

# AQUATIC HABITAT SURVEY RESULTS

## SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT

*Prepared for*

**City of Santa Rosa  
and  
U.S. Army Corps of Engineers**

**MAY 1996**

*Prepared by*

**Merritt Smith Consulting  
Environmental Science and Communication**  
*3675 Mt. Diablo Blvd. #120 Lafayette, CA 94549*

*For*

**HARLAND BARTHOLOMEW & ASSOCIATES, INC.**

---

# **AQUATIC HABITAT SURVEY RESULTS**

## **SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT**

*Prepared for*

**City of Santa Rosa  
and  
U.S. Army Corps of Engineers**

**MAY 1996**

*Prepared by*

**Merritt Smith Consulting  
Environmental Science and Communication**  
*3675 Mt. Diablo Blvd. #120 Lafayette, CA 94549*

*for*

**HARLAND BARTHOLOMEW AND ASSOCIATES, INC.**

## TABLE OF CONTENTS

<b>1.0 PURPOSE</b> .....	<b>1</b>
<b>2.0 METHODOLOGY</b> .....	<b>2</b>
2.1 Habitat Types .....	2
2.2 Habitat Requirements of Sensitive Species.....	6
<b>3.0 RESULTS</b> .....	<b>9</b>
3.1 Results of Other Studies on Project Area Streams.....	9
3.1.1 Russian River.....	9
3.1.2 Laguna de Santa Rosa and Santa Rosa Creek.....	10
3.2 Summary of Survey Results.....	10
3.2.1 West County Streams.....	10
Bloomfield (Reservoir) .....	10
Carroll Road (Reservoir).....	11
Valley Ford (Reservoir).....	14
Americano Creek (Irrigation Area).....	14
Two Rock (Reservoir).....	14
Huntley (Reservoir).....	15
Stemple Creek (Irrigation Area).....	15
Blucher Creek (Irrigation Area).....	16
Gossage Creek (Irrigation Area).....	16
3.2.2 Sebastopol.....	16
Green Valley Creek (Irrigation Area).....	18
Atascadero Creek (Irrigation Area).....	18
3.2.3 South County Streams.....	18
Lichau Creek (Irrigation Area) .....	18
Willowbrook Creek (Irrigation Area).....	19
Petaluma River (Irrigation Area) .....	19
Adobe Creek (Irrigation Area).....	22
Lakeville-Hillside (Reservoir).....	22
Tolay A and C (Reservoirs).....	22
Sears Point (Reservoir).....	22
Adobe (Reservoir) .....	23
Crane Creek (Irrigation Area) .....	23
Copeland Creek (Irrigation Area).....	23
<b>4.0 REFERENCES</b> .....	<b>25</b>

---

**5.0 APPENDICES.....27**

# AUTHORS

This report was prepared by Michael H. Fawcett, Ph.D.

## 1.0 PURPOSE

---

The purpose of conducting the aquatic habitat surveys is to characterize the existing condition of habitat available for fish and other aquatic life in streams or other aquatic systems that may be affected by components of various project alternatives, primarily those associated with storage and irrigation. The objective of the surveys is to provide qualitative information to be used as the basis for site descriptions for the EIR. Since a large number of streams and watersheds could be affected by different project components, it was necessary to use a survey method that could be completed in a relatively short period of time (i.e., a few hours) at each site. The approach used emphasizes descriptions of habitat features known to be important to sensitive, as well as other, native aquatic species, and is described in more detail below under Scope of Surveys.

## 2.0 METHODOLOGY

---

Section 2.0 explains the basis for the survey approach, details of the methods employed, and habitat requirements for local sensitive species (i.e., species having state or federal listing status). Section 3.1 summarizes the general nature and results of other recent biological studies conducted on streams within or near the project area. The results of the habitat surveys conducted to date as part of this project are presented in Section 3.2, organized by three project regions: West County, Sebastopol, and South County.

From May 1994 through August 1995, approximately 30 streams in the project area were examined. Most of these examinations were preliminary in nature, many consisting only of observations made from bridges at public road crossings. Water quality measurements were taken at about a dozen of the sites, and water samples were collected for laboratory analysis at streams proposed for flow augmentation streams.

Access issues, as well as changing project descriptions during this period (May 1994-August 1995), prevented more detailed examination of many of the streams designated in the original scope of work. As access issues were resolved, more intensive habitat surveys were conducted at reservoir sites and at a few of the streams in proposed irrigation areas. Preliminary findings of the surveys conducted through December 1994 were reported in a technical memorandum dated December 22, 1994.

### 2.1 HABITAT TYPES

Detailed maps of the surveyed streams appear in the Appendix with habitat types noted. Habitat was characterized for the streams by four types: Coolwater A Habitat, Coolwater B Habitat, Warmwater A Habitat, and Warmwater B Habitat. These types are described primarily in the context of their ability (or inability) to support fish assemblages and are defined as follows:

- **Coolwater A Habitat: steep gradient with perennial flow.**

Typical Coolwater A Habitat -- perennial, cool, clean water, shaded by riparian canopy; rocky bottom, high stream gradient, stream segments found in headwater and upper-middle watershed, high proportion of riffles, substrate free of fine sediment; abundant instream shelter (boulders, rootwads, cutbanks, woody debris) and gravel spawning beds; banks stabilized by roots and rocks; abundant food (insects) provided by riffle habitat and by input from riparian canopy. Ideal spawning and rearing habitat for salmonids.

- **Coolwater B Habitat: steep gradient with ephemeral or seasonal flow**

Typical Coolwater B Habitat -- flow may be intermittent in summer, but cool temperatures maintained by shade and by subsurface flow through pools; stream

segments usually found in middle to lower-middle watershed, riparian canopy patchy, not as well developed as in coolwater A habitat; gradient and average flow lower, riffles less abundant, substrate moderately embedded with fine sediment, resulting in reductions of food supply, instream shelter, and quality of spawning beds; banks eroded and unstable; fewer cutbanks and rootwads available for shelter. May also support salmonids, but not as biologically productive as Coolwater A Habitat.

- **Warmwater A Habitat: shallow gradient with perennial flow.**

Typical Warmwater A Habitat -- stream gradient low, few riffles, bottom mud or sand, high embeddedness where rocks occur; stream segments found in lower watershed, riparian cover sparse or absent, water temperature subject to great fluctuations (too warm for salmonids on hot days), dissolved oxygen may be low on summer nights; may dry up to a few warm pools in summer; instream shelter usually scarce, consisting mostly of emergent and aquatic plants (but sometimes provided by abundant woody debris or trash introduced by humans); no spawning or rearing habitat for salmonids; banks unstable, slumped or eroded; streams subject to intense flooding during rainy season. Suitable for some native non-salmonid fishes (e.g., Navarro roach and threespine stickleback) and introduced warmwater fishes (e.g., sunfishes, catfishes, and minnows).

