Chapter 5

Subbasin Profiles and Synthesis

5.1 Gualala River Estuary

5.1.1 INTRODUCTION

The Gualala River Estuary/lagoon is within the Big Pepperwood Creek Planning Watershed (10.2 square miles within the Lower South Fork Gualala River Super Planning Watershed), and is located approximately 0.5 miles south of the town of Gualala. During summer months, a sand bar typically forms across the mouth of the estuary which blocks the flow of tidewater, creating a coastal lagoon. Currently, the Gualala River Watershed Council has a grant for a two-year estuary study that includes the mainstem up to the confluence with the North Fork. The full extent of tidal influence on the mainstem will be further described by that study.

Estuaries and coastal lagoons are critical habitats for all anadromous salmonids by linking freshwater and marine environments. The mixing of sea and fresh waters creates conditions well suited for the anadromous life history strategies of coho salmon and steelhead trout. Coho salmon and steelhead trout pass through the estuary as juveniles during their seaward migrations and again as adults, swimming upstream to their freshwater spawning grounds. The brackish water of the estuary provides an important area where coho salmon and steelhead trout acclimate to changes in salinity as they move between the freshwater and marine environments.

Estuaries also are considered important nursery grounds due to high productivity and isolation from predators. Studies have revealed that juvenile salmonids utilizing estuaries for three months or more return to their natal stream at a higher rate than non-estuarine reared siblings (Riemers 1975). Juvenile salmonids may extend their estuarine residency to utilize the sheltered and food rich environments.

The Sotoyome Resource Conservation District, in partnership with the Gualala River Watershed Council, was awarded a $150,000 grant by the California Coastal Conservancy to perform an assessment and to develop an enhancement plan for the estuary. This project will assess the physical and biological conditions of the estuary and lower river from the confluence with the North Fork, ascertain the estuary's importance to the life history strategies of salmonids, and determine how existing conditions may be impairing aquatic productivity. Enhancement recommendations based on the findings will be a final product.

5.1.2 GEOLOGY

The estuary occupies the mainstem of the Gualala River. At times in during the Holocene, the estuary probably extended at least one mile up the North and South Forks. The mainstem cross cuts a series of Pleistocene marine terraces. The marine terraces record one stage of late-Pliocene to early Quaternary uplift with considerable local deformation and at least three stages of regional uplift during the Quaternary. Localized folding that occurred until the mid-Quaternary is evident in those terraces.

One well log comprises the subsurface sedimentological record adjacent to the estuary. Relatively extensive subsurface exploration was conducted one mile upstream at the confluence with the North Fork.

The marine terraces developed as follows:

- Late Pliocene-Early Quaternary (500,000- 5,000,000 years old)- uplift and topographic inversion of Pliocene basin in which Ohlson Ranch Formation accumulated. This formed flat-topped ridges throughout central basin.
- Older Quaternary (500,000 years old) - regional uplift along San Andreas Fault with local vertical deformation elevated marine terraces to over 600 feet above current sea level.
- Subsequently or concurrently, those strata were folded or faulted such that terraces north of the mainstem are 200 feet higher than presumably equivalent terraces on the south side. Folds may correlate across the San Andreas Fault with uplifted and subsided areas. An anticline, north of the mainstem, predates older Quaternary terrace that cut across both fold core (Anchor Bay Fm) and carapace (German Rancho Fm); however, continued folding may have occurred. The west face of the anticline north of the river is deeply incised with close-spaced gulches, while the east face is steeper and has fewer drainages that are not incised. This anomalous pattern probably indicates additional fold growth since emergence.
- Younger Quaternary (83,000-100,000 years old) – regional uplift elevated the lowest emerged marine terrace 130 feet above current sea level without additional local vertical deformation; fold growth had ceased. At Fort Ross, slip along the San Andreas Fault since the formation of this terrace has been estimated at 0.9 miles (Prentice and others 2000).
- Late Quaternary and early Holocene (about 20,000-10,000 years ago)-sea level dropped during the last global ice age and a marine terrace formed. That terrace lies offshore about 200 feet below current sea level. It is undetermined how much uplift has occurred since the formation of the terrace.
- Holocene- sea level rise and valley filling of the mainstem and estuary.

