2000

CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAM INVENTORY REPORT
Dutch Bill Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1997 on Dutch Bill 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 Dutch Bill 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

Dutch Bill Creek is a tributary to the Russian River , located in Sonoma County, California (see Dutch Bill Creek map, page 2). The legal description at the confluence with the Russian River is T7N, R10W,S7. Its location is 38°27'56" N. latitude and 123°00'32" W. longitude. Year round vehicle access exists from Highway 101 taking Highway 12 West, via Bodega Hwy. to Bohemian Hwy., through the town of Occidental (headwaters), to the town of Monte Rio (mouth).

Dutch Bill Creek and its tributaries drain a basin of approximately 11.6 square miles. Dutch Bill Creek is a third order stream and has approximately 9.0 miles of blue line stream, according to the USGS Duncan Mills and Camp Meeker 7.5 minute quadrangles. Major tributaries included in this report are: Tyrone Gulch, Crawford Gulch, Duvoul Creek, Grub Creek,

Alder Creek, Baumert Springs, and an unnamed tributary. Lancel Creek is described in a separate stream report. Summer flow was measured as approximately .18 cfs at the mouth. Elevations range from about 5 feet at the mouth of the creek to 1140 feet in the headwaters. An evergreen forest dominates the watershed, but there are zones of grassland and oak-woodland in the upper watershed. The watershed is entirely privately owned.

METHODS

The habitat inventory conducted in Dutch Bill Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al., 1997). 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 Dutch Bill 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 (1996). 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 were 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". Dutch Bill 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 Dutch Bill Creek, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3), 76 - 100% (value 4). A rating of "not suitable" (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 Dutch Bill 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 ocularly 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, 1997. Canopy density relates to the amount of stream shaded from the sun. In Dutch Bill Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of 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 Dutch Bill 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 by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. 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 Dutch Bill 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:

In October, 1954 Dutch Bill Creek was surveyed to document fish species, in connection with the chemical treatment of the Russian River tributaries to control the 'rough fish' population. Steelhead and coho salmon were observed, the ratio being about 10 to 1 in favor of steelhead. No 'rough' species were observed. The flow was estimated to be less than one cubic foot per second.

On July 18, 1996 the National Marine Fisheries Service (NMFS) conducted a snorkel survey estimation of fish species in Dutch Bill Creek. The inventory was taken from ten pool habitats beginning upstream of Camp Meeker. During their survey they found 276 young of the year (0+) steelhead (SH); 14 one year old (1+)SH; 5 resident SH/rainbow trout; 9 sculpin and 1 California roach.

HABITAT INVENTORY RESULTS

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

The habitat inventory of Dutch Bill Creek was conducted from August 12 to September 10, 1997 by Jon Campo, Simone Watts, Marc Miller (AmeriCorps), and Lloyd Strecker (Volunteer). The survey began at the confluence with the Russian River and extended up Dutch Bill Creek to the end of anadromous fish passage at the town of Occidental. The total length of the stream surveyed was 38,871 feet.

A flow of 0.18 cfs was measured on 9-4-97 at habitat unit #072 with a Marsh-McBirney Model 2000 flowmeter.

Dutch Bill Creek has 8 channel types: from the mouth to 16,253 feet an F4; next 1,320 feet an F3; next 2,825 feet an F2; next 1,637 feet an F3; next 631 feet an F1; next 4,694 feet an F3; next 10,983 feet an F2 and the upper 528 feet a G2.

F channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio. F4 types have a predominantly gravel substrate, F3 channel types have predominantly cobble substrate, F2 has predominantly boulder substrate and F1 has a predominantly bedrock substrate.

G2 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 boulder substrate.

Water temperatures ranged from 53°F to 66°F. Air temperatures ranged from 58°F to 68°F. Summer temperatures were also measured using remote temperature recorders placed in pools (see Temperature Summary graphs at end of report). A recorder in Reach 5 logged temperatures every two hours from July 2 - September 26, 1997. The highest temperature recorded was 64°F in August and the lowest was 54°F in September.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 40% pool units, 27% flatwater units, 26% riffle units, and 7% dry streambed units. Based on total length there were 29% dry streambed units, 27% flatwater units, 26% pool units, and 18% riffle units (Graph 1).

Four hundred fifteen habitat units were measured and 21% were completely sampled. 21 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 24%, runs 13%, root wad scour pools 12% and boulder scour pools 10% (Graph 2). By percent total length, dry streambed made up 29%, low gradient riffles 16%, step runs 14%, and runs 9%.

One hundred sixty-four pools were identified (Table 3). Scour pools were most often encountered at 70%, and comprised 59% 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. 37 of the 164 pools (23%) had a depth of three feet or greater (Graph 4). These deeper pools comprised 10% 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 21. Riffle had the lowest rating with 0 and flatwater rated 4 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 25, backwater pools rated 18, and main channel pools rated 12 (Table 3).

Table 5 summarizes fish shelter by habitat type. By percent area, the dominant pool shelter types were boulders at 30%, root masses 29%, large woody debris 15%, and undercut banks 15%. Graph 5 describes the pool shelter in Dutch Bill Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 2 of the 18 low gradient riffles measured. Small cobble was dominant in 6 of the low gradient riffles (Graph 6).

No mechanical gravel sampling was conducted in 1997 surveys due to inadequate staffing levels.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 163 pool tail-outs measured, 21% had a value of 1; 58% had a value of 2; 11% had a value of 3; and 9% had a value of 4. 37% of the pool tail-out substrates were not suitable for spawning due to the natural geomorphology. On this scale, a value of one is best for fisheries. Graph 7 describes percent embeddedness by reach.

The mean percent canopy density for the stream reach surveyed was 90%. The mean percentages of deciduous and evergreen trees were 48% and 52%, respectively. Graph 8 describes the canopy for the entire survey and graph 9 describes the canopy by reach.

