CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Green Valley Creek
Report Revised April 14, 2006
Report Completed 2000
Assessment Completed 1994

INTRODUCTION

A stream inventory was conducted during the summer of 1994 on Green Valley Creek to assess habitat conditions for anadromous salmonids. 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 Green Valley Creek. The objective of the biological inventory was to document the salmonid and other aquatic species present and their distribution. After analysis of historical information and data gathered recently, stream restoration and enhancement recommendations are presented.

This report is 'preliminary' in that it does not include an assessment of Atascadero Creek, an important tributary in the Green Valley Creek watershed. Atascadero Creek will be dealt with in a separate watershed report due to its large area and unique characteristics. The 'Final' Stream Inventory Report for Green Valley Creek will include any significant findings from the Atascadero Creek inventory.

WATERSHED OVERVIEW

Green Valley Creek is tributary to the Russian River, located in Sonoma County, California (Figure 1). The legal description at the confluence with the Russian River is T8N R10W S25. Its location is 38°30'17" N. latitude and 122°54'30" W. longitude. Year round vehicle access to the watershed exists via Highway 116 near Forestville and Guerneville, and via Green Valley and Graton Roads.

Green Valley Creek is a third order stream and has approximately 11 miles of blue line stream, according to the USGS Guerneville, and Camp Meeker 7.5 minute quadrangles. Major tributaries include Purrington, Harrison, and Atascadero Creeks. Purrington Creek is included as a sub-report to the parent stream, Green Valley Creek. Atascadero Creek and its tributaries have not been inventoried to date, thus are not included in this report. Green Valley Creek and its tributaries drain a basin of approximately 17 square miles, and the system has a total of 14.8 miles of blue line stream. Elevations range from about 30 feet at the mouth of the creek to 700 feet in the headwater areas.

The Green Valley Creek watershed is five miles wide at its widest point. Features include gently sloping hills to the south and east with steep slopes to the west. Green Valley Creek originates on the east-facing slopes, south and east of Oregon Canyon, along Green Valley road (Figure 1). The stream course is J-shaped, and flows three miles to the southeast, at the base of Mt. Pisgah. The creek then turns northeastward meeting Purrington Creek, a small first order tributary. There Green Valley Creek flows one mile northward, north of Atascadero Creek Marsh, and continues another five miles to the Russian River west of Rio Dell.

The Green Valley Creek bottom north of Atascadero Creek Marsh is 200'-1000' wide, becoming steeper and narrower, approximately 300' wide, north of the tributary that drains Forestville Marsh. The lower stream area from Green Valley School Rd to the mouth has year-round flow with springs at the lower end. The lower 8-9 miles of stream has an average summer flow of 1-1.5 cfs into the Russian River. The stream is intermittent above Green Valley School Rd and on Atascadero Creek in the Graton area. The one hundred year flood plain for Green Valley Creek is 900' wide north of Atascadero Creek Marsh, and 500' wide north of the confluence with the western leg. There has yet to be an establishment of a base flood elevation.

Redwood and Douglas Fir forest dominates the watershed, but there are zones of grassland and oak-woodland in the upper watershed. Six of the one hundred and five sensitive native plant species identified in the CNPS Inventory for Sonoma County have been reported in the Green Valley watershed. Sensitive plants listed from the CNPS Inventory and DFG's Natural Diversity Database within Green Valley watershed are:

Actostaphylos censiflora
Alopercurls aequalis sonom
Arctostaphylos bakerii
Calamgrostis crassiglumis
Calamgrostis ophitiuis
Campanula californica
Castilleja uligrosa
Clarkia imbricala
Cordy lanthus tenuis capil.
Covex albida
Delphinium lutera
Fritillaria liliacea
Hemizonia multicaulis s. vernalis
Lilium pardalinum ssp. pitkineousse
Rhynospora californica
Trifolium ameonum

The watershed is almost entirely privately owned. The watershed

was heavily logged in the twenties and in the fifties, and then heavily grazed. The stream has responded to these land use changes but has not necessarily recovered to them in many cases. Common land uses today within the watershed are orchards (apples and pears), vineyards, pasture and rural development. Land uses west of Green Valley Creek are predominately that of diverse agriculture, with dispersed commercial uses existing on isolated parcels. Land use east of the north flowing creek leg consist of rural residential and diverse agriculture. Within the watershed are the towns of Forestville, Graton, Sebastopol, Occidential, two sewage disposal facilities and two quarries.

The Sonoma County General Plan designates Green Valley creek, Purrington Creek, and the tributary draining Forestville Marsh as "riparian corridors". Forestville Marsh, Pitkin Marsh, and the Harrison Grade Road serpentine association are designated as "critical habitat". The Highway 116 corridor and the northeast portion of the Green Valley watershed are designated as "scenic landscape".

Stream Surveys:

In 1954, an early brief DFG survey described the lower valley as long, stagnant pools ranging in size from 5'-25' wide and up to 10' deep. The banks were densely covered with trees and brush. The bottom of the stream bed was described as composed of thick, black mud, with no discernable flow. Many of the pools in the area were covered with scum and the water appeared black, with visibility limited to less than 1". During World War II Green Valley Creek had apparently become polluted by apple processing waste.

The earliest complete stream survey was conducted by the Division of Water Resources in May of 1966. The stream was described as being dry in the Graton area mid-June and summer, with other areas maintaining flow year round. Steelhead and coho salmon were commonly found throughout.

Surveys were also conducted in 1969, 1976 and 1991 by the Department of Fish and Game (DFG).

The DFG summer survey of July 1969, covered the area from the confluence with the Russian River to the headwaters. A general description of the watershed was recorded as follows:

The wetted width of the stream ranged from 1" to 15', with the average being 5'. The depth ranged from 2" to 9', with stream depth generally reaching its maximum in the lower portion of the valley. Flow was measured using a pygmy flow meter at the proposed S.C.S. damsite, approximately one mile northwest of Graton road, and recorded at 0.43 cubic feet per second (cfs). Flow measured at the confluence of the Russian River was 0.27 cfs. Flow was generally

described as dry in the headwaters above the existing springs, rapid in the headwaters and sluggish throughout the valley.

A partial DFG winter survey was also conducted in December 1976, from the confluence to Green Valley road, approximately 5.5 miles. Since the two surveys were conducted during different months, under different conditions, and covered different distances the two years cannot be compared. However, a later general description of the watershed is interesting and was recorded as follows:

The wetted width of the stream ranged from 2'-20', with the average width being 8'. The stream depth ranged from 2"-5', with an average of 2'. Flow estimated by visual observation at the confluence of Atascadero Creek and Green Valley Creek was 4 cfs. At River Road and Green Valley Creek, the flow was estimated as 1 cfs.

