CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Wine Creek
Report Revised April 14, 2006
Report Completed 2000
Assessment Completed 1998

INTRODUCTION

A stream inventory was conducted during the summer of 1998 on Wine Creek. The inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the amount and condition of available habitat to fish, and other aquatic species with an emphasis on anadromous salmonids in Wine Creek. The objective of the biological inventory was to document the salmonid and other aquatic species present and their distribution.

The objective of this report is to document the current habitat conditions, and recommend options for the potential enhancement of habitat for 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

Wine Creek is a tributary to Grape Creek which flows into Dry Creek, a tributary of the Russian River, located in Sonoma County, California (see Wine Creek map, page 2). The legal description at the confluence with Grape Creek is T9N, R10W, S3. Its location is 38°39'20" N. latitude and 122°56'44" W. longitude. Year round vehicle access exists from Highway 101 near Healdsburg, via Westside Road.

Wine Creek and its tributaries drain a basin of approximately 1.5 square miles. Wine Creek is a second order stream and has approximately 2.8 miles of blue line stream, according to the USGS Geyserville 7.5 minute quadrangle. Summer flow was measured as approximately 0.14 cfs at 202 feet from the mouth on August 6, 1998 and was measured as approximately 0.10 cfs on August 17, 1998. Elevations range from about 180 feet at the mouth of the creek to 800 feet in the headwaters. Wine Creek originates in mountainous terrain and flows southeast where it joins Grape Creek. The upper section flows through a moderately steep-sided V-shaped canyon, while the lower section flows through rolling hills bordered by vineyards and some grasslands. The common riparian vegetation of this stream includes, alder, bay, buckeye, oak, maples, poison oak, berries, stinging nettle as well as some redwood and Douglas fir on the northern slopes. The watershed is entirely privately owned and is primarily managed for vineyard development and rural residential.

METHODS

The habitat inventory conducted in Wine Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). The AmeriCorps Volunteers 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 and was supervised by Bob Coey, Russian River Basin Planner (DFG).

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 Wine Creek to record measurements and observations. There are nine components to the inventory form: flow, channel type, temperatures, habitat type, embeddedness, shelter rating, substrate composition, canopy, and bank composition.

1. Flow:

Flow is measured in cubic feet per second (cfs) at the bottom of the stream survey reach using standard flow measuring equipment, if available. In some cases flows are estimated. Flows were also measured or estimated at major tributary confluences.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 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.

3. Temperatures:

Water and air temperatures, and time, are measured by crew members with hand held thermometers and recorded at each tenth unit typed. Temperatures are measured in Fahrenheit at the middle of the habitat unit and within one foot of the water surface. Temperatures are also recorded using remote Temperature recorders which log temperature every two hours, 24 hours/day.

4. Habitat Type:

Habitat typing uses the 24 habitat classification types defined by McCain and others (1988). 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". Wine 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 unit lengths were measured, additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were completely sampled (length, mean width, mean depth, maximum depth and pool tail crest depth). All measurements were in feet to the nearest tenth.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out reaches is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Wine Creek, embeddedness was visually estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4) or "not suitable" (value 5) was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, having a bedrock tail-out, or other considerations.

6. Shelter Rating:

Instream shelter is composed of those elements within a stream channel that provide 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. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All shelter is then classified according to a list of nine shelter types. In Wine Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the shelter. The shelter rating is calculated for each habitat unit by multiplying shelter value and percent covered. 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 measured habitat units, dominant and sub-dominant substrate elements were visually estimated using a list of seven size classes.

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the California Salmonid Stream Habitat Restoration Manual, 1998. Canopy density relates to the amount of stream shaded from the sun. In Wine 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 visually into percentages of evergreen or deciduous trees.

9. Bank Composition:

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 Wine Creek, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully measured unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. Biological inventory is conducted using one or more of three basic methods: 1) stream bank observation, 2) underwater observation, 3) electrofishing. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE IV data entry program developed CDFG. This program processes and summarizes the data, and produces the following tables and appendices:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Shelter by habitat types
- Dominant substrates by habitat types
- Vegetative cover and dominant bank composition
- Fish habitat elements by stream reach

Graphics are produced from the tables using Lotus 1,2,3. Graphics developed for Grape Creek include:

- Level II Habitat Types by % Occurrence and % Total Length
- Level IV Habitat Types by % Occurrence
- Pool Habitat Types by % Occurrence
- Maximum Depth in Pools
- Pool Shelter Types by % Area
- Substrate Composition in Low Gradient Riffles
- Percent Cobble Embeddedness by Reach
- Mean Percent Canopy
- Mean Percent Canopy by Reach
- Percent Bank Composition and Bank Vegetation

HISTORICAL STREAM SURVEYS:

The Department of Fish and Game conducted a survey of Wine Creek on May 5 and 6, 1976. This survey was a complete survey that started at the mouth and ended 0.7 miles from the headwaters. The estimated flow on the survey days was approximately 1/4 cfs. The water temperatures ranged from 53°F to 54°F and the air temperatures ranged from 63°F to 68°F.

The substrate consisted of 10% boulders, 20% cobble, 30% gravel, and 40% sand and silt in the lower section and 25% bedrock, 10% boulders, 20% cobble, 15% gravel, and 30% sand and silt in the upper section. The lower section appeared to have 20% suitable habitat for the spawning of steelhead and the upper section contained approximately 25% suitable spawning habitat. The pool to riffle ratio was 2:1 in the lower section and 1:1 in the upper section. Shelter was considered good in the lower section and excellent in the upper section. Boulders, brush piles, undercut banks, and overhanging vegetation provided the shelter.