For the entire stream reach surveyed, the mean percent right bank vegetated was 78% and the mean percent left bank vegetated was 81%. For the habitat units measured, the dominant vegetation types for the stream banks were: 48% deciduous trees, 48% evergreen trees and 4% brush. The dominant substrate for the stream banks were: 83% silt/clay/sand, 11% bedrock, and 6% boulder (Graph 10).

HABITAT INVENTORY RESULTS FOR MAJOR TRIBUTARIES
(*Except Lancel Creek*)

Results for the habitat inventories of Alder Creek, Baurmert Springs Creek, Crawford Gulch Creek, Duvoul Creek, Grub Creek, Tyrone Gulch Creek and an unnamed tributary are summarized in the table below.

Dutch Bill Tributary Results

Dutch Bill Tributary Results									
Creek	Length	High Temp (F)	% Pools Occurring	% Pools by Length	Mean Pool Shelter Rating	Dom. Pool Shelter	Dom. Embed.	Mean Canopy	Channel Types
Alder	989'	61	25	3	16	Boulder	1/5	95%	A2
Baumert Springs	1023'	57	40	23	10	Boulder	1/5	94%	B2
Crawford Gulch	307'	59	13	5	60	Boulder	2	93%	A2
Duvoul	742'	63	30	18	23	Boulder	1/5	82%	B2
Grub	6206'	70	23	4	20	Boulder	3/5	79%	F2,G3, A2
Tyrone Gulch	723'	60	36	21	33	Undercut Bank	1/2	94%	B2,A3
Unnamed	1697'	58	36	25	29	Undercut Bank	2/3	95%	F3

BIOLOGICAL INVENTORY

JUVENILE SURVEYS:

On October 22, 23, and 27 1997 a biological inventory was conducted in ten sites of Dutch Bill Creek to document 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 ranged from 57°F to 64°F and the water temperature from 52°F. to 58°F. The observers were Bob Coey, Marc Miller, Todd Parlato, and Shamli Tarbell.

The inventory of Reach 1 started on the downstream side of bridge #1 (Bohemian Highway) and continued for approximately 1170 feet. In intermittent pool habitat types, no salmonids were observed. The species observed were: two Sacramento squawfish, 25 sculpin, and three Sacramento suckers.

The inventory of Reach 1 was continued starting at the confluence with Tyrone Gulch and ending approximately 845 feet

upstream. In run and pool habitat types 25 0+, and three 1+ steelhead were observed along with two Sacramento squawfish, 60 sculpin, and two 6" Sacramento suckers.

The inventory of Reach 3 started 754 feet downstream of the fish ladder and ended approximately 754 feet upstream. In riffle, run, and pool habitat types 31 0+, and two 1+ steelhead were observed along with 90 sculpin, three Sacramento suckers, and one bluegill.

The inventory of Reach 4 was started 225 feet upstream from the top of the fish ladder and continued for approximately 657 feet. In pool, run, and riffle habitat types 31 0+, and 15 1+ steelhead were observed along with 61 sculpin and one bluegill.

The inventory of Reach 6 was started from the Westminster Bridge and continued for approximately 625 feet. In pool, run, and riffle habitat types 31 0+, 19 1+, three 2+ and one resident steelhead were observed along with 63 sculpin.

The inventory of Reach 7 was conducted 450 feet downstream from the confluence with Alder Creek and continued for approximately 450 feet. In pool, run, and riffle habitat types 43 0+ and three 1+ steelhead were observed along with 24 sculpin.

The inventory of Reach 7 was continued beginning at habitat unit #340 and ending at the confluence with Lancel Creek. In riffle and pool habitat types 52 0+, six 1+, and three 2+ steelhead were observed along with 25 sculpin, and one bluegill.

The inventory of Reach 7 was continued beginning at habitat unit #360 and ending at unit #370. In run and pool habitat types 25 0+ and one 1+ steelhead were observed along with 18 sculpin.

The inventory of Reach 8 was started from habitat unit #406 and ended at habitat unit #410. In pool, run, and riffle habitat types 63 0+, 8 1+, and two 2+ steelhead were observed.

The inventory of Reach 8 was continued beginning at dam #4 and continued for approximately 94 feet. In pool habitat types six 0+, one 1+, and two 2+ steelhead were observed.

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

Species Observed in Historical and Recent Surveys			
YEARS	**SPECIES**	**SOURCE**	**Native/Introduced**
1954,1996, 1997	Steelhead	DFG,NMFS	N
1954	Coho Salmon	DFG	N
1996,1997	Sculpin	DFG,NMFS	N
1997	Sacramento Squawfish	DFG	N
1997	Sacramento Sucker	DFG	N
1996,1997	California Roach	DFG,NMFS	N
1997	Bluegill	DFG	I

NMFS = National Marine Fisheries Service

Historical records reflect coho salmon fingerlings were stocked in Dutch Bill Creek in 1969 and 1970, Table 2. Historical records also reflect that fish transfer/rescue operations occurred in 1955, 1956, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1966, 1967, 1968, 1969, 1970, and 1971.

