that during the 1972-1991 period, Guadalupe River flows equaled or exceeded 1,500 cfs on only 42 days, approximately 1.5 percent of the total days occurring during the 6-month rainy season. Most high-flow periods had flows exceeding 1,500 cfs for no longer than 1 day in duration (Parsons Engineering Science 1997).

The rate at which juvenile fish would be drawn into the bypass channel depends on the number of juvenile fish migrating downstream when the bypass channel is flooded and the relative proportion of Guadalupe River flows entering the bypass channel during a flood event. The greatest likelihood of juvenile fish entering the bypass channel would occur when peak juvenile migration coincides with floodflows of large magnitude and long duration. Because the bypass channel would operate infrequently and for short durations, it is unlikely that a large proportion of the total juvenile fish population would be drawn into the bypass channel during any given flood event. Furthermore, because the downstream end of the bypass channel would be directly connected with the Guadalupe River, juvenile fish entering the bypass channel would be expected to migrate down the bypass channel and re-enter the River.

Entrapment of juvenile and adult fish could also occur during a receding flood event, if ponded water habitats formed and became isolated as the bypass channel drained. Juvenile and adult fish trapped within these ponded areas could experience delays in migration or, worse, suffer increased mortality from predation and desiccation of habitats.

The proposed design--sloping the bypass channel invert toward the west bank would reduce significant impacts of fish entrapment by creating a low-flow channel that would provide fish with adequate water depths as flows recede. The design would not include features (e.g., gradient-control structures) in bypass channels that could result in the formation of ponded water habitats with the potential to entrap fish during receding flow events. This impact is considered less than significant because bypass channels would operate infrequently, and for short durations, would be unlikely to trap substantial numbers of salmonids or delay their migration.

REDUCED FISH MIGRATION AND SPAWNING SUCCESS IN THE GUADALUPE RIVER RESULTING FROM CHANGES IN HYDRAULIC CHARACTERISTICS. Impacts on spawning and migrating chinook salmon and steelhead trout in main channel reaches depends on several variables, such as the effect of bypass operation on water depths and velocities in main channel reaches, the frequency and duration of bypass operation, and the coincidence of bypass operation with chinook salmon and steelhead trout spawning and migration periods.

When operational, the proposed bypass channels would reduce the magnitude of existing flows in the affected reaches of the Guadalupe River and could adversely affect adult migration and spawning if flow reductions

caused unsuitable hydraulic characteristics (e.g., exceedingly shallow water depths) to occur in the main channel. Adult chinook salmon and steelhead trout require suitable water depths and velocities for successful migration and spawning. Excessively shallow water depths and high water velocities can reduce fish passage capabilities at natural barriers, such as gravel riffles, and unfavorable changes in hydraulic characteristics could reduce the amount of available spawning habitat for adult chinook salmon and steelhead trout.

Impacts on chinook salmon spawning and migrating would be minimal because of the slight probability that bypass operation would occur during chinook salmon spawning and migration (see discussion above under "Fish Entrapment or Delays in Migration Resulting from Operating Bypass Channels"). Furthermore, bypass channel operation would not affect egg survival for either chinook salmon or steelhead trout because bypass operations would not substantially affect hydraulic characteristics in the main channel during egg incubation periods.

Although bypass operation would more likely occur in winter during adult steelhead trout migration and spawning periods (December to March), minimal effects on steelhead trout migration in main channel reaches would occur because bypass operation would not affect water depths and water velocities when flows are less than 1,500 cfs. Based on the existing flow frequency data and known steelhead trout spawning and migration criteria from the scientific literature, most steelhead trout migration and spawning in the Guadalupe River likely occurs at flows less than 1,500 cfs.

These impacts are considered less than significant because bypass operation would have minimal effects on water depths and water velocities during chinook salmon and steelhead trout migration and spawning periods. No mitigation is required.

REDUCED CHANNEL MAINTENANCE FLOWS AND GRAVEL FLUSHING FLOWS. Operation of the bypass channel would reduce the magnitude of high flows in the main channel when floodflows are diverted into the bypass channel. This reduction in high flows in the main channel could have secondary effects on channel geometry and gravel quality because of the reduction in the incidence and magnitude of channel maintenance and gravel flushing and sediment transport flows.

Channel maintenance flows and gravel flushing flows are necessary to maintain stream channel and gravel quality (Milhous and Bovee 1977, Rosgen et al. 1986). Changes in sediment load or discharge can result in changes in channel shape, loss of spawning habitat, and loss of cover (Milhous and Bovee 1977). Increases in the width-to-depth ratio of stream channels can degrade fish habitat, such as spawning habitat, and create fish passage problems for migrating species such as chinook salmon and steelhead trout.

Significant reductions of peak flows can also cause sedimentation problems because the size of the substrate material that can be transported through the system is reduced. As flows are reduced, the size of the substrate material that is deposited is also reduced. Fine sediments, such as sand-, silt-, and clay-sized particles, can adversely affect redd construction, egg survival, fry emergence, and food production by filling in the pore spaces in cobble and gravel beds.

The effects of bypass operation on gravel flushing, sediment transport, and channel maintenance flows are dependent on how bypass operation affects the magnitude and duration of flows responsible for channel formation. Effective discharge, the flow that just fills a nonincised channel to flood stage with an approximate recurrence interval of 1.5 years, is the flow that determines the channel geometry and is responsible for transporting the largest part of the sediment load over the long term (Andrews 1980, Wolman and Miller 1960 in Rosgen et al. 1986). Using the method described by Leopold and Dunne (1978) and streamflow data from Stream gauge Station No. 23B provided by the SCVWD, an annual-maximum flood series was constructed for water years 1971-1991 to determine the effective discharge. The 1.5-year recurrence interval is a good

estimator of effective discharge (Wolman and Leopold 1957, Dunne and Leopold 1957, and Williams 1960 in Rosgen et al. 1986). However, the 1.5-year recurrence flow from the historical annual-maximum flood series may provide only an approximate estimate of effective discharge because of the effects of urbanization and reservoir operation on Guadalupe River hydrology. Based on existing hydrologic data, the 1.5-year recurrence interval flow is estimated to be approximately 850 cfs, considerably lower than the minimum flow (1,500 cfs) required to initiate bypass channel operation. Bypass operation is therefore expected to have minimal, less than significant effects on the magnitude and duration of flows responsible for channel formation.

