Stream Inventory Report
San Jose Creek
2006

Prepared by: Jennifer Nelson (California Department of Fish and Game)
Eileen Baglivio and Tim Kahles (California Conservation Corps)

Introduction

San Jose Creek was surveyed from June 21, 2006 through October 17, 2006 by Tim Kahles and Eileen Baglivio, Special Corps Members of the California Conservation Corps (CCC) and Jennifer Nelson, California Department of Fish and Game (CDFG). The survey included a habitat inventory which documents the quantity and quality of spawning and rearing habitat available for steelhead rainbow trout (*Oncorhynchus mykiss*) and a biological assessment whereby steelhead densities were determined in three locations. In addition, a qualitative survey was done upstream of where the quantitative habitat typing survey ended.

This report discusses the results of the survey in addition to factors which may be limiting production and includes recommendations for habitat enhancement or further studies that are needed to understand watershed processes.

Watershed Overview

San Jose Creek flows directly into the Pacific Ocean approximately 2 miles south of Carmel in Monterey County, California, at N36° 31' 34.8", W121° 55' 30.7", Twp. 16S, R. 1W, on the San Jose Y Sur Chiquito Land Grant (Figures 1 and 2). San Jose Creek is a third order stream that is approximately 10.5 miles in length according to the USGS Monterey and Mt. Carmel 7.5 minute quadrangles and drains an area of approximately 15 square miles. San Jose Creek has several named perennial tributaries including the North Fork San Jose Creek which enters at stream mile 1.4, Seneca Creek (stream mile 4.3), Van Winkley Creek (stream mile 6.5), Williams Canyon Creek (stream mile 7.2) and numerous intermittent and perennial un-named tributaries. Elevations range from sea level at the mouth to 3,200 feet in the headwater. In the lower 1.5 miles and the upper 3 miles of San Jose Creek, the riparian consisted primarily of willow, alder, cottonwood and oaks. The steep middle reach was mixed redwood/hardwood forest. Upland areas consisted of coastal chaparral in the lower watershed, redwood forest in the mid-section, and grasslands/oak woodland higher in the watershed.

Approximately sixty percent of the watershed is publicly owned and is either preserved or managed for limited recreation. The remaining 40% is privately owned and is rural residential with minor cattle grazing. Currently, there are five homes adjacent to San Jose Creek. Three of these houses are on State Park property and are located within 0.6 mile of the ocean. The fourth dwelling is an occasionally used cabin located approximately 100 feet away from the stream, 1.9 miles upstream of the ocean. The fifth house is located 7.8 miles upstream from the ocean and also is approximately 100 feet upslope from the creeks edge. Although not near the creek, the upper part of the watershed has low density housing in the Rancho San Carlos community.

Historically, the watershed was logged and used more extensively for cattle grazing.

Habitat Typing Methods

Sampling Strategy

The inventory uses a method that fully samples approximately 10% of the habitat units within the survey reach. Every habitat unit is classified according to habitat type and measured for length. In addition to length, all pool units are measured for maximum depth, depth at the pool tail crest (measured in the thalweg), dominant substrate at the pool tail crest, and embeddedness of that substrate. All habitat types encountered for the first time and one randomly selected unit on each page is measured for all the parameters on the field form.

Habitat Typing Components

The habitat inventory conducted on San Jose Creek follows the methodology described in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). A standardized habitat inventory form has been developed which allows for the following ten parameters to be recorded in a systematic format. All ten parameters were recorded during this survey however, not all measurements were taken to determine the various channel types. A two member team trained in standardized habitat typing conducted the survey.

1. Stream Flow

Stream flow was measured by setting a transect line perpendicular to flow and recording velocity measurements at one foot increments (or at 0.5 foot increments if the stream was less than 20 feet wide). The six-tenths depth method was used since maximum depth never exceeded 2 feet. All velocity measurements were taken using a Model 2000 Marsh-McBirney Flow-Mate and stream flow was calculated using the Centroid method.

2. Temperatures

Water and air temperatures, in addition to the time, were measured and recorded at the start of a new page or every tenth habitat unit. Water temperatures were taken within one foot of the surface of the water and air temperatures were taken in the shade.

3. Channel Type

Channel typing was conducted according to the classification system developed and revised by David Rosgen (1994) and is described in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). Channel typing was conducted simultaneously with habitat typing and followed a standard form to record measurements on: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity.

4. Habitat Typing

Habitat typing used the 24 habitat classification types defined by McCain and others (1990). Habitat units were numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types (Page 39). For a particular habitat unit to be identified as a discreet unit, the minimum length of the unit must have been equal to, or greater than, the stream's mean wetted width. Once a unit was identified, the average length, width, depth, and maximum depth were measured. All measurements were in feet to the nearest tenth. Habitat dimensions were measured using a laser range finder and stadia rod.

5. Shelter Rating

Instream shelter components included wood (logs, roots, tree’s, stumps), boulders, undercut banks, and other elements within a stream channel that could provide juvenile salmonids protection from predation, reduce water velocities so fish could rest and conserve energy, and allow for separation of territorial units to reduce density related competition for prey. A shelter rating was calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Shelter values ranged from 0, if no instream cover was present, to 3 if diverse/complex instream cover was present. Percent cover was derived by estimating how much of the volume of a particular unit contained cover components. Shelter ratings could range from 0-300 and were expressed as mean values by habitat types within a stream.

6. Substrate Composition

Substrate composition ranged from silt/clay sized particles to boulders and bedrock. In all fully-described habitat units, dominant and sub-dominant substrate elements were estimated using a list of seven size classes and recorded as a one and two, respectively.

7. Substrate Composition and Embeddedness at Pool Tail Crests

The dominant or primary substrate composing the pool tail crest was recorded at each pool. In addition, the depth of fine sediment surrounding or burying the cobbles at the crest was estimated. This figure is expressed as a value and the following criteria were used: 0 - 25% buried (value 1), 26 - 50% (value 2), 51 - 75% (value 3), and 76 - 100% (value 4). A value of 5 was assigned to tail-outs deemed unsuitable for spawning because of an inappropriate substrate such as bedrock, log sills, or boulders.

8. Canopy

Canopy was considered to be anything hanging or situated over the creek (e.g. vegetation, bridges) that would provide shade on the water. It was measured by standing in the center of the unit and visually estimating how much of the unit is covered. Canopy does not take into account topographic shade or other upslope features which may be shading a stream. Estimates of canopy were made at every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the percentage of shade provided by coniferous versus hardwood trees was also estimated.

9. Bank Composition and Vegetation

For every fully described unit, the dominant bank composition type (e.g. bedrock, cobble, soil) and vegetation type (e.g. grass, brush, trees) was recorded for both the right and left banks. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and root wads) was estimated and recorded.

10. Comments and Landmarks

In addition to collecting data on the specific habitat units, comments on land use, water quality, erosion sources, non-native vegetation, impediments, and other issues which may be impacting stream habitat were noted. Landmarks such as tributaries, road or bridge crossings, buildings, or other structures which are not likely to move were noted to facilitate locating certain areas of the stream for future sampling.