The October 1991 stream survey indicated there was good riparian habitat providing sufficient canopy for shading the stream, although the substrate quality had a high percent of fines, presumably due to conversion of the watershed to agriculture. A major problem noted was the unusually low summer flow, which was mostly subsurface due to high sediment. Intensive agricultural development and increased diversions of water from the stream added to the above effects

In Summer 1994, DFG, Inland Fisheries Division, in cooperation with the Redwood Empire Chapter of Trout Unlimited, conducted several habitat improvement projects on a portion of Green Valley creek including erosion control, modifying an in-creek log jam, repairing gullies adjacent to the creek, and installing cover structures in a large pool at the base of the Green Valley Rd culvert on Harrison Creek (see map).

METHODS

The habitat inventory conducted in Green Valley Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). The California Conservation Corps (CCC) seasonal Technical Advisors that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG) and CCC in May 1994. This inventory was conducted by a two person team, under the supervision of Bob Coey DFG's Russian River Basin Planner.

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 Green Valley 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) 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 by David Rosgen (1985). 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 four measured parameters used to determine channel type: 1) water slope gradient, 2) channel confinement, 3) width/depth ratio, 4) substrate composition.

3. Temperatures:

Water and air temperatures, and time taken, are measured by crew members with handheld 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 Ryan Tempmentors 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". Green Valley 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. Channel dimensions were measured using hip chains, range finders, tape measures, and stadia rods. Unit measurements included mean length, mean width, mean depth, and maximum depth. Pool tail crest depth at each pool unit was measured in the thalweg. All measurements were taken 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 Green Valley 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).

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. The shelter rating is calculated for each 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 Green Valley 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 habitat units, dominant and sub-dominant substrate elements were visually estimated using a list of seven size classes. Mechanical substrate sampling is also conducted to quantify the percentage of fine sediment within spawning gravels.

8. Canopy:

Stream canopy is estimated using handheld spherical densiometers and is a measure of the water surface shaded during periods of high sun. In Green Valley Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of each unit. The area of canopy was further analyzed to estimate its percentages of coniferous or deciduous trees, and the results recorded.

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 Green Valley Creek, the dominant composition type in both the right and left banks was selected from a list of eight options on 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 Runtime, a dBASE 4.1 data entry program developed by the California Department of Fish and Game (DFG). This program also processes and summarizes the data.

The Habitat Runtime program produces the following tables:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types
- Maximum pool depths by habitat types
- Dominant substrates by habitat types
- Mean percent shelter by habitat types

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

- Riffle, flatwater, pool habitats by percent occurrence
- Total habitat types by percent occurrence
- Pool types by percent occurrence

HABITAT INVENTORY RESULTS

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

The habitat inventory of June through September, 1995, was conducted by Technical Advisors contracted through the California Conservation Corps (CCC). The survey began at the confluence with the Russian River and extended up Green Valley to the Mill Site above the last Green Valley Road crossing (Figure 1). The total length of the stream surveyed was 52,853 feet.

A flow of .3 cfs was measured 8-20-95 at habitat unit 11, 672' above survey start with a Marsh-McBirney Model 2000 flowmeter. Water temperatures collected daily during the survey period (June 21-Sept 29, 1994) by crew personnel ranged from 54 to 86 degrees fahrenheit. Air temperatures during the same period ranged from 55 to 88 degrees fahrenheit (Appendix A). Stream temperatures collected continuously by Ryan Tempmentors are presented in Figures 2 and 3. Figure 2 depicts temperatures monitored in Green Valley

Creek below the Atascadero Creek confluence and Figure 3 from above. The range between the two horizontal dashed lines represent optimal stream temperatures for salmonids. The range above the solid horizontal line represents the temperatures considered to be lethal.

Green Valley Creek has six channel types: from the mouth to 12,575 feet a C4; next 3041 ft. an F4; next 15,434 ft. an F3; next 919 a B1; next 14,067 a B4; and the upper 5,389 feet a B6.

C4 streams have gentle gradient, meandering, gravel channels. F4 channels are entrenched meandering riffle/pool channels on low gradients (<2%) with high width/depth ratio and cobble substrate. F3 channels are also entrenched meandering riffle/pool channel on low gradients with high width/depth ratio but with gravel substrate. B1 channels are moderate gradient (2-4%), moderately confined bedrock controlled channels. B4 channels are also moderate gradient, moderately confined, but are cobble/gravel channels. B6 channels are moderately entrenched, moderate gradient, riffle dominated channel, with infrequently spaced pools; very stable plan and profile with unstable banks made of silt/clay.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. By percent **occurrence**, RIFFLES made up 5%, FLATWATER types 28%, and POOLS 48% (Graph 1). FLATWATER habitat types made up 37% of the total survey **length**, RIFFLES 3%, and POOLS 34%). 26% of the reach surveyed was DRY.

TWENTY TWO Level IV habitat types were identified. The data are summarized in Table 2. The most frequent habitat types by percent **occurrence** were MAIN CHANNEL POOLS, 21%; DRY UNITS, 19%; LOW GRADIENT RIFFLES, 5%; RUNS, 14%; and GLIDES, 14% (Graph 2). By percent total **length**, DRY units made up 20%; GLIDES, 20%; and RUNS, 17%.

Three hundred and ninety-two (392) pools were identified (Table 3). SCOUR pools were most often encountered at 48%, and comprised 43% of the total length of pools (Graph 3).

Table 4 is a summary of maximum pool depths by pool habitat types. Depth is an indicator of pool quality. Fifty-five of the three hundred and ninety-two pools (14%) had a depth of three feet or greater.

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. RIFFLE types had the lowest shelter rating at 3. POOLS had the highest rating with 20 (Table 1). Of the pool types, the SCOUR POOLS and BACKWATER POOLS rated 24, and MAIN CHANNEL POOLS rated 16 (Table 3).

Table 5 summarizes mean percent cover by habitat type. AQUATIC VEGETATION was the dominant cover type in Green Valley Creek. ROOT MASSES and TERRESTRIAL VEGETATION are the next most common cover type.

Appendix B describes the dominant elements composing the canopy. 18% of Green Valley Creek lacked shade canopy. Of the 82% of the stream that was covered with canopy, 95% was composed of deciduous trees, and 5% was composed of coniferous trees.