- **Warmwater B Habitat: shallow gradient with ephemeral or seasonal flow.**

Typical Warmwater B Habitat -- seasonal flow (dries up completely in summer); fauna dominated by species that can readily disperse (e.g., winged insects) or can survive drought by encystment, estivation, or other methods; Poor water quality (often polluted by farm animal waste); stream segments found in lower watershed, no riparian cover, shallow water subject to great fluctuations in temperature and other parameters; little or no instream shelter, bottom usually mud or sand; banks eroded, slumped, unstable.

Lentic (or standing) waters were treated as a separate category as follows:

- **Pond Habitat: no gradient with perennial water.**

Typical Pond Habitat -- perennial water; no flow, or limited flow in the case of stock ponds formed by dams on streams in valley floors; ponds usually found in lower watershed, variable depth and water quality conditions; includes farm ponds for watering stock and/or irrigation, as well as larger municipal or other agency reservoirs; suitable for warmwater fishes, but some ponds may also support salmonid rearing (usually introduced stocks that do not reproduce); often important habitat for breeding and rearing of sensitive species of reptiles and amphibians, including California red-legged frog and western pond turtle.

Where access was permitted, habitat surveys consisted primarily of visual descriptions and estimates of parameters such as stream flow, gradient, substrate, and vegetation, recorded



on a standard inventory form while walking through the area in hip waders. Photographs of each site were taken. Copies of all original inventory forms are provided in the Appendix. Although no actual sampling of aquatic animals was conducted until the May 1995 surveys, the habitat surveys included careful visual searching for sensitive species of aquatic animals, and emphasized description of habitat features known to be important to sensitive (as well as other) native aquatic species. Sensitive species that are known, or likely to occur in project area streams (or their downstream estuaries) include eight fish species, three amphibians, one reptile, and one invertebrate (see Table 1). These sensitive species and their respective habitat requirements are listed below.

Table 1.

Project Area Sensitive Species

Sensitive (Special Status) Species	Status	
	State <sup>a</sup>	Federal <sup>b</sup>
Steelhead trout ( <i>Oncorhynchus mykiss</i> ) <sup>c</sup>	--	--
Coho salmon ( <i>Oncorhynchus kisutch</i> )	SCT	FPT
Hardhead ( <i>Mylopharodon conocephalus</i> )	SSC	--
Russian River tule perch ( <i>Hysterocarpus traskii pom</i> )	SSC	--
Tidewater goby ( <i>Eucyclogobius newberryi</i> )	SSC	FE
Splittail ( <i>Pogonichthys macrolepidotus</i> )	SSC	FPT
River lamprey ( <i>Lampetra ayresii</i> )	SSC	--
Navarro roach ( <i>Lavinia symmetricus navarroensis</i> )	SSC	--
California red-legged frog ( <i>Rana aurora draytoni</i> )	SSC	FE <sup>d</sup>
Foothill yellow-legged frog ( <i>Rana boylei</i> )	SSC	--
California tiger salamander ( <i>Ambystoma tigrinum californiense</i> )	SSC	FC
Northwestern pond turtle ( <i>Clemmys marmorata marmorata</i> )	SSC	--
California freshwater shrimp ( <i>Syncaris pacifica</i> )	SE	FE

Source: Harland Bartholomew & Associates 1996

<sup>a</sup> **State status:** State status data taken from CDFG document, Endangered and Threatened Animals of California and Listing Dates (Revised April 1996) and Special Animals (Revised August 1994).

SE = State-listed Endangered, ST = State-listed Threatened, CR = State-listed Rare, SCE = State Candidate Endangered, SCT = State Candidate Threatened, SSC = Species of Special Concern, CFP = State-listed Fully Protected

<sup>b</sup> **Federal Status:** Federal status and probable distribution in Marin and Sonoma counties determined by correspondence with Laurie Simons-USFWS, 9 February 1994.

FE = Federal-listed Endangered, FT = Federal-listed Threatened, FPE = Proposed Endangered, FPT = Proposed Threatened, FC = Candidate for listing under the Endangered Species Act

Note: In a series of federal register notices (50 CFR Part 17, Volume 61, Number 40, 7457-74563 and 7595-7613, February 28, 1996), the USFWS reclassified 96 candidate taxa of plants and animals. The USFWS no longer recognizes a federal candidate category 2 status. There are now 182 plant and 89 animal taxa on a single candidate species list. These taxa are considered by the USFWS as candidates for possible addition to the List of Endangered and Threatened Plants and Animals. As a consequence, the status of many taxa originally included in the analysis has changed, requiring that many taxa be removed from the list of species being considered in this EIR/EIS analysis. See Biological Resources Technical Memorandum, Volume II (HBA 1996) for further information.

<sup>c</sup> While the steelhead has no current state or federal status, both DFG and NMFS are investigating its listing.

<sup>d</sup> Federal status for the frog has been updated in this report to reflect the mid-May 1996 Federal ruling. Because other Project technical reports were finalized prior to this ruling, all reports may not reflect the current status of the frog.

## 2.2 HABITAT REQUIREMENTS OF SENSITIVE SPECIES

### **Steelhead trout**(*Oncorhynchus mykiss*)

- High quality, cool perennial streams
- Clean, well-aerated gravel beds (scattered patches adequate) for spawning, typically in steep, rocky reaches of upper tributaries
- Foods: juveniles eat insects, crustaceans, and other stream invertebrates before smolting; adults feed mainly at sea

### **Coho salmon** (*Oncorhynchus kisutch*)

- High quality, cool, perennial coastal streams
- Clean, well-aerated gravel beds (scattered patches adequate) for spawning
- Deep pools or glides with submerged rootwads or other cover for juvenile rearing
- Foods: juveniles eat aquatic insects and crustaceans, terrestrial insects, smaller fish; adults feed at sea

### **Hardhead** (*Mylopharodon conocephalus*)

- Clear, high-quality streams with large, deep, rock or sand-bottom pools
- Clean gravel riffles for spawning
- Absence of high densities of introduced fishes, particularly Centrarchids
- Foods: benthic invertebrates and plants, drifting and floating insects; increasing proportion of plants in diets of older fish

### **Russian River tule perch** (*Hysterocarpus traskii poma*)

- Low-gradient freshwater streams of the Russian River drainage
- Emergent plants or overhanging banks or tree rootwads for feeding, shelter, breeding, and rearing--livebearers
- Foods: amphipods and other crustaceans, aquatic insects, snails and clams

### **Tidewater goby**(*Eucyclogobius newberryi*)

- Low-salinity estuaries, lagoons, or stream mouths or lower reaches of coastal streams
- Clean sand or mud bottom for breeding
- Abundant submerged or emergent vegetation
- Foods: small aquatic insects and crustaceans