HABITAT INVENTORY RESULTS

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

The habitat inventory of August 6 - September 1, 1998 was conducted by Marc Miller, Dez Mikkelsen, Simone Watts (AmeriCorps), and Stephanie Carey (CDFG) with supervision and analysis by CDFG. The survey began at the confluence with Grape Creek and extended up Wine Creek to the end of survey from several possible natural barriers downstream. The total length of the stream surveyed was 12089 feet, with an additional 34 feet of side channel.

A flow of 0.14 cfs was measured August 6, 1998 at 202' above survey start with a Marsh-McBirney Model 2000 flowmeter. A flow of 0.10 cfs was measured at approximately the same location on August 17, 1998.

This section of Wine Creek has 8 channel types: from the mouth to 3508 feet an F4; next 907 feet an F3; next 1749 feet a B3; next 389 feet a B2; next 346 feet a B1; next 1884 feet a B4; next 1011 feet a G3 and the upper 2295 feet a G4.

F4 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly gravel substrate. F3 channel types are similar but have a predominately cobble substrate.

B3 channel types are moderately entrenched, moderate gradient (2-4%), riffle dominated channels, with infrequently spaced pools, a very stable plan and profile, stable banks and have a predominantly gravel substrate. B2, B1, and B4 channel types are similar but have different predominate substrates: B2 is mainly boulder; B1 is mainly bedrock; and B4 is mainly gravel.

G3 channel types are characterized as well entrenched "gully" step-pool channels with a low width/depth ratio, a moderate gradient (2-4%) and a predominantly cobble substrate. G4 channel types are similar but have a predominately gravel substrate.

On September 17, 1998, the habitat typing survey of Wine Creek was stopped at a falls located at habitat unit #224. Steelhead have not been seen spawning above falls by landowners, although some 0+ and 1+ salmonids were observed in pools in this area which may be production from resident trout. The channel type continues as a G4 for the next several hundred feet through the steep canyon

surrounded by dense vegetation. Above the G4 channel type, the channel exhibits F3 characteristics with the channel consisting of steep, eroding banks. Approximately 440 feet above habitat unit #224, where a tributary enters Wine Creek, the channel changes into a G1 channel type with several six to eight foot bedrock waterfalls. In an upper pool, 0+ and 1+ salmonids were observed. No fish were seen above this point. At approximately 1440 feet from habitat unit #224, the channel starts changing into an A2 channel type which consists of steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly boulder substrate. The water temperature was 62°F at this location. There is a large reservoir located in the headwaters of Wine Creek which leaks and is probably responsible for water running year round in the upper reaches of Wine Creek.

Water temperatures ranged from 60°F to 67°F. Air temperatures ranged from 61°F to 88°F. Summer temperatures were also measured using a remote temperature recorder placed in a pool (see Temperature Summary graph at end of report). A recorder placed approximately 5 feet downstream of a culverted road crossing in Reach 3 logged temperatures every 2 hours from July 13 - September 22, 1998. The highest temperature recorded was 67°F in July and the lowest was 57°F in September.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 42% pool units, 32% flatwater units, and 21% riffle units. Based on total length there were 47% flatwater units, 28% pool units, 19% riffle units, (Graph 1).

Two hundred-thirty four habitat units were measured and 29% were completely sampled. Fourteen Level IV habitat types were identified. The data is summarized in Table 2. The most frequent habitat types by percent occurrence were low gradient riffles at 20%, runs 19%, mid-channel pools 14% and root wad scour pools 11% (Graph 2). By percent total length, runs made up 21%, low gradient riffles 15%, glides 13%, and step runs 12%.

Ninety-nine pools were identified (Table 3). Scour pools were most often encountered at 57%, and comprised 42% of the total length of pools (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Thirty-nine of the 99 pools (39%) had a depth of two feet or greater (Graph 4). These deeper pools comprised 12% of the total length of stream habitat.

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. Pool types had the highest shelter rating at 40. Riffle had the lowest rating with 18 and flatwater rated 34 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 44, main channel pools rated 34, and backwater pools rated 15 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were undercut banks at 48%, root masses 27%, terrestrial vegetation 9%, and small woody debris 6%. Graph 5 describes the pool shelter in Wine Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in six of the nine low gradient riffles measured. Small cobble was dominant in none of the low gradient riffles (Graph 6).

No mechanical gravel sampling was conducted in 1998 surveys due to inadequate staffing levels.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 91 pool tail-outs measured, one had a value of 1 (1%); twelve had a value of 2 (13%); thirty two had a value of 3 (35%); and twenty seven had a value of 4 (30%). Nineteen (21%) riffles rated a 5 (unsuitable substrate type for spawning). On this scale, a value of one is best for fisheries. Gravel was the dominant substrate observed at pool tail-outs.

The mean percent canopy density for the stream reach surveyed was 89%. The mean percentages of deciduous and evergreen trees were 41% and 59%, respectively. Graph 8 describes the canopy for the entire survey.

For the entire stream reach surveyed, the mean percent right bank vegetated was 62% and the mean percent left bank vegetated was 66%. For the habitat units measured, the dominant vegetation types for the stream banks were: 42% brush, 27% evergreen trees, 24% deciduous trees, 7% grass and 0% bare soil. The dominant substrate for the stream banks were: 80% silt/clay/sand, 9% bedrock, 8% cobble/gravel and 3% boulder (Graph 10).

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

In the May 1976 survey, no fish were observed in the lower section. In the upper section, 0+ and 1+ steelhead were observed at a rate of approximately 5 to 10/100' along with one sculpin. Yellow-legged frogs and tadpoles were also observed during the survey.

On September 22, 1998 a recent biological inventory was conducted in four sites of Wine Creek to document the fish species composition and distribution. Each site was single pass electrofished using one Smith Root Model 12 electrofisher. Fish from each site were counted by species, and returned to the stream. The air temperature was 60°F and the water temperature was 61°F. The observers were Dez Mikkelsen, Simone Watts (AmeriCorps) and Bob Coey (DFG).