Habitat Typing Data Analysis

Data from the habitat inventory was entered into Stream Habitat 2.0.16, a Visual Basic data entry program developed by Karen Wilson, Pacific States Marine Fisheries Commission in conjunction with the California Department of Fish and Game. Using this program and Microsoft Excel, the following tables and graphics were produced:

- Riffle, Flatwater, and Pool Habitat Types (Table 1)
- Habitat Types and Measured Parameters (Table 2)
- Pool Types (Table 3)
- Maximum Residual Pool Depths by Habitat Types (Table 4)
- Mean Percent Cover by Habitat Type (Table 5)
- Dominant Substrates by Habitat Type (Table 6)
- Mean Percent Vegetative Cover for Entire Stream (Table 7)
- Fish Habitat Inventory Data Summary by Stream (Table 8)
- Mean Percent Dominant Substrate and Vegetation (Table 9)
- Mean Percent Shelter Cover Types for Entire Stream (Table 10)
- Riffle, Flatwater, Pool Habitat Types by Total Length (Graph 1)
- Maximum Residual Depth in Pools (Graph 2)
- Mean Percent Cover Types in Pools (Graph 3)

- Substrate Composition in Pool Tail-outs (Graph 4)
- Dominant Bank Composition by Composition Type (Graph 5)
- Dominant Bank Vegetation by Vegetation Type (Graph 6)

Tables and graphs developed by these programs are located in Appendix A.

Qualitative Survey Methods

Due to time constraints, the upper 1.5 miles of San Jose Creek could not be habitat typed. Instead, a qualitative survey was conducted whereby habitat conditions were generally described between two reference points. Observations on spawning and rearing conditions, impediments, sediment sources, and water diversions were noted and can be found in the supplemental survey report in Appendix B.

Fish Sampling Methods

Using the habitat typing data that was collected from June through August of 2006, three approximately 100 meter long sample sites were chosen to obtain a baseline assessment of steelhead densities. Locations were chosen in the lower, middle, and upper reaches of the creek and were selected based upon how well they represented the habitat within the reach. Once the sites were selected, block nets were placed at the upper and lower ends of the sample station to enclose the population. The water was allowed to clear for approximately fifteen minutes after the nets were placed before sampling began at the lower net, working upstream until the upper net was reached. All fish and amphibians observed were captured using a Smith-Root Model 12 backpack electrofishing unit. Fish and amphibians were held in buckets or placed in flow-through live cars until the upper net was reached. Total time that the anode was functioning was recorded and effort was made to keep time consistent between passes. Electrofishing settings were also fixed between passes to assure that capture probabilities remained constant. Protocols designed to meet the assumptions of the multiple pass removal/depletion method as described by Zippin (1958) were used to analyze the population at each site.

At the end of each pass, steelhead were measured for fork length and/or total length to the nearest millimeter and weighed to the nearest 0.1 gram. Other fish species and amphibians captured were identified and enumerated. After being measured, fish were held in live cars upstream of the upper block net until the sampling was complete, after which, all fish were re-distributed back into the station.

With the paucity of recent information regarding age/length relationships of juvenile steelhead in the central coast region, age classes defined by Shapovalov and Taft (1954) while trapping on Waddell Creek were used. They determined that steelhead captured during September and October measuring less than 105 millimeters fork length were age 0+ or young-of-the-year, fish measuring 105 to 165 millimeters were age 1+, and fish that were 165 to 220 millimeters were age 2+. Obviously, there will be variability in the length ranges for a given age class depending upon food availability, competition, temperature and other rearing conditions. However, until more discreet, stream information becomes available, the age/length categories defined by Shapovalov and Taft will be used.

Population estimates for each site were calculated using the Microfish 3.0 program (Van Devanter and Platts, 1989). Fulton type condition factors were calculated using the equation "Condition = (weight/length^3)*100,000" (Murphy and Willis, 1996).

Habitat Typing Results

Stream Flow

Stream flow was measured weekly or bi-weekly at two locations on lower San Jose Creek. The lower site was located approximately 505 feet upstream from Highway 1 (Figure 1). Flows at this site ranged from 3.38 cubic feet per second (cfs) on June 20th to 0.28 cfs on November 2nd, although the lowest flow was 0.27 cfs on October 18th (Table 1).

The upper site was 1.03 miles upstream from Highway 1 and measured flows ranged from 2.82 cfs on June 20th to 0.751 on Nov. 2nd, although as with lower site, the lowest flow was recorded on October 18th and was 0.683 cfs (Table 1.)

Date	Streamflow (cfs) at lower location	Streamflow (cfs) at upper location
June 20, 2006	3.38	2.82
June 27, 2006	2.48	
June 28, 2006		2.54
July 6, 2006	2.35	2.36
July 12, 2006	1.70	1.81
July 19, 2006	1.19	1.14
July 27, 2006	0.974	1.41
August 1, 2006	0.855	0.925
August 7, 2006	0.98	
August 16, 2006	0.90	1.01
August 28, 2006	0.72	1.28
September 8, 2006	0.45	0.92
September 18, 2006	0.40	0.81
October 10, 2006	0.38	0.85
October 18, 2006	0.27	0.683
November 2, 2006	0.28	0.715

Table 1. Stream flows in San Jose Creek, 2006.

Temperatures

Air and water temperatures taken during the survey ranged from 53°F to 85°F and 53°F to 68°F, respectively. A continuous temperature recording device was also placed approximately 500 feet upstream from the ocean on June 7, 2006 and retrieved on October 18th. Temperatures recorded during this time averaged 57˚F with a minimum of 51˚F and a maximum of 68˚F (Figure 3).

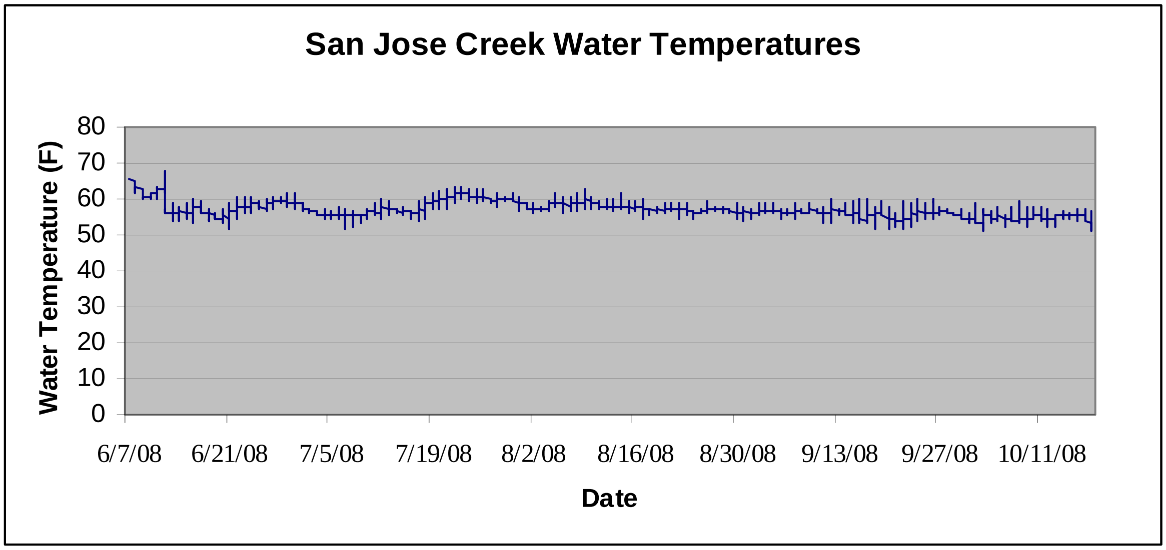


Figure 3. Water temperatures measured by a continuous temperature recording device in San Jose Creek, 2006.