Table 2. Summary of fish hatchery-stocking into Dutch Bill Creek				
YEAR	**SPECIES**	**SOURCE**	**#**	**SIZE**
1969	SS	???	10000	YEAR
1970	SS	Noyo River	10010	YEAR

SS = coho (silver) salmon
YEAR = yearling

Table 3. Summary of fish hatchery - transfers/rescues from Dutch Bill Creek

YEAR	LOCATION	SOURCE	SPECIES	#	SIZE
1955	Russian River	Dutch Bill	SH	10,400	FING
1956	Russian River	Dutch Bill	SH	5,992	FING
1958	Austin Cr	Dutch Bill	SH	6,694	FING
1959	Austin Cr	Dutch Bill	SH	41,494	FING
1960	Austin Cr	Dutch Bill	SH	7,690	FING
1961	Austin Cr	Dutch Bill	SH	18,527	FING
1962	Austin Cr	Dutch Bill	SH	5,651	FING
1963	Austin Cr	Dutch Bill	SH	2,624	FING
1963	Austin Cr	Dutch Bill	SS	???	FING
1964	Austin Cr	Dutch Bill	SH	13,520	FING
1966	Russian River	Dutch Bill	SH	15,680	FING
1967	Russian River	Dutch Bill	SH	23,867	FING
1968	Austin Cr	Dutch Bill	SS	30,032	FING
1968	Russian River	Dutch Bill	SS	8,194	FING
1969	Austin Cr	Dutch Bill	SS	29,684	FING
1970	Austin Cr	Dutch Bill	SS	4,277	FING
1970	Green Valley Cr	Dutch Bill	SH	1,170	FING
1970	Russian River	Dutch Bill	SH	5,106	FING
1970	Russian River	Dutch Bill	SS	1,768	FING
1971	Russian River	Dutch Bill	SS	1,800	FING

SH = steelhead
SS = coho (silver) salmon

FING = fingerling (1st year)

JUVENILE SURVEYS OF TRIBUTARIES

A summary of the juvenile surveys conducted in 1997 in Crawford Gulch Creek, Duvoul Creek, Grub Creek, and Tyrone Gulch Creek appears in the table below. Fair numbers of 0+, 1+, and 2+ steelhead were found in all the tributaries listed above, with the exception of Crawford Gulch Creek. Tyrone Gulch Creek had good numbers of 0+ and 1+ steelhead, but no 2+ steelhead. Tyrone Gulch Creek is a small, but important tributary.

Dutch Bill Tributary Data - Juvenile Surveys				
Creek	0+ Steelhead	1+ Steelhead	2+ Steelhead	Other Species
Crawford Gulch	0	0	0	pacific giant salamander, crawdad
Duvoul	12	1	2	sculpin
Grub	9	11	1	pacific giant salamander
Tyrone Gulch	36	5	0	pacific giant salamander, crawdad, sculpin

ADULT SURVEYS:

A spawning survey was conducted in Dutch Bill Creek on February 3, 1998, beginning at habitat unit #022 (Reach 1) and extending into Tyrone Gulch. Two live steelhead, one male and one female, were observed near a redd. The steelhead pair were 24" to 28" in length and were located 200 yards below bridge #3. Two additional redds were observed, one located beneath bridge #3 and one located 70 yards upstream of bridge #3.

Another spawning/carcass survey was conducted in two sites of Dutch Bill Creek on February 27, 1998. This survey began at the Mt. Zion Bridge #5 (Reach 2) and extended to habitat unit #180 (Reach 4) approximately 2000 feet above the fish ladder. One redd was observed.

The survey continued starting from bridge #7 and ending at habitat unit #240 (Reach 6). Five adult steelhead were observed just downstream of dam #2 at Alliance Redwoods. Three of these were greater than 24", one was approximately 18", and one was

approximately 12". A male and female pair were spawning and the smaller jacks were competing to be part of the act. Under bridge #9, one 28" steelhead was observed near a redd. Upstream of bridge #9, two steelhead, greater than 24" in length, were observed near a redd. One 12" steelhead was observed in the same vicinity. A total of five redds were observed.

DISCUSSION

Dutch Bill Creek has 8 channel types: F4 (16253 ft.), F3 (1320 ft.), F2 (2825 ft.), F3 (1637 ft.), F1 (631 ft.), F3 (4694 ft.), F2 (10983 ft.) and G2 (528 ft.).

There are 16253 feet of F4 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual F1 channel types are good for bank-placed boulders and fair for single wing-deflectors and log cover.

F2 channel types are fair for low-stage weirs, single and opposing wing-deflectors and log cover.

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.

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.

G2 channel types are fair for log cover.

Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

The water temperatures recorded on the survey days 08/12/97 to 09/10/97 ranged from 57°F to 66°F. Air temperatures ranged from 58°F to 68°F. These temperatures are within the threshold stress level (65°F) for salmonids.

Summer temperatures measured using remote temperature recorders placed in pools ranged from 54° to 64° F for Reach 5. This

thermal regime is favorable to salmonids.

Pools comprised 26% of the total length of this survey. 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. In Dutch Bill Creek, the pools are relatively deep with 23% having a maximum depth of at least 3 feet. These pools comprised 10% of the total length of stream habitat. However, 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 21. 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 boulders (30%), root masses (29%), large woody debris (15%), and undercut banks (15%). 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.

Eight of the 18 low gradient riffles measured (44%) had either gravel or small cobble as the dominant substrate. This is generally considered fair for spawning salmonids.

Seventy-nine percent of the pool tail-outs measured had embeddedness ratings of either 1 or 2. Only 21% had a rating of 3 or 4. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered best for the needs of salmon and steelhead.

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.

The mean percent canopy for the entire survey was 90%. This is very good, since 80 percent is generally considered desirable. Large trees contribute shade and provide a long term source of large woody debris needed for instream structure and bank stability.

DISCUSSION OF MAJOR TRIBUTARIES
(Except Lancel Creek)

ALDER CREEK

Alder Creek has 1 channel types: and A2 (989 ft.).

There are 989 feet of A2 channel type in Reach 1. A2 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly boulder substrate. According to the DFG Salmonid Stream Habitat Restoration Manual, the high energy, steep gradient A1/2 channel types have stable stream banks and poor gravel retention capabilities and are generally not suitable for instream enhancement structures.

Pools comprised only 3% of the total ***length*** *of this survey. Therefore, installing structures that will increase pool habitat is recommended for locations where their installation will not jeopardize any unstable stream banks, or subject the structures to high stream energy.*

The mean shelter rating for pools was 16. A pool shelter rating of approximately 80 is desirable. The relatively small amount of pool shelter that now exists is being provided primarily by boulders (98%), large woody debris (2%), undercut banks (0%), and small woody debris (0%). Log and root wad cover structures in the pool and flatwater habitats are needed to improve both summer and winter salmonid habitat. Log cover structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

BAUMERT SPRINGS CREEK

This section of Baumert Springs has 1 channel type: from the mouth to 1023 feet a B2.

