CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Sexton Creek
Report Revised April 14, 2006
Report Completed 2005
Assessment Completed 2001

INTRODUCTION

A stream inventory was conducted during 7/23/2001 to 7/24/2001 on Sexton Creek. The survey began at the confluence with Jonive Creek and extended upstream 1.8 miles.

The Sexton Creek inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Sexton Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for Chinook salmon, coho salmon, and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Sexton Creek is a tributary to Jonive Creek, is a tributary to Atascadero Creek, is a tributary to Green Valley Creek, is a tributary to the Russian River, located in Sonoma County, California (Appendix A). Sexton Creek's legal description at the confluence with Jonive Creek is T6N R9W S5. Its location is 38.391175821589 N north latitude and 122.879230095337 W west longitude, LLID number 1228792383911. Sexton Creek is a second order stream and has approximately 1.48 miles of blue line stream according to the USGS Camp Meeker 7.5 minute quadrangle. Sexton Creek drains a watershed of approximately 10 square miles. Elevations range from about 157 feet at the mouth of the creek to 646 feet in the headwater areas. Mixed hardwood forest dominates the watershed. The watershed is entirely privately owned and is managed for agriculture. Vehicle access exists via Bodega Road from the north. California freshwater shrimp (*Syncaris pacifica*) has been found in this stream.

METHODS

The habitat inventory conducted in Sexton Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration*

Manual (Flosi et al, 1998). The California Conservation Corps (CCC) Technical Advisors and Watershed Stewards Project/AmeriCorps (WSP/AmeriCorps) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement. All pools except step-pools are fully sampled.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Sexton Creek to record measurements and observations. There are nine components to the inventory form.

1. Flow:

Flow is measured in cubic feet per second (cfs) near the bottom of the stream survey reach using a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both

temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface. Additionally, a recording thermograph was deployed in Sexton Creek from 7/30/01 to10/30/01 to record temperatures on a 24 hour basis during warm summer months.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1990). Habitat units are numbered sequentially and assigned a type identification number selected from a standard list of 24 habitat types. Dewatered units are labeled "dry". Sexton Creek habitat typing used standard basin level measurement criteria. These parameters require that the minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics are measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Sexton Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide juvenile salmonids protection from predation, reduce water velocities so fish can rest and conserve energy, and allow separation of territorial units to reduce density related competition for prey. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Sexton Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

Substrate composition ranges from silt/clay sized particles to boulders and bedrock elements. In all fully-described habitat units, dominant and sub-dominant substrate elements were ocularly estimated using a list of seven size classes and recorded as a one and two, respectively. In addition, the dominant substrate composing the pool tail-outs is recorded for each pool.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*. Canopy density relates to the amount of stream shaded from the sun. In Sexton Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or hardwood trees.

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Sexton Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and rootwads) was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Sexton Creek. In addition, ten sites were electrofished using a Smith-Root Model 12 electrofisher. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Stream Habitat 2.0.14, 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. This program processes and summarizes the data, and produces the following ten tables:

- Riffle, Flatwater, and Pool Habitat Types
- Habitat Types and Measured Parameters
- Pool Types
- Maximum Residual Pool Depths by Habitat Types
- Mean Percent Cover by Habitat Type
- Dominant Substrates by Habitat Type

- Mean Percent Vegetative Cover for Entire Stream
- Fish Habitat Inventory Data Summary by Stream Reach (Table 8)
- Mean Percent Dominant Substrate / Dominant Vegetation Type for Entire Stream
- Mean Percent Shelter Cover Types for Entire Stream

Graphics are produced from the tables using Microsoft Excel. Graphics developed for Sexton Creek include:

- Riffle, Flatwater, Pool Habitat Types by Percent Occurrence
- Riffle, Flatwater, Pool Habitat Types by Total Length
- Total Habitat Types by Percent Occurrence
- Pool Types by Percent Occurrence
- Maximum Residual Depth in Pools
- Percent Embeddedness
- Mean Percent Cover Types in Pools
- Substrate Composition in Pool Tail-outs
- Mean Percent Canopy
- Dominant Bank Composition by Composition Type
- Dominant Bank Vegetation by Vegetation Type

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of 7/23/2001 to 7/24/2001, was conducted by J. Smith and C. Sangiacomo. The total length of the stream surveyed was 9,369 feet with an additional 316 feet of side channel.

