SECTION 7: HABITAT INVENTORY

7.1 Introduction

This section summarizes field assessments, based on California Department of Fish and Game protocols for measuring biological conditions of Carpinteria Creek (Padre and Associates, 2001 and Ecology Consultants, 2003). Baseline environmental inventories are conducted during watershed planning exercises to measure change in watershed conditions. Meticulous records are often kept by botanists and bird watchers, and agencies typically document stream flow, but a thorough assessment using an established protocol creates an excellent baseline of information. This section combines biological inventories species lists and field assessments.

Stream habitat conditions and the endangered Southern steelhead trout (*Oncorhynchus mykiss*) in Carpinteria Creek were studied with the following objectives:

- Determine the approximate quantity, in stream miles and quality of spawning and rearing habitat for steelhead in Carpinteria Creek and its tributaries.
- Assess the current steelhead/rainbow trout population in Carpinteria Creek in terms of location, numbers, age class structure, and health.
- Identify and assess factors that limit the creek's steelhead/rainbow trout population including sections that lack year-round flow, suitable spawning beds, and/or rearing pools; fish passage barriers, excess sediment delivery, water pollution, loss of riparian and upland vegetation, alterations to stream channel geomorphology, etc.
- Provide baseline data that can serve as a point of comparison for future monitoring and habitat restoration efforts in Carpinteria Creek.
- Recommend actions that can be implemented to recover the creek's steelhead population.

7.2 Field Methods

Field surveys were completed at two different times in 2003: once in the spring to coincide with possible adult steelhead in-migration and spawning, and again in late summer to coincide with presumed steelhead juvenile rearing and smolt out-migration. This strategy allowed for the assessment of stream habitat conditions, water chemistry, and steelhead/rainbow trout distribution and abundance in Carpinteria Creek and its two main tributaries Upper Carpinteria Creek and Gobernador Creek, during two critical times of the year. Detailed surveys were conducted in four study reaches: two in the lower main stem of Carpinteria Creek, one in Upper Carpinteria Creek, and one in Gobernador Creek and the tributary Steer Creek. Study Reaches are shown in Figure 7.1.

Insert **Figure 7.1: Habitat Study Reaches in the Carpinteria Creek Watershed.**

Assessment methods were based on those found in the California Salmonid Stream Habitat Restoration Manual (Flosi, et.al., 1998). A stream channel type and habitat type were assigned for each stream reach studied, using this protocol.

7.2.1 Channel Typing

Stream channel typing describes relatively long reaches within a stream using eight morphological characteristics. These eight characteristics include: channel width, depth, discharge velocity, discharge volume, channel slope, roughness of channel materials, sediment load, and sediment size. A wide array of channel types result from the dynamics between the channel stability and supply of sediment.

7.2.2 Habitat Typing

Habitat typing physically describes the wetted channel, also known as the as the low flow channel, and includes the specific pool, flatwater and riffle habitats within a stream. There are 24 habitat types described for habitat typing, though most streams will not include all habitat types. Channel and habitat types are recorded because of their importance in providing critical habitat information about conditions for steelhead migration, spawning and growth. The "Key to Classification of Streams" table is located in Appendix D.

7.2.3 Water Quality Parameters Measured in the Field

Fish and other aquatic organisms require specific levels of certain water quality conditions for spawning and living. Water quality parameters measured in the field in combination with the habitat type data collection, included: air temperature, stream temperature, dissolved oxygen concentration, conductivity, and specific conductance, pH, flow in cubic feet per second (cfs).

7.2.4 Large Woody Debris Surveys

Large woody debris (LWD) inventories were conducted using DFG protocols. These surveys provided a quantification of woody debris in the stream channel, and potentially available woody debris from future recruitment of dead and live material along the stream banks and floodplains. Large woody debris, including logs and tree stumps within the channel can provide shelter for fish. LWD also plays some role in channel formation locally, and reductions in LWD would be expected to have a diminishing effect on the formation of stream habitat features. Loss of LWD inputs to the stream ecosystem also reduces a major primary energy source for the food web.

7.2.5 Fish Surveys

Visually-based stream bank and underwater snorkel surveys were conducted to determine steelhead/rainbow trout distribution, abundance, age class structure, and overall health, as well as the presence and abundance of other aquatic species. Snorkel surveys were conducted in stream habitat units of at least two feet deep, which mostly constituted pools,

but also some deeper runs and cascades in the upper watershed. Visual surveys were conducted from the stream banks in stream habitat units shallower than two feet. Observations of plant and animal species made during the surveys were recorded and combined with other species information located in Appendix C. For more information about each study reach, including location, length, and dates surveyed and types of survey work completed, and a key to classification of streams, see Appendix D.

7.3 Results and Discussion

7.3.1 Channel Type

Study Reach 1

Study Reach 1 of Carpinteria Creek best corresponded with a B5 channel type per the DFG classification system. The B5 channel type is described as "moderately entrenched, moderate gradient, riffle-dominated channel with infrequently spaced pools, very stable plan and profile, stable banks, and sand-dominated channel".

Study Reach 2

Study Reach 2 best corresponded with a B3 channel type per the DFG classification system. The B3 channel type is described as "moderately entrenched, moderate gradient, riffle-dominated channel with infrequently spaced pools, very stable plan and profile, stable banks, and cobble-dominated channel".

Study Reach 3

Upstream of the confluence of Upper Carpinteria Creek and Gobernador Creek, gradient increases quickly, ranging from about 0.02 to 0.04 in the foothills and 0.04 to 0.10 further upstream in the Santa Ynez Mountains. The lower 300 feet of Study Reach 3 (Upper Gobernador Creek) is situated in a steep, narrow gorge with near vertical sandstone canyon walls. This section of the creek best corresponded with an A2 channel type; which is a "steep, narrow, cascading step-pool streams, high energy/debris transport associated with depositional soils, boulder channel". Three hundred feet upstream in Study Reach 3 are a pair of 10' to 15' high waterfalls, where the gorge abruptly transitions to a relatively wide and gently sloping valley. At this point Gobernador Creek transitions to a high quality B3 channel type, in comparison to Study Reaches 1 and 2, with respect to gradient and substrate size.