The inventory of Reach 1 started at culvert #2 and continued for approximately 431 feet. The creek was dry downstream of the culvert. Upstream of the culvert, in run habitat types, 55 0+ and 33 1+ steelhead were observed along with 27 sculpin.

The inventory of Reach 1 was continued beginning 50 feet downstream of culvert #6 and ending approximately 50 feet upstream. In run habitat types 19 0+, 6 1+, and 1 2+ steelhead were observed along with 30 sculpin.

The inventory of Reach 1 was continued beginning at culvert #6 and ending approximately 600 feet upstream. In pool and run habitat types 12 0+, 4 1+, and 2 2+ steelhead were observed along with 3 coho, 18 sculpin, and 1 bullfrog. After completing this survey, a few more pools in Reach 1 were spot checked. In pool habitat types 5 1+ and 6 2+ steelhead were observed along with 2 crayfish.

During the inventory of Reach 3, in run habitat types, 6 0+ and 4 1+ steelhead were observed along with one sculpin and one pacific giant salamander. In several deep pools below culverts and other plunge pools located in Reach 3, many 2+ and 1+ steelhead were observed along with some 0+ steelhead.

During the habitat inventory, no salmonids were observed upstream of unit #199 where a 3' culvert (inlet end smashed) appears to impede passage. However, fish were observed upstream of this partial barrier during a general foot survey of the upper reaches of Wine Creek.

A summary of historical and recent data collected appears in the table below.

Table 1. Species Observed in Historical and Recent Surveys

YEARS	SPECIES	SOURCE	Native/Introduced
1998	Coho	DFG	N
1976, 1998	Steelhead	DFG	N
1976, 1998	Sculpin	DFG	N
1998	Pacific Giant Salamander	DFG	N
1998	Crayfish	DFG	N
1976	Yellow-legged Frog	DFG	N
1998	Bullfrog	DFG	I

Historical records reflect that no hatchery stocking has occurred in the watershed. However, it was noted in the May 1976 survey that a conversation with a local resident indicated that trout were planted in the upper portions of Wine Creek approximately 1.3 miles from the mouth. This planting was carried out as part of the County fish rescue program. Also, part of the fish rescue operations carried out by the Department of Fish and Game in the early 1950's involved 1,000 young steelhead rescued each year from Wine Creek and stocked in other waters.

ADULT SURVEYS:

In the May 1976 survey, three barriers were observed. The first two barriers consisted of two 48 inch

circular culverts approximately 12 feet long. Both culverts posed an approximate 1 1/2 foot barrier to the upstream movement of fish. The third barrier was an area on the west fork of Wine Creek where a caterpillar had filled with dirt a 10-foot section of the creek. The dirt fill completely blocked surface stream flow and diverted the creek water underground. The fill appeared to be used to create a swimming pool area above. This was noted to also be a potential sediment problem when the winter flows arrive and move the sediment downstream. No pollution was readily observed in the lower section. One inactive diversion was also noted during the survey.

No spawning/carcass survey was conducted in 1998/1999 due to inadequate staffing levels.

DISCUSSION

Wine Creek has eight channel types: F4, F3, B3, B2, B1, B4, G3 and G4. There are 3508 feet of F4 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, F4 channel types are good for bank-placed boulders and fair for low-stage weirs, single and opposing wing-deflectors, channel constrictors and log cover.

There are 907 feet of F3 channel type in Reach 2. F3 channel types are good for bank-placed boulders as well as single and opposing wing-deflectors. They are fair for low-stage weirs, boulder clusters, channel constrictors and log cover.

There are 1749 feet of B3 channel type in Reach 3 and 1884 feet of B4 channel type in Reach 6. B3 and B4 channel types are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors and log cover. They are also good for medium-stage plunge weirs.

There are 389 feet of B2 channel type in Reach 4. B2 channel types are excellent for low and medium-stage plunge weirs, single and opposing wing deflectors and bank cover.

There are 346 feet of B1 channel type in Reach 5. B1 channel types are excellent for bank-placed boulders and bank cover and good for log cover.

There are 1011 feet of G3 channel type in Reach 7 and 2295 feet of G4 channel type in Reach 8. G3 and G4 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

Many site specific projects can be designed within the F and B channel types of Reaches 1 to 6, especially to increase pool frequency, volume and shelter.

The water temperatures recorded on the survey days August 6 - September 1, 1998 ranged from 60°F to 67°F. The upper water temperatures, if sustained, are above the threshold stress level (65°F) for salmonids. Air temperatures ranged from 61°F to 88°F. The warmer water temperatures were recorded in Reach 6.

Summer temperatures measured using a remote temperature recorder placed in a pool ranged from 57° to 67°F. The Temperature Summary graph shows that for much of the summer (July through August) the lower watershed exhibited temperatures near optimal for salmonids.

Pools comprised 28% of the total length of this survey. In first and second order streams a primary pool is defined to have a maximum 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. In Wine Creek, the pools are relatively shallow, with 39% having a maximum depth of at least 2 feet. These pools comprised 12% of the total length of stream habitat. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat length.

The mean shelter rating for pools was 40. However, a pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by undercut banks (48%), root masses (27%), terrestrial vegetation (9%), and small woody debris (6%). Log and root wad cover in the pool and flatwater habitats would improve both summer and winter salmonid habitat. Log cover provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Six of the nine low gradient riffles measured (67%) had either gravel or small cobble as the dominant substrate. This is generally considered fair for spawning salmonids.

Sixty-five percent of the pool tail-outs measured had embeddedness ratings of either 3 or 4. Only 1% had a rating of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead. In a reach comparison, Reach 1 had the best ratings and Reaches 5 and 6 had the poorest ratings. Reach 4 is unsuitable for spawning due to the natural geomorphology of the reach.