**Splittail** (*Pogonichthys macrolepidotus*)

- Slow-moving reaches of larger rivers of the Sacramento-San Joaquin estuary (including Petaluma River), low-salinity areas of estuaries
- Dead-end sloughs with submerged macrophytes or weedy tributary mouths and side channels with at least some inundated streambank vegetation for spawning, ability to spawn many miles upstream
- Foods: benthic invertebrates, earthworms in flooded areas in spring, eggs of other fish species

**Navarro roach** (*Lavinia symmetricus navarroensis*)

- Slow-moving rivers and small streams of the Navarro River and Russian River watersheds
- Broad tolerance of water quality conditions
- Well aerated gravel or emergent vegetation in flowing water for spawning
- Foods: filamentous algae, small insects and crustaceans

**River lamprey** (*Lampetra ayresi*)

- High quality, cool, perennial streams for spawning and larval rearing
- Clean, well-aerated gravel beds for spawning
- Soft-bottom pools with abundant silt or detritus for larval rearing
- Foods: adults parasitic on other fishes in ocean or estuaries; larvae are deposit-feeders, consuming algae, bacteria, and detritus around the openings of their burrows

**California red-legged frog** (*Rana aurora draytoni*)

- Permanent (at least through September) standing water, preferably deeper than 1 meter, in low-gradient streams, ponds, or low-salinity lagoons
- Dense vegetative cover for feeding, shelter, and reproduction, with sunny openings for basking
- Absence or relatively low density of introduced bullfrogs
- Foods: insects, fish, tadpoles, crustaceans, smaller frogs.

**Foothill yellow-legged frog** (*Rana boylei*)

- Rocky streams with riffles and sunny banks
- Permanent (at least through September) water to allow development of tadpoles
- Absence or low densities of introduced bullfrogs and Centrarchid fishes

- Foods: aquatic and terrestrial insects, snails, other invertebrates

**California tiger salamander** (*Ambystoma tigrinum californiense*)

- Vernal pools, seasonal wetlands, occasionally reservoirs or other man-made ponds for reproduction (adults terrestrial)
- Absence or scarcity of predatory fishes in breeding areas
- Foods: larvae predatory, consuming aquatic invertebrates and smaller amphibian larvae

**Northwestern pond turtle** (*Clemmys marmorata*)

- Permanent pools or ponds, preferably deeper than 1 meter
- Emergent vegetation and some riparian cover
- Sunny basking sites either protected by emergent or riparian cover, offshore location, or by affording good view of approaching predators
- Access to sunny, friable sand or soil for egg laying
- Foods: insects, worms, fish, mollusks, carrion, vegetation

**California freshwater shrimp** (*Syncaris pacifica*)

- Clean, moving water with emergent vegetation or submerged plant roots along shoreline
- Absence of high densities of introduced fishes
- Foods: detritus

## 3.0 RESULTS

---

Beginning in May 1995, a round of reservoir site visits was conducted, including sites not accessible during the first round (May 1994-February 1995). West County reservoir sites were surveyed again in August 1995. New (or repeated) habitat surveys were conducted in conjunction with sampling by seine or dipnet for aquatic reptiles, amphibians, fish, and invertebrates. Special-status reptile and amphibian surveys are primarily the responsibility of HBA biologists, so observations made by the MSC team were routinely relayed to an HBA representative. All of the types of aquatic habitat in each reservoir site were examined by a team of two people walking the stream in hip waders, a process requiring about four hours per site. Particular emphasis was put on the least degraded areas, often headwater tributaries, where some riparian vegetation was still in place, as such areas characteristically contain the most diverse aquatic fauna and native species diagnostic of undisturbed streams.

Intensive habitat and aquatic life surveys were conducted at five proposed streams in irrigation areas; four in the West County area: Blucher, Gossage, Stemple, and Americano Creeks; and one in the Sebastopol area: Atascadero Creek.

### 3.1 RESULTS OF OTHER STUDIES ON PROJECT AREA STREAMS

Several streams that may be affected by project components have been the subject of other recent or ongoing studies that include extensive habitat and aquatic life surveys. Thus, it was determined that additional surveys of these streams were unnecessary for this project; instead, existing information from reports on these other studies will be used in preparing the EIR.

The streams identified as requiring no additional survey work are the following: Russian River, Laguna de Santa Rosa, and Santa Rosa Creek. Although Green Valley Creek has been surveyed in other studies (and therefore has not been re-surveyed for this project), a summary of habitat for the creek appears in Section 3.2.2 text and in Table 3 because of its proximity and similarity to Atascadero Creek.

#### 3.1.1 Russian River

Fishery resources of the mainstem of the Russian River have been surveyed by CDFG in 1954, 1955, 1968, and 1984 (unpublished file reports provided by Bill Cox, CDFG) and by Goodwin, et al. (1994). An ongoing study of aquatic plants, benthos, and water quality is being conducted as part of the long-term project and is summarized in the following Technical Reports: *Russian River Algae and Macrophytes* (MSC 1996), *Laguna Water Quality Monitoring Results* (MSC 1996), and *Russian River Water Quality Monitoring Results* (MSC 1996). A general conclusion that can be drawn from these studies is that the mainstem of the River is essentially a warmwater fish habitat for at least five months of each year, which means that water temperatures are too high in summer for salmonids

(steelhead trout, and coho salmon) and other coldwater fishes. Thus, salmonids are not year-round residents of the River. Salmonid spawning and juvenile rearing takes place in smaller tributaries that have at least some habitat (usually in upper reaches) where cooler water persists throughout the summer months. The fish species resident in the mainstem throughout the year are native species such as Sacramento sucker (*Catostomus occidentalis*), hardhead, Sacramento squawfish (*Ptychocheilus grandis*), and Navarro roach, and introduced warmwater species such as carp (*Cyprinus carpio*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), catfishes (*Ictalurus spp.*), and many others.

### 3.1.2 Laguna de Santa Rosa and Santa Rosa Creek

Studies of fishery resources, fish migration, water quality, and related issues in the Laguna drainage have been conducted annually since 1987 by team members (MSC) for the Subregional System, resulting in numerous reports (MSC 1989, 1990, 1995, 1996b; Roth et al. 1991, 1992, 1993). General conclusions about aquatic habitat that can be drawn from the above studies are that the Laguna proper as well as the lower reach of Santa Rosa Creek (Santa Rosa Flood Control Channel) represent warmwater habitat and aquatic fauna very similar to the Russian River, and that the upper reaches of Santa Rosa Creek and Mark West Creek are still in a fairly natural condition and support self-sustaining annual runs of wild steelhead.

## 3.2 SUMMARY OF SURVEY RESULTS

All of the streams surveyed for aquatic habitat and aquatic life have been highly modified by human activities, most by agricultural practices, some by urban development. In typical streams, livestock grazing or tree-cutting has largely destroyed the corridor of riparian trees that once shaded the streams and stabilized the stream banks. Subsequent erosion and trampling has further altered the aquatic habitat. Streams that were once perennial, cool-water streams of moderate gradient that supported runs of steelhead or coho salmon have become (in the worst cases) unshaded, warmwater, mud-bottom channels with no surface water remaining in the summer.