There are 1023 feet of B2 channel type in Reach 1. B2 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 boulder substrate. According to the DFG Salmonid Stream Habitat Restoration Manual, B2 channel types are excellent for low and medium-stage plunge weirs, single and opposing wing deflectors and bank cover.

Pools comprised 23% of the total length of this survey. The mean shelter rating for pools was 10. 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 boulders (55%), undercut banks (17%), small woody debris (13%), and large woody debris (10%).

Fifty-eight percent of the pool tail-outs measured had an embeddedness rating of 5 which is considered unsuitable for spawning due to the natural geomorphology. Only 25% 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.

CRAWFORD GULCH CREEK

Crawford Gulch has 1 channel type: A2 (307 ft.). According to the DFG Salmonid Stream Habitat Restoration Manual, the high energy, steep gradient A2 channel types have stable stream banks and poor gravel retention capabilities and are generally not suitable for instream enhancement structures.

Pools comprised 5% of the total length of this survey. The mean shelter rating for the pool was 60. This is good since approximately 80 is desirable. The pool shelter that now exists is being provided primarily by undercut banks (40%), boulders (40%) and large woody debris (20%).

DUVOUL CREEK

Duvoul Creek has 1 channel type: B2 (742 ft.). According to the DFG Salmonid Stream Habitat Restoration Manual B2 channel types are low and medium-stage plunge weirs, single and opposing wing deflectors and bank cover.

GRUB CREEK

Grub Creek has 3 channel types: F2 (4113 ft.), G3 (1116 ft.) and A2 (978 ft.).

There are 4113 feet of F2 channel type in Reach 1. F2 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a predominantly boulder substrate. According to the DFG Salmonid Stream Habitat Restoration Manual, F2 channel types are fair for low-stage weirs, single and opposing wing-deflectors and log cover.

There are 1116 feet of G3 channel type in Reach 2. 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. G3 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

In Reach 3 there is 978 feet of A2 channel type. The high energy, steep gradient A2 channel types have stable stream banks and poor gravel retention capabilities and are generally not suitable for instream enhancement structures.

Many site specific projects can be designed within the (F2 and G3) channel types, especially to increase pool frequency, volume and shelter. These channel types have suitable gradients and the stable stream banks that are necessary for the installation of instream structures designed to increase pool habitat, trap spawning gravels, and provide protective shelter for fish. Any work considered will require careful design, placement, and construction that must include protection for any unstable banks.

The water temperatures recorded on the survey days 08/05/97 to 08/07/97 ranged from 60°F to 70°F. Air temperatures ranged from 72°F to 94°F. The warmer water temperatures were recorded in Reach 2. These temperatures, if sustained, are above the threshold stress level (65°F) for salmonids.

It is unknown if this thermal regime is typical, but our electrofishing samples found steelhead more frequently in the lower 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.

Neither of the 2 low gradient riffles measured had either gravel or small cobble as the dominant substrate. This is generally considered poor for spawning salmonids.

Eighty-nine percent of the pool tail-outs measured had embeddedness ratings of either 3 or 5. An embeddedness rating of 5 is considered unsuitable for spawning due to the natural geomorphology. 0% 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.

TYRONE GULCH CREEK

Tyrone Gulch has 2 channel types: B2 (723 ft.) and A3 (917 ft.).
There are 723 feet of B2 channel type in Reach 1. According to the DFG Salmonid Stream Habitat Restoration Manual, B2 channel types are excellent for low and medium-stage plunge weirs, single and opposing wing deflectors and bank cover.

In Reach 2 there is 917 feet of A3 channel type. A3 channel types are steep (4-10%), narrow, cascading, step-pool streams with a high energy/debris transport associated with depositional soils and a predominantly cobble substrate. A3 channel types are good for bank-placed boulders and fair for low-stage weirs, opposing wing-deflectors and log cover.

UNNAMED TRIBUTARY

Unnamed tributary has 1 channel type: F3 (1697 ft.)

There are 1697 feet of F3 channel type in Reach 1. F3 channel types are entrenched meandering riffle/pool channels on low gradients (<2%) with a high width/depth ratio and a

predominantly cobble substrate. According to the DFG Salmonid Stream Habitat Restoration Manual, 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.

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, fair numbers of steelhead (but no coho) were observed during the 1997 surveys. The 1998 spring surveys documented 0+ fish indicating successful spawning in the middle reaches of Dutch Bill Creek. Many 1+ fish were observed indicating good rearing conditions the year before or good holding-over conditions in general. Overall however, habitat conditions for both steelhead and coho have declined over time.

In general, Reaches 3-7 of Dutch Bill Creek are good for salmon and steelhead habitat. Some deep, sheltered sections of the stream occur in the mid and upper Reaches which may be used as rearing habitat. However, in the lower Reaches (1 and the lower portion of 2) pool shelter and frequency are lacking and portions are dry, limiting successful spawning and rearing. Portions of Dutch Bill have been channelized from road construction and urbanization along the creek, thus stream velocity has increased resulting in downcutting, streambank erosion and loss of mature riparian. Riffle habitat exists for spawning, but many areas are unsuitable for spawning due to high gravel embeddedness. Winter resting cover from high velocities and summer rearing habitat for juveniles is lacking. The effects of channelization limits instream habitat improvement alternatives, although some opportunity exists. Any work considered will require careful design, placement, and construction that must include protection for the unstable banks and high stream velocities. Reaches 2 and 4 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.