Stream flow was not measured on Sexton Creek.

Sexton Creek is a F4 channel type for 9,369 feet of the stream surveyed (Reach 1). F4 channels are entrenched, meandering, riffle/pool channels on low gradients with high width/depth ratios and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 55º to 59ºF. Air temperatures ranged from 60º to 73ºF. Water temperatures were taken with a recording thermograph deployed from 7/30/01 to 10/30/01, every hour and a half and ranged from 49.7ºF to 61.5ºF.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 27% pool units, 54% flatwater units, 4% no survey units, 6% culvert units, 8% riffle units, 2% dry units, (Graph 1). Based on total length of Level II habitat types there were 3% pool units, 62% flatwater units, 26% no survey units, 1% culvert units, 8% riffle units, 0% dry units, (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were 42% Run units, 17% Mid-Channel Pool units, 10% Glide units, 6% Culvert units, 6% Low Gradient Riffle units, 4% Corner Pool units, 4% Plunge Pool units, 4% Not Surveyed units, 2% Lateral Scour Pool - Root Wad Enhanced units, 2% Pocket Water units, 2% Bedrock Sheet units, 2% Dry units, (Graph 3). Based on percent total length: 57% Run units, 26% Not Surveyed units, 8% Low Gradient Riffle units, 3% Pocket Water units, 2% Mid-Channel Pool units, 2% Glide units, 1% Culvert units, 1% Corner Pool units, and 1% Plunge Pool units.

A total of fourteen pools were identified (Table 3). Main Channel pools were the most frequently encountered at 64% (Graph 4), and comprised 59% of the total length of all pools (Table 3).

Table 4 is a summary of maximum residual pool depths by pool habitat types. Pool quality for salmonids increases with depth. Ten of the 13 pools (77%) had a residual depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the twelve pool tail-outs measured, eight had a value of 1 (66.7%); three had a value of 2 (25%); one had a value of 4 (8.3%) (Graph 6). On this scale, a value of 1 indicates the best spawning conditions and a value of 4 the worst. Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate like bedrock, log sills, boulders.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Flatwater habitat types had a mean shelter rating of 13, and pool habitats had a mean shelter rating of 33 (Table 1). Of the pool types, the Main Channel pools had a mean shelter rating of 21, Scour pools had a mean shelter rating of 55 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Undercut Banks are the dominant cover types in Sexton Creek. Graph 7 describes the pool cover in Sexton Creek. Undercut Banks is the dominant pool cover type followed by Bedrock Ledges.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs.

The mean percent canopy density for the surveyed length of Sexton Creek was 94%. The mean percentages of hardwood and coniferous trees were 47.7% and 46.3%, respectively. Six percent of the canopy was open. Graph 9 describes the mean percent canopy in Sexton Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 55%. The mean percent left bank vegetated was 57%. The dominant elements composing the structure of the stream banks consisted of Sand/Silt/Clay (Graph 10). Coniferous Trees was the dominant vegetation type observed in 35.7% of the units surveyed. Additionally, 28.6% of the units surveyed had hardwood trees as the dominant vegetation type, and 25% had brush as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY

On 10/24/01 a biological inventory was conducted at one site on Sexton Creek to document fish species composition and distribution. The site was between Lat. 38:22'40.9", Long. 122:52'29.1" and Lat. 38:22'38.0", Long. 122:52'29.4". Fish from the site were counted by species, and returned to the stream. The air temperature ranged from 66-69ºF and the water temperature ranged from 50-51ºF.

The inventory began at 1200 hours in Reach 1 and ended at 1340 hours. Habitat types surveyed were lateral scour pool - bedrock formed, mid-channel pools, runs and glides. The following table displays the information yielded from this site.