For the stream reach surveyed, the mean percent right bank vegetated was 71% and left bank vegetated was 74% (Appendix B). Table 2 summarizes the mean percentage of the right and left stream banks covered with vegetation by habitat type.

Appendix C describes the dominant elements composing the structure of the stream banks. 71% consisted of silt clay, 21% cobble/gravel, and 6% bedrock. Additionally, 82% of the banks were covered with deciduous trees, 12% brush, 4% grass, and 1% with coniferous trees, including downed trees, logs, and root wads.

SUBSTRATE SAMPLING

Gravel sampling is generally conducted to determine the percentage of fine sediment present in probable fish spawning areas. These areas are generally found in low gradient riffles at the tail-outs of pools. 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 the 1969 survey, composition of the stream bed was visually estimated as gravel (75%), mud/silt (15%), and bedrock (10%),

In 1975 the composition the composition had declined and was estimated at only 20% gravel with mud/silt (60%), and sand (20%) dominating.

No mechanical gravel sampling was conducted in 1994 surveys due to inadequate staffing levels, however, dominant substrate types observed and embeddedness ratings are discussed below.

Pool tail embeddedness, a measure of the suitability of spawning gravel, in reaches 1 through 3 and 6, ranged from 75- 100% embedded (Level 4). In reaches 4 and 5, 60% of the pool tailouts measured a Level 1 or 2. Level 1, is considered best for the needs of salmon and steelhead.

Table 6 summarizes the dominant substrate by habitat type. GRAVEL

was the dominant substrate observed in 21 of the 41 LOW GRADIENT RIFFLES (51%). SAND was the next most frequently observed dominant substrate type, and occurred in 15% of the LOW GRADIENT RIFFLES.

BIOLOGICAL INVENTORY

HISTORICAL INFORMATION:

The Division of Water Resources survey in May 1966, found Steelhead and coho salmon commonly throughout the sixteen miles of the survey.

In the 1969 survey, fish species present included: juvenile steelhead, sculpin, stickleback, green sunfish, roach and squawfish. Steelhead, Roach, and Sculpin were most abundant, with other species being less abundant. Numbers of non-game fish increased moving downstream toward the confluence with the Russian River, while the number of juvenile steelhead decreased through the same area. No non-game fish were observed upstream of the confluence with Atascadero Creek. Approximately 4.4 miles of stream was estimated to be suitable for steelhead spawning (near the Highway 116 bridge and upstream of the confluence with Atascadero Creek). The lower two mile section contained extremely long, deep pools, and shelter consisting of undercut banks and logs. Barriers to fish included a log jam located approximately one mile upstream from the confluence with Purrington Creek, and a road culvert forming a 4' vertical fall, on Harrison Creek near the confluence. Numerous smaller jams were also observed. Eleven diversions of varying size were observed, primarily on Green Valley Creek, with a few on the tributaries. Summertime water temperatures recorded ranged from 63 degrees, to 77 degrees. Domestic dump sites were also observed at various locations. No habitat improvement projects were observed on the survey.

In the 1975 survey, salmonid fingerlings were seen but not identified. Available spawning habitat was again identified as upstream of the confluence with Atascadero Creek and at a 1/4 mile stretch of stream north of Highway 116. All other areas appeared heavily embedded with silt. Pool development in the lower section of the stream was described as less with only 25% pool habitats, and shelter provided primarily by overhanging terrestrial plants.

Three partial barriers were observed. Diversions were observed along the creek to irrigated vineyards. Winter time water temperatures ranged from 41-42 degrees. No domestic dumpsites were observed or recorded during the survey however.

During October 1991, the Department of Fish and Game surveyed fish populations in three different sites on Green Valley Creek. Each of the sites were located upstream of the confluence of Atascadero Creek. The sites surveyed consisted of widely separated to

somewhat separated pools, with little to no surface flow. A brief summary follows: Site #1 was a shallow pool located in a channelized section, with limited undercut banks, no significant woody debris, but banks well vegetated with large alder trees. Substrate was primarily sandy gravel, marginally suitable for spawning. The fish population was dominated by Sculpin and Stickleback, with some Roach and Lamprey ammocetes, and very few Steelhead. California fresh water shrimp Syncaris pacifica were found near exposed roots of undercut Alders.

At Site #2 a large amount of large woody debris had created a deep pool, with thick riparian growth, good tree canopy, and deep undercutting with exposed roots in the pool. The gravel was coarser and considered more suitable for spawning. Few California Fresh Water Shrimp were found in site 2, and more Bluegill and some Green sunfish were observed.

Site #3 was a shallow pool with a thick herbaceas growth, occasionally completely covered in Duckweed, with reduced riparian canopy, completely lacking in some locations. The streambed was composed of gravel and small cobble. Dominant fish species observed were juvenile Steelhead, with fewer Sculpin and Sticlkeback. No Bluegill or Green sunfish were present. California Fresh Water Shrimp were also found in shallow pools. Farm ponds in the drainage are thought to be responsible for the Bluegill and Green sunfish introductions.

Although in the past Coho Salmon had been reported in Green Valley Creek, none were observed during either the 1969 or 1991 surveys. However, in November 1993, a City of Santa Rosa survey resulted in the capture of several juvenile Coho near Green Valley Road.

Historical records reflect steelhead fingerlings were transferred during a 1970 fish rescue operation from Dutch Bill Creek (tributary to the Russian River) downstream. In 1984, Green Valley and Atascadero Creeks (tributary to Green Valley) were stocked by Warm Springs Hatchery, Table 1.

Table 1. Summary of fish hatchery-stocking/transfers/rescues

YEAR	SPECIES	SOURCE	#	SIZE
1970	SH	DUTCH BILL CRK	1,170	FING
1984	SH	WARM SPRINGS	15,400	FING
1984*	SH	WARM SPRINGS	15,400	FING

WARM SPRINGS = Warm Springs Hatchery (Geyserville)
SHD = Steelhead
1984* = Steelhead planted in Atascadero Creek

RECENT JUVENILE SURVEYS:

Biological inventory was conducted in Green Valley Creek to document the fish species composition and distribution at several locations. Each site was single pass electrofished in Green Valley Creek using one Smith Root Model 12 electrofisher. Fish from each site were counted by species, and returned to the stream.