GENERAL RECOMMENDATIONS

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

Shortly before the survey, winter storms brought down many large trees and other woody debris into the stream, which increased the number and quality of pools since drought years. This woody debris, if left undisturbed, would have provided fish shelter and rearing habitat, and offset channel incision. Recently, many logs were removed by flood control crews and historic tree and log removal were evident in the active channel during our survey. 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 sensitive and the city 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) Access for migrating salmonids is an ongoing potential problem, therefore, fish passage should be improved where possible. Baffles should be installed in several tributary culverts to facilitate easier fish access.

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

3) In Dutch Bill Creek, active and potential sediment sources related to the County road system need to be improved, and treated according to their potential for sediment yield to the stream and its tributaries. Maintenance of ditches,

culverts, and inboard cutbank slides should be improved to decrease the potential of sediment delivery to Dutch Bill Creek. During storms, surface runoff over the road causes outboard cutbank slides, delivering sediment and threatening the road integrity. This is primarily due to the existing conditions of the road drainage network

.4) Spawning gravels on Dutch Bill Creek are limited to relatively few reaches. 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 Dutch Bill Creek Reaches 3-7)

5) Map sources of upslope and in-channel erosion, and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream. Near-stream riparian planting along any portion of the stream should be encouraged to provide bank stability and a buffering against urban runoff.

6) Access for migrating salmonids is an ongoing potential problem, therefore, fish passage should be monitored before and after improvements of culverts.

RESTORATION IMPLEMENTED

1) The fish ladder at Reach 3 should be improved to pass fish easier at all flows.

DUTCH BILL CREEK TRIBUTARY RECOMMENDATIONS

BAUMERT SPRINGS CREEK

1) Access for migrating salmonids is an ongoing potential problem in Reach 1, therefore, fish passage should be monitored, and improved where possible. An instream culvert located at habitat unit #030 is a possible fish barrier and needs to be repaired. Future design should include improved passage of gravel and fish passage as a first priority.

DUVOUL CREEK

1) Access for migrating salmonids is an ongoing potential problem in Reach 1, therefore, fish passage should be monitored, and improved where possible. A culvert located at habitat unit #001 is a possible fish barrier that should be analyzed for fish passage and baffles should be installed if necessary. A permanent barrier exists at 668' (30' high bedrock waterfall).

GRUB CREEK

1) Access for migrating salmonids is an ongoing potential problem in Reach 1, therefore, fish passage should be monitored, and improved where possible. The concrete box culvert at habitat unit #003 should be analyzed for fish passage and baffles should be installed if necessary.

2) There are at least 2 sections (Reach 2 and Reach 3) where the stream is being impacted from livestock in the riparian zone. Livestock in streams generally inhibit the growth of new trees, exasperate erosion, and reduce summertime survival of juvenile fish by defecating in the water. Alternatives to limit cattle access, control erosion and increase canopy, should be explored with the landowner, and developed if possible.

3) Near-stream riparian planting along any portion of the stream should be encouraged to provide bank stability and a buffering against agricultural, grazing and urban runoff.

4) In Grub 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.

TYRONE GULCH CREEK

1) A culvert located at habitat unit #004 is a partial fish barrier that should be replaced with an arched culvert to improve passage.

PROBLEM SITES AND LANDMARKS - DUTCH BILL 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 LEN (FT.)	COMMENTS
1.00	372	LG. ROOTWAD TUCKED UNDERNEATH BRIDGE, POSSIBLE FOR RESTORATION USE
3.00	537	O+ SHD
4.00	610	POSSIBLE RESTORATION MATERIALS; RT WAD, LWD
5.00	692	RIP RAP RB
6.00	816	CULVERT LB 18"
9.00	1009	0+
12.00	1176	RIP RAP, EROSION, 0+ SHD
13.00	1258	RUSTED CAR IN CR.
14.00	1288	0+ SHD
18.00	1525	0+, 1+, 2+ SHD
19.00	2447	BRIDGE AND CULVERT LB
20.00	2542	3 POOLS SERIES
27.00	4473	DOZER TRACKS IN CR.
28.00	4502	PUMP IN CR. CULVERT
29.00	7732	CULVERT ,TRIB PUMP @ 1800' RB

30.00 7764 MANY 0+

31.00 7922 PIPE ACROSS CR.

32.00 7962 0+, 1+, 2+;RB RETAINING WALL

33.00 8948 SEE YELLOW BK

34.00 8964 0+ SHD, RIP RAP

35.00 9244 LONG RIP RAP UNIT RB

36.00 9317 0+SHD, 68 DEG. WATER; ALGAE

38.00 9500 SEE JOURNAL

39.00 11430 BRIDGE @ 600', BLOWOUT @ 1000'

41.00 11508 WET TRIB LB, 2 CULVERTS 0+SHD

43.00 11565 RETAINING WALL LB, 40'L X 8' H

44.00 11601 CONCRETE UTILITY BOX 0+ SHD

45.00 11661 RIPRAP LB 90'L

47.00 12097 RIPRAP LB 90'L

48.00 12132 0+SHD

50.00 12327 0+, 1+ SHD

51.00 12593 2 RETAINING WALLS 90'L LB

52.00 12623 CRAWFISH, 0+SHD

54.00 12806 50 0+SHD

55.00 12853 RIPRAP RB 50'L

56.00 12913 1+ SHD

60.00 13134 DRY TRIB LB W/CULVERT UNDER TYRONE RD. 0+, 1+ SHD

61.00 13154 DRY TRIB W/CULVERT LB

62.00 13190 0+ SHD

66.00 13401 227' VEGETATED GRAVEL BAR

68.00 13498 EROSION LB

69.00 13585 EROSION LB CAUSED BY ROAD RUNOFF

71.00 13696 12" CULVERT LB
72.00 13726 PUMP ON LB W/PUMP HOUSE

79.00 14051 6"CRAWFISH; LANDOWNER SAYS HE HAS SEEN SEVERAL 18" SHD
86.00 14551 BOULDERS = CONCRETE SLABS (4) CULVERT LB

87.00 14603 POSSIBLE RESTORATION SITE, SHELTER ENHANCEMENT

88.00 14660 WET TRIB LB

89.00 14742 DRY TRIB RB W/2 CULVERTS

95.00 15117 LANDOWNER TRAINBRIDGE

96.00 15160 LG AMOUNTS OF COBBLE
98.00 15300 PUMP ON RB; SHD SPAWNING PAIR PHOTOGRAPH - MR. FINER TOOK PHOTO
101.00 15606 RB 12" CULVERT