The higher the percent of fine sediment, the lower the probability that eggs will survive to hatch. This is due to the reduced quantity of oxygenated water able to percolate through the gravel, or because of fine sediment capping the redd and preventing fry emergence. In Wine Creek Reaches 2, 3, 5, and 6 sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean percent canopy for the survey was 89%. This is very good, since 80 percent is generally considered desirable. However, the riparian buffer is thin or nearly absent in areas with agriculture development (Reach 1). Riparian removal and vineyard development within the riparian corridor could all lead to less stream canopy and channel incision causing bank erosion and higher water temperatures.

SUMMARY

Biological surveys were conducted to document fish distribution and are not necessarily representative of population information. Steelhead were documented consistently during each past survey year and coho only intermittently. This is likely because physiological and environmental

requirements for coho are more stringent than for steelhead, or coho were absent or present only in small numbers in some years. The 1998 surveys documented 0+ fish indicating successful spawning in the lower and middle reaches of Wine Creek. However, few 0+ fish were observed in the upper reaches indicating migration problems mid-watershed. Suitable habitat exists above the culvert barrier for steelhead rearing should it be improved. Overall, habitat conditions for both steelhead and coho have declined over time.

The best spawning habitat in the watershed exists within the middle portion of Wine Creek. The best rearing habitat in the watershed exists within the middle and upper portions of Wine Creek.

In Reach 1 spawning and rearing habitat quality diminishes due to the effects of eroding stream banks, lack of riparian habitat, and increased temperatures and nutrient runoff from agriculture.

Portions of reach 1 has been channelized and levied, thus stream velocity has increased resulting in streambank erosion and loss of mature riparian. Little riffle habitat exists for spawning, and what does exist is unsuitable for spawning due to high gravel embeddedness. The unstable banks and effects of channelization in these reaches limits instream habitat improvement alternatives, although some opportunity exists. Any work considered in these reaches will require careful design, placement, and construction that must include protection for the unstable banks and high stream velocities.

Upstream of Reach 1 conditions are better. In upper reaches, spawning and rearing habitat exists, canopy shading is higher, although instream shelter is still lacking and stream bank erosion is prevalent due to channel down-cutting. However, many opportunities and alternatives exist for habitat improvement due to the more stable channel type.

GENERAL MANAGEMENT RECOMMENDATIONS

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

Recent winter storms brought down many large trees and other woody debris into the stream, which increased the number and quality of pools since the drought years. 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 are encouraged not to remove woody debris from the stream, except under extreme buildup and only under guidance by a fishery professional.

PRIORITY FISHERY ENHANCEMENT OPPORTUNITIES

1) Access for migrating salmonids is an ongoing potential problem in Reach 2, therefore, fish passage should be monitored, and improved where possible. The road culvert (culvert #7) is undermining and is a fish barrier at most flows. Eventually this culvert will have to be replaced. Future design should include improved passage of gravel and fish passage as a priority. An arched culvert is recommended at this location. There is one log debris

accumulation present on Wine Creek that has the potential for being a barrier (located at habitat unit #196). Modification must be done carefully to preserve existing habitat provided by the woody debris.

2) In Wine Creek, active and potential sediment sources related to the road system need to be mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

3) Spawning gravels on Wine Creek are limited to relatively few reaches (middle reaches). Structures to decrease channel incision (vortex and boulder weirs) and recruit spawning gravel (using gravel retention structures), should be installed to trap, sort and expand redd distribution in the stream (particularly in Reach 1).

4) In combination with grade stabilizers (boulder weirs), reach 1 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.

5) Increase the canopy on Wine Creek by planting willow, alder, redwood, and Douglas fir (non-pierce's disease host species) along the stream where shade canopy is not at acceptable levels (Reach 1). In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

6) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing shelter is from vegetation and undercut banks. Adding high quality complexity with larger woody cover is desirable. Combination cover/scour structures constructed with boulders and woody debris would be effective in many flatwater and pool locations in the upper reaches.

7) Where feasible, design and engineer pool enhancement structures (boulder weirs) to increase the number of pools in the upper reaches.