On 11/18/94 the survey started on Green Valley Creek below the confluence of Green Valley and Purrington Creek at an unknown tributary and continued to the East Fork of Green Valley Creek above Harrison Creek. Observations began at habitat unit #440 of Green Valley Creek. Sixteen 0+, seven 1+ and one 2+ Steelhead were observed as well as sculpin (17) and one Tule perch. Below the seasonal dam six 0+ Steelhead, four 1+ Steelhead and 6 Fresh Water Shrimp, sculpin and stickleback were observed. Above the dam three 0+ Steelhead, two 1+ Steelhead, Sculpin and Sticklebacks were observed. On Green Valley Creek, above the confluence with Harrison Creek, six- 0+ Steelhead, four-1+ Steelhead, stickleback and sculpin were observed.

Harrison Creek was also surveyed from the confluence to the second culvert (at Harrison Grade Rd). Below the culvert at Green Valley Road, three 1+ and one 2+ Steelhead, 6 fresh water shrimp, and Stickleback and sculpin were observed. Above the culvert on Harrison Creek, no fish were observed although the habitat is suitable. The largest pool, beneath the culvert at Harrison Grade Road, was to deep to electrofish adequately. However, an earlier foot survey upstream revealed little flow (spring fed), and no fish were observed visually.

On 06/13/95 the survey started on Harrison Creek, above the Green Valley Creek culvert and continued upstream to Buds' Flat, with the object of determining suitability of upper Harrison Creek for spawning and rearing. The streambed was dry from the culvert upstream for approximately 100 meters, then pools were observed only intermittently. Pool temperatures were 55 degrees. Four 0+ SHD were observed in total below the Harrison Grade Culvert. No other fish species were observed. The survey continued downstream from the Green Valley Road culvert to the confluence with Green Valley Creek. Ninety-eight 0+, four 1+, and three resident (2+) SHD and one 0+ coho were observed. Sculpin and stickleback were also observed. Flow was continuous and estimated at 0.05 CFS. Subsurface flow from Harrison Creek was observed seeping from the bank beneath the culvert, and appears to be attributing to the undermining of this structure.

On 06/13/95 the survey on Green Valley Creek started at the confluence of Green Valley and Harrison Creek and continued upstream to the second flashboard dam site (in-operable), habitat

unit #769. Seven 0+ SHD and 2 resident SHD (2+) were observed in pools along with stickleback and sculpin. Downstream, the survey continued at the first Green Valley Road crossing, habitat unit # 711, and continued upstream to habitat unit #722. Twenty-nine 0+, two 1+ and one resident (2+) SHD and 2 0+ coho were observed. Freshwater shrimp were noted in great abundance. Sculpin, stickleback and 1 juvenile bluegill were also observed. A summary of historical and recent data collected appears in Table 2 below.

Table 2. Summary of Salmonids found in Juvenile Surveys

YEAR	SPECIES	SOURCE
1966	SHD,SS	DFG
1969	SHD	DFG
1975	?	DFG
1991	SHD	DFG
1993	SHD,SS	City of SR
1994	SHD	DFG
1995	SHD,SS	DFG

SHD= Steelhead SS= Coho (Silver) Salmon ?= Unidentified Salmonids

RECENT ADULT SURVEYS:

A carcass/spawning survey was conducted over several reaches on Green Valley Creek from February 7-9, 1995.

The first survey began at the Green Valley and Purrington Creeks confluence (habitat unit marker 474) and continued upstream to the Bones Rd Bridge crossing. No fish, redds or carcasses were observed, however, the gravel quality appeared suitable for spawning in some areas.

The second survey began at the upper Green Valley Road bridge and surveyed upstream to habitat unit 777. One salmonid carcass (spp. unknown) was found with a lower jaw bone with white gums and a crimson red cheek plate. Two definite redds and 1 possible redd were also observed. A female steelhead was seen, upstream of the Harrison Creek confluence, which appeared to be building a redd, although no other fish were observed. A possible redd was observed further upstream, at the tail end of the pool. Considerable amounts of fresh gravel had entered the system from the confluence of Harrison creek down to the Green Valley Rd bridge. This gravel was visually estimated as "fair" for spawning however, due to the fines content. Gravel from the confluence of Harrison Creek

upstream however, was even poorer, very thin layered and highly silt laden.

The third survey was conducted from habitat unit 777 on Green Valley Creek just above the confluence of Harrison creek and continued upstream appx. 1/4 of a mile to the private road culvert just below the end of anhydraemia. No carcasses, redds or fish were observed. Gravel quality was visually estimated as poor throughout the survey. A large bank failure on the right bank just above habitat unit # 798 was observed, a definite sediment source.

Possible barriers at this water level were identified throughout all reaches; 1) at the first private bridge upstream of Green Valley Rd bridge,; 2) at the grade stabilizer below the seasonal dam site upstream,; and 3) at the private road culvert. It was noted the 3rd private bridge upstream from Green Valley Rd, would provide better access with baffles in the box culvert to slow down water flow for migrating fish.

At habitat unit 505 (100' upstream from confluence of Purrington Creek) a large wood accumulation was observed caused by five large pepperwood trees which had recently slid into the creek. 200' upstream (100' downstream from habitat unit 593) a huge right bank failure measuring 50' x 10' x 25'. Neither wood accumulation appeared to be a barrier to migration.

A spawning/carcass survey was conducted on February 8, 1995 on Harrison Creek (tributary to Green Valley Creek), a first order intermittent stream.

Observations began at the mouth of Harrison Creek and continued upstream approximately 2 miles to Buds' Flat. Large amounts of gravel had settled and passed into and through the system where there had only been hard packed clay in the past. 100 feet upriver from the confluence of Green Valley Creek we observed the first redds. Gravel quality was visually estimated as fair to good. In total 7 redds and 1 possible redd were found in close proximity to each other from the confluence with Green Valley Creek upstream to the concrete box culvert on Green Hill Road. From the culvert at Harrison Grade upstream to Bud's flat 3 redds and 1 possible redd were identified.

Observations and pictures were taken by Trout Unlimited volunteers 3 weeks previously during extreme high water, of fish trying to jump 5 feet up into the concrete box culvert from below. A landowner reported seeing fish above the culvert as well. Signs of redds upstream point to successful entry by some fish and passage upstream.

DISCUSSION

Green Valley Creek has SIX channel types: C-4, F-4, F-3, B-1, B-4 and B-6. The lower 12,575 feet of Green Valley Creek (from the mouth to the rock quarry bellow HWY 116) is a C-4 channel type. C-4 channels are meandering stream types on non-cohesive gravel beds which have poorly consolidated and unstable stream banks. They are generally not suitable for instream enhancement structures. However, bank placed boulders, bank cover, overhead log cover and shelter structures in straight reaches are often appropriate. Any work considered in this reach will require careful design, placement, and construction that must include protection for the unstable banks.