Channel Typing

San Jose Creek fluctuates between a C4 and C2 channel type for the first 2.8 miles, a F2/F4 channel type for the next 1.9 miles, and then back to primarily a C4 channel type for the remaining 4 miles that were surveyed. The "C" channel type is characterized as low gradient, meandering, with point-bars, riffle/pool sequences and broad, well defined floodplains. The "2" and "4" refer to the dominant substrate which is boulder and gravel, respectively.

The "F" channel type is also low gradient and meandering, with riffle/pool sequences, but the channel is entrenched instead of being connected to a flood plain. Here again, the "2" and "4" refer to the dominant substrate which is boulder and gravel, respectively.

Habitat Typing

A total of 1,101 discreet habitat units were identified in the 44,041 feet of main channel surveyed. Based on total length, 16.5% (7,287 feet) consisted of riffles, 43.6% (19,193 feet) was flatwater, 36.6% (16,116 feet) were pools, 3.1% (1,374 feet) was lagoon, 0.1% (36 feet) was dry, and 0.1% (18 feet) was under log jams (Table 1 and Graph 1, Appendix A).

Riffle Results

Riffle habitat includes low gradient riffles (gradient < 4%), high gradient riffles (gradient > 4%), bedrock sheets, and cascades. In San Jose Creek, 237 low gradient riffles, 8 high gradient riffles, 6 bedrock sheets, and 7 cascades, and were identified in the surveyed reach. Detailed information on the average length, width, and depth of the riffles is in Table 2 (Appendix A). Average maximum depth in the low and high gradient riffles was 1.2 and 1.0 feet, respectively.

Instream shelter in low and high gradient riffle units consisted primarily of boulders/large cobble (34%), small woody material (25%), bubble curtain (16%), root mass (13%), and submerged terrestrial vegetation (7%), however, large woody material (3%), bedrock ledges (2%), and undercut banks (1%) were also present (Tables 5 and 10, Appendix A). The volume of riffle habitat with instream shelter ranged from 5% to 40% (average: 19%). Within all measured riffle units, 75% of the units contained shelter up to 10% of the volume. The remaining 25% of the units had shelter in 20% to 40% of the volume.

Low gradient riffles consisted of large cobble (44% of the units), small cobble (22%), gravel (22%), and boulders (11%). Primary substrate within the high gradient riffles was boulders.

The six bedrock sheets ranged in length from nine to sixteen feet and all were low gradient. None of the bedrock sheets were considered to be an impediment.

The seven bedrock and boulder cascades ranged in length from 9 to 33 feet and ranged in height from 3 to 7 feet. The only cascade that was considered a potential impediment to adult fish passage under certain flows was habitat unit 305 at stream mile 2.85 (Figure 4). The cascade ranged from 5 to 7 feet high with a pool at the base that had a maximum depth of 2.5 feet. Towards the right bank, there was a 0.7 foot high bedrock sheet beneath a 7 foot high bedrock outcrop. Towards the left bank, a 4 foot high cascade was beneath a 2.2 foot deep pool before a final jump over a 3.5 foot high angled back bedrock section at the upper part of the cascade.

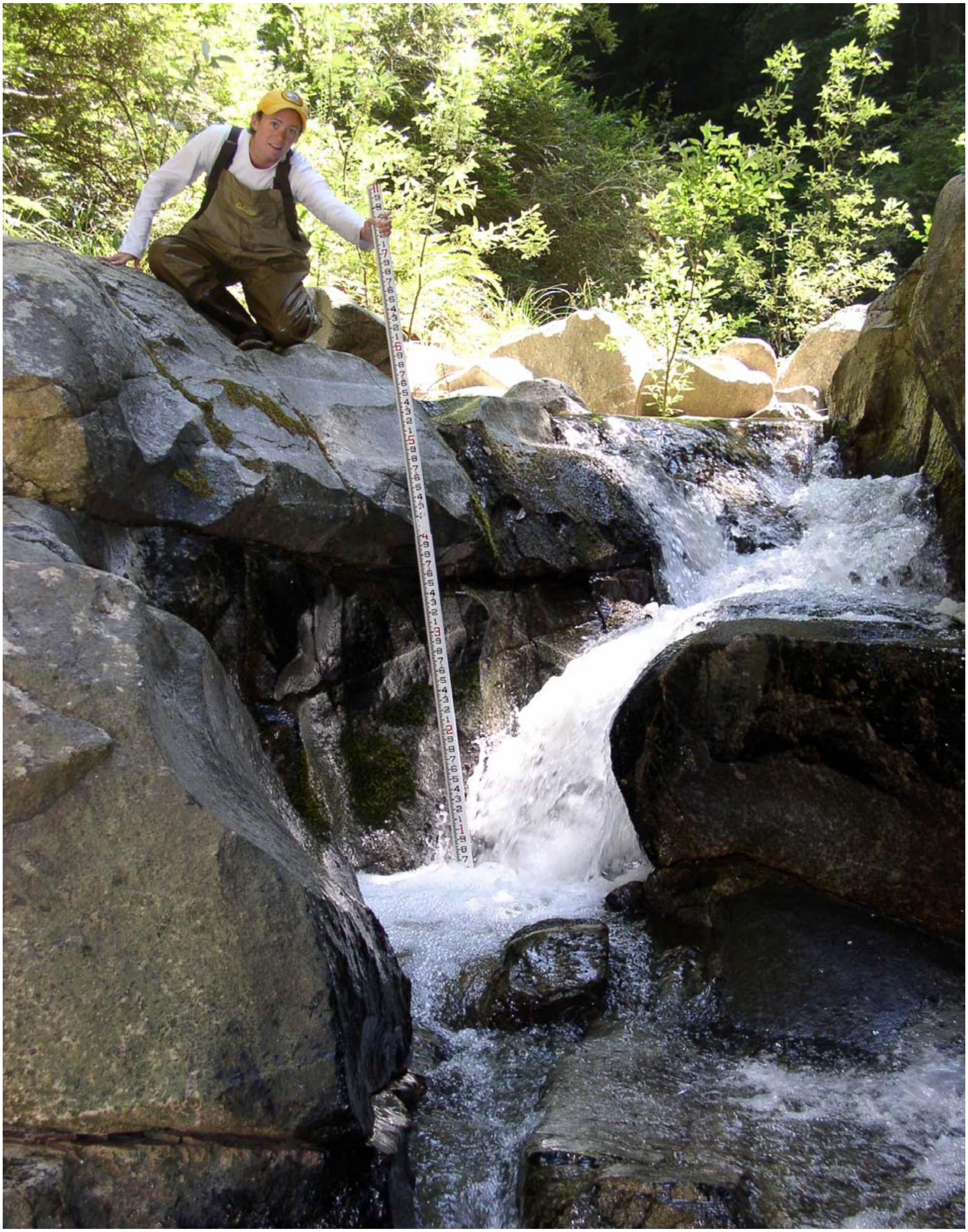


Figure 4. The boulder/bedrock cascade in habitat unit 305, San Jose Creek, 2006.