### 3.2.1 West County Streams

The West County streams surveyed to date for this task are located in one of three watersheds: Estero Americano-American Creek, Estero de San Antonio-Stemple Creek, or Russian River-Laguna de Santa Rosa. The streams are listed in Table 2, which summarizes the basic features of each stream. The inventory forms on which observations were recorded each time a site was visited are provided in the Appendix. Summary descriptions of each stream are presented below.

#### ***Bloomfield (Reservoir)***

This site was visited in June 1994, and May and August 1995. This unnamed stream has three main branches draining the hills to the north of the reservoir site and smaller

tributaries entering from the east and west sides. The mainstem (near the Briggs' family barns and below) consists of a mud-bottomed, eroded and cattle-trampled ditch with slumped banks, no riparian plants, and a series of small ponds formed by stone or concrete dams. The three northern branches each have small remnants of natural riparian forest (willows), and larger areas shaded by dense groves of Eucalyptus trees. However, all of the streambeds and banks are in poor condition. The substrate is mud/sand, with occasional angular cobbles, offering little or no instream shelter for fish or other animals, except for occasional patches of emergent plants. Most of the tributaries were dry in June 1994, and the mainstem had very slight flow (<0.1 cfs) and an afternoon temperature of 28°C. Slight flow was present in the tributaries in May 1995, but they were dry in August 1995. It is likely that the only surface water that persists through each summer is within the stock ponds. The ponds and parts of the mainstem provide habitat potentially suitable for red-legged frog, and northwestern pond turtle. No habitat suitable for salmonids or other sensitive species was found on the site.

### ***Carroll Road (Reservoir)***

This site was visited in September 1994, and May and August 1995. The mainstem on the Renati property flows through a narrow sandstone gorge, approximately ¼ mi. long, with vertical walls 20-30 ft. high. The streambed within the gorge is primarily bedrock overlain by muddy silt resulting from erosion upstream. Deposits of marine fossils are evident in the walls of the gorge and in dislodged boulders lying in the stream. The stream within the gorge is deeply shaded and retains cool water in pools throughout the summer (three steelhead up to 15 in. length were observed in these pools in September 1994). Above and below the gorge the mainstem and tributaries have been heavily affected by cattle grazing and trampling. Patches of dense riparian growth are interspersed with denuded areas of slumped banks and gullies, and heavy siltation has affected all of the areas seen. The tributary draining the Booth property flows through a dense Eucalyptus grove, and the stream is choked with Eucalyptus debris and silt. The stream has been damaged further by the horse stable operators' practice of dumping manure and straw over the bank and into the stream behind the stables. The remaining stands of mature willows surrounding some large pools just downstream from the gorge provide potentially suitable habitat for red-legged frog, and northwestern pond turtle. Gravel beds that occur just upstream of the gorge may have been suitable for salmonid spawning in the past, but are now too laden with silt for successful spawning. Some of the stream could be suitable for California freshwater shrimp, but this species is believed to be extirpated in the Americano Creek watershed (Hedgepeth 1975).



**TABLE 2.**

Aquatic Habitat: West County Streams

<b>Stream Name</b>	<b>Watershed</b>	<b>Project Component</b>	<b>Permanence<sup>a</sup></b>	<b>Level of Disturbance<sup>b</sup></b>	<b>Sensitive SPP Present or Likely<sup>c</sup></b>	<b>Sensitive SPP Present or Likely Downstream<sup>c</sup></b>
Unnamed	Americano	Valley Ford Reservoir	S	2	CA red-legged frog, Northwestern pond turtle	Tidewater goby, CA red-legged frog, Northwestern pond turtle
Unnamed	Americano	Carroll Road Reservoir	P	2	CA red-legged frog, Northwestern pond turtle, Steelhead trout	Tidewater goby, CA red-legged frog, Northwestern pond turtle,
Unnamed	Americano	Bloomfield Reservoir	S	3	CA red-legged frog, Northwestern pond turtle	Tidewater goby, CA red-legged frog, Northwestern pond turtle,
Americano Creek	Americano	Irrigation	S	3	CA red-legged frog, Northwestern pond turtle	Tidewater goby,
Unnamed	Stemple	Huntley Reservoir	S	3	CA red-legged frog, Northwestern pond turtle	Tidewater goby, CA freshwater shrimp, Northwestern pond turtle, CA red-legged frog,
Unnamed	Stemple	Two Rock Reservoir	P	3	CA red-legged frog, Northwestern pond turtle	Tidewater goby, CA freshwater shrimp, Northwestern pond turtle, CA red-legged frog
Stemple Creek	Stemple	Irrigation	P	3	CA red-legged frog, CA freshwater shrimp, Northwestern pond turtle	Tidewater goby, CA freshwater shrimp,

TABLE 2.

Aquatic Habitat: West County Streams

Stream Name	Watershed	Project Component	Permanence <sup>a</sup>	Level of Disturbance <sup>b</sup>	Sensitive SPP Present or Likely <sup>c</sup>	Sensitive SPP Present or Likely Downstream <sup>c</sup>
Blucher Creek	Laguna de Santa Rosa-Russian River	Irrigation	P	3	CA red-legged frog, CA freshwater shrimp, Northwestern pond turtle, Navarro roach	Coho salmon, Steelhead trout, CA red-legged frog, Northwestern pond turtle, Hardhead, Russian River tule perch, Navarro roach, River lamprey
Gossage Creek	Laguna de Santa Rosa-Russian River	Irrigation	P	3	CA red-legged frog, Northwestern pond turtle, Navarro roach	Steelhead trout, Coho salmon, Russian River tule perch, CA red-legged frog, Northwestern pond turtle, Hardhead, Navarro roach, River lamprey

Source: Merritt Smith Consulting, 1996

<sup>a</sup> Permanence: P = Perennial; continuous surface flow through summer, or subsurface flow sufficient to maintain cool water in intermittent pools during dry season. S = Seasonal; dries completely or nearly so; warm pools or stock ponds may persist, but no cool pools in dry season.

<sup>b</sup> Level of Disturbance: 3-Heavy to moderate throughout. 2-Most of stream disturbed, but patches of natural habitat remain. 1 Low, near natural conditions.