The middle 45,000 feet (from HWY 116 to Bones Rd crossing) consists of two F-# channel types. They are good for bank-placed boulders and single and opposing wing-deflectors. They are fair for low-stage (low profile) weirs, boulder clusters and channel constrictors. Log cover structures can be used to increase instream cover.

The upper 20,000 feet (from Bones Rd crossing to the headwaters) consists of three B-# channel types. They are excellent for many types of low and medium stage instream enhancement structures. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and pool cover.

Flatwater habitat types comprised 37% of the total **length** of this survey, riffles 3% and pools 34%. Twenty-six percent of the survey reach was dry. The pools are relatively shallow with only 114 of the 392 (30%) pools having a maximum depth greater than 3 feet. In coastal coho and steelhead streams, it is generally desirable to have primary pools comprise approximately 50% of total habitat. In third and fourth order streams a primary pool is defined to have a maximum depth of at least three feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Therefore, installing structures that will increase pool habitat is recommended for locations where their installation will not jeopardize the unstable stream banks, or subject the structures to high stream energy.

The mean shelter rating for all habitat types was low with a rating of 20 for pools, flatwater habitats 18, and riffles 3. A pool shelter rating of approximately 80 is desirable. The relatively small amount of cover that now exists is being provided primarily by aquatic and terrestrial vegetation, and root mass in all habitat types. Additionally, small woody debris and undercut banks contribute a small amount. Log and root wad cover structures in the pool and flatwater habitats are needed to improve 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.

Pool tail embeddedness, a measure of the suitability of spawning gravel, in reaches 1 through 3 and 6, ranged from 75- 100% embedded (Level 4). In reaches 4 and 5, conditions for spawning are better where 60% of the pool tailouts measured 25% or less (Level 1), or Level 2 (25-50%). Level 1, is considered best for the needs of salmon and steelhead.

Fifty-one percent of the low gradient riffles had gravel and 12% had cobble as the dominant substrate. These percentages of gravel are generally considered fair for spawning salmonids, although the occurrence of riffle habitat within the creek is extremely small overall (only 3%). Most of the spawning gravel occurs in Reaches 4 and 5, and is provided by Harrison Creek which has a surplus of gravel, yet only washes down in large storms. Gravel recruitment structures should be increased downstream to sort and store gravel and offset channel incision. Upstream, in Reach 6, sediment sources should be reduced to decrease embeddedness of these gravel beds.

The mean percent canopy for the survey reach was 82%. This is very good, since 80 percent is generally considered desirable. However, the riparian buffer is thin and nearly absent where livestock or agriculture encroaches. Water temperatures could be increased by decreasing stream canopy, due to riparian removal or increased grazing or channel incision causing bank erosion. Larger trees required to contribute shade to the deep channel typical of many reaches would eventually also provide a long term source of large woody debris needed for instream structure and bank stability to prevent further erosion.

Due to the many bridges, culverts and seasonal dams in the higher gradient portion of the stream (Reaches 4 and 5), and landuse practices which have hardened the watershed and increased the rate of storm run-off, downcutting of the streambed downstream of the structures has occurred. Due to this situation, and channel narrowing and channelization in many other areas of Reaches 1-3, an increase in stream velocity has caused excessive scouring of the bed and an overall channel incision in most of the stream. This has led to many habitat problems in the stream including: loss of gravel used for spawning, bank erosion and loss of riparian habitat, loss of instream structure (ie. woody debris) and thus pool habitat, and lowering of the groundwater table near the stream banks. In general this has resulted in an overall loss of pools, loss of instream shelter for juveniles, and access problems for spawners.

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. Overall, very few fish were observed during the 1994 surveys. However, the surveys were conducted late in the year when many fish may have outmigrated already. The 1995 spring surveys documented many 0+ fish indicating successful spawning in the upper reaches of Green Valley Creek. However, few 1+ fish were observed indicating poor rearing conditions the year before or poor holding-over conditions in general. In addition, steelhead were observed upstream of the survey area indicating a point for the end of anadromy higher up in the system than was previously noted. Habitat conditions upstream of our survey reach are extremely poor, however.

Apparently adult steelhead were successful in spawning on upper Harrison Creek and in negotiating the culvert at Green Valley Road due to the high flows in January, 1995. However, fish abundance above the culvert indicates poor rearing conditions due to lack of water even in early summer. Fish abundance downstream of the culvert indicates good to excellent conditions, however.

The water temperatures recorded daily by crew personnel ranged from 54° F to 86° F. Air temperatures ranged from 55° F to 88° F. The warmer water and air temperatures were recorded in the upper and lower sections of the survey reach. Together with figure 2 this information shows that for much of the summer (July through August) the lower watershed exhibited temperatures above the optimal for salmonids. Through September the extreme temperatures were above optimal. Figure 3 shows that in the upper watershed extreme temperatures were suboptimal through portions of September as well. These warmer temperatures, if sustained, are above the threshold stress level for salmonids. It is unknown if this thermal regime is typical, but our electrofishing samples found steelhead more frequently in the shadier, cooler sample sites. To make any further conclusions, temperatures need to be monitored for a longer period of time through the critical summer months, and more extensive biological sampling conducted.

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. Overall, habitat conditions for both steelhead and coho have declined over time.

In general, Reaches 1-3 of Green Valley Creek are marginal for salmon and steelhead habitat. Some long, deep sections of the stream occur which may be used as rearing habitat, however, shelter is lacking and stream temperatures are high. Portions of these reaches have 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. In Reach 1 bank protection, riparian planting and exclusionary fencing for livestock is recommended. Reaches 2 and 3 are good for bank-placed boulders and single and opposing wing-deflectors. They are fair for low-stage (low profile) weirs, boulder clusters and channel constrictors. Log cover structures can be used to increase instream shelter.

Upstream of the Atascadero Creek confluence conditions are better. In reaches 4 and 5, spawning and rearing habitat exists, canopy shading is higher, although instream shelter is still lacking and stream bank erosion is prevalent due to channel downcutting. However, many opportunities and alternatives exist for habitat improvement due to the more stable channel type. Reaches 4 and 5 are excellent for many types of low and medium stage instream enhancement structures. Many site specific projects can be designed within this channel type, especially to increase pool frequency, volume and shelter.