Bypass channel operation would therefore not increase the frequency or duration of low- to medium-range flows that could result in an increase in the amount of fine sediments deposited in the main channel. Bypass channel operation would not affect the magnitude or duration of intermediate flows that control channel geometry and transport the largest part of the sediment load over the long term. Existing dams and reservoirs are likely the dominant factor controlling gravel abundance, relative composition, and quality in the Guadalupe River. Impacts are therefore considered less than significant, and no mitigation is required.

REDUCTION IN IN-STREAM COVER AND SHADE ASSOCIATED WITH PERIODIC VEGETATION REMOVAL AND DISTURBANCE FOR FLOODWAY MAINTENANCE. Implementing the proposed maintenance program (Parsons Engineering Science 1997) would result in periodic removal or substantial trimming of riparian plants in the channel bottom, removal of weedy species, application of herbicides on maintenance roads, and trimming of overhanging vegetation to a height of 12 feet along maintenance roads. The proposed maintenance program incorporates several measures that would protect and enhance the riparian system, including selectively removing nonnative trees and shrubs to increase the ratio of native to non-native vegetation.

This impact is considered less than significant because the project would decrease the extent or frequency of vegetation clearing over preproject practices. No mitigation is required; however, the SCVWD would implement Mitigation Measure V-3, a vegetation protection plan for riparian and urban forests (refer to Section 4.12, Vegetation). Successful implementation of this measure would mitigate to insignificance the potential of inadvertent impacts and improve the integration of vegetation replacement, enhancement, protection, and monitoring activities with floodway maintenance and management in the project area.

Significant Impacts

REDUCTION IN SHADED RIVERINE AQUATIC (SRA) COVER RESULTING FROM THE REMOVAL OF 4,958 LINEAR FEET OF OVERWATER VEGETATION AND 1,100 LINEAR FEET OF UNDERCUT BANK ALONG THE GUADALUPE RIVER. Construction activities associated with grading and excavation of streambanks and bank protection activities would initially result in the direct removal of 4,958 linear feet of overhead cover (this represents 30 percent of the overhead forest cover and 13 percent of the undercut bank habitat that is present) in the form of overwater riparian forest vegetation and 1,100 linear feet of undercut banks in Reaches 7-12. More than half of the loss of overwater vegetation would occur in Reaches 9 and 10A, whereas 61 percent of the loss of undercut banks would occur in Reach 10A. The removal of overwater vegetation would reduce existing shading amounts by an average of approximately 5 percent throughout all project reaches (Parsons Engineering Science 1997).

Overhead cover and undercut banks are important SRA cover variables that would be affected by the Bypass Channel plan. Undercut banks and overhead cover provide fish with cover from predators, and canopy cover (overhanging vegetation) maintains shade for stream temperature control and provides an energy input to the stream in the form of fallen leaves and insects. Riparian forest also is important in controlling watershed and streambank erosion and in maintaining undercut banks.

This impact would diminish over time as these habitat features reestablish, but in the short to intermediate term it is significant because overhead cover is an essential component of salmonid streams in this region. Salmonid populations are highly influenced by the amount of available cover, and much of the SRA cover in the Guadalupe River has been lost in recent decades as a result of urbanization, roadway and bridge construction, and flood control projects. Without appropriate mitigation, reductions in SRA cover could adversely affect fish production, abundance, and distribution in the Guadalupe River by reducing fish egg survival through increases in water temperature, increasing juvenile fish mortality through decreases in escape habitat, and reducing habitat complexity.

Canopy cover maintains shade for water temperature control. Approximately 50 to 75 percent midday shade provides optimal thermal regulation for most trout streams (Raleigh et al. 1984). Limited shading can result in water temperatures exceeding the optimal range for salmonids (53°F to 66°F); too much shade can also limit primary productivity in streams. Chinook salmon and steelhead trout are coldwater species sensitive to temperature changes within and above optimal levels. Deleterious water temperatures during spawning, egg incubation, and early-rearing periods can reduce fish survival. The existing amount of stream shading is well below the range considered optimal for trout streams, and existing water temperatures approach or exceed optimal values for salmonid production. In the absence of preventive measures, additional decreases in stream shading would likely result in an increase in water temperatures and contribute to ongoing temperature-related impacts on fishery resources.

USFWS (1997) calculations suggest that the Bypass Channel plan would need an addition 1.41 acres of SRA cover to mitigate the losses caused by construction. This is based on optimistic assumptions, which are supported by the SCVWD's analyses, regarding the success of SRA cover mitigation in Reach 10B. The Bypass Channel plan contains other measures, discussed previously under Beneficial Impacts, that enhance fish passage and overall fisheries habitat conditions in the river. These beneficial aspects should be sufficient to make up for the apparent shortage of SRA cover mitigation.

Construction Impacts — Wildlife

The same assumptions made for the vegetation and fisheries analyses are applicable to this section. Following are the significant impacts of the Bypass Channel Plan on wildlife.

REMOVAL AND FRAGMENTATION OF RIPARIAN WILDLIFE HABITAT. The Corps and the FWS had agreed to modify the previous terrestrial HEP to reflect current project impacts and mitigation areas. Sufficient background data on this HEP could not be located, so it was necessary to do a new terrestrial HEP. The SCVWD was initially involved in the process, but did not agree with the use of certain models and with the HEP's assumptions regarding the timing of impacts and mitigations and, as a result, withdrew. The FWS feels this new HEP better characterizes the habitat values to be affected, while the SCVWD disagrees.

The HEP analysis of the riparian wildlife resources of the project was designed to:

- Describe the existing riparian wildlife habitat conditions for selected evaluation species in the project area and mitigation sites;
- Determine the baseline riparian wildlife habitat values for the evaluation species in the project area and mitigation sites;
- Quantify impacts on riparian wildlife habitat from implementation and operation of the project;

- Determine whether the proposed compensation mitigation plan would fully offset direct, on-site, project-related impacts on riparian wildlife habitat for the evaluation species; and
- Develop management actions for mitigation sites in the project area.

The Bypass Channel Plan would result in removing 9.08 acres of riparian forest that is important wildlife habitat from construction activities such as grading and excavation. Losses of riparian habitat are presented by reach in Table F-10 in Appendix F. The significant loss of riparian habitat would eliminate or displace wildlife species such as the yellow warbler (state species of special concern) that occupy riparian habitat at the project site. The HEP analysis determined that the evaluation species least affected by project implementation would be the northern oriole and that the downy woodpecker would be the most affected evaluation species. Replanting would mitigate this impact to insignificance in the long term.