Flatwater Results

Flatwater habitat includes runs, step-runs, glides, pocket water, and edgewater. Within San Jose Creek 172 runs, 132 step-runs, 50 glides, and 2 pocket water units were identified. Average length, width and depth of these units are in Table 2. Average maximum depth was 1.4 feet in the runs, 1.8 feet in the step-runs, 1.1 feet in the glides, and 0.5 feet in the pocket water.

Instream shelter in all flatwater units combined included boulders (38%), small woody material (26%), root mass (16%), submerged terrestrial vegetation (6%), bubble curtain (5%), undercut bank (4%), large woody material (3%), and aquatic vegetation (1%) (Tables 5 and 10, Appendix A). The volume of flatwater habitat with instream shelter ranged from 5% to 45%. Within all of the measured flatwater units, 37% had shelter in up to 10% of the volume; 55% had shelter in 11% to 20% of the volume; and the remaining 8% of the units had shelter in 30% to 45% of the volume.

Primary substrate within runs consisted of sand (38%), boulder (38%), small cobble (13%), and large cobble (13%). Step-runs consisted of boulder (65%), sand (18%), large cobble (12%), and small cobble (6%). Primary substrate within glides and pocket water was sand (100%) (Table 6, Appendix A).

Pool Results

Out of the 1,101 distinct units identified, 483 of these units were pools. The most abundant pool type was mid-channel pools (315 units), although lateral scour root pools (45), step-pools (32), lateral scour boulder pools (22), lateral scour log pools (22), lateral scour bedrock pools (17), plunge pools (14), corner pools (14), dammed pools (1), and a channel confluence pool were also identified. Average length, width, and depth for each of these pool types are listed in Table 2 (Appendix A).

Maximum depths for all pool types ranged from less than one foot (218 pools) to over 4 feet (1 pool). An additional 200 pools ranged between 1 and 2 feet maximum depth, 24 pools ranged between 2 and 3 feet, and 3 pools ranged between 3 and 4 feet (Table 4 and Graph 2, Appendix A). Maximum depths are not taken on step-pools.

Shelter components in pools included boulders (30%), small woody debris (21%), root mass (16%), undercut banks (15%), large woody material (7%), terrestrial vegetation (6%), bubble curtain (3%), bedrock ledges (2%), and aquatic vegetation (1%) (Tables 5 and 10, Graph 3, Appendix A). The percentage of pool volume with instream shelter ranged between 5% and 35% in those pools that were fully measured. Shelter components ranged between 5% and 10% of the volume in 25% of the pools, 11% to 20% in 60% of the pools, 21% to 30% in 10% of the pools, and 5% of the pools had shelter components within 31% to 40% of the volume.

Substrate Composition and Embeddedness at Pool Tail Crests

To determine the quality of the spawning habitat, the substrate composing the pool tail crest and the embeddedness of that substrate were evaluated. For the latter, a scale of 1 to 5 was used to describe embeddedness with a value of 1 meaning the substrate was loose and easily moved by adult steelhead to a value of 5 which indicates the substrate cannot be used because it was immobile.

Of the 483 pool tail crests, 47% (227) of the pool tail crests consisted of boulders, 23% (111) consisted of sand, and 2% (10) had bedrock at the pool tail crests. Bedrock and boulder substrates cannot be used for spawning and had a rating of 5. Sand can be used for spawning, but survival of eggs to the fry stage would most likely be poor to non-existent so these crests also had a rating of 5. The remaining pool tail crests consisted of gravel (11% or 53 units), small cobble (8% or 39 units) and large cobble (9% or 43 units) (Graph 4, Appendix A).

Of those pool tail crests that consisted of either gravel or cobble, 42 had a value of 1 (8.7%); 63 had a value of 2 (13%); 27 had a value of 3 (5.6%); and 3 had a value of 4 (0.6%).

Other potential spawning sites are identified in the Comments and Landmarks section and in the qualitative survey report (Appendix B).

Canopy

Canopy density for the surveyed area averaged 63% and consisted of 66% hardwoods (willow, alder, tan oak, big leaf maple, sycamore) and 34% redwood (Table 7, Appendix A).

Stream Bank Composition

Of the habitat units fully surveyed, stream banks were composed of sand/silt/clay (67.5% of the units), boulder (14.1%), cobble/gravel (10.7%), and bedrock (7.7%) (Graph 5, Appendix A). On the right and left banks, vegetation coverage averaged 80% and 85%, respectively and included brush (39.3%), hardwood trees (36.8%), coniferous trees (21.4%), and grass (2.1%). Approximately 0.4% of the area had no vegetation (Table 9 and Graph 6, Appendix A).

Woody Debris Accumulations

Approximately 70 log jams composed of small and/or large woody debris were identified within the surveyed reach, the majority of which would not impede fish passage or become barriers to upstream migration. In some cases the log jams were retaining sediment upstream while others allowed free passage of stream flow and fish beneath. Two log jams that may be impediments under certain winter flow conditions were located in habitat units 957 and 1050. Habitat unit 957 (stream mile 7.5) was the most significant and, at the time of survey, was possibly the (temporary) upper limit of anadromy. A redwood clump fell into the original channel from the left bank causing the stream flow to divert to, and scour out a new channel on the right bank side by head cutting upstream until it merged with the original channel. The right bank channel is 8 higher than the channel below and the stream is flowing beneath roots and woody debris (Figures 5 and 6). The original channel upstream of the fallen redwoods and head cut section was filled with sand, inundating the lower portions of tree trunks (Figure 7).

Figure 5. Diverted channel in unit 957, San Jose Creek, 2006.

Figure 6. The log jam and small woody debris impediment in unit 957, San Jose Creek, 2006.

Figure 7. The original channel upstream of the log jams in unit 957, San Jose Creek, 2006.

A log jam in habitat unit 1050 (stream mile 8.0) is also problematic for passage. The log jam is 8 feet high, 22 feet long, and spans the width of the channel. Just upstream of the low jam, the channel has aggraded 8 feet. A new channel is starting to scour or head cut into the left side of the creek (Figure 8).