Species Observed	**Numbers Recorded at Site 1**
Steelhead YOY	9
Steelhead Y+	8
Steelhead 2+	8
Sculpin	9
Freshwater Shrimp	2

There is no record of hatchery stocking or fish rescue/transfer operations in Sexton Creek.

DISCUSSION

Sexton Creek is a F4 channel type for 9,369 feet of the stream surveyed (Reach 1). According to the DFG Salmonid Stream Habitat Restoration Manual, the suitability of F4 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders; fair for plunge weirs, single and opposing wing deflectors, channel constrictors, and log cover; and poor for boulder clusters. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

The water temperatures recorded on the survey days 7/23/2001 to 7/24/2001, ranged from 55ºF to 59ºF. Air temperatures ranged from 60ºF to 73ºF. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 62% of the total length of this survey, riffles 8%, and pools 3%. The pools are relatively deep, with ten of the thirteen (77%) pools having a maximum residual depth greater than two feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum residual depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Eleven of the twelve pool tail-outs measured had embeddedness ratings of 1 or 2. One of the pool tail-outs had embeddedness ratings of 3 or 4. None of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Sexton Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Eight of the thirteen pool tail-outs measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 33. The shelter rating in the flatwater habitats was 13. A pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by Undercut Banks in Sexton Creek. Undercut Banks are the

dominant cover type in pools followed by bedrock ledges. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 94%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 55% and 57%, respectively. In areas of stream bank erosion or where bank vegetation is sparse, planting endemic species of coniferous and hardwood trees, in conjunction with bank stabilization, is recommended.

GENERAL RECOMMENDATIONS

Sexton Creek should be managed as an anadromous, natural production stream.

Winter storms often bring down large trees and other woody debris into the stream, which increases the number and quality of pools. This woody debris, if left undisturbed, will provide fish shelter and rearing habitat, and offset channel incision. Landowners should be sensitive about the natural and positive role woody debris plays in the system, and encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

RECOMMENDATIONS

1. Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

2. Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from undercut banks. Adding high quality complexity with woody cover is desirable.

3. Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

4. Sexton Creek would benefit from the utilizing bio-technical vegetative techniques to re-establish floodplain benches and a defined low flow channel. This would discourage lateral migration of the base flow channel and decrease bank erosion.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

Sexton Creek

Position (ft.)	Habitat Unit #	Comments:
0	0001.00	5 YOY
59	0003.00	Not surveyed due to brush
2339	0004.00	Wet trib RB 210' in HU; Dry trib 250' in HU; 15' x 15' EROSION; See field notes(WP 004)
2777	0006.00	Culvert LB 100' in HU; Rip Rap RB 50' long, 125' in HU(WP 006)
3199	0008.00	Wood retaining wall 25' in HU
3564	0010.00	N38°22'55.6"/W12252'30.7"
3642	0011.00	LWD PROTOCOL(OK/2.0/20/B/10)
4302	0014.00	5 YOY Dry Trib LB 200' in HU; Dry Trib 340' in HU LB; WET Trib 360' in HU RB

5065	0020.00	NO GPS
5078	0021.00	LWD PROTOCOL(BA/2/20/C/.3); 5 YOY
5814	0025.00	5 YOY
6037	0027.00	LWD PROTOCOL (HW/1.5/10/B/3); 20 YOY; 5-6" salmonid; dry trib LB
6740	0030.00	5 YOY and 1 1+ and 1 8" salmonid
6767	0031.00	5 YOY
7167	0032.00	Dry Trib 100' LB
7409	0034.00	Dry Trib RB 200' in the HU
8021	0039.00	5 YOY
8039	0040.00	NO GPS
8176	0041.00	1 6-8" Salmonid
8740	0048.00	Dry Trib RB 63'
8901	0051.00	4-5" salmonid

8932	0052.00	Dry Trib LB 210' in the HU; Wet Trib RB 200' in HU; 13' WATER FALL(NO GPS) END OF SURVEY:

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

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Rosgen, D.L., 1994. A Classification of Natural Rivers. Catena, Vol 22: 169-199, Elsevier Science, B. V. Amsterdam.