Project construction would increase wildlife habitat fragmentation along the Guadalupe River corridor, possibly reducing local species diversity by affecting the capability of certain reaches of the river, notably Reaches 9 and 10A, to support breeding riparian bird species (Terborgh and Winter 1980; Jensen et al. 1990). This significant impact would be mitigated over time as riparian forest develops on revegetation sites.

Removal of riparian forest is considered significant because of the disproportionately high value of this resource as wildlife habitat, and because of the local (Santa Clara Valley), regional (Central Coast), and statewide declines that have increased the significance of remaining occurrences of this habitat.

DISTURBANCE OF RIPARIAN WILDLIFE HABITAT ADJACENT TO CONSTRUCTION AREAS. In the absence of preventive measures, constructing the Bypass Channel Plan could result in substantial loss of riparian wildlife habitat outside, but adjacent to, grading and construction areas. This loss of habitat is considered significant because of the local, regional, and statewide decline of riparian habitats. This impact would be mitigated to insignificance by measures to avoid impacts outside of designated construction areas.

REMOVAL OF URBAN FOREST WILDLIFE HABITAT. The Bypass Channel Plan would result in removal of urban forest wildlife habitats amounting to a total of 1.29 acres in Reaches 8 and 9 and on Ross Creek (Table F-10, Appendix F; see also Parsons Engineering Science 1997, Table 4.12-5). Additional backyard trees could die or become severely stressed if their root systems were disturbed by floodwall construction or other actions affecting Ross and Canoas creeks or the Guadalupe River. The loss of this buffer would temporarily reduce the habitat values of the adjacent riparian forest. Many animals, especially birds, that use the riparian forest corridor move out to forage in adjacent upland habitats, including urban forests. This impact is significant in the short term, whereas in the long term, the impact would be fully mitigated by proposed revegetation along the Bypass Channel and elsewhere.

REMOVAL OF WETLAND AND AQUATIC WILDLIFE HABITATS. The Bypass Channel Plan would result in the permanent removal or temporary disturbance of approximately 0.9 acre of wetland and 9.93 acres of other waters of the United States (Table F-10, Appendix F). The original vegetation, functions and values of these habitats may reestablish naturally in areas of temporary disturbance, and possibly in areas of excavation or filling, depending on the degree of disturbance. This impact is considered significant because wetland and aquatic wildlife habitats have high value for wildlife and have declined substantially in Santa Clara Valley, the central Coast Ranges region, and the state. The impact would be mitigated to insignificance in the long term with establishment of mitigation replantings.

CONSTRUCTION DISTURBANCE TO WILDLIFE SPECIES ALONG THE GUADALUPE RIVER. Construction-related noise and activity could disturb foraging, breeding, and roosting wildlife along the Guadalupe River. This

short-term impact is considered significant because of the high use of the Guadalupe River by water birds for foraging and roosting and because construction activity could disturb substantial numbers of breeding or roosting wildlife along the river.

DISRUPTION OF BREEDING AND RISK OF MORTALITY TO BURROWING OWLS. Implementing the Bypass Channel plan could result in the disturbance (e.g., from grading and construction activities) of breeding burrowing owls in Reach 12. If present during breeding or wintering seasons, owls in burrows could be injured or killed by construction activities. This impact is considered significant because CDFG includes the burrowing owl on its list of species of special concern and the project could contribute to the decline of the species locally and regionally. The impact would be mitigated to insignificance by completing surveys to determine any owl burrow locations, avoidance of these locations, and relocation if necessary.

Operations Impacts — Wildlife

Operations impacts on wildlife would be insignificant. The project would reduce the extent of habitat disturbance along the riparian corridor compared to existing practices. Recreational use of the river corridor would increase, but activity would be controlled and concentrated along a well-defined trail, resulting in minimal disturbance of sensitive wildlife that resides in riparian forest habitats, compared to the existing condition, in which human disturbance is diffuse and largely uncontrolled along the river.

Rare, Threatened and Endangered Species

FEDERALLY LISTED OR PROPOSED SPECIES. The SCVWD's EIR/S (Parsons Engineering Science 1997) serves as the Biological Assessment of the Bypass Channel plan's effects on listed and proposed species, as well as candidates and species of concern. In general, the same conclusions reached for the Channel Widening plan (see also Appendix K) are applicable to the Bypass Channel plan and are summarized below.

Steelhead Trout and Other Salmonids. As discussed previously for the Channel Widening plan and under "Fisheries" for this alternative, Bypass Channel construction would have short-term adverse impacts on stream habitat features that may affect migration, spawning, and rearing by steelhead trout and chinook salmon. With mitigation as proposed, these short-term effects would be offset by long-term improvements in habitat quality. Short-term water quality impacts would be mitigated by measures to be incorporated into the Stormwater Pollution Prevention Plan and by limiting construction to the low-flow season. The Bypass Channel plan would reduce peak flows in the main channel, but other measures to improve fish passage are expected to more than offset any adverse effect of reduced peak flows.

California Red-Legged Frog (Rana aurora draytoni). Impacts on California red-legged frogs are considered unlikely, given that this species has not been found in the study area despite repeated surveys. Survey results have been forwarded to the USFWS, and their response is pending.

FEDERAL SPECIES OF CONCERN; STATE-LISTED, PROPOSED, AND SPECIAL CONCERN SPECIES. Impacts of the Bypass Channel plan on these species are essentially the same as those of the Channel Widening plan discussed previously (see also Appendix K; Parsons Engineering Science 1997). Potentially significant impacts on burrowing owls in Reach 12 are mitigable to less-than-significant levels as described under Mitigation Measures below. All other impacts are considered less-than-significant after mitigation, with any adverse short-term effects more than offset by long-term gains in habitat value.

4.4.4 Mitigation Measures

Channel Widening Plan

Vegetation

Areas where riparian forest would be planted to mitigate losses caused by construction are shown on plates in Appendix E. The total of 12.1 acres of mitigation matches that required under equal compensation according to the HEP (USFWS 1997). Mitigation acreages by reach are as follows:

Reach	*Bench Acreage*	*Non-Bench Acreage*	*Total*
7	3.37	0.60	3.97
8	0.00	0.00	0.00
9	0.00	0.24	0.24
10a	0.32	0.00	0.32
10b	0.00	2.52	2.52
10c	1.23	0.14	1.37
11	1.70	1.61	3.31
12	0.00	0.37	0.37
Total	**6.62**	**5.48**	**12.10**

Note: Riparian forest acreage within total mitigation acreage. Reach 10b acreage is classified as non-bench mitigation as it would not be located on a bench excavated for channel widening.