Study Reach 4

The data collected in Upper Carpinteria Creek (Study Reach 4) best corresponded with an A3 channel type. The A3 channel type is described as "steep, narrow cascading step-pool stream, high energy/debris transport associated with depositional soils, cobble channel".

7.3.2 Stream Discharge

Discharge in Carpinteria Creek is highly variable between seasons and years primarily due to the semi-arid climate of the region and highly seasonal pattern of rainfall during the year. High stream discharges occur during and immediately after heavy rainfall events, which occur almost exclusively between October and May in the region. Discharge normally drops quickly after rainfall ceases, and low surface flows or dry conditions exist between rainy periods.

Study Reach 1

The lower reach of the creek from the estuary to approximately one-half mile upstream of U.S. 101 typically has perennial flow. Base flow in this section of the creek is likely a combination of groundwater arriving at the creek bed surface and runoff from adjacent agricultural and residential areas.

Study Reach 2

The remainder of the main stem and the lower mile of both Upper Carpinteria Creek and Gobernador Creek experience intermittent flow conditions. During the wettest of years, these creek segments have surface flow for most of the year, but typically dry up within a few weeks of major rainfall events. The latter situation was the case when this reach was surveyed in 2003.

Study Reaches 3 and 4

From about one mile upstream of their confluence and well into the mountains, both Upper Carpinteria Creek and Gobernador Creek, as well as several of their tributaries including Sutton Canyon Creek, Steer Creek, and El Dorado Creek have year-round flow in most years. Landowners report that base discharges in these creeks are fed by several springs and seeps. Base discharges are typically lowest near the end of the dry season in the late summer and fall.

7.3.3 Habitat Inventory Data

Table 7.1 describes habitat units found in this assessment. Descriptions of other habitat unit types can be found in Part III of the DFG Manual.

Study Reach 1: Carpinteria Creek, Lower Main Stem
April Survey:

A total of 25 Level IV habitat units were distinguished in this 2,650' study reach, including 10 low gradient riffles (LGR), 8 pools, both mid-channel pools (MCP) and corner pools (CRP), six flat water units, both pocket water (POW) and glides (GLD), and a culvert section. Descriptions of habitat unit types are provided in Appendix D as adapted from the DFG Manual. Riffles, pools, flat water, and culvert units occupied 38, 37, 24, and one percent, respectively of the total length of the study reach.

Wetted stream width varied between eight and 20 feet throughout, averaging 16 feet. Average stream depth was 0.4 feet in riffles, one foot in pools, and 0.4 feet in flat water areas, and 0.6 feet overall. Maximum depth was three feet. Four of the eight pools had maximum depth of two feet or greater. Average pool tail crest depth in the eight pools in the study reach ranged from, averaged 0.4 feet. Sand, gravel, and cobble were the dominant substrates in the pool tail crests. Cobble embeddedness in fine sediments in pool tail crests averaged in the 25-50% range. Two of the eight pools had the lowest possible embeddedness rating of 0-25%. Dominant streambed substrates were large cobble and small cobble in riffles, sand and large cobble in pools, large cobble and small cobble in flat water units, and large cobble and small cobble overall.

Shelter can be described as places where fish can hide. Habitat units were rated for in-stream shelter on a scale of 0 to 3 (three representing the highest rating) per the protocol provided in Part III of the DFG manual. Shelter values ranged from 0 to 3 in the units rated, and averaged 1.4 overall, 1.3 in riffles, 1.7 in pools, and 1.0 in flat water areas. The overall percentage of streambed with shelter was estimated to be 14%. Dominant shelter types were boulders and terrestrial vegetation hanging over the water.

Exposed substrate in the stream channel, which means substrate above the water line, averaged 14%. Percent riparian canopy coverage, or the percentage of the streambed that was covered by overhanging riparian vegetation, averaged 61%. Vegetative cover on the stream banks averaged 93%. Dominant vegetative cover types were deciduous trees and brush. Dominant stream bank composition was fine sediments (i.e., silt, clay, and sand).

Study Reach 1: Carpinteria Creek, Lower Main Stem
September Survey:

Stream conditions were noticeably different compared to the April survey due to seasonal differences in discharge and weather. A total of 30 Level IV habitat units were distinguished, including 13 low gradient riffles (LGR), 15 pools including mid-channel pools (MCP), corner pools (CRP), lateral scour pools-root wad enhanced (LSR), one dry section (DRY), and one culvert. Riffle, pool, dry, and culvert units occupied 48, 46, four, and one percent, respectively of the total length.

Wetted stream width varied between three and 15 feet throughout, averaging nine feet. Average stream depth was 0.2 feet in riffles, 0.5 feet in pools, and 0.4 feet overall. Maximum depth was two feet. Only one of the 15 pools had maximum depth of two feet or greater. Average pool tail crest depth averaged 0.3 feet. Sand was the dominant substrate in the pool tail crests. Cobble embeddedness in sand/fine sediments in pool tail crests averaged 25-50%. Three of 15 pools had the lowest possible embeddedness rating of 0-25%. Dominant streambed substrates were large cobble, sand, and small cobble in riffles, sand and large cobble in pools, and sand and large cobble overall.

Table 7.1 Habitat Units Found During this Assessment in Carpinteria Creek.