107.00 15893 JUV. SCULPIN

108.00 15972 LG COBBLE TRANSITION FROM GRAVEL

112.00 16153 RETAINING WALL RB

115.00 16290 CHANNEL CHANGE TO F3

120.00 16660 0+SHD

121.00 16731 LG CULVERT

123.00 16840 BRIDGE 5

125.00 17037 LB STORAGE ITEMS; FURNITURE , EMPTY DRUMS, METAL BOXES. ALL UNDERNEATH A TARP

129.00 17231 MANY SQUAWFISH

132.00 17425 0+SHD

135.00 17656 BEGINNING OF F2

138.00 17858 0+SHD

139.00 17955 1"PVC PIPE

140.00 18037 DRY TRIB LB

142.00 18180 EROSION RB 30'L X 15'W X 3'D

143.00 18616 18" CULVERT ON RB

145.00 19006 3 8" BLUEGILLS, 1+ SHD, SCULPIN, CRAYFISH

146.00 19200 DRY TRIB RB 18" CULVERT

147.00 19328 2+ SHD, BEGINNING OF FISH LADDER

148.00 19648 3 ½' JUMP UP TO SECOND STEP. END OF UNIT @ END OF LADDER. SEE BK

149.00 19709 RB RIPRAP, RETAINING WALL

155.00 20476 BEGINNING OF F3 CHANNEL TYPE

156.00 20516 OLD BRIDGE ABUTMENT , BLOWN OUT FOR SOME TIME

157.00 20595 DRY TRIB RB

164.00 21008 DRY TRIB RB

165.00 21048 SCULPIN

171.00 21351 MORE BEDROCK OBSERVED ON BANKS; 0+ SHD

174.00 21501 CULVERT RB - NEEDS MAIN.
181.00 21932 DUVOUL TRIB RB; CULVERT (SEE FORM)
MANY 0+, 1+; 1-2+ SHD
182.00 21970 RIPRAP RB
184.00 22043 SCULPIN AND CRAYFISH

186.00 22189 0+ SHD; BEDROCK = CONCRETE;
80'L RETAINING WALL RB
CHANNEL CHANGE TO F1

187.00 22259 A FEW 1+ AND 0+ SHD
188.00 22280 ACTIVE EROSION RB - 100'L
189.00 22394 10" CULVERT LB
191.00 22530 CULVERT LB
194.00 22698 POOL FORMED @ WESTMINSTER DAM;
POSSIBLE RESTORATION SITE
195.00 23494 CHANNEL CHANGE TO F3; FOOTBRIDGE
OVER DAM; POOL BACKED UP
197.00 23646 *POSSIBLE RESTORATION SITE*;
GOOD POOL - NO SHELTER
198.00 23745 12" CULVERT RB
199.00 23822 PICNIC AREA LB
200.00 23887 GRUB CREEK RB; PICNIC AREA LB
203.00 24153 PUMP RB
205.00 24306 0+ SHD
207.00 24389 REMAINS OF OLD CONCRETE DAM
214.00 24813 MANY SHD; 0+, 1+, 2+,
RES?- GREAT POOL
216.00 24933 BRIDGE#7
219.00 25123 0+, 1+,SHD
221.00 25253 WELL IN STREAM - 3' CORRUGATED
STEEL; 1+, 0+ SHD
224.00 25443 FOOT BRIDGE
229.00 25828 SCULPIN, 0+ SHD, 1+, 2+,
CRAWFISH

230.00 26255 CONCRETE DEFLECTOR WEIR; RIPRAP LB;
BRIDGE #8
231.00 26291 RIPRAP LB
232.00 26388 WET TRIB LB W/CONCRETE WEIR ACTING AS
A DAM W/ACTIVE PUMP
236.00 26672 Bridge #9

239.00 26897 LOTS OF BEDROCK
242.00 27190 1+ SHD
243.00 27210 1+ SHD
246.00 27392 *POSSIBLE RESTORATION*
LACK OF LWD
247.00 27417 CHANNEL CHANGE TO F2
258.00 28072 1+ SHD
264.00 28376 18" CULVERT RB - ERODING
268.00 28587 1+ SHD
269.00 28868 LOGJAM; 20" CULVERT RB
271.00 29244 PUMP RB W/PIPING
EXTENDING UPSLOPE INTO
DRY TRIB, CULVERT EXTENDING UNDER
ROAD- (BOHE. HWY.)
0+ SHD
272.00 29283 DRY TRIB LB; 0+ SHD
274.00 29370 2+ SHD
276.00 29453 0+ SHD
277.00 29492 1+ SHD
278.00 29526 EROSION RB - SEE EROSION FORM
283.00 29868 CEMENT WELL RB; WATER HOLDING TANK
RB W/1" PVC RUNNING 15' OVER CREEK
TO
SPRING LB
286.00 30028 ALDER CREEK TRIB RB
COBBLE WALL LB W/12' CEMENT DRAINAGE
CHUTE; DRAINAGE FROM TRIB WHICH
FLOWS
UNDER ROAD (BOHE. HWY.) IS DRY
296.00 30523 0+ SHD; 1+ SHD
297.00 30553 OLD FRIDGE IN CREEK
299.00 30617 0+ SHD
301.00 30795 0+ SHD
306.00 31176 0+ SHD
307.00 31269 0+ SHD, SCULPIN
313.00 31626 2+ SHD, 0+ SHD
315.00 31878 WET TRIB LB; 2" PVC PIPE FROM WET
TRIB OVER CREEK 3"
316.00 32175 CULVERT RB; 2" PIPE LAYING
LENGTHWISE
IN CREEK EXTENDING 346' - NOT IN USE
320.00 32373 BRIDGE #10 @ TOWER RD.
322.00 32491 SCULPIN