PROBLEM SITES AND LANDMARKS - WINE CREEK SURVEY COMMENTS

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

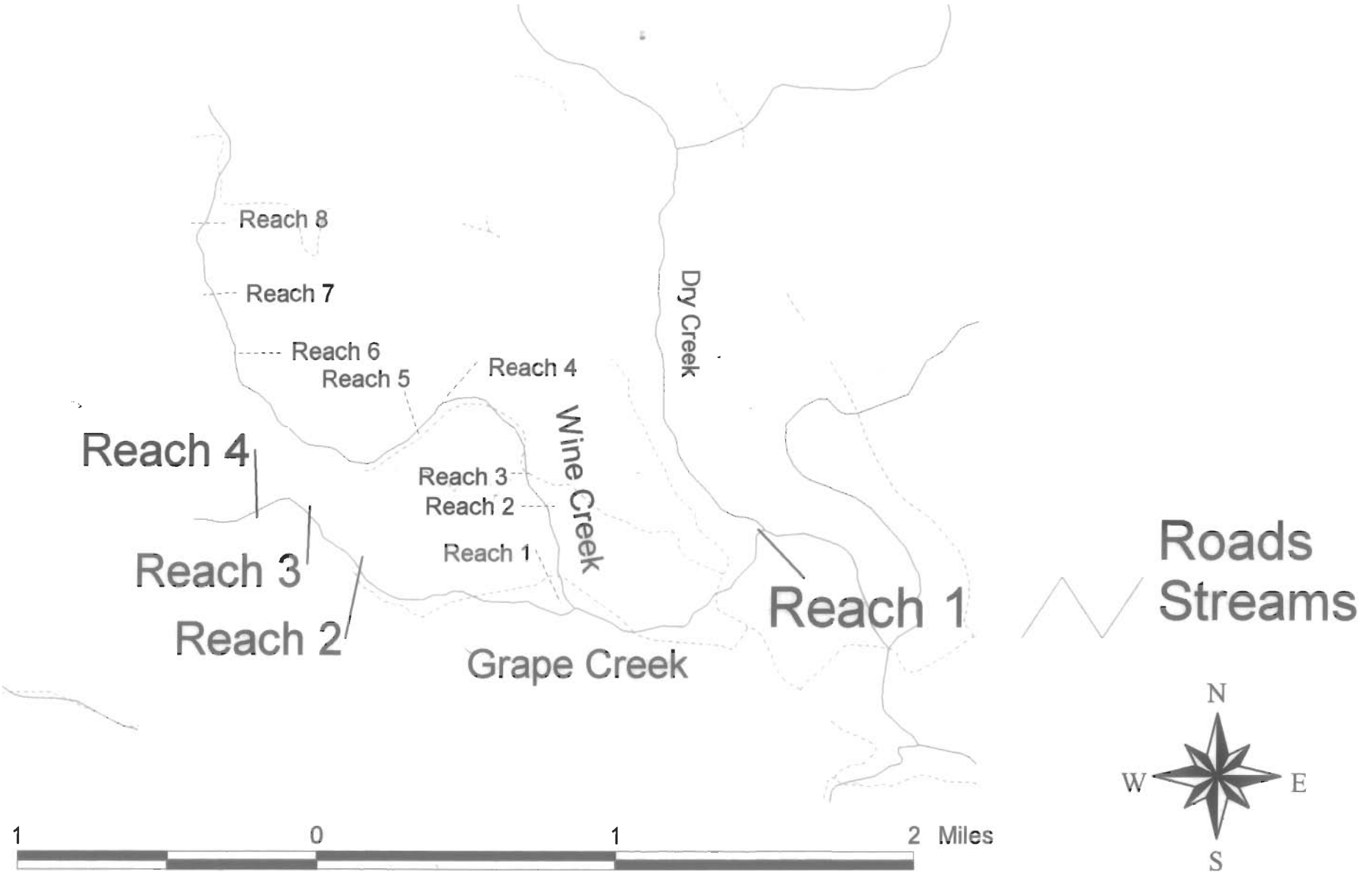
Habitat Unit #	Stream Length(ft)	Comments
Reach 1		
1.00	61	Begin habitat unit #48 from Grape Creek.
3.00	278	31’ into unit water line 2" PVC over creek. 0+ (7) SHD
4.00	289	0+ SHD

5.00	463	Trib RB 0+, 1+ SHD
8.00	559	0+ (8) SHD
9.00	721	Culvert #1 (see sheet) (20) 0+ SHD
10.00	757	Bridge/box culvert #2
11.00	986	Rock wall RB for winery. riparian removed. culvert LB, see sheet
13.00	1634	Vineyards adjacent to creek
15.00	1713	Culvert RB no riparian LB weeds only
16.00	2113	NO ACCESS-map wheeled
18.00	2279	Vineyards supplies stored aboveRB
20.00	2342	Irrigation pipe across stream-7' above bank
22.00	2411	1 & 0+ SHD; Vineyards both sides of creek
24.00	2476	*Periwinkle* cover LB
31.00	2748	Culvert RB see sheet. Only 2/3 riparian trees. 6 0+SHD
33.00	2801	*Perwinkle*, Himalayan blackberry.
36.00	2898	Culvert LB (another 12")
40.00	3021	Rip-rap RB. boulders dumped instream. One alder only tree in unit
42.00	3140	Bullfrog (6)
43.00	3172	Residence RB
45.00	3259	Deer fencing RB falling in
46.00	3284	New vineyards being installed LB
47.00	3316	Cars parked above RB on residence
48.00	3344	Him. blackberries cover RB
50.00	3397	culvert #6
51.00	3446	Vineyards end, area becomes wooded-bay
53.00	3508	Residence RB 2 SHD
Reach 2		
54.00	3567	Substrate change to F3. Footbridge
57.00	3834	Redwoods. residence RB
58.00	3883	Dry trib LB at top of unit
59.00	3902	English Ivy LB
60.00	3971	Fotbridge over creek
61.00	4303	Road RB 20' upstream. Footbridge and residences. English ivy both banks, Periwinkle, bamboo LB
Reach 3		
66.00	4415	Locals say unit used as otter den; 5.5' plunge to pool
70.00	4690	Culvert #7
71.00	4832	7" culvert RB
72.00	4852	Creek runs between 2 roads (approx. 10') very small amount of riparian vegetation-through unit 80
80.00	5186	Row of old metal posts used at LB to stabilize banks
82.00	5244	Old stairs RB
84.00	5279	4" diversion pipe LB-bucket acting as a server
89.00	5623	Hung flag-end of day
90.00	5661	Dirt road RB. Very dusty-across road is sliding hillside