Habitat Type	Description
Low-Gradient Riffle (LGR)	Shallow reaches with swiftly flowing, turbulent water with some partially exposed substrate. Gradient is <4%, substrate is usually cobble dominated.
High-Gradient Riffle (HGR)	Steep reaches of moderately deep, swift and very turbulent water. Amount of exposed substrate is relatively high. Gradient is >4%, substrate is boulder dominated.
Cascade (CAS)	The steepest riffle habitat, consisting of alternating small waterfalls and shallow pools. Substrate is usually bedrock and boulders.
Bedrock Sheet (BRS)	A thin sheet of water flowing over a smooth bedrock surface. Gradients are variable.
Pocket Water (POW)	A section of swift flowing stream containing numerous boulders or other large obstructions which create eddies or scour holes (pockets) behind the obstructions.
Glide (GLD)	A wide, uniform channel bottom. Flow with low to moderate velocities, lacking pronounced turbulence. Substrate usually consists of cobble, gravel and sand.
Run (RUN)	Swiftly flowing reaches with little surface agitation and no major flow obstructions. Often appears as flooded riffles. Typical substrate consists of gravel, cobble, and boulders.
Step Run (SRN)	A sequence of runs separated by short riffle steps. Substrate is usually cobble and boulder dominated.
Edgewater (EDW)	Quiet, shallow area found along the margins of the stream, typically associated with riffles. Water velocity is low and sometimes lacking. Substrate varies from cobbles to boulders.
Trench Pools (TRP)	Channel cross sections typically U-shaped with bedrock or coarse-grained bottom flanked by bedrock walls. Current velocities are swift and the direction of flow is uniform.
Mid-Channel Pool (MCP)	Large pools formed by mid-channel scour. The scour hole encompasses more than 60% of the wetted channel. Water velocity is slow and the substrate is highly variable.
Channel confluence pool (CCP)	Large pools formed at the confluence of two or more channels. Scour can be due to plunges, lateral obstructions or scour at the channel intersections. Velocity and turbulence are usually greater than those in other pool types.
Step Pool (STP)	A series of pools separated by short riffles or cascades. Generally found in high gradient, confined mountain streams dominated by boulder substrate.
Corner Pool (CRP)	Lateral scour pools formed at a bend in the channel. These pools are common in lowland valley bottoms where stream banks consist of alluvium and lack hard obstructions.
Lateral Scour Pool-log enhanced (LSL)	Formed by flow impinging against a partial channel obstruction consisting of large woody debris. The associated scour is generally confined to <60% of the wetted channel width.
Lateral Scour Pool-root wad enhanced (LSR)	Formed by flow impinging against a partial channel obstructions consisting of a root wad. The associated scour is confined to <60% of the wetted channel width.
Lateral Scour Pool-bedrock formed (LSBk)	Formed by flow impinging against a bedrock stream bank. The associated scour is generally confined to <60% of the wetted channel width.
Lateral Scour Pool-boulder formed (LSBo)	Formed by flow impinging against a partial channel obstruction consisting of a boulder. The associated scour is generally confined to <60% of the wetted channel width.
Plunge pool (PLP)	Found where the stream passes over a complete or nearly complete channel obstruction and drops steeply into the streambed below, scouring out a depression; often large and deep. Substrate size is highly variable.
Secondary Channel Pool (SCP)	Pools formed outside of the average wetted channel width. During summer, these pools will dry up or have very little flow. Mainly associated with gravel bars and may contain sand and silt substrate.
Backwater Pool-boulder formed (BPB)	Found along channel margins and caused by eddies around a boulder obstruction. These pools are usually shallow and are dominated by fine grain substrate. Current velocities are quite low.
Backwater Pool-Root wad formed (BPR)	Found along channel margins and caused by eddies around a root wad obstruction. These pools are usually shallow and are dominated by the fine-grain substrate. Current velocities are quite low.

(Adapted from California Department of Fish and Game Salmonid Restoration Manual)

In-stream shelter values ranged from two to three in the habitat units evaluated, and averaged 2.9 overall, 2.5 in riffles and 3.0 in pools. Overall shelter coverage was estimated to be 69%. The dramatic increase in shelter compared to conditions in April was due to the formation of thick mats of floating algae on the water surface.

Exposed substrate in the stream channel, averaged 23%. Percent riparian canopy coverage averaged 69%. Vegetative cover on the stream banks averaged 84%, made up predominantly of deciduous trees and brush. Dominant stream bank composition was fine sediments (i.e., silt, clay, and sand).

Study Reach 2: Carpinteria Creek, Upper Main Stem
April Survey

A total of 15 Level IV habitat units were distinguished in the first 1,500' of this 2,640' study reach during the April 17 survey, including low gradient riffles (LGR), high gradient riffles (HGR), mid-channel pools (MCP), corner pools (CRP), plunge pools (PLP), lateral scour pool-boulder formed (LSBo), edge water (EDW), pocket water (POW), and an at-grade concrete road crossing (see Barrier ID: BR_CA_2 in Figure 7.2). The last or most upstream 1,140' of the study reach had gone completely dry by the time the survey was resumed on April 23. Overall, a total of seven riffle units (LGR and HGR), 6 pools (MCP, CRP, PLP, and LSBo), two flat water sections (EDW and POW), one dry section, and one road crossing section were identified during the combined surveys. Riffle, pool, flat water, dry, and road crossing units occupied 39, 11, five, 43, and two percent of the total, respectively.

Wetted stream width varied between eight and 22 feet throughout the wet section, averaging 12 feet. Average stream depth was 0.5 feet in riffles, one foot in pools, 0.6 feet in flat water sections, and 0.7 feet overall. Maximum depth was 3.5 feet. Only one of the six pools had maximum depth of two feet or greater.

Average pool tail crest depth averaged 0.5 feet. Large and small cobble were the dominant substrate in the pool tail crests. Cobble embeddedness in fine sediments in pool tail crests averaged 0-25%. Four of six pools had the lowest embeddedness rating of 0-25%.

Dominant streambed substrates were small cobble and large cobble in riffles and pools, gravel, small cobble and large cobble in flat waters, and small cobble and large cobble overall.

Shelter values ranged from one to two in the units rated, and averaged 1.6 overall, 1.5 in riffles and 1.6 in pools. Overall shelter coverage was estimated to be 10%. Dominant cover types were boulders and terrestrial vegetation.

Exposed substrate in the stream channel averaged 12% in Study Reach 2. The percent riparian canopy coverage averaged 61%, while vegetative cover on the stream banks averaged 80%. The dominant vegetative cover was deciduous trees. Dominant stream bank composition was fine sediments (i.e., silt, clay, and sand).

Study Reach 2: Carpinteria Creek, Upper Main Stem

September Survey:

Due to the dry conditions present in Study Reach 2, a September habitat inventory survey was not conducted.