The best spawning gravel and habitat in the watershed exists within the lower portion of Harrison Creek, and below its confluence on Green Valley Creek. Unfortunately upper Harrison Creek will not provide year-round rearing habitat for salmonids as it dries up in the summer. In Reach 6 (upstream of the confluence of Harrison Creek) 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 and livestock. Additionally, these upstream effects seriously impact resources downstream (in reaches 4 and 5) especially during the warmer months when stream temperature rises, algae blooms and demand for oxygen and other resources increases. Sediment transported downstream from Reach 6 in the winter also impacts the source of high quality spawning gravel from Harrison Creek. Stream bank protection, riparian planting and exclusionary fencing for livestock is recommended, as well as structures to offset channel downcutting and recruit gravel for spawning.

GENERAL RECOMMENDATIONS

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

The winter 1995 storms brought down many large trees and other woody debris into the stream, which increased the number and quality of pools since the date of this survey. This woody debris, if left undisturbed, will provide fish cover and rearing habitat, and offset channel incision. Many signs of recent and historic tree and log removal were evident in the active channel during our survey. Misguided efforts to increase flood protection or improve fish access in the short run, have led to long term problems in the system. Landowners should be educated 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.

SPECIFIC FISHERY ENHANCEMENT RECOMMENDATIONS

1) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing cover 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. This must be done in conjunction with stream bank armor to prevent erosion (reach 3). In some areas the material is at hand.

2) Spawning gravels on Green Valley Creek are limited to relatively few reaches (only reaches 4 and 5 are suitable for spawning). Crowding and/or superimposition of redds have been observed during a recent winter survey. Structures to decrease channel incision and recruit spawning gravel (using gravel retention structures), should be installed to trap, sort and expand redd distribution in the stream.

3) Where feasible, design and engineer pool enhancement structures to increase the number of pools in the upper reaches. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion (reach 3).

4) Increase the canopy on Green Valley Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels (portions of reaches 1 and 5). The reach above the survey section should be assessed for planting and treated as well, since water temperatures

throughout are effected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

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

6) Monitor fish passage at improved locations.

RESTORATION IMPLEMENTED

1) Where feasible, increase woody cover in the pool and flatwater habitat units along the entire stream. Most of the existing cover 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. This must be done where the banks are stable (reaches 4-6). In some areas the material is at hand.

2) Spawning gravels on Green Valley Creek are limited to relatively few reaches (only reaches 4 and 5 are suitable for spawning). Crowding and/or superimposition of redds have been observed during a recent winter survey. Structures to decrease channel incision and recruit spawning gravel (using gravel retention structures), should be installed to trap, sort and expand redd distribution in the stream (particularly on Harrison Creek below the culvert at Green Valley Rd, and on Green Valley Creek above and below the Harrison Creek confluence).

3) Where feasible, design and engineer pool enhancement structures to increase the number of pools in the upper reaches. This must be done where the banks are stable.

4) Access for migrating salmonids is an ongoing potential problem in Reach 4, therefore, fish passage should be monitored, and improved where possible. Baffles should be installed in several culverts to facilitate easier fish access. The jump pool below the grade stabilization structure at the existing private summer dam should be improved. A fish ladder is needed at the private car bridge above Green Valley Road (see Problem Sites below). The Green Valley Road culvert on Harrison Creek is undermining and is a fish barrier except under extreme flows. Harrison Creek provides an important source of gravel for spawning, and rearing conditions upstream of the culvert appear inadequate at this time due to subsurface flow. Eventually this culvert will have to be replaced. Future

design should include improved passage of gravel as a first priority and fish passage secondarily.

5) There is at least one section (Reach 6) where the stream is being impacted from cattle trampling the riparian zone, and defecating in the water. Alternatives to limit cattle access, control erosion and increase canopy, should be explored with the landowner, and developed if possible.

6) There are several log debris accumulations present on Green Valley Creek that have the potential for causing bank erosion (specifically upstream of the Atascadero confluence). The modification of these debris accumulations is not recommended at this time, but they should be monitored. If modification becomes necessary, it must be done carefully to preserve existing habitat provided by the woody debris.

7) Increase the canopy on Green Valley Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels (portions of reach 6).

PROBLEM SITES AND LANDMARKS - GREEN VALLEY CREEK SURVEY COMMENTS

160 Huge fallen tree across stream. NOT BARRIER
672 **TWO Bridges at River Rd**; Pillars in water creating scour. All of the canopy created by bridge. **UNIT 11.
760 30% of canopy created by bridge
2268 cattle trails
2478 cattle trails
2523 frogs, algae blooms
2909 cow trails
3836 CATTLE FROM #58-63
3886 Logs located on bottom of creek.
3931 Cattle from unit numbers 58-63.****
5075 bridge. ****UNIT 85
5532 Bridge supports created backwater pool.
5072 Tree trunk pulled up by cable onto right bank.
5954 Barbed wire fence crosses stream.
6026 Many frogs in and around floating pondweed.
6720 Mallard
7013 Creek runs directly over dirt road.
7682 Oil sheen on surface of water.
7712 Gravel dumped in creek.
8499 Culvert located in concrete dam. Dam dimensions: 3 ft. tall; 4 ft. diameter.
8630 Barbed wire fence; cow trails.
8876 RIP RAP left bank extending 20 ft. in length.
9168 Substrate retaining moisture, no surface water.
9216 Dry region connecting wetted channel 11 habitat units long.
9247 Lateral scour formed by metallic debris.

9324 Gravel bars obstructing flow causing wetted
channel to migrate from right to left bank.
Gravel deposition due to artificial diversion.
9324 Pool cut off by gravel deposition at the head and
tail.
9379 Garbage on left bank including a refrigerator.
9438 Dam on right bank. Oil sheen on surface of water.
9702 Electrofishing location.
10201 NO FLOW AT START OF UNIT.
10253 VINE/TREE ACROSS CREEK UPSTREAM.
10883 TREE/VINE ACROSS CREEK DOWNSTREAM.
11309 BRIDGE. SURFACE OILY/SCUMMY. UNIT 156 ************.
11439 ERODED LFT BANK, NEARLY BARE.
11548 film on surface
11661 gravel bar no flow between pools
12046 submerged veg on rt bk
12120 lft bk eroded
12304 pools separated by gravel bars
12559 CULVERT ON LFT BANK SCOURING POOL BOTTOM.
12580 DRY UNIT-GRAVEL SUBSTRATE 1.0' ABOVE ADJACENT
WETTED CHANNEL.
12595 rip rap ON RT BANK HELD IN PLACE BY WIRE
FENCE.
12825 OIL SCUM ON WATER SURFACE.
13398 LOCATION OF TEMP PROBE. NO FLOW/POOLED WATER ONLY
IN ENTIRE LOWER CREEK. UNIT 199 *****************
13430 MOSTLY DRY, WITH SOME SMALL POOLING OF WATER.
14207 FIRST FLOW SEEN.
14238 DIRECTLY BELOW BRIDGE. UNIT 211.**********************
14281 AQUATIC- DUCKWEED.
14361 SCUM ON WATER SURFACE.
14711 MAN-MADE DAM FROM RUBBER.
14811 NO FLOWS.
15398 **MARTINELLI RD. BRIDGE** UNIT 232. **********************
5458 OILY SCUM ON WATER SURFACE.
15687 SOME FLOW.
15800 DENSE TULES/CATTAILS.
16710 UNACCESSIBLE REACH. **BRIDGE AT HIGHWAY 116.**UNIT 240
****
NOT SURVEYED FLAG AT THE PROPERTY LINE.
16781 RT BANK CLEARED OF VEG.
16910 WATER PUMP ON RIGHT BANK/PIPE IN WATER.
16964 RT BANK CLEARED.
17122 SWD FORMED.
17409 WATER DEEP.
17597 FALLEN TREES.
17740 CREEK DAMMED BY 1 PIECE OF LWD.
17984 LOGJAM. LWD/GARBAGE.
18067 BACKWATER POOL FORMED BY GRAVEL BAR.
18326 LFT BANK ERODING INTO WETTED CHANNEL.