99.00	6046	Unknown fish seen.
100.00	6066	Wet trib #1 LB. Unknown fish
101.00	6164	Dead crawdad
Reach 4		
102.00	6196	Picture taken #6 B3-B2
106.00	6448	Photo #7
107.00	6553	Dry side channel on LB
Reach 5		
108.00	6859	Bedrock substrate shallow pools with rock sheet. photo #8. Channel change to B1
109.00	6883	Pool created by culvert
110.00	6899	So far no newts have been seen in entire stream/culvert #8
Reach 6		
111.00	6918	Channel change back to B4
117.00	7260	Footbridge
118.00	7298	(2) 0+.
120.00	7379	Crawdad. photo #12. Several fish 1' long. Culvert #9
127.00	7545	House abandoned LB
131.00	7691	1st. salamander/newt
132.00	7704	Footbridge
133.00	7729	Ladder into stream; 4-6' undercut banks; cement box gathering spring water; dry trib LB
134.00	7857	Dirt rd. immediately 10' up RB
133.00	7932	Unstable bank below rd. LB- need of repair
138.00	8196	Bridge This unit has been cleared of vegetation. Him. Blackberries make most of vegetation some willow, spice bush. Rip-rap @ RB for approx. 10'
140.00	8276	Nice pool
150.00	8534	Small footbridge over creek. Small house
155.00	8676	Small footbridge creating scour. Bridge=undercut bank
157.00	8730	Bridge #2
158.00	8783	At top of unit 1' high board dam (1 plank)
Reach 7		
159.00	8842	Human-made glide B4-G3
160.00	8878	Small oriental footbridge
161.00	8978	Pool used summertime dam and recreation. Dock on side with boat. Fish present. Dirt rd LB 10' up, may be contributing sediment
166.00	9326	LB is eroding possibly due to above RD
172.00	9771	Dry trib. RB
Reach 8		
173.00	9794	Old animal carcass above RB
178.00	10118	Fish. House above RB. Pipe hanging above creek.
180.00	10232	Dam at bottom of unit. Small waterfall at top. Fish observed. Dry trib

		RB. Water not flowing over top of dam
184.00	10405	Pair of pileated wood peckers sighted
185.00	10420	Good canopy provided from redwoods
191.00	10557	Possible substrate change dry trib at LB
194.00	10735	Landslide LB 25' X 26' X 5'
196.00	10889	See debris jam sheet trees marked for logging within 25' of creek-marked unit #196 through #204
198.00	11203	Changes in substrate, vegetation, much of banks are heavily downcut (10'-15'), and eroding as well. Invasive plants (broom) . Logging access road, LB-trees falling into creek due to erosional slumping. Marsh type grass, both banks.
216.00	11868	"Y" in creek where 2 tribs. meet. LB is quite overgrown, will check later. Bridge #3
218.00	11917	Seen no fish since culvert in unit# 199.
220.00	11968	Spring LB
221.00	11988	The trees that provide the canopy are slated for logging.
223.00	12028	Downcutting severe-steep 10' vertical banks
224.00	12089	**END OF HABITAT TYPING SURVEY**
		General observations made for upper reach

Grape\ Wine Creek Habitat Inventory



Wine Creek

Drainage: Grape Creek, Dry Creek, Russian River

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES

Survey Dates: 08/06/98 to 09/01/98

Confluence Location: QUAD: Geyserville LEGAL DESCRIPTION: T09NR10WS03 LATITUDE: 38°39'20" LONGITUDE: 122°56'44"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	ESTIMATED TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
50	9	RIFFLE	21	46	2299	19	5.0	0.3	403	20137	146	7298	193	18
76	17	FLATWATER	32	75	5696	47	5.2	0.4	626	47551	304	23088	0	34
99	43	POOL	42	35	3453	28	6.8	1.1	231	22874	273	27039	215	40
9	0	CULVERT	4	75	675	6	4.8	0.7	136	1224	151	1361	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
234	69	12123	91785	58786

Wine Creek.

Drainage: Grape Creek, Dry Creek, Russian River

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS

Survey Dates: 08/06/98 to 09/01/98

Confluence Location: QUAD: Geyserville LEGAL DESCRIPTION: T09NR10WS03 LATITUDE: 38°39'20" LONGITUDE: 122°56'44"

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
47	7	LGR	20	39	1834	15	5	0.2	0.8	250	11728	63	2948	0	19	84
2	1	HGR	1	80	159	1	5	0.3	0.7	257	513	77	154	0	0	95
1	1	CAS	0	306	306	3	7	0.5	1.7	1928	1928	964	964	193	30	90
20	7	GLD	9	82	1633	13	6	0.5	1.3	866	17320	438	8761	0	50	97
45	7	RUN	19	57	2586	21	4	0.3	1.4	286	12870	95	4296	0	23	88
11	3	SRN	5	134	1477	12	5	0.5	1.7	971	10677	546	6006	0	25	90
32	10	MCP	14	31	994	8	6	1.1	3.7	179	5729	203	6510	159	36	90
9	5	STP	4	90	809	7	5	0.9	2.4	511	4597	493	4441	351	23	89
8	6	CRP	3	31	244	2	7	1.0	2.6	219	1748	215	1721	173	24	71
1	1	LSL	0	26	26	0	6	0.7	1.5	156	156	109	109	47	45	100
25	5	LSR	11	24	597	5	7	0.8	2.9	167	4169	137	3437	96	44	96
13	8	LSBk	6	31	400	3	7	1.1	3.3	216	2803	259	3370	211	25	96
9	6	PLP	4	22	197	2	9	1.9	5.0	205	1848	439	3953	397	91	88
2	2	DPL	1	93	186	2	12	1.7	4.4	1137	2274	2003	4006	2850	15	81
9	0	CUL	4	75	675	6	5	0.7	0.7	136	1224	151	1361	0	0	78

TOTAL UNITS	TOTAL UNITS		LENGTH (ft.)		AREA (sq.ft)	TOTAL VOL. (cu.ft)
234	69		12123		79585	52039

Wine Creek

Drainage: Grape Creek, Dry Creek, Russian River

Table 3 - SUMMARY OF POOL TYPES

Survey Dates: 08/06/98 to 09/01/98

Confluence Location: QUAD: Geyserville LEGAL DESCRIPTION: T09NR10WS03 LATITUDE: 38°39'20" LONGITUDE: 122°56'44"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
41	15	MAIN	41	44	1803	52	5.9	1.1	240	9846	257	10531	192	34
56	26	SCOUR	57	26	1464	42	7.2	1.1	190	10659	219	12292	179	44
2	2	BACKWATER	2	93	186	5	12.0	1.7	1137	2274	2003	4006	2850	15