Study Reach 3: Upper Gobernador Creek and Steer Creek
April Survey:

A total of 53 Level IV habitat units were distinguished in this 2,680 foot long study reach during the April surveys, including high gradient riffles (HGR), cascades (CAS), mid-channel pools (MCP), plunge pools (PLP), backwater pool-boulder formed (BPB), lateral scour pool-bedrock formed (LSBk), lateral scour pool-boulder formed (LSBo), step pools (STP), and runs (RUN). Overall, a total of 25 riffle units (HGR and CAS), 25 pools (MCP, PLP, BPB, LSBk, LSBo, and STP), and three flat water sections (RUN) were identified. Riffle, pool, and flat water units occupied 64, 32, and four percent, respectively of the total length.

Wetted stream width varied between eight and 25 feet throughout, averaging 13 feet. Average stream depth was 0.7 feet in riffles, 1.7 feet in pools, 0.7 feet in flat water sections, and 1.2 feet overall. Maximum depth was six feet. Eighteen of 25 pools had maximum depth of two feet or greater.

Average pool tail crest depth ranged from 0.3 to 1.0 feet, averaging 0.6 feet. Large cobble was the dominant substrate in the pool tail crests. Cobble embeddedness in fine sediments in pool tail crests averaged 0-25%. Sixteen of 25 pools had the lowest embeddedness rating (0-25%).

Dominant streambed substrates were boulders and large cobble in riffles, boulders and sand in pools, boulders and bedrock in flat waters, and boulders, sand, and small cobble overall.

In stream shelter values ranged from one to three in the units rated, and averaged 2.0 overall, 1.8 in riffles, 2.2 in pools, and 1.5 in flat waters. Overall shelter coverage was estimated to be 18%. Dominant cover types were boulders and bubble curtains.

Exposed substrate in the stream channel averaged 10%. Percent riparian canopy coverage averaged 74%. Vegetative cover on the stream banks averaged 61%. Dominant vegetative cover types were deciduous and evergreen trees. Stream banks were composed primarily of boulders and bedrock, which somewhat limited growth of riparian plants on the banks.

Study Reach 3: Upper Gobernador Creek and Steer Creek
September Survey:

Due to an inability to obtain access to Study Reach 3, summer habitat was not assessed in this reach.

Study Reach 4: Upper Carpinteria Creek

April Survey:

Permission to access Study Reach 4 was not obtained in time for the April surveys.

Study Reach 4: Upper Carpinteria Creek
April Survey:

A total of 24 Level IV habitat units were distinguished in this 1,667 foot long study reach, including low gradient riffles (LGR), high gradient riffles (HGR), cascades (CAS), mid-channel pools (MCP), plunge pools (PLP), and step pools (STP). Overall, a total of 12 riffle units (LGR, HGR, and CAS) and 12 pools (MCP, PLP, and STP) were identified. Riffle and pool units occupied 66 and 34 percent, respectively of the total length.

Wetted stream width varied between four and 30 feet, averaging seven feet. Average stream depth was 0.3 feet in riffles, 0.7 feet in pools, and 0.5 feet overall. Maximum pool depth was four feet. Three of 12 pools had maximum depth of two feet or greater.

Average pool tail crest depth averaged 0.3 feet. Sand was the dominant substrate in the pool tail crests. Cobble embeddedness in pool tail crests averaged 76-100%. All of the pool tails had greater that 25% embeddedness..

Dominant streambed substrates were sand and boulders in riffles, sand and bedrock in pools, and sand, boulders and bedrock overall.

In stream shelter values ranged from zero to three in the units rated, and averaged 1.4 overall, 1.6 in riffles, and 1.3 in pools. Overall shelter coverage was estimated to be 20%. Dominant cover types were boulders and terrestrial vegetation.

Exposed substrate in the stream channel averaged 18%. Percent riparian canopy coverage averaged 95%. Vegetative cover on the stream banks averaged 80%. The dominant vegetative cover type was deciduous trees. Stream banks were composed primarily of boulders, fine sediments, and bedrock.

7.3.4 Fish Passage Impediments

Several impediments to fish passage exist in Carpinteria Creek and its tributaries. These include natural barriers such as waterfalls and steep stream segments in the mountain tributaries, and manmade barriers including debris dams, grade drop structures, and culverted and at-grade road crossings. The Conception Coast Project (Stoecker et al., 2002) completed an inventory of fish passage barriers in Carpinteria Creek, classifying the barriers by the degree to which each impedes upstream migration of adult steelhead. Categories of passage impediment are Low (<0.5), Moderate (0.6-0.7), High (0.8), Extremely High (0.9), and Impassable (1.0). Impediment data is reproduced below in Table 7.2. The locations of the fish passage barriers are shown in Figure 7.2.

Moving upstream from the ocean, the most problematic manmade impediments to steelhead passage (High, Extremely High, or Impassable rating) are “BR_CA_2”, an at-

grade stream crossing just downstream of the Highway 192 bridge, two road crossings and a debris dam in Upper Carpinteria Creek; and in Gobernador Creek, three road crossings and a debris dam. There are also two waterfalls in Upper Carpinteria Creek and one in upper Gobernador Creek, all with High or Extremely High passage impediment ratings. The natural limits of steelhead habitat in each of the four major tributaries (Steer Creek, El Dorado Creek, Upper Carpinteria Creek, and Sutton Canyon Creek) are marked by sections of creek with sustained slopes in excess of 10% located several miles up into the mountains. There are also several lesser impeding (i.e., Low, Moderate rating) manmade and natural barriers in the watershed (see Table 7.2 and Figure 7.2). The severity rating system discussed above and in Table 7.2 was created by the Conception Coast Project (Stoecker et al., 2002). Descriptions of significant man-made barriers are in Section 8.

7.3.5 Water Quality

Water quality data collected during this assessment is summarized in Table 7.3 by sampling location and date. Section 4 contains more information on Water Quality.

Study Reaches 1 and 2

Sampling during April surveys revealed conditions generally favorable for steelhead in the lower and upper main stem of Carpinteria Creek. September surveys in these reaches, however resulted in variable conditions, with higher water temperatures, variable dissolved oxygen levels and conductivity and specific conductance levels double that of April surveys. Elevated conductance can be related to salts common to human activities.

[INSERT FIGURE 7.2 HERE]

Figure 7.2: Steelhead Habitat Distribution, Quality and Fish Passage Impediments in the Carpinteria Creek Watershed (Source: Stoecker et al., 2002).

Table 7.2: Fish Passage Impediments in the Carpinteria Creek Watershed. (Stoecker et al., 2002).