The valley of the mainstem is the only watergap across the otherwise continuous ridge that separates the watershed from the ocean. Flow through the mainstem was probably established during the Pleistocene marine low-stand when relative sea level was about 200 feet lower than today. One well located about 100 feet south of and 20 feet higher than the mainstem was drilled to 50 feet in depth and revealed brown, black, and blue clay throughout. Bedrock was not encountered. Subsurface information at Elk Prairie (about one mile upstream) at the mouth of the North Fork reveals that the paleo-valley there is nearly 200 feet deep. Thus, the paleo-valley underlying the estuary may also be 200 feet deep. This depth corresponds to the elevation of a submerged marine terrace just off shore, which probably defined base level at the time of paleo-valley development. The well logs at Elk Prairie and adjacent to the estuary both show considerable history of clay deposition indicative of low energy environments, probably estuarine, that extended from the ocean to at least Elk Prairie. Thus, the estuary migrated back and forth from at least Elk Prairie to somewhat off the modern shoreline depending on the interplay of sea level rise and tectonic uplift. Subsurface well logs are not available for the South Fork. However, the estuary may have extended upstream on the South Fork as well as the North Fork.

5.1.3 RIPARIAN VEGETATION

The riparian likely consisted of alders with a redwood over story along the upper estuary above the Highway 1 bridge. Most available photos of the lower estuary were taken after the redwood mill was built, which was located on the flat area on the northwest side of the bridge. It is undetermined if the area was cleared or was scrub naturally.

Wetlands are primarily located on the south side of the estuary towards the ocean, where saltgrass (*Distichlis spicata*) and salt rush (*Juncus lesueurii*) have been observed. Sea rocket (*Cakile spp*) and beach verbena (*Abronia spp*) grow on the dunes between the estuary and beach. Coyote bush (*Baccharis pilularis)* appears to be dominant on the drier, less saline soil located on the southwest landward side (Table 5.1-1).

Table 5.1-1
Riparian Vegetation Inventory of the Gualala River Estuary/Coastal Lagoon, February 2002

Common Name	Scientific Name
North Side of Estuary	
Lupine	*Lupines spp.*
Fennel	*Foeniculum vulgare*
Himalaya Berry	*Rebus thrysauthus*
California Blackberry	*Rubus vitifolius*
Thimble Berry	*Rubus parviflorus*
Coyote brush	*Baccharis pilularus*
Rush	*Juncus spp.*
Pennyroyal	*Mentha spp.*
Teasel	*Dipsacus fullonum*
Horsetail	*Equisetem spp.*
Swordfern	*Polystichum munitum*
Mugwort	*Artemisia douglasiana*
Bull Thistle	*Cirsium vulgare*
Cow Parsnips	*Heracleum lanatum*
Stinging Nettle	*Urtica gracilis*
Dead Nettle	*Lamium spp.*
Small Flowered Nightshade	*Solanum spp.*
Stachys	*Stachys spp.*
Wild Radish	*Raphanus sativus*
Yarrow	*Achillea millefolium*
Horseweed	*Conyza spp.*
Alder	*Alnus rubra*
Poison Hemlock	*Conium maculatum*
English Ivy	*Hedera helix*
Bay Laurel	*Umbellularia californica*
Dock	*Rumex spp.*
Nut Sedge	*Cyperus spp.*

Table 5.1-1
Riparian Vegetation Inventory of the Gualala River Estuary/Coastal Lagoon, February 2002