18423 SMALL GULLY ON LFT BANK.
18667 LANDOWNER INDICATED THEY WOULD AID IN RESTORATION ON THEIR LAND.
19567 ACCESS RT BANK.
19908 AUTO GARBAGE IN WATER.
20042 1'DIAM LOG ACROSS WATER.
20441 CHANNEL HAS SCOUR POCKETS. OPEN PASTURE LFT AND RT BANK.
20643 BANKS ERODED. DEBRIS CAUSING SEDIMENT BUILDUP.
20686 GULLY RT BANK.
21002 DRY SIDE CHANNEL LFT BANK.
21157 VEGETATION CLEARED FROM BANKS. DAMMED AT TOP OF UNIT. ********** UNIT 321
21197 LFT BANK ABOVE CREEK BULLDOZED.
21402 SHALLOW GULLY RT BANK.
21724 SHALLOW GULLY RT BANK.
21946 UNIT 333 200' UPSTREAM FROM **ROSS STA RD BRIDGE.** BELOW TO UNIT 332 NOT SURVEYED.*****UNIT 333.
23311 2.2' BANKFILL DEPTH FROM THALWEG.
23615 UNIT 355 FLAG ON UPSTREAM OF BEND.
24551 AT **CONFLUENCE OF GVC AND ATASCADERO,** ATASCADERO CREEK WET.********** UNIT 367
25960 TEMPMETER THIS UNIT. RT BANK REINFORCED WITH VERT. WOOD PLANKS. NOW ERODING.
27884 cattle fenced off creek lft bank.
28040 DRY GRAVEL BED EXTENDS TO **GREEN VALLEY ROAD BRIDGE.**
28238 RT BANK EROSION.
28393 LFT BANK ERODING.
28423 CORNER POOL.
28458 LOG FORMED POOL. POOLTAIL CREST FROM PREVIOUS POOL.
28484 RT BANK ERODING.
28646 ROOT WAD POOL.
28661 LOG-FORMED POOL.
28756 RT BANK DRY TRIB.
29193 RT BANK EROSION.
29456 RT BANK DRY TRIB RUNNING PARALLEL TO GVC.
29484 CATTLE FENCED OUT ON LEFT.
29577 RT BANK TRIB.
29650 GULLY LFT BANK REMOVING SOIL FROM VEG. ROOTS.
30188 DRY GULLY RT BANK. RT BANK TERRACED.
30203 LOG JAM, FIVE PIECES LWD.
30346 LFT BANK TERRACED.
30411 LOG JAM IN POOL, LWD. NOT A BARRIER.
30900 LFT AND RT BANK TERRACED 100'.
30900 RT BANK GULLY.
31482 LOG JAM LWD.
31482 GULLY RT BANK. DAM OF LWD RETAINING GRAVEL. ********** UNIT 462.1
31503 CHANNEL TYPE CHANGE

31797 RT BANK ERODING.
31884 RT AND LFT BANK ERODING.
32034 GULLY ON RT BANK.
32609 LFT BANK ERODED.
32745 PETROLEUM PESTICIDE ODOR IN WATER.
33064 RT BANK ERODING.
33232 WASH ON LFT BANK.
34153 FENCE AND ROCK USED TO STABILIZE LFT BANK.
34199 BANK EROSION HERE.
34257 MAJOR EROSION PROBLEM CAUSED BY DAM IN CHANNEL. 25' BANK CAVE. ********** UNIT 513.
34477 RT BANK EROSION. LARGE TREE FALLEN.
34484 WASH WITH WET SPRING ENTERS POOL AT MAX DEPTH. 56 DEGREES.
34819 CLAY BEDROCK.
34881 DIRT ROAD THROUGH CREEK. *******UNIT 524
34911 RT BANK SEVERLY ERODED, VOID OF VEGETATION.
35070 WASH ON LFT BANK.
35123 BANK ERODED.
35204 BANK EROSION/UNDERCUTTING.
35373 WASH ON RT BANK.
35406 WASH ON RT BANK.
35697 LOG JAM ACROSS CHANNEL.
35757 ERODING BANK UNDERCUTTING TREES.
35901 STRONG CHEM. ODER HERE.
36008 SPRING ON LFT BANK ABOVE BEDROCK.
36113 LFT BANK TERRACED.
36140 RT BANK ERODING, UNDERCUTTING.
36468 PARTIAL BANK EROSION.
36507 ERODING LFT BANK.
37146 SMALL LOG JAM.
38121 RT AND LFT BANK EROSION.
38203 LFT BANK EROSION.
38243 GULLY/WASH LFT BANK. **BONES RD BRIDGE.** ***** UNIT 57
38339 GULLY LFT BANK.
38728 LFT BANK EROSION.
38798 NARROW, DEEP GULLY RT BANK.
39249 LOG JAM WITH WOODY GROWTH.
39326 6'TALL LOG JAM.
39534 LFT BANK GULLY 20' WIDE.
39638 LFT BANK ERODED, SANDSTONE CLAY.
39796 LFT AND RT BANK ERODING.
40078 EROSION AROUND FOUNDATION OF BRIDGE ON RT BANK ********** UNIT 623
40115 LFT BANK GULLY TO TOP OF BANK.
40253 GULLY LFT BANK.
40284 LWD 4' TALL.
40484 2 DRY GULLYS ON RT BANK.
40545 DFG RESTORATION OF LOG JAM SITE.
40559 ERODED BACKWATER POOL.