Barrier ID	**Stream**	**Barrier Type**	**Severity**
BR_CA_1	Carpinteria Creek	Pedestrian Culvert Crossing	0.5
BR_CA_2	Carpinteria Creek	"At-Grade" Road Crossing	0.9
BR_CA_3	Carpinteria Creek	Metal Pipe	0.3
BR_CA_4	Carpinteria Creek	USGS Gaging Weir	0.4
BR_CA_5	Upper Carpinteria Creek	"At-Grade" Road Crossing	0.9
BR_CA_6	Upper Carpinteria Creek	Bridge/ Channelization	1.0
BR_CA_7	Upper Carpinteria Creek	Bridge and Concrete Apron	0.7
BR_CA_8	Upper Carpinteria Creek	SBCFCD Debris Basin	1.0
BR_CA_9	Upper Carpinteria Creek	Private Property Seasonal Diversion Dam	0.7
BR_CA_10	Upper Carpinteria Creek	Natural Waterfall	0.8
BR_CA_11	Upper Carpinteria Creek	Natural Waterfall	0.9
BR_CA_12	Upper Carpinteria Creek	Sustained Slope >10%	1.0
BR_CA_SN_1	Sutton Canyon Creek	"At-Grade" Road Crossing	0.0
BR_CA_SN_2	Sutton Canyon Creek	Sustained Slope >10%	1.0
BR_CA_GR_1	Gobernador Creek	Metal Pipe	0.3
BR_CA_GR_2	Gobernador Creek	"At-Grade" Road Crossing	0.3
BR_CA_GR_3	Gobernador Creek	Box Culvert Road Crossing	0.8
BR_CA_GR_4	Gobernador Creek	Box culvert Road Crossing	0.9
BR_CA_GR_5	Gobernador Creek	Culvert Stream Crossing	1.0
BR_CA_GR_6	Gobernador Creek	SBCFCD Debris Basin	1.0
BR_CA_GR_7	Gobernador Creek	Natural Waterfall	0.9
BR_CA_SR_1	Steer Creek	Sustained slope >10%	1.0
BR_CA_ED_1	El Dorado Creek	Sustained slope >10%	1.0
Fish Passage Impediment Severity Ratings: Low (0.2-0.5), Moderate (0.6-0.7), High (0.8), Extremely High (0.9), Impassable (1.0).			

The generally poor water quality in this stretch of the creek observed in the summer is probably due to a combination of factors including naturally lower discharge and more stagnant conditions, higher air temperatures, more open riparian canopy compared to other study reaches, and likely a greater discharge contribution attributable to nearby runoff and leaching. These patterns have been observed in part or whole in several other studies (Ecology, 2003, Padre Associates, Inc. 2000, County of Santa Barbara 1999-2003).

Table 7.3: Water Quality Data from this Assessment of Carpinteria Creek

Sampling Location	Study Reach 1	Study Reach 1	Study Reach 2	Study Reach 3	El Dorado Creek[1]	Study Reach 4	Gobernador Creek[2]
Date(s)	4/16, 4/17	9/10	4/17	4/30, 5/1	5/1	9/18	9/17
No. times sampled	3	4	1	7	1	3	1
Water temp. (°C)	11.7-18.5	17.1-21.5	16.1	10.4-13.9	13.1	15.8-17.5	18.0
Air temp. (°C)	12-21	18-23	19	13-20	18	18-22	22
Dissolved O_2 (mg/l)	9.45-10.36	1.42-14.94	9.42	9.42-10.77	9.83	7.76-8.80	8.80
pH	7.90-8.10	7.27-8.02	8.5	8.16-8.40	8.29	7.95-8.40	8.37
Conductivity (µS)	544-630	1286-1606	542	381-550	573	381-884	531
Specific conductance (µS)	719-783	1520-1723	654	489-707	741	463-1037	613

[1] Just upstream of the confluence with Steer Creek.

[2] Approximately ½ mile downstream of debris basin.

Source: Ecology Consultants, 2004)

Study Reaches 3 and 4

Water quality in Gobernador Creek and its tributaries as well as upper Carpinteria Creek is very favorable for steelhead year-round, as evidenced by the data collected in this and previous studies (Padre Associates, Inc., 2000 Ecology, 2003, Ecology, 2004). Spring water temperatures measured during this study were cool, with optimum dissolved oxygen levels in both the spring and summer. Human activities are limited to use of dirt roads and trails beginning about 1.5 miles upstream of the confluence with Carpinteria Creek, so other water quality problems (e.g., nutrients, toxins, etc.) are not expected beyond that point. Landowners report that feral cattle live in the upper watershed and cow manure and wild animal droppings were found in several locations in Study Reach 3. The lower reach of Gobernador Creek, between the debris basin and the confluence with Carpinteria Creek may experience elevated nutrients, sediment loads, and other pollutants from orchard and rural residential uses, but concentrations are expected similar to those in Study Reach 4.

7.3.6 Large Woody Debris Inventory

Density of LWD per stream mile was highest in Study Reach 3 (Upper Gobernador Creek), and much lower in Study Reaches 1, 2, and 4. Upper Gobernador Creek is a wide, undisturbed riparian corridor with more trees, and the channel is not regularly cleared of fallen trees and other large debris as are the downstream creek sections. The main stem of Carpinteria Creek and lower parts of Gobernador Creek and Upper Carpinteria Creek (including Study Reach 4) are subject to routine clearing of downed trees and woody debris for flood control purposes and since the riparian corridor is relatively narrow, there are fewer trees available for recruitment as LWD. Results of the Large Woody Debris (LWD) inventory are summarized in Table 7.4.