Figure 8. Log jam in unit 1050, San Jose Creek, 2006

Additional Creek Features

One concrete dam and one concrete weir, located in habitat units 156/157 and 748 respectively, were noted during the survey. The dam in unit 156 extends 12 feet into the creek channel from the right bank and is 3.5 feet high with the face of the dam sloped back at a 45 degree angle. Upstream of the dam, the creek channel has aggraded three feet. Fish passage on the left bank side is unaffected (Figure 9).

Figure 9. Concrete dam in units 156 and 157, San Jose Creek, 2006.

In unit 748, a concrete weir spans the 36 foot wide creek channel. The structure has a V-shaped notch that ranges from 7 feet wide at the top to 0.9 feet wide at the bottom. The jump from the stream up to the notch is a 2.1 feet high and the pool below is 2.2 feet deep. Upstream, the channel has aggraded 1.8 feet. The structure is being undermined on the left bank side (Figure 10).

Figure 10. The concrete weir/ flashboard dam in unit 748, San Jose Creek, 2006.

Although no longer present at the time of the survey, two other areas of San Jose Creek had been impounded behind earthen dams before they failed during the winter of 1997-98. The first dam was located at approximately stream mile 4.4 and the impounded area extended several hundred feet upstream (Figure 1). The area that used to be the reservoir now has 8 to 12 foot high vertical banks that are 15 to 20 feet back from the active channel and consist entirely of denuded soil. The riparian zone in front of the banks consist of a dense thicket of even age alder trees.

The second area that used to be impounded was located at stream mile 9.1 (Figure 2). When the dam was in place, it appeared to be approximately 87 feet wide and the channel upstream was excavated to the same width for 80 feet upstream. Beyond the 80 feet, the area would still have been impounded, but the channel was stream-like. More details on this impoundment can be found in the attached sub-section report (Appendix B).

Other features included eleven road crossings. Six of the road crossings were in the lower 8.1 miles that were habitat typed. The road crossings identified in the survey were located in habitat units 148, 154, 177, 453, 526, and 758 and consisted of wet-stream crossings with steep, short approaches. The remaining crossing were upstream of the habitat typed portion and included one bridge, two culvert crossings under Rancho San Carlos Road and two fords (one of which appeared to be abandoned) that had culverts and fill. More details on the latter five crossings can be found in the attached sub-section report (Appendix B).

Sediment Sources

Obvious sources of fine sediment in San Jose Creek included the road crossings and some bank erosion sites, the most significant of which was on a private parcel where all the riparian vegetation was removed (Figure 11). No obvious landslides or other areas of mass land movement were observed.

Figure 11. A bank failure site on San Jose Creek, 2006.

Lagoon

When the survey began on June 21st, San Jose Creek was still flowing to the ocean (Figure 12). Unlike many of the lagoons along the Big Sur coast, the San Jose Creek mouth is not confined by bedrock banks, consequently once the stream flows under the Highway 1 Bridge, the stream flows north for several hundred feet between a substantial sand bar on the west side of the creek and Highway 1 on the east side of the creek before hitting a bank and flowing to the ocean (Figures 13 and 14). It is unknown how the construction of the Highway 1 approaches on the north and south sides of the creek and the Highway 1 Bridge affect lagoon formation, and the opening and closure of the sandbar. However, the creek is quite pinched as it flows under Highway 1 and the only place for a lagoon to form is on the west side of Highway 1 over the sand. By July 15th, the channel west of Highway 1 was dry.

Figure 12. San Jose Creek as it enters the ocean, June 21, 2006.

Figure 13. The wall on the north side of the beach that San Jose Creek hits and turns towards the ocean, June 21, 2006.

Figure 14. The channel that runs between the sand bar on the west side and Highway 1 on the east side, June 21, 2006.

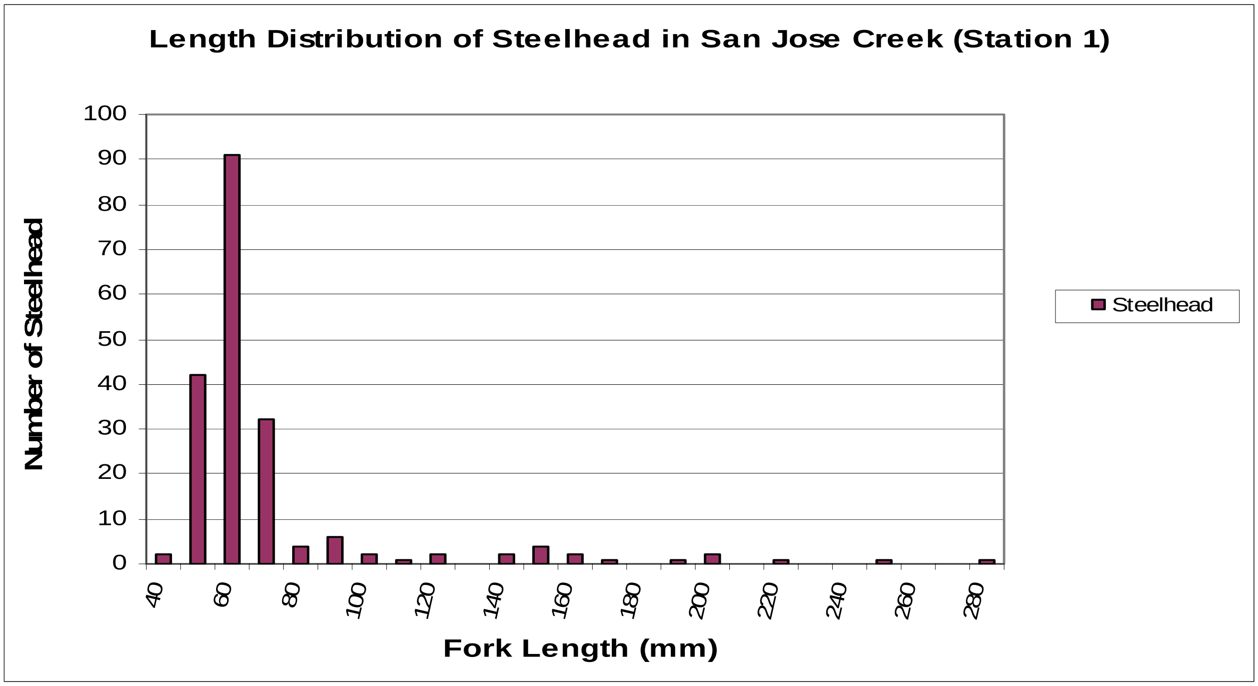
Biological Inventory Results

Results for Station 1

The lower sample site on San Jose Creek was located approximately 0.45 mile upstream from the confluence with the ocean (Figure 1). The site was in a reach of stream that was low gradient, meandering, with riffle pool sequences, substrate consisting primarily of gravel and riparian vegetation consisting of willow. Stream flow on the sampling date (October 18, 2006) was 0.68 cfs and air and water temperatures ranged from 64°F - 69°F and 53°F - 56°F, respectively.