Common Name	Scientific Name
North Side of Estuary (con't)	
Grass perennial	
Reed (water)	
South Side of Estuary	
Lupine	*Lupines spp.*
Coyote brush	*Baccharis pilularus*
Teasel	*Dipsacus fullonum*
California Iris	*Iris douglasiana*
Pacific Madrone	*Arbutus edulis*
Grand Fir	*Abies grandis*
Swordfern	*Polystichum munitum*
Rush	*Juncus spp.*
Grass perennial	
Nut Sedge	*Cyperus spp.*
Dock	*Rumex spp.*
Stinging Nettle	*Urtica gracilis*
Thimble Berry	*Rubus parviflorus*
Alder	*Alnus rubra*
Poison Hemlock	*Conium maculatum*
Horsestail	*Equisetem spp.*
Dead Nettle	*Lamium spp.*
California Blackberry	*Rubus vitifolius*
Bull Thistle	*Cirsium vulgare*
Island	
Pampas Grass	*Cortaderia jubata*
Dunegrass	*Unsure*
Reed (water)	*Unsure*
Iceplant	*Carpobrotus edulis*
Lupine	*Lupines spp.*
Plantain	*Plantago lanceolata*
Coyote brush	*Baccharis pilularus*
Sand Verbena	*Abronia latifolia*
Yarrow	*Achillea millefolium*

5.1.4 LAND USE

A lumber mill operated at the mouth of the estuary in the 1860s to the early 1900s. Photos from 1936 show the abandoned mill site with minimal development around the estuary. The town of Gualala consisted of several buildings accessed by a dirt road. These photos showed an aggraded stream channel (Figure 5.1-1). Most of the central and upper reaches of the watershed still consisted of virgin

old growth at this time. During the late 1950s, a second mill complex was built near the confluence with the North Fork. Road development along the coastal plateau, a highway bridge and artificial breaching of the bar may have influenced the physical structure of the estuary through actual physical modifications. Commercial, recreational, and residential development characterizes current land use around the estuary (Figure 5.1-2).

1936

1961

Figure 5.1-1
Aerial Photos of the Gualala River Estuary in 1936 and 1961

1981

1999

Figure 5.1-2
Aerial Photos of the Gualala River Estuary in 1981 and 1999

5.1.5 FISH HABITAT RELATIONSHIP

Several fish species occupy the estuary, particularly for reproduction and early stages of their life cycle. Some species deposit eggs or give live birth directly in estuaries, while others have evolved mechanisms

which help the delivery of their young into estuaries by ocean tides or riverine currents which assist in the transition from a freshwater to marine water environment. Fish including salmonids that utilize estuaries for an important part of their life cycle are estuarine-dependant. The estuarine rearing is a strategy that adds diversity to juvenile salmonid life history patterns and likely increases the odds for survival of a species encountering a wide range of environmental conditions in both the freshwater and marine environments. An extended estuarine residency may be especially beneficial for salmonids from rivers where low summer flows or warm water temperatures limit summer rearing habitat.

Fish presence observations in the 1980s were summarized in *An Account of the Fishes Caught in the Lower Gualala River, California, 1984 through 1986* (Brown 1986): "Sampling occurred at seven stations, two upstream of the Highway 1 bridge."…"We caught seven species of fishes in the Gualala Estuary and lower river. Steelhead trout were caught at all stations. Roach, coastrange and prickly sculpin were caught at lower river and upper estuary stations. Starry flounder and Pacific staghorn sculpin were only caught in the lower estuary near the ocean. Threespine stickleback were caught in the lower river and upper to mid-estuary."…"Steelhead trout were larger in the fall than in the spring at mid-estuary stations, but larger in the spring at lower estuary stations."

5.1.6 SUBBASIN ISSUE SYNTHESIS AND RECOMMENDATIONS

The term "issues" is used here in a generic sense to denote any topic of interest, concern, import, or relevance to the watershed assessment. As such, issues can be direct limitations on salmonid suitability, potential factors for consideration, concerns regarding potential practices, suggestions, or observations of the data that are particularly relevant to the development of hypotheses and recommendations.

- Has the estuary filled in since the turn of the century due to sedimentation from logging?
- What is the role of the Gualala River Estuary with respect to salmonid abundance and distribution, especially regarding it use as habitat for steelhead trout and coho salmon?
- What factors may be limiting coho salmon and steelhead trout production in the estuary?

Working Hypotheses

No hypotheses have been developed. This section will be revised upon completion of the estuary study.