In other respects, mitigation measures for the Channel Widening Plan are in part adapted from those developed for the Bypass Channel Plan (Parsons Engineering Science 1997). The Channel Widening Plan proposes seeding cut slopes of the widened river channel, and other disturbed upland habitats with herbaceous vegetation sufficient for erosion control.

1. Prepare and implement an integrated vegetation mitigation plan. The Corps shall prepare and implement a detailed mitigation plan to compensate for removal of riparian forest, SRA cover, City ordinance trees, and wetlands and other jurisdictional waters of the United States. All of these planting needs shall be integrated into a single plan because some plantings shall provide compensation for more than one impact; plantings that compensate for different impacts shall be implemented side-by-side at the same time; methods of planting. maintenance, and monitoring shall be similar for all types of vegetation; and scheduling of planting, maintenance, and monitoring shall be coordinated for all mitigation plantings.

   The integrated vegetation mitigation plan shall provide detailed information on planting locations (specific to each vegetation type), plant materials (e.g., species, source, and size), planting methods (e.g., site preparation and plant spacing), maintenance methods (e.g., irrigation and weed control), monitoring methods (e.g., sample design, data requirements, survey frequency, and reporting requirements), and success criteria (e.g., species composition, percent survival, and percent canopy cover).

Goals, concepts, and guidelines that shall be incorporated into the detailed mitigation plan are listed below.

RIPARIAN FOREST

- Establish sufficient acreage on newly excavated benches and cut slopes and in compensation sites elsewhere along the river to avoid a long-term net loss of acreage and ecological function, based on the results of the USFWS HEP analysis (1997). For planning purposes, the Corps will use

equal compensation, i.e., no net loss of habitat value for all evaluation species combined, as a basis for mitigation planning. The USFWS HEP suggests that 12.1 acres of riparian forest mitigation are needed to provide equal compensation for the Channel Widening plan's impacts. As indicated above the currently planned mitigation plantings meet this threshold.

- Plant local, native riparian species, including herbaceous plants used for erosion control.

- Where possible, plant riparian vegetation for mitigation in existing gaps or openings (e.g., those that are unvegetated or are ruderal herbaceous areas) to reduce fragmentation and heterogeneity in the riparian corridor.

- Use percent survival, canopy cover, stem density, and species composition of planted vegetation as success criteria for the riparian forest mitigation plantings. Percent survival would be most relevant during the first 1-3 years, whereas longer-term goals should emphasize cover, density, and species composition.

SHADED RIVERINE AQUATIC HABITAT

- Establish sufficient linear footage of new vegetative cover to ensure no net long-term loss of SRA habitat values by planting native riparian shrubs and trees (especially willows) along unshaded banks. As currently proposed, about 10,000 linear feet of river-forest interface would be created by the Channel Widening Plan.

- Plantings intended to provide SRA cover shall be planted along the water's edge at summer low flows and shall be sufficiently dense to provide shade along at least 85 percent of the bank's length. At ground level, the width of plantings for riparian mitigation will vary from approximately 10 to over 30 feet because the space available for vegetation planting varies. Where mitigation plantings are confined to narrow strips, riparian trees would be allowed to spread out above a height of 12-15 feet. In other areas, SRA cover will be planted where there are no constraints on planting widths. Only riparian plantings located within 15 feet of the wetted channel are considered as SRA mitigation. When mature, the widths of SRA plantings will exceed the ground level width by 10-50 feet, depending on the diameter of the canopies.

CITY ORDINANCE TREES

- Provide adequate compensation for removal of ordinance trees (typically 4:1 replacement based on tree number [Hamilton 1993]) and incorporate these trees into the mitigation plantings for riparian forest or urban forest, as appropriate.

WETLANDS AND OTHER JURISDICTIONAL WATERS OF THE UNITED STATES

With the exception of the riparian forest/SRA cover mitigation plan for Reach 10B, permanent impacts on true marsh habitat as opposed to other wetland areas of non-marsh vegetation within the stream channel would be minimal under the Channel Widening Plan.

- Establish sufficient acreage of constructed jurisdictional wetlands to provide no net loss of wetlands within the project area. Restore as much as possible of the temporarily disturbed wetlands on-site along the edges of the excavated bench.

- Use native grasses, sedges (*Cyperus* spp. *Carex* spp.), water-plantain (*Alisma* spp.), and knotweeds (*Polygonum* spp.) or other native plants that are flexible enough to be minimally disturbed by channel maintenance activities and minimize obstruction of flood flows.

- Use jurisdictional wetland delineation criteria as a basis for success criteria for the constructed wetlands.

- Post-construction acreage of waters of the United States will equal or exceed pre-construction acreage; hence no mitigation is suggested.

LOCATIONS

- Locate all mitigation plantings in Reaches 7-12 and begin "off-site" mitigation plantings in areas where channel widening is not required, such as Reach 12, as early as possible.

- Where sites can be revegetated following construction disturbance or minor grading, implement mitigation directly on the sites that were disturbed. Implement the remaining mitigation plantings in appropriate locations that are currently unvegetated or occupied by ruderal vegetation or sparse, degraded riparian forest.

SUCCESS CRITERIA

Monitoring shall continue for 5 years or until all success criteria are met. Criteria for success of the mitigation plantings shall be based on density of live woody plants per acre and plant species diversity during the initial 5-year monitoring period. Specific criteria for tree and shrub densities shall vary with the type of community. Revegetation sites shall be required to contain all the native species initially planted (although relative amounts may change) after 5 years. Remedial action shall be implemented and the monitoring period extended if success criteria are not met.

MAINTENANCE AND MONITORING

- Ensure protection of mitigation plantings and facilitate establishment of vigorous vegetation.

- Monitor the mitigation plantings in a manner that provides early feedback to the Corps and its revegetation contractors on methods to improve results or correct problems, allows a determination of when success criteria have been achieved, and provides the documentation needed for monitoring required under CEQA and by project permits.
- Follow the mitigation monitoring guidelines of the Corps (1991) for standards of wetland monitoring design and reporting. Riparian and wetland plantings shall be monitored for at least 5 years, including at least 2 years after the removal of irrigation systems.

2. Implement a public education program. The Corps shall participate with the SCVWD in a program to educate the community and creekside homeowners about biological mitigation and habitat protection associated with the project and to solicit their cooperation and support. The program shall be similar

to that proposed for the Bypass Channel Plan. The program shall be coordinated with Mitigation Measure 1 and the SCVWD's channel maintenance program for the Guadalupe River.

3. Implement a vegetation protection plan for riparian and urban forests. The Corps shall prepare and implement a plan to protect vegetation that does not need to be removed during project construction from inadvertent damage.