<sup>c</sup> Sensitive Species: Coho salmon (*Oncorhynchus kisutch*), Steelhead trout (*Oncorhynchus mykiss*), Hardhead (*Mylopharodon conocephalus*), Russian River tule perch (*Hysterocarpus traskii pomø*), Sacramento splittail (*Pogonichthys macrolepidotus*), Tidewater goby (*Eucyclogobius newberryi*), California tiger salamander (*Ambystoma tigrinum californiensø*), CA red-legged Frog (*Rana aurora draytoni*), Foothill yellow-legged frog (*Rana boylei*), Northwestern pond turtle (*Clemmys marmorata marmorata*), CA freshwater shrimp (*Syncaris pacifica*), River lamprey (*Lampetra ayresii*), Navarro roach (*Lavinia symmetricus navarroensis*)

### ***Valley Ford (Reservoir)***

This site was surveyed in September 1994, and May and August 1995. This unnamed stream has three main branches, with stock ponds on each. Cattle have severely affected the stream system throughout the reservoir site. Riparian vegetation is limited to stands of old willows around the upper ends of two of the ponds, and to a small strip of the easternmost tributary from which cattle have been experimentally excluded. Throughout the site, streams are muddy, exposed channels with trampled, slumped banks. The ponds provide habitat suitable for red-legged frog, western pond turtle and . No habitat suitable for salmonids or other sensitive aquatic species was observed.

### ***Americano Creek (Irrigation Area)***

Americano Creek was briefly examined in May 1995 from the Gericke Road bridge, but has been examined numerous times in the past by the MSC team at the same site and other sites between Valley Ford and Bloomfield (MSC 1996). Americano Creek could be affected by project irrigation runoff, as well as by seepage from proposed reservoirs (Valley Ford, Carroll Road, and Bloomfield). The mainstem of Americano Creek has been heavily influenced by livestock grazing, and probably by other agricultural activities in historic times (CDFG 1977, CSCC 1987, Buell 1988). The streambed is buried with silt, banks are slumped and eroded, and riparian vegetation is limited and isolated. The former perennial stream now goes dry each summer except for isolated pools heavily polluted with cattle wastes. In addition, water at the upper end of the tidal channel becomes hypersaline in summer (Smith 1988). Spawning runs of steelhead and coho salmon died out many years ago, and the California freshwater shrimp may have also been extirpated in the Americano system (Hedgepeth 1975). Suitable habitat for California red-legged frog, and northwestern pond turtle persists in the form of pools within remnant stands of willows.

### ***Two Rock (Reservoir)***

This unnamed stream and series of ponds was surveyed for this project in May 1994, and in May and August 1995. It has also been the subject of Subregional System-sponsored surveys by MSC personnel on several occasions prior to 1994 (MSC unpublished data). The stream is fed by three tributaries draining hills to the north of the site and by an ill-defined series of ephemeral channels draining the pasture area at the northeast end of the reservoir site. The mainstem of the stream is now mostly submerged in a series of stock reservoirs, with short sections of the original streambed between the ponds. The entire stream system studied shows typical cattle-caused damage: slumped banks, erosion, loss of riparian vegetation, and trampling and siltation of the streambed. Of the three main tributaries, the one that enters the mainstem just below the dam site is the least damaged, and appears to most likely have supported runs of steelhead and coho in the past (prior to construction of the existing concrete dam/fish barrier downstream). This tributary has the most potential for salmonid restoration. Most of this branch is deeply shaded by riparian trees, allowing cool pools to persist possibly through the summer. This branch, as well as parts of the mainstem below the dam site could potentially be good habitat for California

freshwater shrimp, as well as for steelhead, coho, and California red-legged frog. The mature willows and other trees standing in the upper ends of the ponds and along the stream channel between the ponds provide good habitat for red-legged frog, and northwestern pond turtle.

### ***Huntley (Reservoir)***

The unnamed stream system at this site was surveyed in February 1995, and May and August 1995. All but a small portion of the mainstem (the area of dense willows on the lower Shannon property) has been severely damaged by cattle grazing and trampling. Pasture grass is the only vegetation along most of the stream banks, which are gullied, slumped, and eroded. A few small bits of willow or blackberry occur along the stream on the Bles and Pulis properties; otherwise riparian vegetation is absent from the Shannon property down to and below the dam site. The streambed is filled with silt, and the only instream shelter available for fish, frogs, or turtles is occasional undercut banks and rootwads from riparian remnants. The stream on the Diaz-Romero property is surrounded by a dense Eucalyptus forest, which limits growth of any riparian understory and fills the stream with Eucalyptus leaves and debris. The stream originates from several springs at the upper end of the Diaz-Romero property. Some of the springs have been developed to supply water to the owners, and others have been left as small oases of willow and blackberry surrounded by pasture. The springs could provide spawning habitat for California tiger salamander, but their value as such is limited by their isolation from any natural forest. The stream system throughout the site is poor fish habitat in general, but does provide habitat for red-legged frog, and northwestern pond turtle (both of which were found during the surveys).

### ***Stemple Creek (Irrigation Area)***

Stemple Creek was examined in May 1994 (Bodega Highway crossing) and in July 1995 (Nunes property). Stemple Creek has also been surveyed many times in the past few years by MSC personnel at these and other sites (MSC 1996).

Stemple Creek could be affected by irrigation runoff or by seepage from the proposed Two Rock and Huntley reservoirs. The mainstem and tributaries of Stemple Creek have been heavily influenced for a long time by livestock ranching and other agricultural endeavors. The stream formerly supported runs of steelhead and coho salmon, which were extirpated by the 1970's (CDFG 1977). The stream now becomes intermittent in the summer. Most of the mainstem flows through dairy and other livestock operations, with the result that riparian vegetation is reduced and discontinuous, the streambanks are eroded, the streambed is loaded with silt, and the pools that persist during the summer are typically trampled and polluted by cattle. Suitable habitat remains for red-legged frog, northwestern pond turtle, and California freshwater shrimp. The downstream estuary contains large numbers of tidewater goby.

### ***Blucher Creek (Irrigation Area)***

Blucher Creek was surveyed in May 1994 at the Old Gravenstein Highway crossing, where the creek is a straight, mud-bottomed, channelized slough with a narrow strip (5-10 feet) of riparian brush along each side, surrounded by either commercial development or intensive agriculture (sod farming). The slough extends to the confluence with the Laguna de Santa Rosa. The slough habitat may be suitable for red-legged frog, western pond turtle, and Navarro roach. In June 1994 Blucher Creek was surveyed further upstream, near Canfield (Bernard Nahmens Trust property) and at Bloomfield Road. At the Nahmens property the active stream channel in summertime is narrow (2 feet wide) and shallow (4-8 inches in depth), and the streambed is completely covered with silt. Riparian tree rootwads provide good cover for California freshwater shrimp, which are known to occur here. The stream banks are slumped from past livestock grazing, but cattle are now fenced out from the riparian corridor. The ranch manager indicated that he personally planted the willows in the now dense riparian corridor about twenty years ago, in response to suggestions from CDFG. He also indicated that the stream is perennial and used to have steelhead spawning in it, but he has not seen any in many years. In its present condition, the stream on the ranch property could serve as rearing, but not spawning, habitat for coho or steelhead. The stream may be marginally suitable for CA red-legged frog and northwestern pond turtle (it lacks deep pools). Further upstream at Bloomfield Road, the stream is similar in most respects to the Nahmens ranch reach, but willows are sparse. The streambed is covered in silt, but a few boulders are showing.