The total survey length was 276 feet and included two mid-channel pools (22% of the length), two runs (20%), two riffles (30%), one dammed pool (16%), and one log scour pool (12%).

A total of 197 steelhead were captured with a calculated abundance of 205 steelhead in station 1. Using the age length criteria described in the methods, 179 of the steelhead captured were considered to be age 0+ with an average fork length of 66 millimeters (range: 46 – 103 mm), nine of the steelhead were age 1+ with an average fork length of 141 millimeters (range: 114 – 157 mm), six of the steelhead were age 2+ with an average fork length of 185 millimeters (range: 166 – 209 mm) and three were age 3+ with an average fork length of 254 millimeters (range: 222 – 285 mm) (Graph 8).



Graph 8. Length frequency distribution of steelhead captured in Station 1, San Jose Creek, October 2006.

Fulton condition factors (K) are a measure of "fitness" or how much mass a fish has relative to its length. Higher numbers indicate better fitness or greater plumpness. Table 10 summarizes the Fulton condition factors for the steelhead captured in Station 1.

Fork Length (mm)	Number of Fish	Weight Range (grams)	Range of Condition Factors (K)	Average Condition Factor
40 - 49	2	1.5 - 2	1.36 - 2.05	1.71
50 - 59	42	1.5 - 3	0.97 - 1.54	1.26
60 - 69	91	2.5 - 4.5	1.04- 1.64	1.23
70 - 79	32	4 - 6.5	1.03- 1.42	1.21
80 - 89	4	6.5 - 8	1.10 - 1.22	1.17
90 - 99	6	7 - 11.5	0.90 - 1.53	1.23
100 - 109	2	11.5 - 12	1.08-1.10	1.09
110 - 119	1	17.5	1.18	1.18
120 - 129	2	21	1.03 - 1.05	1.04
130 -139				
140 - 149	2	34 - 36	1.07 - 1.11	1.09
150 - 159	4	35 - 46.5	0.98-1.2	1.09
160 - 169	2	48 - 59	1.05 - 1.24	1.15
170 - 179	1	54.5	1.05	1.05
180 - 189				
190 - 199	1	83.5	1.08	1.08
200 - 209	2	74.5 - 98	0.92 -1.07	1
210 - 219				
220 -229	1	122	1.12	1.12
230 - 239				
240 - 249				
250 - 259	1	142.5	0.86	0.86
260 - 269				
270 - 279				
280 - 285	1	196	0.85	0.85

Table 10. Condition factors of the steelhead captured in Station 1, San Jose Creek, October 2006.

Twenty-seven of the steelhead captured in this station were infected with *Salmonicula,* a copepod which attaches to the gills, fins, and/or mouth. None of the steelhead captured were beginning to show external characteristics of smolting.

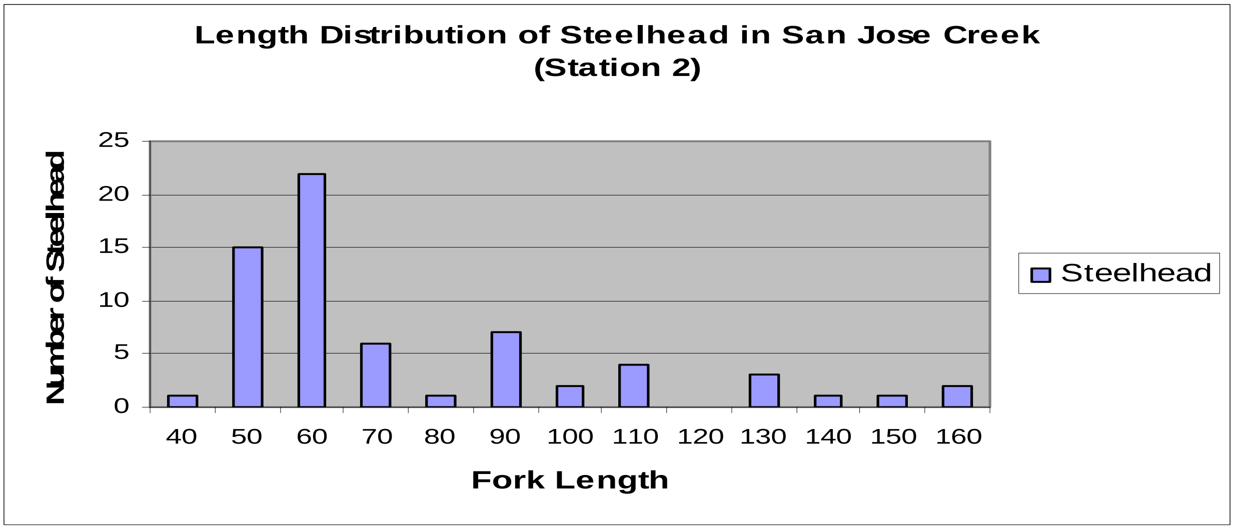
In addition to steelhead, coast range sculpin (*Cottus aleuticus*), prickly sculpin (*Cottus asper*), and stickleback (*Gasterosteus aculeatus*) were also captured.

Results for Station 2

The middle sample site on San Jose Creek was located at stream mile 4.3 at the confluence with Seneca Creek. This site was also located in a reach of stream that was low gradient and meandering, but the habitat consisted of more runs and riffles and the substrate was primarily boulders and large cobble. The riparian vegetation at this site was alder. Stream flow on the date of the sampling (October 17, 2006) was 0.68 cfs and air and water temperatures ranged from 49°F - 59°F and 50°- 54°F, respectively.

The total survey length was 300 feet and included two low gradient riffles (18% of the length), one mid-channel pool (26%), one step run (26%), one high gradient riffle (9%), and one run (21%).

In station two, 65 steelhead were captured with a calculated abundance of 77 steelhead. Fifty-four of the steelhead captured were considered to be age 0+ with an average fork length of 68 millimeters (range: 49 – 102 mm), nine were considered to be age 1+ with an average fork length of 129 millimeters (range: 112 – 153 mm), and two of the steelhead were in the age 2+ category with an average fork length of 168.5 millimeters (range: 168 – 169 mm)(Graph 9).



Graph 9. Length frequency distribution of steelhead captured in Station 2, San Jose Creek, October 2006.

Table 11 summarizes the Fulton condition factors calculated for steelhead captured in Station 2.

Length Range (millimeters)	Number of Fish	Weight Range (grams)	Condition Factor Range (K)	Average Condition Factor
40 - 49	1	1.5	1.27	1.27
50 - 59	15	1.5 - 3	1.01 - 1.54	1.23
60 - 69	22	2.5 - 4.5	1.00 - 1.43	1.19
70 - 79	6	3 - 5.5	0.87 - 1.25	1.09
80 - 89	1	7.5	1.1	1.1
90 - 99	7	8.5 - 10.5	0.98 - 1.18	1.09
100 - 109	2	11.5	1.08 - 1.15	1.12
110 - 119	4	15 - 19.5	1.07 - 1.25	1.15
120 - 129				
130-139	3	23.5 - 28	1.05 - 1.16	1.1
140-149	1	34	1.07	1.07
150-159	1	34.5	0.96	0.96
160-169	2	47.5 -49.5	1.00 - 1.03	1.015

Table 11. Condition factors of the steelhead captured in Station 2, San Jose Creek, October 2006.