   Before construction begins, a survey shall be conducted to identify and flag locations of construction area boundaries, specific trees near or within construction areas that are to be saved, and selected trees that may be transplanted to a mitigation area. Orange plastic barricade fencing shall be erected or similar measures taken along construction area boundaries to identify areas of protected vegetation. The fencing shall be placed as close to the actual limit of grading or construction (i.e, as far from the forest edge) as possible. If practical. selected trees within construction areas shall be transplanted for use in a designated mitigation area by an experienced tree-moving contractor.

   During construction, attachment of ropes, cables, or guys to trees outside the construction area shall be avoided, except in emergencies. Trees not designated for removal that are damaged during construction shall be trimmed under the direction of a qualified arborist to minimize the risk of disease. Trees outside the construction area that are damaged beyond recovery shall be replaced by the contractor at a minimum 3:1 basis with additional native trees in a designated riparian forest mitigation area or shaded riverine aquatic habitat cover mitigation area.

Fisheries

4. Conserve and restore undercut banks on site and improve fish passage conditions. The Corps shall mitigate construction-related impacts on undercut banks and short-term temperature impacts associated with vegetation clearing during construction by implementing the following specific measures:

   Avoid losses of undercut banks where possible. Depending on final engineering design requirements, it may be possible to avoid the excavation of undercut banks along some sections designated for channel widening. In these areas, banks shall be fenced off-limits to construction activity.

   Even if undercut banks can be saved, the FWS feels that the removal of adjacent trees whose roots stabilize these banks would result in the loss of these banks over time. The Corps and USFWS have assumed for planning purposes (including the HEP) that this would be the case. However, if undercut banks can be saved initially, it may be possible to stabilize them afterwards through plantings of young willows. The mitigation plan for the channel widening alternative calls for planting these residual bank areas for mitigation purposes. It is not known to what extent this would preserve existing undercut banks.

   Based on the revised aquatic HEP (USFWS 1997), there would be no need to create artificial undercut banks. The FWS assumes in the aquatic HEP that SRA cover attributes would gradually return over a period of 30 years, but only in areas that are not hardened, and the HEP discounts the instream cover correction factor accordingly.

   In addition, the loss of undercut banks, overhead cover and stream shading shall be mitigated to insignificance by implementing Measure 1.

Wildlife

Impacts on wildlife other than rare, threatened, or endangered species (discussed below) shall be mitigated by vegetation measures described previously (Mitigation Measures 1 through 3).

RARE, THREATENED, AND ENDANGERED SPECIES

Steelhead Trout. Additional mitigation measures if necessary shall be determined in consultation with NMFS.

California Red-Legged Frog. This species is unlikely to be present or affected by the project, and no mitigation measures are proposed. The Corps will consult with USFWS to determine whether additional protective measures are warranted.

5. To mitigate potential impacts on burrowing owls to insignificance, surveys shall be conducted in planned mitigation areas in Reach 12 during the nonbreeding season (September-January) and no more than 2 weeks before construction begins, to determine whether burrowing owls are occupying the construction site before construction.

Within 30 days of conducting the survey(s), the results shall be forwarded to the CDFG. If no burrowing owls exist at the construction site, no additional mitigation measures shall be required. If survey results reveal the presence of burrowing owls, monitoring by a qualified wildlife biologist shall be required during construction activities, and a report of monitoring activities shall be forwarded to the CDFG.

The following mitigation measures shall be implemented, depending on when construction is scheduled to occur.

- If construction occurs during the nonbreeding season (September-January), construction shall be avoided within 160 feet of the active burrow to avoid disturbing or killing the burrowing owls, until the burrow is vacated and destroyed as indicated below. This schedule shall comply with laws under the California Fish and Game Code, the federal Migratory Bird Treaty Act, and CDFG's burrowing owl guidelines.

Monitoring of potential wintering burrows would be necessary to ensure that no owls were killed during grading. A qualified wildlife biologist shall survey the affected area within 2 weeks before construction activity begins to determine if active burrows are present. After determining that active burrows are unoccupied, the burrows shall be destroyed to prevent reoccupancy during construction.

- If construction occurs during the breeding season (February-August), the owls shall be excluded from the construction area before the breeding season begins and prevented from returning by the following actions:

  - Examining all potential burrows in Reach 12 during the nonbreeding season (September-January) to determine the presence or absence of owls,

  - Destroying or collapsing unoccupied burrows to prevent their use during the nonbreeding and breeding seasons, and

  - Monitoring the construction site and continuing to destroy burrows until grading begins to ensure that new burrows constructed by ground squirrels are not occupied by owls and used as dens.

- If no other options are available, relocate burrowing owls. The Corps shall prepare a relocation and habitat protection plan in coordination with CDFG and USFWS and obtain permits from both CDFG and USFWS.

Within 60 days of completion of construction activities in Reach 12, a letter report shall be submitted to CDFG that includes results of the preconstruction survey, monitoring and preventive actions taken during construction, and postconstruction conditions. With implementation of these mitigation measures, there would be no impact on this species unless relocation becomes necessary.

Bypass Channel Plan

Vegetation

Plates in Appendix E show areas preliminarily designated for the mitigation plantings called for in Mitigation Measure 1. A reach-by-reach quantification of net changes in habitat types, assuming successful mitigation, is provided in Parsons Engineering Science (1997). Mitigation acreages by reach are as follows:

Reach	*Acreage*
7	3.28
8	0.13
9	1.84
10	5.53
11	4.23
12	6.15
Total	**21.16**

Certain revegetation measures not described here are assumed to be part of the Bypass Channel Plan (i.e., seeding grasses and other herbaceous plants on the floodway benches and bypass channel bottoms, planting most gabion slopes with blackberries, and seeding upland sites with grasses as needed to minimize soil erosion as required in the Stormwater Pollution Prevention Program).

1. The Corps shall prepare and implement a detailed mitigation plan to compensate for removal of riparian forest, shaded riverine aquatic (SRA) cover, urban forest. City ordinance trees, and wetlands and other jurisdictional waters of the United States. All of these planting needs shall be integrated into a single plan because some plantings shall provide compensation for more than one impact; plantings that compensate for different impacts shall be implemented side-by-side at the same time; methods of planting. maintenance, and monitoring shall be similar for all types of vegetation; and scheduling of planting, maintenance, and monitoring must be coordinated for all mitigation plantings.