### ***Gossage Creek (Irrigation Area)***

Gossage Creek was surveyed in May 1994 at Peterson Road and in June 1994 at the Highway 116\Stony Point Road crossing. At Stony Point Road the stream is enclosed in a concrete and rip-rap channel which continues downstream to the confluence with the Laguna. There is no riparian vegetation in the channel, but the stream flows through dense emergent vegetation (cattail, bulrush, and exotic plants). This area is suitable for CA red-legged frog, northwestern pond turtle, Navarro roach, and warmwater fishes. Warmwater fish are abundant in the pool below the road crossing. At the Peterson Road site, the stream is also channelized, but has shade provided by dense blackberries and willows. The streambed is covered with silt.

### **3.2.2 Sebastopol**

The Sebastopol stream surveyed for this project (Atascadero Creek) drains to Green Valley Creek which is tributary to the Russian River. Atascadero Creek is classified as a Sebastopol stream because some of the irrigation area associated with the Sebastopol project area occurs in the watershed. Summary information for the stream is presented in Table 3. The field inventory form for Atascadero Creek is provided in the Appendix.

TABLE 3.

Aquatic Habitat: Sebastopol Streams

Stream Name	Watershed	Project Component	Permanence <sup>a</sup>	Level of Disturbance <sup>b</sup>	Sensitive SPP Present or Likely <sup>c</sup>	Sensitive SPP Present or Likely Downstream <sup>c</sup>
Green Valley Creek	Russian River	Irrigation	P	2	CA red-legged frog, Steelhead trout, Coho salmon, CA freshwater shrimp, Northwestern pond turtle, Russian River tule perch, Navarro roach	Coho salmon, Steelhead trout, CA red-legged frog, Northwestern pond turtle, Hardhead, Russian River tule perch, River lamprey, Navarro roach
Atascadero Creek	Russian River	Irrigation	P	2	Steelhead trout, Coho salmon, CA red-legged frog, CA freshwater shrimp, Northwestern pond turtle, Russian River tule perch, Navarro roach	Coho salmon, Steelhead trout, CA red-legged frog, Northwestern pond turtle, Hardhead, Russian River tule perch, Navarro roach, River lamprey

Source: Merritt Smith Consulting, 1996

<sup>a</sup> Permanence: P = Perennial; continuous surface flow through summer, or subsurface flow sufficient to maintain cool water in intermittent pools during dry season. S = Seasonal; dries completely or nearly so; warm pools or stock ponds may persist, but no cool pools in dry season.

<sup>b</sup> Level of Disturbance: 3-Heavy to moderate throughout. 2-Most of stream disturbed, but patches of natural habitat remain. 1 Low, near natural conditions.

<sup>c</sup> Sensitive Species: Coho salmon (*Oncorhynchus kisutch*), Steelhead trout (*Oncorhynchus mykiss*), Hardhead (*Mylopharodon conocephalus*), Russian River tule perch (*Hysterocarpus traskii pomø*), Sacramento splittail (*Pogonichthys macrolepidotus*), Tidewater goby (*Eucyclogobius newberryi*), California tiger salamander (*Ambystoma tigrinum californiensø*), CA red-legged Frog (*Rana aurora draytoni*), Foothill yellow-legged frog (*Rana boylei*), Northwestern pond turtle (*Clemmys marmorata marmorata*), CA freshwater shrimp (*Syncaris pacifica*), River lamprey (*Lampetra ayresii*), Navarro roach (*Lavinia symmetricus navarroensis*)

### ***Green Valley Creek (Irrigation Area)***

MSC team members have conducted Subregional System-sponsored semi-annual surveys of aquatic habitat and fishery resources in Green Valley Creek since 1993 (MSC 1995). CDFG has also conducted recent habitat and fishery surveys in the Green Valley Creek drainage (Cox, *pers. comm.*, 1995), although their findings are not yet available. The general finding of the MSC surveys is that only a small portion of the drainage (near Green Valley Creek Road) still contains habitat adequate for salmonid spawning and rearing, supporting small runs of steelhead and coho salmon, and supporting a resident population of the endangered California freshwater shrimp. Other information (Cox, *pers. comm.*, 1995) indicates that some steelhead and coho spawning and rearing also occur in the same watershed in Atascadero Creek at Ragle Regional Park.

### ***Atascadero Creek (Irrigation Area)***

Atascadero Creek was surveyed in June 1994 from road crossings (Bodega Highway and Watertrough Road). At Watertrough Road the stream was sluggish and shallow (about 6 inches in depth), mud-bottomed, with dense growths of blackberries along the banks, and a lot of trash (corrugated metal, roofing, broken toys, etc.) in the stream. At the Bodega Highway crossing about a mile downstream from Watertrough Road, Atascadero Creek is a deep, mud-bottomed slough which flows as such to the confluence with Green Valley Creek. Some habitat known to be used for steelhead and coho spawning occurs further upstream in Ragle Regional Park (Cox *pers. comm.*, 1995). Park property was surveyed by the MSC team in July 1995. Stream habitat there consists of a small mud-bottom stream, but with cool flowing water and dense riparian emergent vegetation. The areas surveyed for this project appear to have habitat suitable for CA red-legged frog, northwestern pond turtle, Russian River tule perch, Navarro roach, and possibly California freshwater shrimp, which are known to reside in Green Valley Creek (Cox, *pers. comm.*, 1995). Habitat for steelhead and coho is poor, but these species continue to spawn in Atascadero Creek.

### **3.2.3 South County Streams**

South County streams surveyed for this project include tributaries of the Laguna de Santa Rosa, the Petaluma River, and Sonoma Creek. The Laguna is classified as such because some of the irrigation area associated with the South County project area is in the Laguna watershed. Summary information for each stream is presented in Table 4. The field inventory forms for each stream are provided in the Appendix.

### ***Lichau Creek (Irrigation Area)***

This creek was examined briefly in May 1994 at the Railroad Road crossing. The stream at this site is a mud-bottomed ditch surrounded by hayfields. There is no riparian corridor, and the stream at the time of the survey was completely dry. A riparian forest can be seen following the stream into the hills above the upper end of Davis Lane, but access to this area was restricted.

### ***Willowbrook Creek (Irrigation Area)***

Willowbrook Creek was examined briefly in May 1994 at two locations: at the entrance to the Flying Cloud Ranch on Jacobsen Lane, and at the Adobe Road Crossing. At the first site (viewed from a bridge) the stream was barely flowing (<0.1 cfs.) over a cobble substrate overlain with silt, and was deeply shaded by a riparian corridor of willow and blackberries. Further downstream at the Adobe Road bridge, the stream was dry and in poor condition, with slumped, eroded banks, a sand/mud bottom, no riparian plants, and mown hayfields to the edge of the banks. Access was not obtained for further surveys.