326.00 33149 CAMP MEEKER DAM - SUMMER FLASHBOARD
327.00 33179 0+ SHD, DRY TRIB LB
332.00 33389 0+ SHD
334.00 33513 0+ SHD; BRIDGE #11 - BOHE. HWY.
336.00 33658 0+ SHD
338.00 34016 1 1/4" WATER DIVERSION PIPE (PVC)
4.5' OVER CREEK
339.00 34060 0+ SHD
341.00 34254 0+ SHD
342.00 34482 0+ SHD; EROSION - SEE FORM
343.00 34509 0+ SHD
345.00 34705 (3) 2+ SHD(POSSIBLE RESIDENTS)
NICE POOL
349.00 34938 0+ SHD
352.00 35189 LANCEL CREEK CONFLUENCE RB
353.00 35241 0+ SHD; 2+ SHD
356.00 35357 ABUNDANCE OF SMALL BLACK SNAILS
357.00 35388 2+ SHD, 0+ SHD
358.00 35456 1" PVC PIPE ACROSS CREEK;
2' ABOVE CREEK
359.00 35494 0+ SHD
361.00 35555 CULVERT LB; EROSION LB;
LOG JAM (SEE FORM)
365.00 35703 DRY TRIB
366.00 35751 0+ SH
374.00 36301 CULVERT LB - DRAINAGE FROM ROAD
381.00 36629 0+ SHD
382.00 36719 2.5' CULVERT RB - 110' OFF BANK
383.00 36748 0+ SHD
385.00 36833 0+ SHD
392.00 37192 0+ SHD
395.00 37390 0+ SHD
396.00 37570 DRY TRIB LB
397.00 37654 0+ SHD
404.00 38181 0+ SHD
406.00 38441 CHANNEL CHANGE TO G
410.00 38749 CULVERT - SEE FORM; 1 3/4" METAL
PIPE RUNNING 7.5' ACROSS CREEK
414.00 39036 FLASHBOARD DAM 4 - SEE FORM;
INSULATED 1" PIPE 4' OVER CREEK
416.00 39147 0+ SHD; BACKED UP BY ROCK WEIR;
2 4" WATER PIPES 7' OVER CREEK;
PUMPHOUSE RB; 1 1/4" PVC IN CREEL

419.00	39244	CULVERT LB - SEE FORM			
421.00			39306	0+	SHD
424.00	39418	CULVERT LB - SEE FORM			
425.00			39508	0+	SHD
427.00	39592	INSTREAM CULVERT - SEE FORM			
429.00	40402	END OF SURVEY			

PROBLEM SITES AND LANDMARKS - ALDER CREEK SURVEY COMMENTS

HABITAT UNIT #	STREAM LEN (FT.)	COMMENTS
1.00	434	FIRST 148' CHANNELIZED BY 4 8'ROCK WALLS W/CONCRETE BOTTOM BRIDGE FORM
2		DRY TRIBS RB
3.00	695	BEDROCK CASCADE BARRIER 14.5' JUMP . ROCK WALLS BOTH BANKS W/DECK LB. SERIES OF CASCADES 8.5', 8.5',11'.8" SEDIMENT SOURCE LB--SEE FIELD BOOK
8.00	991	OLD ROCK DAM-SHEET FILLED W/GRAVEL TO RIM DRY ABOVE TO HEADWATERS AREA. RD 40' ABOVE END OF SURVEY. END OF ANADROMY LIMIT #008 . SEE FIELD BK. #2 FOR ADDITIONAL COMMENTS.

PROBLEM SITES AND LANDMARKS - BAUMERT SPRINGS SURVEY COMMENTS

HABITAT	DISTANCE	COMMENTS

UNIT #	UPSTREAM		
2	77	(4)	0+ SH
5	206		0+ SH
11	444	Bank Armorment	LB
12	473	Rock Barrier- Partial	
14	512	Pump piping found throughout creek on LB & RB	
15	539	Barrier- appears to be a barrier, but fish spotted above it.	
23	755	Erosion Blowout	
24	764	Culvert in stream.	
25	799	Culvert LB. Two massive water tanks on LB	
		Dia= 17'	
30	1023	-Culvert	
		-Instream Barrier: could be repaired.	
		****End of Survey****	

PROBLEM SITES AND LANDMARKS - DUVOUL CREEK SURVEY COMMENTS

HABITAT UNIT #	STREAM LEN (FT.)	COMMENTS
1.00	79	CULVERT
2.00	116	FRESHWATER SNAILS
6.00	617	BARRIER 80' ANGLE BEDROCK FALLS

		30.5' HIGH
8.00	668	Definite Barrier- 80 degree angle bedrock falls 30.5' high
9.00	674	Juvenile newts
10.00	744	***End of Anadromy unit #008 ****End of Survey****

PROBLEM SITES AND LANDMARKS - GRUB CREEK SURVEY COMMENTS

HABITAT UNIT #	STREAM LEN (FT.)	COMMENTS
1.00	126	1' of gravel aggraded at mouth
3.00	248	BEDROCK = CONCRETE BOX CULVERT, DEPTH LESS THAN .1, BUT STILL FLOWING
5.00	585	ROAD ENTER CREEK THEN LEAVES CR. 100' UPSTREAM . 2 LOG WEIRS RETAINING GRAVEL. INCREASING GRADE @ START OF UNIT. DRY TRIB LB
6.00	609	RD RUNS ALONG CR. LB . 3-4 0+ SHD
7.00	792	WATER DIVERSION PIPE OVER CR. 12" CULVERT LB NO MAINTENANCE . DRY TRIB RB
18.00	1404	DRY TRIB RB. RB BLOWOUT DOWN TO

BEDROCK 25L X 50W X 10D

19.00 1421 12" CULVERT LB NO MAINT.