   The integrated vegetation mitigation plan shall provide detailed information on planting locations (specific to each vegetation type), plant materials (e.g., species, source, and size), planting methods (e.g., site preparation and plant spacing), maintenance methods (e.g., irrigation and weed control), monitoring methods (e.g., sample design, data requirements, survey frequency, and reporting requirements), and success criteria (e.g., species composition, percent survival, and percent canopy cover).

This measure is expected to provide a net long-term increase in habitat quality along the Guadalupe River, because it shall replace with native species all of the riparian forest removed during construction (much of which is dominated by non-native and weedy plants). Net loss of habitat value shall be avoided by using a sufficient replacement ratio based on the results of the new terrestrial HEP, initiating construction in Reaches 12 and 10B in the early years of the multi-phase construction implementation, and revegetating Reaches 12 and 10B in the first fall planting season after reach construction.

Goals, concepts, and guidelines that shall be incorporated into the detailed mitigation plan are listed below.

Riparian Forest

- Establish new riparian forest in Reaches 7-12. Mitigation required by the Corps would be based upon the results of the new terrestrial HEP, after completion of an incremental mitigation analysis. As currently proposed (Parsons Engineering Science 1997), the Bypass Channel plan provides approximately 21 acres of mitigation plantings to offset the loss of about 9 acres. This exceeds the threshold of value of 14.6 acres for equal compensation as well as the value needed for in-kind compensation, determined by the revised USFWS HEP (1997).

- Plant tree and shrub species that are native to the local riparian system. Incorporate only native plant material into seed mixes of herbaceous plants used for erosion control.

- Where possible, plant native riparian trees and understory shrubs for mitigation in existing gaps or openings (unvegetated or ruderal herbaceous areas) to reduce fragmentation and heterogeneity in the riparian forest.

- Use percent survival, canopy cover, stem density, and species composition of planted vegetation as success criteria for the riparian forest.

Shaded Riverine Aquatic Habitat

- Establish at least 4,958 linear feet of new vegetative cover by planting native riparian shrubs and trees (especially willows) along unshaded banks. This provides the replacement ratio needed to meet the SRA cover requirements.

- Plantings intended to provide SRA cover shall be located along the water's edge at summer low flows and should be sufficiently dense to provide shade along at least 85 percent of the bank's length. Sufficient bank lengths shall be planted to achieve the net replacement of overhead cover, taking into account the formation of gaps in the canopy. At ground level, the width of plantings for riparian mitigation shall vary from approximately 10 to over 30 feet because the space available for vegetation planting varies. In some areas, SRA cover shall be planted on narrow strips of the low flow channel and floodway terraces that shall be kept free of woody vegetation.

  In other areas, SRA cover shall be planted where there are no constraints on planting widths. Only riparian plantings located within 15 feet of the wetted channel are considered as SRA cover mitigation. When mature, the widths of SRA plantings shall exceed the ground level width by 10-50 feet, depending on the diameter of the canopies.

Urban Forest

- Establish at least 1.29 acres of new sycamore-valley oak forest in selected top-of-bank sites in Reaches 7-12. This goal is based on a 1:1 replacement ratio (based on canopy area).

- Use native tree species in the urban forest revegetation sites, especially California sycamore, valley oak, coast live oak, and California wild rose.

City Ordinance Trees

- Comply with the City of San Jose's tree ordinance requirements for trees removed by the project that are not on SCVWD property.

- Consult with the City Arborist to identify and evaluate trees greater than 18 inches DBH that shall be removed by the project on land not owned by the SCVWD. Identify specific compliance and mitigation requirements when the number and value of affected trees have been determined.

- Provide adequate compensation for removal of ordinance trees (typically 4:1 replacement based on tree number [Hamilton 1993]) and incorporate these trees into the mitigation plantings for riparian forest or urban forest, as appropriate.

Wetlands and Other Jurisdictional Waters of the United States

- Establish at least 0.89 acre of constructed jurisdictional wetlands to provide no net loss of wetlands within the project area.

- Construct new wetlands in Reaches 10B and 12. Restore as much as possible of the temporarily disturbed wetlands on-site in Reaches 7-12.

- Use native grasses, sedges (*Carex* spp.), water-plantain (*Alisma* spp.), knotweeds (*Polygonum* spp.), or other native plants that would be minimally disturbed by channel maintenance activities and minimize obstruction of flood flows.

- Use jurisdictional wetland delineation criteria as a basis for success criteria for the constructed wetlands.

- Provide at least 9.93 acres of constructed and restored other waters (at least a 1:1 replacement ratio) to compensate for other waters that are either disturbed or eliminated during project construction.

Locations

- Locate all mitigation plantings in Reaches 7-12 and begin implementation of mitigation plantings in Reach 12 in the early years of the multi-phase construction.

- Where sites can be revegetated following construction disturbance or minor grading, implement mitigation directly on the sites that were disturbed. Implement the remaining mitigation plantings in appropriate locations that are currently unvegetated or occupied by ruderal vegetation or sparse, degraded riparian forest.

- Plates in Appendix E show anticipated locations of mitigation planting sites for riparian forest, urban forest, and wetlands. More detailed specifications of planting locations are to be included in the detailed mitigation plan.

Success Criteria

Monitoring shall continue for 5 years or until all success criteria are met. Criteria for success of the mitigation plantings shall be based on density of live woody plants per acre and plant species diversity during the initial 5-year monitoring period. Specific criteria for tree and shrub densities shall vary with the type of community. Revegetation sites shall be required to contain all the native species initially planted (although relative amounts may change) after 5 years. Remedial action shall be implemented and the monitoring period extended if success criteria are not met.

Maintenance and Monitoring

- Provide maintenance that shall protect mitigation plantings and facilitate establishment of vigorous vegetation.

- Monitor the mitigation plantings in a manner that provides early feedback to the SCVWD and its revegetation contractors on methods to improve results or correct problems, allows a determination of when success criteria have been achieved, and provides the documentation needed for monitoring required under CEQA and by project permits.

- Follow the mitigation monitoring guidelines of the Corps (1991) for standards of wetland monitoring design and reporting. Riparian and wetland plantings shall be monitored for at least 5 years, including at least 2 years after the removal of irrigation systems.

Riparian Forest Fragmentation

Estimates of post-project riparian forest patch and gap lengths (Parsons Engineering Science 1997) indicate that reductions in total gap length ranging from 11 percent to 60 percent would occur in Reaches 7, 10B-C, 11, and 12. Small increases or decreases (+ 4 percent to -6 percent) would occur in Reaches 8, 9, and 10A. Overall, total gap length would decrease by 23 percent and total patch length:gap length ratio would improve from 1.2:1 under preproject conditions to 2.3:1 under postproject conditions under the Preferred Project. No additional mitigation measures are suggested.