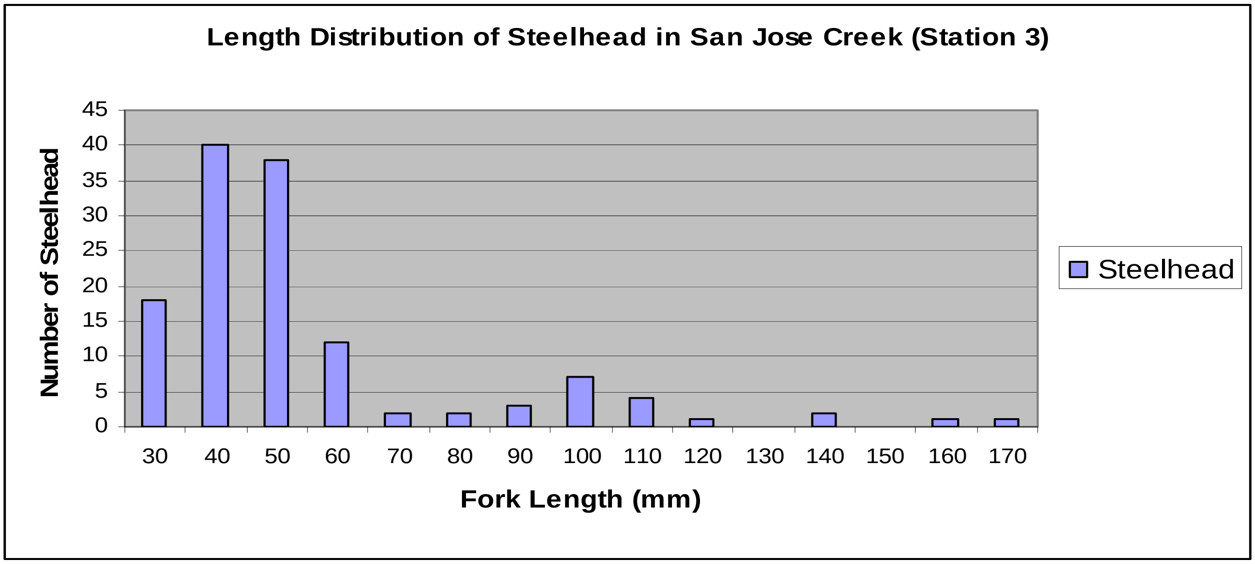
Six of the steelhead captured at this site were infected with *Salmonicula*. None of the steelhead captured at this site were showing external characteristics of smolting. In addition to steelhead, one adult red legged frog (*Rana aurora*) and three signal crayfish (*Pacifastacus leniusculus*) were observed.

Results for Station 3

The upper sample site on San Jose Creek was located at stream mile 7.08, approximately 0.2 mile downstream of the confluence with Williams Canyon Creek. This reach of stream was entrenched with moderate gradient, and predominately fast water habitat (riffles and runs) with infrequently spaced pools. The substrate consisted of boulders and large cobble and the riparian vegetation included redwood and tan oak trees. Stream flow on the day of the sampling (August 15, 2006) was approximately 0.2 cfs and air and water temperatures were 61°F and 53° F, respectively.

The total survey length was 323 feet and included three runs (26% of the length), two low gradient riffles (12%), two mid-channel pools (20%), one step-run (30%), and one corner pool (12%).

At this station, 131 steelhead were captured with a calculated abundance of 157 steelhead. One hundred twenty-one steelhead captured were considered to be age 0+ with an average fork length of 53 millimeters (range: 30 - 105 mm), eight of the steelhead were considered to be age1+ with an average total length of 123 millimeters (range: 106 - 146 mm), and 2 of the steelhead were in the age 2+ category with an average total length of 171 millimeters (range: 168 – 174 mm) (Graph 10).



Graph 10. Length frequency distribution of steelhead captured in Station 3, San Jose Creek, October 2006.

Table 12 summarizes the Fulton condition factors calculated for steelhead captured in Station 3. Because of the questionable accuracy of the scale at such low weights, the eighteen steelhead in the 30 to 39 millimeter range were not weighed.

Fork Length (mm)	Number of Fish	Weight Range (grams)	Condition Factor Range (K)	Average Condition Factor
30 - 39	18			
40 - 49	40	0.5 - 1.5	0.51 - 1.54	1.13
50 - 59	38	1.0 - 2.5	0.55 - 1.42	1.08
60 - 69	12	2.5 - 4.0	1.0 – 1.26	1.16
70 -79	2	3.5 - 4.0	1.02 – 1.12	1.07
80 - 89	2	8.0 – 9.0	1.21 – 1.37	1.28
90 -99	3	10.5 – 13.0	1.26 – 1.38	1.31
100 - 109	7	10.5 - 13.0	11.5 – 19.5	1.18
110 - 119	4	18.5 – 19.5	1.19 – 1.25	1.22
120 - 129	1	20.5	1.13	1.13
130 - 139				
140 - 149	2	36.5 – 38.5	1.20 – 1.24	1.22
150 - 159				
160 - 169	1	54.5	1.15	1.15
170 - 179	1	64	1.21	1.21

Table 13. Condition factors of 113 steelhead captured at Station 3, San Jose Creek, October 2006.

Discussion

From June to November, stream flows were measured at two locations in the lower watershed. In June, flows at the lower site were slightly higher than at the upper site but by late August, flows at the lower site were less than half those measured at the upper site. Although no instream diversions were observed between the upper and lower sites, State Park employee housing, the Carmelite Monastery and the associated Church may obtain their water via wells adjacent to San Jose Creek located between the lower and upper stream flow stations. Well water extraction could affect surface flows, especially at the end of the summer when there is less water available to recharge the aquifer. In addition, the upper stream flow monitoring site was at the upper end of the valley in the redwood zone and the lower site was in the alluvial valley within the willow zone, so different transpiration rates, geology, climatic conditions, and reduced flow from springs throughout the dry season all play a role in reducing stream flow.

Regardless of the mechanism of flow reduction, the impacts are the same. Severe flow reduction reduces rearing space in the pools and lagoon, decreases benthic macro-invertebrate production and delivery of those invertebrates to trout downstream, and can delay or prevent a timely breach of the sandbar if the first rainfall events of the season are absorbed to replenish low aquifers.

Even with low stream flows, water temperatures remained fairly cool throughout the watershed. Because the stream flowed through a narrow valley, it was shaded by the south slope or north facing slope for most of the way so even if tree canopy were sparse or non-existent, the stream remained shaded. The topographic shade, in addition to the numerous springs and perennial tributaries entering higher up in the watershed kept water temperatures relatively cool even when air temperatures were 85˚F.