Table 7.4: LWD Inventory (Ecology Consultants, 2004)

Parameter	Study Reach 1	Study Reach 2	Study Reach 3	Study Reach 4
Total length surveyed (ft.)	600	600	600	600
Dead/down (6-20) 1-2	5	2	5	1
Dead/down (20+) 1-2	0	0	1	0
Dead/standing (6-20) 1-2	0	0	4	0
Dead/standing (20+) 1-2	0	1	0	0
Perched (6-20) 1-2	1	0	0	0
Perched (20+) 1-2	0	1	0	0
Root 1-2	0	0	0	1
Live Deciduous. 1-2	46	19	49	28
Live Evergreen. 1-2	4	28	65	1
Dead/down (6-20) 2-3	0	2	1	0
Dead/down (20+) 2-3	0	0	2	0
Dead/standing (6-20) 2-3	0	0	0	0
Dead/standing (20+) 2-3	0	0	0	0
Perched (6-20) 2-3	0	0	0	0
Perched (20+) 2-3	0	0	0	0
Root 2-3	0	0	0	0
Live Deciduous. 2-3	26	5	6	2
Live Evergreen. 2-3	1	3	41	3
Live Deciduous. 3-4	1	4	1	0
Live Evergreen. 3-4	0	0	1	3
Live Deciduous. 4+	0	0	0	0
Live Evergreen. 4+	0	0	0	2
Total Dead	**5**	**5**	**13**	**1**
Total Live	**74**	**59**	**164**	**40**
Total	**79**	**64**	**176**	**41**

7.3.7 Riparian Plant Community

While many riparian trees and plants were common to all of the study reaches, there are changes with respect to dominant riparian species, proportion of nonnative species, and width and condition of the riparian community, while moving from the estuary upstream into the headwaters.

Study Reaches 1 and 2

Along the Carpinteria Creek main stem, the riparian corridor is fairly narrow in most places, usually being limited by the tops of the stream banks or a short distance further out, typically less than 30 feet. Certain reaches of stream corridor below both debris basins and downstream of U.S. Highway 192, the riparian forests have been extremely compromised by urban and agricultural development, where grading and construction have altered or removed the vegetation within close proximity of the channel bank. The width of the riparian corridor in most developed reaches exists only on the immediate banks of the

channel. There is essentially no over bank riparian vegetation. Additionally, nonnative weeds and ornamental plants has severely reduced the plant diversity within this corridor. For example, Cape ivy has eliminated much of the understory vegetation in many places and where giant reed (*Arundo donax)* grows, no other native plants occur. The compromised riparian corridor size and diversity reduces the wildlife habitat and the ability of the corridor to provide functions such as biofiltering, bank stabilization, etc. There is a section of the creek approximately a half-mile upstream of U.S. 101 with a fairly wide section of remnant riparian vegetation extending at least 150 feet out from the top of the creek banks.

Study Reaches 3 and 4

Moving into the foothills and mountains along Upper Carpinteria Creek and Gobernador Creek, riparian vegetation transitions to a species composition and form characteristic of local mountain streams. Infestations of Cape ivy, periwinkle and thoroughwort extend well into Upper Carpinteria and Gobernador Creeks. For more information about types of plants found in the watershed, see Section 6.

7.3.8 Benthic Macroinvertebrates

Benthic macroinvertebrate (BMI) community composition, including the types and diversity of taxa present, has proven to be a reliable indicator of ecological integrity in Carpinteria Creek and in South Coast creeks as a whole (Ecology, 2003 and 2004). BMIs are of particular interest in that they are important cyclers of energy and organic matter in the stream ecosystem, and an important food source for steelhead and other sensitive aquatic vertebrates. BMI data has been collected in each of the last four years in the Carpinteria Creek Watershed by the City of Carpinteria (2000) and County of Santa Barbara Project Clean Water (2001-2003). Sampling locations include (1) the lower main stem within Study Reach 1, and (2) Gobernador Creek just above the debris basin, approximately 1.5 miles upstream of the confluence with Carpinteria Creek.

Study Reach 1

The BMI community in the lower main stem of Carpinteria Creek has consistently had low diversity (20 insect families, 25 BMI families found in four years) and a community composition dominated by disturbance-tolerant forms including Chironomidae (midges), *Simulium sp*. (black flies), oligochaete worms, and ostracods. There is an almost complete lack of mayflies, caddisflies, stoneflies and other disturbance-sensitive taxa in this stretch of the creek. The BMI community in the lower main stem reflects poor water quality and degraded physical habitat conditions (Ecology, 2003 and 2004).

Study Reach 2

BMI data is not available for Study Reach 2. Due to the highly intermittent nature of discharge in this section of the creek, the formation of a mature BMI community is probably limited to the wettest of years, where surface flow lasts several months or more.

Study Reach 3
The BMI community at the sampling location in Gobernador Creek has consistently been good to excellent biological integrity in terms of high diversity (41 insect families, 45 BMI families found in four years), and a substantial portion of the community composition being made up of disturbance-sensitive taxa including numerous families of mayflies, caddisflies, stoneflies, water beetles, and dragonflies (Ecology, 2003 and 2004). Perennial reaches of Gobernador Creek and tributaries Steer Creek and El Dorado Creek are expected to have a healthy BMI community similar to the Study Reach 3 in Gobernador Creek. During this study, remains of disturbance-sensitive BMIs including caddisflies of *Lepidostoma sp.* and *Gumaga sp.* were found in a dry section of lower Gobernador Creek. indicating adequate water quality and habitat when surface flow occurs.

Study Reach 4
BMI data is unavailable for Upper Carpinteria Creek. However, disturbance sensitive BMIs including *Lepidostoma sp.* and *Gumaga sp.* were observed in large numbers in Study Reach 4, indicating this creek section has adequate water quality and habitat when surface water is present. Based on the habitat conditions present further upstream, perennial sections of Upper Carpinteria Creek and tributary Sutton Canyon Creek are expected to have a healthy BMI community. Similar to Gobernador Creek, the lower section of Upper Carpinteria Creek is also expected to have a fairly healthy BMI community.

7.3.9 Vertebrates

A total of 63 vertebrate species were observed in all four study reaches, including three fish, three amphibians, three reptiles, 46 birds, and eight mammals. Four of the observed species are designated as sensitive by one or more government organizations and/or scientific organizations: steelhead, California newt, Western pond turtle, and Cooper's hawk. See Section 6 for additional information.

7.4 Fish Survey Data

Results of the snorkel/stream bank surveys in terms of steelhead/rainbow trout distribution and abundance by age class (i.e., young of the year, juveniles, and adults) are summarized in Table 7.5.