2. The Corps shall prepare and implement a program to educate the community and creekside homeowners about biological mitigation and habitat protection associated with the project and to solicit their cooperation and support. Principal actions shall include:

    - Developing an educational brochure on proper stream care to be distributed to homeowners along the Guadalupe River within the environs of the project area before construction begins. This brochure shall explain (1) the reasons for the removal of non-native vegetation, (2) the values of native vegetation along the riparian corridor and on private property, (3) reasons for not dumping debris, (4) related issues concerning water quality, and (5) guidelines for aesthetic improvement.

    - Conducting a series of workshops for creekside homeowners before and after project construction to explain the riparian mitigation program to be implemented, the value of riparian habitat to wildlife, and the goals of the mitigation program.

The program shall be coordinated with Mitigation Measure 1 and the SCVWD's channel maintenance program for the Guadalupe River.

3. The Corps shall prepare and implement a plan to protect vegetation that does not need to be removed during project construction from inadvertent damage. This plan shall incorporate standard construction practices used by the SCVWD and described in the project description.

Before construction begins, a survey shall be conducted to identify and flag locations of construction area boundaries, specific trees near or within construction areas that are to be saved, and selected trees that may be transplanted to a mitigation area. Orange plastic barricade fencing shall be erected or similar measures taken along construction area boundaries to identify areas of protected vegetation. The fencing shall be placed as close to the actual limit of grading or construction (i.e, as far from the forest edge) as possible. If practical, selected trees within construction areas may be transplanted for use in a designated mitigation area by an experienced tree-moving contractor.

During construction, attachment of ropes, cables, or guys to trees outside the construction area shall be avoided, except in emergencies. Trees not designated for removal that are damaged during construction shall be trimmed under the direction of a qualified arborist to minimize the risk of disease. Trees outside the construction area that are damaged beyond recovery shall be replaced at a minimum 3:1 basis with additional native trees in a designated riparian forest mitigation area or shaded riverine aquatic habitat cover mitigation area.

4. The Corps shall replace or compensate property owners for any native or non-native backyard trees that die or become severely stressed as a result of flood wall construction or other construction-related activities. Replacement shall be provided on a 1:1 in-kind basis for trees with drip lines within 10 feet

of project construction that die or become severely stressed during construction, or within 1 year after completion of construction for trees that are determined by a qualified arborist, on a case-by-case basis, to have been affected by project construction.

5. The Corps shall use live willow cuttings and other plant materials in the revegetation of eroded areas as specified in the maintenance program, and shall revegetate all areas cleared for access to the erosion repair sites with native riparian vegetation. This mitigation measure is similar to the riparian mitigation called for in Mitigation Measure 1. The mitigation goal for the erosion repair sites is no net loss because the initial impact resulted from natural causes (flooding), the proposed repair methods shall allow for on-site recovery of riparian vegetation, and the sites shall be less susceptible to erosion after the repairs are completed.

Fisheries

6. The Corps shall mitigate construction-related impacts on undercut banks and short-term temperature impacts associated with vegetation clearing during construction by implementing the following specific measures:

CONSTRUCT 1,100 LINEAR FEET OF UNDERCUT BANKS, USING APPROPRIATE BIOTECHNICAL TECHNIQUES AND PROVIDE 4,958 LINEAR FEET OF SRA HABITAT. In consultation with CDFG and USFWS, the design shall use appropriate prevention materials in association with replanted vegetation, to create 1,100 linear feet of undercut bank habitats. This measure is not part of the Corps' Bypass Channel plan, but part of a separate project that would be constructed by the SCVWD. This measure shall compensate for the loss of undercut banks during grading and streambank excavation at a 1 to 1 ratio. Before initiating construction, the existing 1,100 linear feet of undercut banks shall be documented in terms of water depths, velocities, and depths of undercut to provide detailed information on existing conditions. Undercut bank mitigation areas shall be located in Reaches 7, 10A, 10B, 11A, 11B, and 11C. Mitigation areas shall be evaluated annually for five years to determine whether created undercut banks are functioning properly by providing habitat conditions similar to those that were measured for existing conditions. If full mitigation cannot be achieved by created banks, the SCVWD shall consult with CDFG and USFWS, initiate remedial actions, and continue monitoring for an additional 5 years. Remedial actions shall include redesign of revetment or other appropriate mitigation based on negotiations with CDFG and USFWS.

Mitigation shall be considered complete in the fifth year if created undercut bank lengths provide habitat conditions similar to those measured for preproject conditions. In addition, the loss of undercut banks, overhead cover and stream shading shall be mitigated by implementing Measure 1. Successful implementation of this measure, in combination with proposed restoration efforts in Reaches 10B and 12 and proposed reductions in-channel vegetation maintenance throughout all project reaches, is expected to result in an overall net increase in overwater vegetation, provide for more continuous shading over the entire project area, mitigate the impact to insignificance and be consistent with the USFWS requirement of "no net loss of aquatic habitat values or acreage."
Implementing these measures shall result in a 1:1 replacement of overwater vegetation (Parsons Engineering Science 1997). Locations of proposed revegetation sites, including SRA cover mitigations sites, are presented in plates in Appendix E.

IMPROVE FISH PASSAGE CONDITIONS ON GUADALUPE CREEK. This mitigation measure will not be part of the Corp's Bypass Channel plan, but will instead be considered a separate project by the local sponsor as a cumulative beneficial impact. Mitigation benefits from this proposal have not been quantified using the HEP

methodology, so their cost-effectiveness can not be compared to other mitigation measures. This measure can be considered as a qualitative benefit to fisheries.

The SCVWD shall improve fish passage conditions on Guadalupe Creek at:

- Stream Gauge Station No. 43, and
- a channelized stream reach midway between the Pheasant Creek confluence and Reynolds Road.

Fish passage structures shall be designed in consultation with CDFG and USFWS and incorporate engineering considerations and biological criteria developed for fish passage to ensure that adequate fish passage is maintained.

The Corps and SCVWD shall implement a two-phase monitoring program of fish passage improvement (i.e. along the channelized stream reach halfway between the Pheasant Creek confluence and Reynolds Road) to determine the success of the improvements: annual surveys (phase one) to determine whether fish are using the structures; and ongoing maintenance surveys in perpetuity (phase two) to ensure that structures are operating as designed. No monitoring of stream gauge Station No. 23 is proposed because only minor modifications to the weir are needed to improve fish passage, precluding the requirement to build an actual fish passage structure such as a fish ladder. The SCVWD shall develop an appropriate monitoring program in coordination with CDFG and USFWS to document the successful passage of migratory fish (primarily chinook salmon and steelhead trout). Phase one of the monitoring program shall commence in the fall following completion of fish passage improvements. Monitoring shall be conducted from October 1 to April 30 when migrating adult chinook salmon and steelhead trout are expected to occur.