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
99	43	3453	22779	26829

Wine Creek

Drainage: Grape Creek, Dry Creek, Russian River

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES

Survey Dates: 08/06/98 to 09/01/98

Confluence Location: QUAD: Geyserville LEGAL DESCRIPTION: T09NR10WS03 LATITUDE: 38°39'20" LONGITUDE: 122°56'44"

UNITS MAX DPTH MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
31	MCP	31	0	0	22	71	6	19	3	10	0	0
7	STP	7	0	0	5	71	2	29	0	0	0	0
8	CRP	8	0	0	3	38	5	63	0	0	0	0
1	LSL	1	0	0	1	100	0	0	0	0	0	0
25	LSR	25	1	4	17	68	7	28	0	0	0	0
12	LSBk	12	0	0	4	33	7	58	1	8	0	0
8	PLP	8	0	0	2	25	2	25	1	13	3	38
2	DPL	2	0	0	0	0	1	50	0	0	1	50

TOTAL UNITS
94

Wine Creek | Drainage: Grape Creek, Dry Creek, Russian River

Table 5 - Summary of Shelter by Habitat Type | Survey Dates: 08/06/98 to 09/01/98

Confluence Location: QUAD: Geyserville LEGAL DESCRIPTION: T09NR10WS03 LATITUDE: 38°39'20" LONGITUDE: 122°56'44"

UNITS MEASURED	UNITS SHELTER MEASURED	HABITAT TYPE	% TOTAL UNDERCUT BANKS	% TOTAL SWD	% TOTAL LWD	% TOTAL ROOT MASS	% TOTAL TERR. VEGETATION	% TOTAL AQUATIC VEGETATION	% TOTAL WHITE WATER	% TOTAL BOULDERS	% TOTAL BEDROCK LEDGES
47	8	LGR	0	1	0	0	75	0	0	24	0
2	1	HGR	0	0	0	0	0	0	0	0	0
1	1	CAS	5	5	5	0	0	0	10	75	0
20	8	GLD	43	0	0	0	57	0	0	0	0
45	8	RUN	33	0	5	0	62	0	0	0	0
11	3	SRN	25	16	0	3	41	0	0	15	0
32	31	MCP	57	7	0	8	27	0	0	1	0
9	7	STP	20	8	7	40	7	0	0	15	3
8	8	CRP	95	1	0	2	2	0	0	0	0
1	1	LSL	25	0	50	25	0	0	0	0	0
25	24	LSR	29	11	11	43	5	0	0	0	0
13	13	LSBk	75	2	0	14	2	0	1	7	0
9	9	PLP	49	0	2	37	1	0	0	6	4
2	2	DPL	72	0	0	25	2	0	0	0	0
9	1	CUL	0	0	0	0	0	0	0	0	0
ALL HABITAT TYPES 234	125					20	19	0	1	9	1
POOLS ONLY 99	95		48	6	5	27	9	0	0	4	1

Wine Creek

Drainage: Grape Creek, Dry Creek, Russian River

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE

Survey Dates: 08/06/98 to 09/01/98

Confluence Location: QUAD: Geyserville LEGAL DESCRIPTION: T09NR10WS03 LATITUDE: 38°39'20" LONGITUDE: 122°56'44"

TOTAL HABITAT UNITS	UNITS SUBSTRATE MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
47	9	LGR	11	11	67	0	11	0	0
2	1	HGR	0	0	0	0	100	0	0
1	1	CAS	0	0	0	0	0	0	100
20	8	GLD	25	50	25	0	0	0	0
45	8	RUN	0	25	63	13	0	0	0
11	3	SRN	33	0	33	33	0	0	0
32	14	MCP	14	57	21	7	0	0	0
9	5	STP	0	60	40	0	0	0	0
8	6	CRP	0	67	33	0	0	0	0
1	1	LSL	0	100	0	0	0	0	0
25	8	LSR	25	63	13	0	0	0	0
13	8	LSBk	13	63	25	0	0	0	0
9	7	PLP	14	71	14	0	0	0	0
2	2	DPL	50	50	0	0	0	0	0
9	1	CUL	100	0	0	0	0	0	0

Wine Creek

APPENDIX A. Summary of Mean Percent Vegetative Cover for Entire Stream

Mean Percent Canopy	Mean Percent Evergreen	Mean Percent Deciduous	Mean Right bank % Cover	Mean Left Bank % Cover
88.74	59.47	40.53	61.76	65.82

APPENDIX B.

Mean Percentage of Dominant Substrate

Dominant Class of Substrate	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Bedrock	5	8	9.15
Boulder	4	0	2.82
Cobble/Gravel	8	3	7.75
Silt/clay	54	60	80.28

Mean Percentage of Dominant Vegetation

Dominant Class of Vegetation	Number Units Right Bank	Number Units Left Bank	Percent Total Units
Grass	6	4	7.04
Brush	24	35	41.55
Deciduous Trees	18	16	23.94
Evergreen Trees	23	16	27.46
No Vegetation	0	0	0

APPENDIX C. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: Wine Creek
SAMPLE DATES: 08/06/98 to 09/01/98
SURVEY LENGTH:
MAIN CHANNEL: 12089 ft. SIDE CHANNEL: 34 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: Geyserville Latitude: 38°39'20"
Legal Description: T09NR10WS03 Longitude: 122°56'44"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 1 (Units 1-53)

Channel Type: F4	Mean Canopy Density: 75%
Main Channel Length: 3508 ft.	Evergreen Component: 23%
Side Channel Length: 0 ft.	Deciduous Component: 77%
Riffle/Flatwater Mean Width: 4.8 ft.	Pools by Stream Length: 24%
Pool Mean Depth: 1.1 ft.	Pools >=2 ft. Deep: 33%
Base Flow: 0.1 cfs	Pools >=3 ft. Deep: 5%
Water: 62-64°F Air: 72-85°F	Mean Pool Shelter Rtn: 10
Dom. Bank Veg.: Brush	Dom. Shelter: Terrestrial Veg.
Bank Vegetative Cover: 77%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 5% 2. 32% 3. 37% 4. 5% 5. 21%