Study Reaches 1 and 2
No trout were observed in the Carpinteria Creek main stem (inclusive of Study Reaches 1 and 2) during the April and September surveys. Steelhead are known to at least occasionally occur in this section of the creek, as evidenced most recently in the winter of 2000 by the illegal catch of a large adult female steelhead in the creek near the U.S. 101 crossing (Stoecker et al. 2001). Three-spine sticklebacks and mosquito fish were observed in large numbers in Study Reach 1.

Table 7.5: Trout Survey Data (Ecology Consultants, 2004)

Survey Date	4/23	4/17 and 4/23	5/7	9/10	9/18
Start Point	Start of reach 1	Start of reach 2	2,400' downstream of reach 3	Start of reach 1	Start of reach 4
End Point	1 mile upstream of reach 1	End of reach 2	End of reach 3	End of reach 2	End of reach 4
No. Trout Observed	0	0	159	0	0
Young of the Year (<3" long)	0	0	63	0	0
Juveniles (3"-6" long)	0	0	88	0	0
Adults (>6" long)	0	0	8	0	0

Study Reach 4

Trout were not observed during the survey in Upper Carpinteria below the detention basin (Study Reach 4). However, 10 to 12 trout of approximately two to five inches in length were observed in a shallow pool immediately upstream of the detention basin. Large numbers of trout have been reported to exist in Carpinteria Creek from the detention basin upstream several miles (Stoecker et al, 2002).

Study Reach 3

Large numbers of trout were observed in a one-mile section of Upper Gobernador Creek inclusive of Study Reach 3 during the April survey. A total of 159 trout were counted during the survey, including 63 young of the year (less than 3" long), 88 juveniles (3" to 6" long), and eight adults (greater than 6" long). The trout observed had the characteristics of resident rainbows, including prominent dark brown spots dorsally and rainbow coloration on their sides. Adult rainbow trout were fairly small; the largest fish observed being about 8" long. Adult steelhead were not observed.

Trout have also been observed in large numbers (up to 25 fish per pool) and all age classes during recent surveys in Gobernador Creek just upstream of the detention basin (Ecology, 2003 and 2004). Habitat conditions in this stretch of the creek are generally similar to the upstream segments of Study Reach 3 surveyed for this study.

Since genetic analysis has not been conducted, the origin of the trout in the Gobernador Creek and Upper Carpinteria Creek Watersheds is not definitively known. Many local creeks have been stocked with trout from hatcheries, other regions, and other local streams such as the Santa Ynez River over the years (Titus and Erman, 1993). The trout observed generally appeared to be healthy and active, and the quantity of fish observed, multiple age classes, excellent spawning and rearing habitat available in the upper reaches, distribution of fish along many stream miles in several tributaries, and absence of recent stocking suggest that these are healthy, self-sustaining populations.

Also of interest is that large numbers of California newts were observed in upper Gobernador Creek. A total of 280 adult newts were counted in Study Reach 3 during this survey.

7.5 Steelhead Habitat and Population Summary

A discussion of steelhead habitat quality moving upstream from the main stem to the mountain tributaries follows. Ideally, steelhead spawning and rearing streams have cool, clean, well-oxygenated waters that flow year-round, "clean" spawning cobble and gravel deposits for spawning, deep pools with adequate shelter features for cover and resting, and an abundant, healthy benthic macro-invertebrate community as a food base.

Study Reach 1

The lower main stem of Carpinteria Creek does have perennial surface flow in most years, and water temperatures appear to be within the maximum range normally tolerated by steelhead (generally up to 20 to 25°C) even in the summer months. However, there are a number of factors that limit the quality of habitat in the lower main stem for steelhead, including the following:

- Low discharge and highly variable dissolved oxygen concentrations in the summer months, well below the generally accepted 5.0 mg/l standard for steelhead in some of the pools. Nighttime dissolved oxygen levels may drop to very low levels in the summer months in much of the lower main stem due to respiration by extensive mats of floating algae and vascular aquatic plants that colonize in the creek channel.

- Poor water quality in the form of elevated conductance, nutrients, etc.

- Infrequency of deep pools. Eight pools were found in both survey periods. Four of the eight pools in Study Reach 1 had a maximum depth of two feet or greater during the April surveys, and only two of the eight pools were of such depth in the summer.

- Moderate cobble embeddedness with fine sediments (average of 25-50% embedded) in pool tail crests. Pool tail crests are particularly important in that they are where steelhead typically dig redds into cobble and gravel deposits and spawn. "Clean" cobble and gravel deposits that are not embedded in sand and fine sediments are the highest quality substrate for steelhead spawning. Increasing embeddedness of spawning substrate reduces the ability of water and oxygen to circulate through the substrate, potentially suffocating steelhead eggs and hatching young.

- Low in stream shelter rating (1.4 in April), and frequent disturbances and noise from human activities and domestic pets.

- Potentially inadequate food source due to the poor integrity of the benthic macroinvertebrate community.

The lower main stem, as indicated by the parameters observed in Study Reach 1, provides at best marginal steelhead spawning and rearing habitat.

Study Reach 2

While some habitat conditions such as cobble embeddedness and water quality improve moving upstream from the lower main stem into the upper main stem, others such as pool depth and cover, LWD, riparian zone width and composition remain similar. Also, Study Reach 2 has very intermittent surface flow, and typically is dry several months each year. Study Reach 2 provides adequate spring spawning habitat for steelhead in wet years, and only marginal rearing habitat into the summer months in very wet years. Overall quality of habitat in this reach is marginal.

Study Reach 3 and Downstream

The lower mile or so of Gobernador Creek is similar to the upper main stem of Carpinteria Creek in terms of surface flow (i.e., intermittent) and overall habitat quality. Upstream from a point about a half mile downstream of the detention basin, surface flow is usually perennial. The half mile stretch below the detention basin provides good spawning and rearing habitat for steelhead, having cool, fairly clean water, high dissolved oxygen, fairly clean spawning cobbles, and some deep pools with good cover.