With the exception of a few areas which may problematic for adult steelhead passage under certain flows, the entire length of San Jose Creek surveyed, could be accessed and used by steelhead. There were steeper boulder sections (B channel) between the confluence of the North Fork San Jose Creek and Williams Canyon Creek, but they were too short to call out as distinct channel types. Consequently the stream channel was predominately low gradient with the lower and upper sections of San Jose Creek connected to the flood plain and the middle section of the channel confined by steep valley walls. Boulders were the primary component in forming pools (both boulder scour and mid-channel pools) and providing cover in the middle section of the creek, even though large and small hardwood and redwood material was abundant and distributed throughout the entire channel. In the lower and upper watershed, pool formation was caused primarily by wood (log or root scour and mid-channel pools confined by wood).

In addition to having abundant wood in the channel, sand was also abundant. A few bank erosion sites, roads, and road crossings were obviously contributing fine sediment, but these few sources could not explain the tremendous amount of sand that was overburdening the system. San Jose Creek had less deposited sand above Seneca Creek confluence and even less above Williams Canyon confluence, yet sand was still a significant substrate component throughout the system. It is thought that San Jose Creek is still recovering from the winter of 1997-98 where earthen dams located at stream miles 4.4 and 9.1 failed, releasing not only the sediment that formed the dams, but also the sediment stored in the reservoirs. During the same winter, several road crossing with culverts and fill failed in Williams Canyon Creek, and debris flows and landslides occurred throughout the watershed, although the latter are not quite as evident on the landscape.

The consequences of the excessive sand deposition included shallow pools and decreased rearing space, degraded spawning areas, reduced surface area for macro benthic invertebrate production, and the formation of dry reaches as flow went sub-surface beneath sand bars. Even though patches of high quality spawning substrate existed throughout the entire length of San Jose Creek, the substrate was consistently better above Williams Canyon Creek confluence and the highest quality spawning habitat existed within, and above the upper reservoir location which may speak to the effect of the impact the failure of that dam and the road crossings in Williams Canyon Creek had on the lower reaches.

The three areas that may be problematic for adult steelhead passage are located at stream miles 2.85 (the boulder/bedrock cascade), 7.5 (log jam), and 8.0 (log jam). The cascade may impede passage at very low or high winter flows, but could be passed during most of the flows experienced during the rainy season. The two log jams are problematic only because they are high in the watershed above most of the significant tributaries and based on the size of the channel, the volume of water flowing over them in the winter may not be sufficient to allow adults to pass under most winter flows. However, based on the high densities of *O. mykiss* observed above both of these log jams, either steelhead make it above these log jams often, or there is a robust resident trout population in the headwaters.

Steelhead densities at the three sites chosen for sampling were variable with 197 steelhead captured at the lower site (1.4 fish per linear foot), 65 at the middle site (0.22 fish per linear foot), and 131 steelhead captured at the upper site (0.4 fish per linear foot). Young-of–the-year or age 0+ were the dominant age class captured at all three locations with 91%, 83%, and 92% of the fish categorized as age 0+ at the lower, middle and upper site. The age 0+ steelhead captured at the upper site were generally smaller with several of them under 40 millimeters in fork length which brought the average length for this age group down to 53 millimeters. The middle and lower sites had similar average fork lengths for age 0+ fish (68 and 66 millimeters, respectively), but densities were three times greater at the lower site.

Older age classes of fish were most abundant at the lower site (18 steelhead) compared to the middle and upper sites (11 and 10, respectively). This was most likely because half of the habitat sampled was pool habitat which accommodates not only more fish, but larger fish as well. Higher numbers of larger fish could also have been because these fish were moving downstream in anticipation of emigrating to the ocean.

In summary, low stream flows and excessive sedimentation were the primary factors in decreasing and degrading spawning and rearing habitat for steelhead. Stream temperatures were well within an acceptable range for rearing steelhead, even higher in the watershed where air temperatures were quite high. Woody material was abundant throughout the entire length of the stream and was serving to store sediment, create pools, and provide cover; however the latter two were only occurring in the upper and lower sections of San Jose Creek. Habitat in the middle section was created by boulders. Patches of high quality spawning gravel were observed in the lower and middle reaches, but gravel quality was consistently higher above the confluence of Williams Canyon Creek. Perennial lagoon habitat is not available in this system

Recommendations Based on the Habitat Typing and Supplemental Report

1) Excessive sediment deposition has reduced and degraded spawning and rearing habitat throughout most of San Jose Creek. Although most of the sediment was deposited or released during the 1997-98 winter storms, there are still active point and non-point sources of sediment contributing to the creek. It is recommended that active and potential sediment sources throughout San Jose Creek watershed be identified, mapped, and prioritized for remediation. The assessments should focus on roads, building sites and other activities in the upper watershed, and landslides.

2) The two significant log jams that were mentioned under the potential impediment section should be surveyed every summer to determine if adult salmonids are still able to pass upstream. If not, and the log jams are not serving the purpose of stabilizing a slide or metering sediment, then CDFG should be contacted for possible modification of the sites.

3) Six wet ford crossings were located within the survey reach. For the two crossings in the upper watershed, the culverts and associated fill should be removed; the approaches rocked, or if the roads are no longer used, re-vegetated. The other four road crossings are used and there may be plans to place bridges at these sites. Bridges usually are the best option and if the abutments and bridge are above flood stage, impacts to the stream are minimal. However, in this case, if the bridges are placed at the current road crossing sites, they are not going to have the height required to pass flood water and wood. With the improved infrastructure, active management of the channel and woody material will occur. If at all possible, maintaining the current configuration and rocking the approaches may be the best solution.

4) Although only two instream diversions were noted during the survey, water is clearly being withdrawn from the system. Water, extracted via wells adjacent to San Jose Creek, may be used for State Park employee housing, the Carmelite Monastery and the church in the lower watershed. Underflow is diverted in the upper section of San Jose Creek by

Rancho San Carlos and water is diverted from Williams Canyon Creek for the Mitteldorf Preserve. It is unknown what diversions may exist on the other perennial creeks that haven't been surveyed. It is highly recommended that a comprehensive flow and/or hydrologic study be conducted to determine a water budget, ideal instream flow requirements for all life history stages of steelhead, and how cumulatively all the diversions are effecting the lagoon.

5) Because lagoons provide high quality rearing habitat for steelhead, in addition to providing a transition zone for migrating adults and smolts, it is recommended that a focused geomorphic and hydrologic study be conducted on the lagoon area to determine what limits lagoon formation and explore options for lagoon restoration.

6) In the middle section of San Jose Creek, all of the trees on both slopes were dead from sudden oak death for approximately 1,000 feet. Because there are no longer viable root systems to hold the soil in place, these very steep slopes are at risk of sliding during intense storm events. It is not known what, if any, management options are available to deal with a large scale forest die-off, but if proactive options are available it is recommended that those actions be implemented.

Level III and Level IV Habitat Types

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8 }
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9 }
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4 }
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5 }
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6 }
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7 }
Dammed Pool	(DPL)	[6.5]	{13}
<u>ADDITIONAL UNIT DESIGNATIONS</u>			
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

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