STREAM REACH 2 (Units 54-66)

Channel Type: F3	Mean Canopy Density: 96%
Main Channel Length: 907 ft.	Evergreen Component: 88%
Side Channel Length: 0 ft.	Deciduous Component: 12%
Riffle/Flatwater Mean Width: 5.5 ft.	Pools by Stream Length: 42%
Pool Mean Depth: 1.5 ft.	Pools >=2 ft. Deep: 50%
Base Flow: 0.1 cfs	Pools >=3 ft. Deep: 13%
Water: 63-63°F Air: 74-80°F	Mean Pool Shelter Rtn: 32
Dom. Bank Veg.: Brush	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 50%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 38% 3. 13% 4. 0% 5. 50%

STREAM REACH 3 (Units 67-101)

Channel Type: B3	Mean Canopy Density: 97%
Main Channel Length: 1749 ft.	Evergreen Component: 80%
Side Channel Length: 13 ft.	Deciduous Component: 20%
Riffle/Flatwater Mean Width: 5.0 ft.	Pools by Stream Length: 22%
Pool Mean Depth: 0.9 ft.	Pools >=2 ft. Deep: 29%
Base Flow: 0.1 cfs	Pools >=3 ft. Deep: 0%
Water: 63-64°F Air: 69-80°F	Mean Pool Shelter Rtn: 24
Dom. Bank Veg.: Brush	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 58%	Occurrence of LOD: 15%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddness Value: 1. 0% 2. 0% 3. 75% 4. 8% 5. 17%

STREAM REACH 4 (Units 102-107)

Channel Type: B2	Mean Canopy Density: 98%
Main Channel Length: 389 ft.	Evergreen Component: 87%
Side Channel Length: 21 ft.	Deciduous Component: 13%
Riffle/Flatwater Mean Width: 0.0 ft.	Pools by Stream Length: 26%
Pool Mean Depth: 1.4 ft.	Pools >=2 ft. Deep: 50%
Base Flow: 0.1 cfs	Pools >=3 ft. Deep: 50%
Water: 64-64°F Air: 78-78°F	Mean Pool Shelter Rtn: 55
Dom. Bank Veg.: Brush	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 83%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.
Embeddness Value: 1. 0% 2. 0% 3. 0% 4. 0% 5. 100%	

STREAM REACH 5 (Units 108-110)

Channel Type: B1	Mean Canopy Density: 95%
Main Channel Length: 346 ft.	Evergreen Component: 60%
Side Channel Length: 0 ft.	Deciduous Component: 40%
Riffle/Flatwater Mean Width: 7.0 ft.	Pools by Stream Length: 7%
Pool Mean Depth: 1.0 ft.	Pools >=2 ft. Deep: 0%
Base Flow: 0.1 cfs	Pools >=3 ft. Deep: 0%
Water: 64-64°F Air: 78-80°F	Mean Pool Shelter Rtn: 5
Dom. Bank Veg.: Brush	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 74%	Occurrence of LOD: 5%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.
Embeddness Value: 1. 0% 2. 0% 3. 0% 4. 100% 5. 0%	

STREAM REACH 6 (Units 111-158)

Channel Type: B4	Mean Canopy Density: 93%
Main Channel Length: 1884 ft.	Evergreen Component: 49%
Side Channel Length: 0 ft.	Deciduous Component: 51%
Riffle/Flatwater Mean Width: 5.5 ft.	Pools by Stream Length: 29%
Pool Mean Depth: 1.1 ft.	Pools >=2 ft. Deep: 35%
Base Flow: 0.1 cfs	Pools >=3 ft. Deep: 13%
Water: 60-67°F Air: 61-88°F	Mean Pool Shelter Rtn: 57
Dom. Bank Veg.: Brush	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 72%	Occurrence of LOD: 0%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.
Embeddness Value: 1. 0% 2. 0% 3. 27% 4. 59% 5. 14%	

STREAM REACH 7 (Units 159-173)

Channel Type: G3	Mean Canopy Density: 70%
Main Channel Length: 1011 ft.	Evergreen Component: 53%
Side Channel Length: 0 ft.	Deciduous Component: 47%
Riffle/Flatwater Mean Width: 3.5 ft.	Pools by Stream Length: 55%
Pool Mean Depth: 1.4 ft.	Pools >=2 ft. Deep: 63%
Base Flow: 0.1 cfs	Pools >=3 ft. Deep: 25%
Water: 60-62°F Air: 62-70°F	Mean Pool Shelter Rtn: 60
Dom. Bank Veg.: Brush	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 60%	Occurrence of LOD: 22%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddedness Value: 1. 0% 2. 13% 3. 25% 4. 25% 5. 38%

STREAM REACH 8 (Units 174-224)

Channel Type: G4	Mean Canopy Density: 93%
Main Channel Length: 2295 ft.	Evergreen Component: 77%
Side Channel Length: 0 ft.	Deciduous Component: 23%
Riffle/Flatwater Mean Width: 5.3 ft.	Pools by Stream Length: 26%
Pool Mean Depth: 0.9 ft.	Pools >=2 ft. Deep: 43%
Base Flow: 0.1 cfs	Pools >=3 ft. Deep: 5%
Water: 60-61°F Air: 68-80°F	Mean Pool Shelter Rtn: 55
Dom. Bank Veg.: Brush	Dom. Shelter: Undercut Banks
Bank Vegetative Cover: 53%	Occurrence of LOD: 24%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 0 ft.

Embeddedness Value: 1. 0% 2. 11% 3. 37% 4. 47% 5. 5%