Monitoring activities shall consist of visual surveys at improvement locations; carcass, redd, and juvenile surveys in reaches upstream of improvement locations; automated fish counting systems mounted at each fish passage structure; or a combination of two or more methods to document the successful passage of adults. The precise sampling protocol shall be developed in consultation with CDFG and USFWS and shall depend on the opportunities and constraints governed by the local conditions (e.g., high turbidity levels during storm runoff periods may preclude the use of visual observations as a sampling method).

The SCVWD shall submit an annual monitoring report to CDFG for up to 5 years after completion of fish passage improvements. In addition to formal monitoring efforts, the SCVWD shall look for indicators of passage problems, such as fish congregating downstream of the ladder or failed attempts by fish to negotiate the ladder during routine and ongoing maintenance practices, conducted during phase two (discussion below). If the objective of attaining fish passage has not been met and is not due to factors beyond the SCVWD's control (e.g., drought, natural downstream barriers, or limited number of fish), remedial actions shall be initiated and monitoring shall continue for up to an additional 5 years. Remedial actions shall include redesign of structural improvements or further negotiations with CDFG and USFWS regarding other appropriate mitigation.

This measure shall be considered successful when fish passage was documented, and no indicators of passage problems are present. After successful fish passage was documented, phase one of the monitoring program shall considered complete.

Phase one of the monitoring plan shall include repeated surveys during the rainy season (i.e., October 1 through April 30) to ensure that the fishways are free if obstructions and debris that would preclude their normal operation. The SCVWD shall follow the same maintenance and inspection procedures as outlined in an existing MOU with CDFG and take reasonable and appropriate measures to remove accumulated debris

in a timely manner to restore to normal the operation of the fishway. The current MOU requires the SCVWD to inspect all fish ladders once every working day and at least once per day during high flow events on nonworking days during the migration season. This phase of the monitoring program shall continue for the life of the improvement structure.

Mitigation Measure Cf-1 (Chapter 6, "Cumulative Impacts") requires the SCVWD to provide fish passage at the gabion structure on Alamitos Creek, which shall provide fish access to an additional 10.68 miles of stream habitat. This measure would increase the availability of habitat by slightly more than what would be potentially affected by the cumulative effects of this project, including other ongoing projects on the Guadalupe River (i.e., State Route 87 and the Corps Downtown Guadalupe River Flood Control Project), which totals approximately 9 miles of river. Successful implementation of Mitigation Measure Cf-1, in conjunction with implementing Mitigation Measure 6, should provide chinook salmon and steelhead trout access to a combined total of 13.3 miles of additional spawning and rearing habitat. Together, these measures would result in a long-term benefit to the anadromous fishery of the Guadalupe River because of the increase in habitat availability and the anticipated benefits associated with the improved habitat conditions found in these tributary streams.

Wildlife

Apart from impacts on special status wildlife (see below), impacts of the Bypass Channel Plan on wildlife shall be mitigated by the vegetation mitigations (1 through 5).

7. To mitigate impacts on burrowing owls to insignificance, surveys shall be conducted in planned construction and mitigation areas in Reach 12 during the nonbreeding season (September-January) and no more than 2 weeks before construction begins, to determine whether burrowing owls are occupying the construction site before construction.

Within 30 days of conducting the survey(s), the results shall be forwarded to the CDFG. If no burrowing owls exist at the construction site, no additional mitigation measures shall be required. If survey results reveal the presence of burrowing owls, monitoring by a qualified wildlife biologist shall be required during construction activities, and a report of monitoring activities shall be forwarded to the CDFG.

The following mitigation measures shall be implemented, depending on when construction is scheduled to occur.

- If construction occurs during the nonbreeding season (September-January), construction shall be avoided within 160 feet of the active burrow to avoid disturbing or killing the burrowing owls, until the burrow is vacated and destroyed as indicated below. This schedule shall comply with laws under the California Fish and Game Code, the federal Migratory Bird Treaty Act, and CDFG's burrowing owl guidelines.

Monitoring of possible wintering burrows would be necessary to ensure that no owls were killed during grading. A qualified wildlife biologist shall survey the affected area within 2 weeks before construction activity begins to determine if active burrows are present. After determining that active burrows are unoccupied, the burrows shall be destroyed to prevent reoccupancy during construction.

- If construction occurs during the breeding season (February-August), the owls shall be excluded from the construction area before the breeding season begins and prevented from returning by the following actions:

- Examining all potential burrows in Reach 12 during the nonbreeding season (September-January) to determine the presence or absence of owls,

- Destroying or collapsing unoccupied burrows to prevent their use during the nonbreeding and breeding seasons, and

- Monitoring the construction site and continuing to destroy burrows until grading begins to ensure that new burrows constructed by ground squirrels are not occupied by owls and used as dens.

- If no other options are available, relocate burrowing owls. The Corps shall prepare a relocation and habitat protection plan in coordination with CDFG and USFWS and obtain permits from both CDFG and USFWS.

Within 60 days of completion of construction activities in Reach 12, a letter report shall be submitted to CDFG that includes results of the preconstruction survey, monitoring and preventive actions taken during construction, and postconstruction conditions.

Rare, Threatened, and Endangered Species

STEELHEAD TROUT. Additional mitigation measures if necessary shall be determined in consultation with NMFS.

CALIFORNIA RED-LEGGED FROG. Given the conclusion that this species is unlikely to be present or affected by the project, no mitigation is proposed. The Corps will consult with the USFWS to determine whether any additional protective measures are warranted.

4.4.5 Unavoidable Significant Adverse Impacts

Channel Widening Plan

All significant impacts can be mitigated to less-than-significant levels in the long term, because sufficient acreage is available to provide riparian forest habitat replacement to compensate for losses that would occur in conjunction with channel widening. Detailed assessments of the channel widening's effects on river hydrology are required to determine the precise location and extent of riparian forest restoration.

Impacts would be significant in the short and intermediate term until establishment of mitigation replantings.

Bypass Channel Plan

All significant impacts can be mitigated to less than significant levels in the long term, based on the completion of detailed assessments and consultation defined for the channel widening above. Impacts would be significant in the short and intermediate term until establishment of mitigation replantings.