### ***Petaluma River (Irrigation Area)***

The upper Petaluma River was surveyed in May 1994 at a site about ¼ mile north of the Corona Road crossing. In this area the river is a small channelized stream with an industrial park on one side, and commercial and residential development on the other. The streambed has gravel buried beneath silt, the banks are slumped but grass covered, and patches of riparian and emergent plants provide some shade and instream shelter. Flow was approximately 1 cfs at the time, and the water was warm (21°C). Some potentially suitable habitat for CA red-legged frog and northwestern pond turtle exists at this site. In mid-June 1994 the estuarine part of the Petaluma River was surveyed by boat from the Petaluma Marina to the Black Point railroad bridge, as part of the scoping process for other studies. The main channel is bordered by shallow mudflats and saltmarsh habitat typical of San Pablo Bay. The shallow flats and marsh are suitable habitat for the California brackish-water snail.



**TABLE 4.**

Aquatic Habitat: South County Streams

<b>Stream Name</b>	<b>Watershed</b>	<b>Project Component</b>	<b>Permanence<sup>a</sup></b>	<b>Level of Disturbance<sup>b</sup></b>	<b>Sensitive SPP Present or Likely<sup>c</sup></b>	<b>Sensitive SPP Present or Likely Downstream<sup>c</sup></b>
Lichau Creek	Petaluma River	Irrigation	S	3	none	Northwestern pond turtle, Sacramento splittail, River lamprey, Steelhead trout
Willowbrook Creek	Petaluma River	Irrigation	S	3	none	Northwestern pond turtle, Sacramento splittail, River lamprey, Steelhead trout
Petaluma River	Petaluma River	Irrigation	P	3	Northwestern pond turtle, CA red-legged frog	Sacramento splittail, River lamprey, Steelhead trout
Adobe Creek	Petaluma River	Irrigation	P	2	CA red-legged frog, Northwestern pond turtle, Steelhead trout, Foothill yellow-legged frog	Sacramento splittail, River lamprey, Steelhead trout
Unnamed	Petaluma River	Lakeville-Hillside Reservoir	S	3	CA red-legged frog, Northwestern pond turtle	Sacramento splittail, River lamprey, Steelhead trout
Tolay Creek	Sonoma Creek	Tolay Reservoir	S	3	CA red-legged frog, Northwestern pond turtle	Sacramento splittail, River lamprey, Steelhead trout
Tolay Creek	Sonoma Creek	Sears Point Reservoir	S	2	CA red-legged frog, Northwestern pond turtle	Sacramento splittail, River lamprey, Steelhead trout
Unnamed	Petaluma River	Adobe Reservoir	S	2	CA red-legged frog, Northwestern pond	CA red-legged frog, Northwestern pond turtle, Steelhead trout, River lamprey,

TABLE 4.

Aquatic Habitat: South County Streams

Stream Name	Watershed	Project Component	Permanence <sup>a</sup>	Level of Disturbance <sup>b</sup>	Sensitive SPP Present or Likely <sup>c</sup>	Sensitive SPP Present or Likely Downstream <sup>c</sup>
					turtle	Sacramento splittail
Crane Creek	Laguna-Russian River	Irrigation	P	2	CA red-legged frog, Northwestern pond turtle	CA red-legged frog, Northwestern pond turtle, Coho salmon, Steelhead trout, Hardhead, Russian River tule perch, River lamprey, Navarro roach
Copeland Creek	Laguna-Russian River	Irrigation	P	2	CA red-legged frog, Northwestern pond turtle, CA freshwater shrimp	CA red-legged frog, Northwestern pond turtle, Coho salmon, Steelhead trout, Hardhead, Russian River tule perch, River lamprey, Navarro roach

Source: Merritt Smith Consulting, 1996

<sup>a</sup> Permanence: P = Perennial; continuous surface flow through summer, or subsurface flow sufficient to maintain cool water in intermittent pools during dry season. S = Seasonal; dries completely or nearly so; warm pools or stock ponds may persist, but no cool pools in dry season.

<sup>b</sup> Level of Disturbance: 3-Heavy to moderate throughout. 2-Most of stream disturbed, but patches of natural habitat remain. 1 Low, near natural conditions.

<sup>c</sup> Sensitive Species: Coho salmon (*Oncorhynchus kisutch*), Steelhead trout (*Oncorhynchus mykiss*), Hardhead (*Mylopharodon conocephalus*), Russian River tule perch (*Hysterocarpus traskii pom*), Sacramento splittail (*Pogonichthys macrolepidotus*), Tidewater goby (*Eucyclogobius newberryi*), California tiger salamander (*Ambystoma tigrinum californiensis*), CA red-legged Frog (*Rana aurora draytoni*), Foothill yellow-legged frog (*Rana boylei*), Northwestern pond turtle (*Clemmys marmorata marmorata*), CA freshwater shrimp (*Syncaris pacifica*), River lamprey (*Lampetra ayresii*), Navarro roach (*Lavinia symmetricus navarroensis*)

### ***Adobe Creek (Irrigation Area)***

A short (~100 ft.) reach of Adobe Creek was surveyed in May 1994 at Vallejo's Adobe State Park. At this site the streambed is a mixture of boulders and cobble, moderately embedded in sandy silt. The stream has riffles and pools (up to about 18 in. deep at the time), shaded by riparian trees and shrubs. Instream shelter is provided by cutbanks, boulders, rootwads, and emergent plants. The stream appears to be potentially suitable for CA red-legged frog, foothill yellow-legged frog, northwestern pond turtle, and salmonids. Access has not been obtained for a more extensive survey. Bill Cox (CDFG *pers. comm.*, 1995) reports that there may be "resident" steelhead in a perennial area somewhere upstream of the park.

### ***Lakeville-Hillside (Reservoir)***

The unnamed stream at this site was surveyed in late May 1995. The stream is a tributary of the Petaluma River, and may have been perennial prior to agricultural modification, but is a seasonal stream now. The owner of the property (Marcucci) at the proposed dam site reported that the stream dries completely each summer. At the time of the survey, flow at the dam site was <0.2 cfs, and water temperature was high (24°C). The streambed, banks, and riparian corridor have all been altered by many years of cattle grazing. Riparian vegetation is absent from most of the mainstem and its two main tributaries. On the Marcucci property the few isolated willow clumps remaining along the stream are heavily used by cattle seeking shade, so the streambed and banks in those areas are thoroughly trampled. Occasional *Scirpus* (bulrush) and other emergents provide the only instream shelter available. The streambed is mud and sand, the banks slumped and eroded. Deep gullying and continuing erosion of the stream channel is evident on the upper part of the Marcucci property. A large stand of mature willow lines the creek on the Namdar property just above the Marcucci property line, but the stream there is also heavily trampled by cattle. The stream throughout the reservoir site appears to have no habitat suitable for fish, and only marginally suitable habitat for CA red-legged frog and northwestern pond turtle.