20.00 1440 DRY TRIB RB

21.00 1451 TADPOLES

22.00 1478 ACTIVE EROSION FROM ROAD LB 50L X 20H

23.00 1529 2 SM. FROGS

24.00 1562 12" CULVERT LB NO MAINT. 2+ SHD

32.00 2087 BLOWOUT RB

34.00 2229 1+ SHD

36.00 2368 DRY TRIB LB. ACTIVE EROSION ALONG RD. LB 30L X 10 H

38.00 3011 PLASTIC & METAL PIECES IN CR. DRY TRIB LB. 2 FORKS. CULVERT IN STREAM 12" CULVERT LB.

39.00 3030 OLD ROCK DAM RB. 2 LG PIECES OF DAM IN CR. BANK EROSION 370' INTO UNIT. RIPARIAN ZONE IS DEPLETED.

40.00 4115 OLD LAKE BED 1ST 600' OF UNIT LG. DRY TRIB RB. ARRUNDO DONAX LB 30'. CROSSING AFTER LAKE BED RD. INTO LAKE BED (DRY TRIB)

41.00 4126 DRY TRIB RB

42.00 4292 18" CULVERT LB. UNDERSIZED FOR TRIBS

43.00 4310 LOTS 'O' FROGS CULVERT INSTREAM @ END OF UNIT

44.00 4908 DRY TRIB RB-2 DRY TRIB LB SM. SLIDE LB 35L X 40W X 10D BLANCHARD PROP. BEGINS FLOATING FENCE 370' INTO UNIT

47.00 4991 MACROINVERTEBRATES

48.00 5231 DRY TRIB RB. BANK SLUMP LB 60W X 50L BOULDER CLOG AT END OF UNIT

50.00 5344 DRY TRIB LB. 2 BANK EROSION RB 30L X 30 W X 10 D EVIDENCE OF COWS IN CR.

52.00 5556 DRY TRIB RB COW TRAILS ALONG CR. LB/RB

53.00 5610 MACROINVERTEBRATES

56.00 5698 DRY TRIB LB

57.00 5866 BANK EROSION RB 30L x 40 W x 5D BANK EROSION LB SLIDE 25L X 40W X 5D

60.00 6007 ERODED BANK LB 40L X 20W

63.00 6090 EVID. OF COWS IN CR. DRY TRIB LB

64.00 6184 BANK EROSION R/B 30L X 35W

66.00 6211 17.5' BEDROCK CASCADE POSSIBLE FISH BARRIER AT HEADWATERS FORK. DRY ABOVE CHANNEL WIDTH LESS THAN 3' NO FISH OBSERVED 8/7/97. END OF SURVEY***

PROBLEM SITES AND LANDMARKS - TYRONE GULCH CREEK SURVEY COMMENTS

HABITAT UNIT #	STREAM LEN (FT.)	COMMENTS
1.00	111	Culvert sheet, Hab unit#004 possible barrier, landowner says not as many prawns as in the past-or steelhead. He thinks the decline occurred when the culvert was placed. Flows under landowner porch; concrete weir; 0plus SHD
3.00	447	0 plus SHD
4.00	477	pump on r/b; 0 plus
8.00	633	confluence with Crawford Gulch tributary
11.00	795	Beginning of new channel

21.00	1331	Sculpin; 0 plus SHD; dry trib at r/b
26.00	1528	2 plus SHD; residents?
28.00	1640	END OF SURVEY**

PROBLEM SITES AND LANDMARKS - UNNAMED CREEK SURVEY COMMENTS

HABITAT UNIT #	STREAM LEN (FT.)	COMMENTS
3.00	85	0 plus SHD
8.00	256	2 0plus SHD; pumphouse on r/b
11.00	390	Sculpin; 0plus SHD
13.00	472	channel type
14.00	573	Channel Type
19.00	758	0 plus SHD
31.00	1164	0 plus SHD, Sculpin
32.00	1266	Dry trib at R/B
35.00	1521	Dry Trib RB
36.00	1697	Railroad tracks up above; fish barrier- END OF SURVEY***

LEVEL III and LEVEL IV HABITAT TYPE KEY:

HABITAT TYPE	LETTER	NUMBER
RIFFLE		
Low Gradient Riffle	[LGR]	1.1
High Gradient Riffle	[HGR]	1.2
CASCADE		
Cascade	[CAS]	2.1
Bedrock Sheet	[BRS]	2.2
FLATWATER		
Pocket Water	[POW]	3.1
Glide	[GLD]	3.2
Run	[RUN]	3.3
Step Run	[SRN]	3.4
Edgewater	[EDW]	3.5
MAIN CHANNEL POOLS		
Trench Pool	[TRP]	4.1
Mid-Channel Pool	[MCP]	4.2
Channel Confluence Pool	[CCP]	4.3
Step Pool	[STP]	4.4
SCOUR POOLS		
Corner Pool	[CRP]	5.1
Lateral Scour Pool - Log Enhanced	[LSL]	5.2
Lateral Scour Pool - Root Wad Enhanced	[LSR]	5.3
Lateral Scour Pool - Bedrock Formed	[LSBk]	5.4
Lateral Scour Pool - Boulder Formed	[LSBo]	5.5
Plunge Pool	[PLP]	5.6
BACKWATER POOLS		
Secondary Channel Pool	[SCP]	6.1
Backwater Pool - Boulder Formed	[BPB]	6.2
Backwater Pool - Root Wad Formed	[BPR]	6.3
Backwater Pool - Log Formed	[BPL]	6.4

Dammed Pool	[DPL]	6.5