40780 RT BANK ERODED.
40913 RT BANK ERODED.
40992 LFT BANK ERODING 30', UNDERCUTTING.
41025 RT BANK DRY WASH.
41225 DFG AND TU RESTORATION SITE. EROSION ON LFT BANK.
41439 GULLIES LFT AND RT BANKS.
41619 RT BANK 9" CULVERT, RIP RAP ARMORING.
41728 POOL CREATED BY BRIDGE FOOTING. FISH PRESENT.******
********** UNIT 653.
41890 TOP LFT BANK AT BRIDGE FOOTING
41937 RT BANK, LARGE BAY TREE DEEPLY UNDERCUT.
42459 ALOT OF STEELHEAD HERE.
42556 ********UNIT 692 .
42623 SKIPPED 40 UNITS. TROUT UNLIMITED SURVEY.
42735 RT BANK ERODING.
42771 SM. ROOT WAD POOL ADJACENT TO #697.
42844 ERODING LFT BANK.
42899 WATER NOT FLOWING.
42925 WATER NOT FLOWING.
43157 ERODING LFT BANK. FISH HERE.********** UNIT 705
43411 CEMENT RIP RAP AT BASE OF **GREEN VALLEY RD BRIDGE**. BOX CULVERT NEEDS BAFFLES.
********* UNIT 711
43436 GRADIENT CHANGED 2.5' FROM CULVERT DOWNSTREAM.
43533 DRY GULLY ON RT BANK 7'X 75'LONG.
43590 LFT BANK ERODED, BARE OF YOUNG VEGETATION.
30'X 12' WIDE.
43642 RT BANK DRY GULLY, 4'W X 20'L.
43678 BRIDGE. RIP RAP IN CHANNEL. RETAINING GRAVEL. SEASONAL BARRIER DURING LOWER FLOWS. SCOUR ON LFT BANK, UNDERCUT BAY TREE.
43810 LFT BANK CHARRED VEGETATION.
43842 1 LWD. DAMMED AT LOWER END. 1+ STEELHEAD.
43948 CATTLE TRAIL ON LFT BANK, FLOOD PLAIN.
44094 LEFT BANK BARE OF VEGETATION.
44151 LFT BANK ERODING.
44303 CATTLE ACCESS. EF SPOT.
44332 EROSION ON RT BANK, UNDERCUTTING TREES.
44367 EROSION 5' UNDERCUT YOUNG TREES ABOVE WETTED CHANNEL
44584 ERODING RT BANK. HOLE 20'W, 6' H, 4' DEEP.
44610 SKID TRAIL ON LFT BANK. CHANNEL TYPE.******
UNIT 735
44733 EROSION ON LFT AND RT BANKS, NO NEW VEGETATION.
44762 ROOFING SHINGLES ON RT BANK.
45059 SANDSTONE ACTS AS BEDROCK.
45374 EROSION FROM LFT BANK UNITS #742-745.
45485 CHANNEL NARROWS FOR BEDROCK SUBSTRATE CONSTRICTING BOTH BRANCHES.
45504 ROCK FALLS/GRADE STABILIZER. DOWNCUTTING 9.8' FROM SILL, 6' BENEATH TOE.

45553 CEMENT 1.3' H, NOTCH IN DAM AT .4'H, BEDROCK
SHELTER = CEMENT
45829 BOARD DAM 20' ACROSS, 6.6'H.
45912 **CONFLUENCE OF GVC AND HARRISON CREEK**.**********
UNIT 754.
46024 CHANGE IN GRADIENT.
46050 GRADIENT CHANGE. ROCK FALLS. FISH ACCESS OK.
46061 CAR BRIDGE 9'W CEMENT BASE. NOT DOWNCUTTING.
46086 CATTLE INFLUENCE.
46175 CATTLE WATERING HOLE, SILTED IN, COW FECES.
46215 CATTLE TRAIL LFT AND RT BANKS.
46315 TRIB/GULLY LFT BANK. HIGHLY ERODED.********* UNIT 769
46783 RIP RAP RT BANK. CREEK FENCED OFF RT BANK. CATTLE
INFLUENCE.
46797 OVER GROWN WITH WILLOW, RIP RAP RT BANK.
46861 FENCE ACROSS CREEK.
47048 STOCK TRAIL LFT BANK.
47098 EROSION/TRAIL? RT BANK.
47138 DENSE WILLOW GROWTH IN CREEK.
47154 BEDROCK= SEDGE COVERED CLAY BANK.
47166 GRAVEL AGGRADING.
47233 GULLY RT BANK.
47538 CATTLE TRAILS TO CREEK, LFT AND RT BANKS.
47730 CATTLE TRAILS/EROSION LFT BANK.
47773 ERODING RT BANK.
47962 GULLY/TRIB LFT BANK.********** UNIT 800
48186 CATTLE TRAILS RT BANK, DEER TRAIL LFT BANK.
48236 RIP RAP EXTENDING DOWN CREEK.
48262 6'CULVERT UNDER BRIDGE. DEFINITE BARRIER AT LOWER OR
ALL FLOWS DUE TO RIP RAP PLACEMENT. NO JUMP POOL OR ACCESS
FOR FISH. 5' GRADIENT CHANGE DUE TO CULVERT.
******* UNIT 803
48547 ERODING LFT BANK.
48587 CATTLE TRAIL TO WATER LFT BANK.
49039 ERODING LFT AND RT BANKS, STOCK TRAILS.
49214 CATTLE TRAILS/FENCE.
49222 CATTLE TRAILS ABOVE RT BANK. FENCE.
49240 WOODEN AND CEMENT DAM5. 2'H X 16' ACROSS.
49493 CULVERT UNDER BRIDGE.
********** UNIT 816
50687 CULVERT UNDER BRIDGE, BOTTOM ERODING.
SECOND CULVERT 1.5' ACROSS FROM CULVERT.****UNIT 825
50841 CATTLE ACCESS RT BANK.
50868 LFT BANK BARBED WIRE FENCE.
51038 OVERGROWN WITH VEGETATION. FISH HERE.
51328 CULVERT RUNNING UNDER DIRT RD. 2ND CULVERT IS
2.5'W. 6" GRADE FROM CULVERT TO POOL.
51553 WATER ORANGE COLORED. SAWMILL ON LFT.
51858 SPLIT IN CREEK UPSTREAM. DENSE VEGETATION.
END SURVEY