### ***Tolay A and C (Reservoirs)***

Tolay Creek was surveyed at these reservoir sites in May 1994 and again in May 1995. Most of the stream and its tributaries within the reservoir areas consist of canals with levees or ditches surrounded by hayfields, pasture, or vineyards. Most of the stream has no riparian corridor, and emergent plants provide the only instream shelter. The streambed consists of mud. However, some mature riparian forest remains along the stream near the Tolay A dam site on the Roche property and on the eastern end of the Cardoza property, along the mainstem and the tributary draining the foothills to the northeast. Habitat in these areas appears suitable for CA red-legged frog and northwestern pond turtle.

### ***Sears Point (Reservoir)***

The proposed Sears Point reservoir site is on Tolay Creek downstream from the Tolay A site. The Sears Point site was surveyed in September 1994 and May 1995. In the first survey, all of the stream that was surveyed (from Highway 121 up to about the middle of

the reservoir ) was dry and severely trampled by cattle. Mature buckeye, oak, and willow were scattered along the stream, but there was no riparian understory. The streambed was filled with mud and sand, and banks were flattened and barren. In the May 1995 survey, the upper part of the reservoir area was surveyed (Roche property) along with the tributary on the Stefansky property. At that time, both the mainstem and the Stefansky tributary were still flowing, and some shady pools up to 4 feet deep were found on the mainstem; some of these pools could persist through summer, providing a refuge for fish, although only threespine stickleback were found. All of the streambanks on both properties have been damaged by cattle, but the streambed is not completely buried with mud and sand as it is nearer the dam site. Bedrock, boulders, and cobble riffles alternate with mud-bottomed pools on the mainstem and on the Stefansky tributary. Riparian vegetation consists of scattered stands of mostly mature trees, with some understory of young willow and shrubs. Instream shelter is provided by boulders, rootwads, woody debris, and cutbanks. Habitat is available for CA red-legged frogs and northwestern pond turtle, and possibly California freshwater shrimp.

### ***Adobe (Reservoir)***

The unnamed stream (known to some as Washington Creek) at this reservoir site was surveyed in September 1994 and May 1995. The stream was completely dry when first surveyed, but was flowing (<0.2 cfs) in May 1995. All of the stream seen (from Frates Road to the upper end of the reservoir footprint) has been damaged by cattle. Banks are slumped and eroded, deep gulying is evident, and there is no growth of young riparian vegetation, although large buckeye, bay, willow, and oak provide deep shade along most of the stream. Landslides and downed trees show the extent of erosion that occurred during the wet winter of 1994-1995. The streambed is mostly covered with mud and sand, but short sections have exposed boulders and cobble. Instream shelter is provided by boulders, rootwads, and woody debris. Some habitat appears suitable for CA red-legged frog and northwestern pond turtle, but its value is limited by seasonal drought.

### ***Crane Creek (Irrigation Area)***

Crane Creek was briefly examined in May 1994 from the Petaluma Hill Road bridge. The portion of the stream visible from the bridge is an exposed cobble and gravel riffle. Some pools and a dense riparian corridor can be seen upstream from the bridge. That area probably includes habitat suitable for CA red-legged frog and northwestern pond turtle (possibly also for foothill yellow-legged frog, steelhead, coho, and California freshwater shrimp).

### ***Copeland Creek (Irrigation Area)***

Along with Crane Creek, Copeland Creek was briefly examined from the Petaluma Hill Road crossing in May 1994. The visible portion of the stream was dry at that time, but a dense riparian area could be seen further upstream, and may contain suitable habitat for CA red-legged frog, northwestern pond turtle, and other sensitive species. Access for

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT  
AQUATIC HABITAT SURVEY RESULTS

further survey work was not obtained. Both Copeland Creek and Crane Creek may have supported steelhead runs in the past (*Coxpers. comm*, 1995).

## 4.0 REFERENCES

---

- Buell and Associates 1988. *Estero Americano Study, Reclamation Alternative Evaluation. Freshwater Resident/Anadromous Fisheries Development Potential*. Report prepared for David W. Smith Consulting. 70 p.
- California Department of Fish and Game 1977. *The Natural Resources of Esteros Americano and de San Antonia* Coastal Wetland Series, No. 20. Prepared by Madrone Associates.
- California Coastal Commission 1987. *Draft Sonoma County Wetlands Enhancement Plan*
- Cox, Bill, CDFG 1995. Personal communications to Michael Fawcett.
- David W. Smith Consulting 1989. *Long-term Detailed Wastewater Reclamation Studies, Santa Rosa Subregional Reclamation System* Technical Memorandum E5: Preliminary Estero Americano Discharge Criteria.
- David W. Smith Consulting 1990. *History, Land Uses, and Natural Resources of the Laguna de Santa Rosa*. Prepared for Santa Rosa Subregional Reclamation System. 134 p. + appendices.
- Goodwin, P., C. K. Cuffe, J. L. Nielsen, and T. Light 1994. *Russian River Estuary Study 1992-1993*. Report prepared for Sonoma County Planning Department and the CSCC. 186 p. + appendices.
- Hedgepeth, J. W. 1975. California fresh and brackish water shrimps, with special reference to the present status of *Syncaris pacifica* USCA freshwater shrimp Report. 34 p.
- Merritt Smith Consulting 1995. *Anadromous Fish Migration Study Program, 1991-1994* Santa Rosa Subregional Long-Term Wastewater Project.
- Merritt Smith Consulting 1996a. *Environmental Conditions in West County Waterways* Technical Report. Santa Rosa Subregional Long-Term Wastewater Project.
- Merritt Smith Consulting 1996b. *Anadromous Fish Migration Study Program, 1991-1995* Technical Report. Santa Rosa Subregional Long-Term Wastewater Project.
- Roth, J. C., M. L. Commins, and M. H. Fawcett 1991. *Steelhead Trout Migration in Mark West Creek and Santa Rosa Creek, 1991*. Laguna de Santa Rosa Intensive Monitoring Program. Technical Memorandum.
- Roth, J. C., M. L. Commins, and M. H. Fawcett 1992. *Steelhead Trout Migration in Mark West Creek and Santa Rosa Creek, 1992*. Laguna de Santa Rosa Intensive Monitoring Program. Technical Memorandum.

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT  
AQUATIC HABITAT SURVEY RESULTS

Roth, J. C., M. L. Commins, M. H. Fawcett, and R. W. Maddox 1993. *Steelhead Trout Migration in Mark West Creek and Santa Rosa Creek, 1991-1993*. Laguna de Santa Rosa Intensive Monitoring Program. Technical Memorandum.

## 5.0 APPENDICES

---



The Appendix of this report is filed as  
Exhibit L-4