From the detention basin upstream, Gobernador Creek provides excellent year-round spawning and rearing habitat for steelhead. Waterfalls exist about a mile above the debris basin (CA_GR_7), which is a barrier of extremely high to impassable severity to steelhead passage (Stoecker et al., 2000). Excellent habitat continues and improves above the waterfalls. The stream has strong flow, and cool, clean waters with high dissolved oxygen all year. The majority of the pools surveyed in Study Reach 3 were at least two feet deep, and cobble embeddedness in pool tails averaged 0-25%, providing excellent spawning habitat for trout. Habitat in tributaries Steer Creek and El Dorado Creek is also excellent up to the point of sustained slopes of 10% or greater. The excellent habitat conditions in Gobernador Creek and tributaries are evidenced by the large numbers of trout and full range of age classes observed (Stoecker, et al. 2000, Ecology 2003 and 2004).

Study Reach 4 and Upstream

The lower mile of Upper Carpinteria Creek down to the confluence with Gobernador is similar to the upper main stem of Carpinteria Creek and lower section of Gobernador Creek in terms of intermittent surface flow and marginal overall habitat quality. Upstream from a point about a half mile downstream of the detention basin, surface flow is typically perennial. The half-mile reach below the detention basin provides fair rearing habitat for steelhead, having cool, fairly clean water, high dissolved oxygen, and a few deep pools with good cover. However, 10 of the 12 pools lacked suitable spawning cobbles and gravels, with sand or bedrock as the dominant substrate. The two pools with appreciable cobble and gravel deposits were highly embedded (50-100%) with sand and fine sediments. Spawning habitat in this reach is poor to marginal. Large areas of soft and friable red bedrock were noted to be actively eroding in several areas, with significant deposits of red sand immediately down slope in the stream channel. Accelerated erosion from human

impacts including hillside orchards, cleared floodplain areas, and destabilized creek banks from loss of riparian vegetation are also evident. A lack of scouring flows may also contribute to sediment accumulation in the channel downstream of the detention basin, which releases flows in a controlled manner through a three-foot diameter pipe.

From the detention basin upstream, Carpinteria Creek provides good to excellent spawning and rearing habitat for steelhead. There are excess levels of sand and fine sediment in the stream channel immediately above the detention basin due to erosion in the watershed and loose sandstone canyon walls. Fine sediment embeddedness lessens and habitat quality improves shortly upstream of the detention basin, with excellent habitat quality extending several miles up in Carpinteria Creek and Sutton Canyon Creek to the point of sustained slopes exceeding 10% (Stoecker et al., 2002).

7.5.1 Synopsis

Figure 7.2 designates the locations and quality of steelhead habitat in the Carpinteria Creek Watershed. The map also shows the locations of fish passage barriers in the watershed, which is supported by Table 7.2.

Based on stream designations on the Carpinteria and White Ledge Peak USGS 7.5 minute quadrangle maps, there are approximately 13.6 miles of perennial stream habitat in the Upper Carpinteria Creek and Gobernador Creek watersheds combined. Perennial stream miles are listed below by tributary.

Stream	Perennial Stream Lengths
Gobernador Creek	2.3 miles
Steer Creek	3.2 miles
El Dorado Creek	1.3 miles
Upper Carpinteria Creek	4.0 miles
Sutton Canyon Creek	2.8 miles
TOTAL	13.6 miles

Overall, there are approximately 11.1 stream miles of high quality steelhead habitat in the Carpinteria Creek Watershed. The breakdown by tributary is as follows:

Stream	High Quality Habitat Lengths
Gobernador Creek	2.3 miles
Steer Creek	1.5 miles
El Dorado Creek	1.9 miles
Upper Carpinteria Creek	3.4 miles
Sutton Canyon Creek	2.0 miles
TOTAL	11.1 miles

Based on an extrapolation of fish data collected from the one mile stretch of Gobernador Creek and a multiplication factor of one to three to account for unseen fish, the watershed currently supports a population of perhaps 2,000 to 5,000 rainbow trout. While this population is likely contributing substantial numbers of out migrating steelhead smolts to the sea-run steelhead population, all of the high quality steelhead spawning and rearing habitat in the watershed is behind a series of obstructions, namely "BR_CA_2" the at-grade crossing on the upper main stem, and road crossings and detention basins on Upper Carpinteria Creek and Gobernador Creek, that are nearly impassable or completely impassable to upstream migrating steelhead. Based on these findings all high quality habitat in the watershed is probably unavailable to returning sea-run steelhead at this time. If all of this habitat were made available, it could conservatively support hundreds of pairs (perhaps 300 or more) of spawning steelhead.

7.5.2 Recommendations for Steelhead Habitat Restoration and Recovery

1. Restore the ability of upstream migrating steelhead to access prime spawning and rearing habitat by correcting problems at several manmade passage impediments in the main stem, Gobernador Creek, and Upper Carpinteria Creek. Currently, the entire prime and perennial habitat in the watershed, not coincidentally the entire existing trout population, is upstream of significant barriers. The creek's steelhead population cannot recover without access to the upper watershed.

2. Increase instream habitat wherever possible but especially downstream of the debris basins. Create deep over-summering pools above and below barrier removal projects.

3. Improve habitat conditions in the estuary, Carpinteria Creek main stem, and lower sections of Upper Carpinteria Creek and Gobernador Creek. Due to their generally shallow depth, homogenous bottom, and in some locations intermittency of surface flow, the lower watershed probably did not serve as prime spawning and rearing habitat for steelhead in most years even prior to human disturbance. However, the lower

watershed has always been and continues to be of critical importance to steelhead as a migration corridor between the ocean and high quality spawning and rearing habitat in the upper watershed, and as temporary resting and feeding habitat for upstream migrating adult steelhead and downstream migrating steelhead smolts. The brackish estuary is also of critical importance as the place where migrating steelhead acclimate to the differences between salt and fresh water.

4. Adapt outreach and education efforts to facilitate water quality and water quantity improvement.

   Key human causes of habitat degradation in the lower watershed are water pollution, increased inputs of fine sediments, loss of riparian habitat, increased cover of impervious surfaces, routine physical disturbance of stream habitat, and noise and disturbance from human activities and domestic pets

   Excellent stream habitat and healthy resident rainbow trout populations exist in Gobernador Creek, Upper Carpinteria Creek, and their tributaries, and adult steelhead still enter this stream on occasion. While there are major problems in the lower watershed in the form of fish passage barriers, water pollution, and physical habitat degradation, such problems are not insurmountable.