STREAM INVENTORY REPORT

Panther Gulch

INTRODUCTION

A stream inventory was conducted during the summer of 1999 on Panther Gulch. The survey began at the confluence with Hayworth Creek and extended upstream 5,693 feet.

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

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

Panther Gulch is a tributary to Hayworth Creek, a tributary to the North Fork Noyo River, a tributary to the Noyo River, located in Mendocino County, California (Map 1). Panther Gulch's legal description at the confluence with Hayworth Creek is T19N R15W S33. Its location is 39° 27′42″ north latitude and 123°31′25″ west longitude. Panther Gulch has approximately 1.0 miles of ephemeral stream according to the USGS Northspur 7.5 minute quadrangle. Panther Gulch drains a watershed of approximately 0.7 square miles. Elevations range from approximately 720 feet at the mouth of the creek to 1,617 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Highway 20 to Irmulco Road (approximately six miles west of Willits).

METHODS

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

SAMPLING STRATEGY

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

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 Panther Gulch 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 a Marsh-McBirney Model 2000 flow meter.

2. Channel Type:

Channel typing is conducted according to the classification system developed and revised by David Rosgen (1985 rev. 1994). This methodology is described in the *California Salmonid Stream Habitat Restoration Manual*. Channel typing is conducted simultaneously with habitat typing and follows a standard form to record measurements and observations. There are five measured parameters used to determine channel type: 1) water slope gradient, 2) entrenchment, 3) width/depth ratio, 4) substrate composition, and 5) sinuosity. Channel characteristics are measured using a clinometer, hand level, hip chain, tape measure, and a stadia rod.

3. Temperatures:

Both water and air temperatures are measured and recorded at every tenth habitat unit. The time of the measurement is also recorded. Both temperatures are taken in degrees Fahrenheit at the middle of the habitat unit and within one foot of the water surface.

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". Panther Gulch habitat typing used standard basin level measurement criteria. These parameters require that the

minimum length of a described habitat unit must be equal to or greater than the stream's mean wetted width. All measurements are in feet to the nearest tenth. Habitat characteristics were measured using a clinometer, hip chain, and stadia rod.

5. Embeddedness:

The depth of embeddedness of the cobbles in pool tail-out areas is measured by the percent of the cobble that is surrounded or buried by fine sediment. In Panther Gulch, embeddedness was ocularly estimated. The values were recorded using the following ranges: 0 - 25% (value 1), 26 - 50% (value 2), 51 - 75% (value 3) and 76 - 100% (value 4). Additionally, a value of 5 was assigned to tail-outs deemed unsuited for spawning due to inappropriate substrate particle size, 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. The shelter rating is calculated for each fully-described habitat unit by multiplying shelter value and percent cover. Using an overhead view, a quantitative estimate of the percentage of the habitat unit covered is made. All cover is then classified according to a list of nine cover types. In Panther Gulch, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

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

8. Canopy:

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

9. Bank Composition and Vegetation:

Bank composition elements range from bedrock to bare soil. However, the stream banks are

usually covered with grass, brush, or trees. These factors influence the ability of stream banks to withstand winter flows. In Panther Gulch, the dominant composition type and the dominant vegetation type of both the right and left banks for each fully-described unit were selected from the habitat inventory form. Additionally, the percent of each bank covered by vegetation (including downed trees, logs, and root wads) was estimated and recorded.

BIOLOGICAL INVENTORY

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

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat, a dBASE 4.2 data entry program developed by Tim Curtis, California Department of Fish and Game. This program processes and summarizes the data, and produces the following six 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 Quattro Pro. Graphics developed for Panther Gulch include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length
- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in low gradient riffles
- Mean percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

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

The habitat inventory of August 17, 1999, was conducted by Toni Beaumont and Chris Ramsey (WSP/AmeriCorps). The total length of the stream surveyed was 5,693 feet.

Stream flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.12 cfs on August 23, 1999.

Panther Gulch is an F4 channel type for the entire 5,693 feet of the stream surveyed. F4 channels are entrenched, meandering, riffle/pool channels with low gradients, high width/depth ratios, and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 56 to 59 degrees Fahrenheit. Air temperatures ranged from 57 to 77 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 4% riffle units, 44% flatwater units, and 50% pool units (Graph 1). Based on total length of Level II habitat types there were 4% riffle units, 78% flatwater units, and 18% pool units (Graph 2).

Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were runs, 28%; mid-channel pools, 20%; and step-runs, 16% (Graph 3). Based on percent total length, runs made up 53%, step runs 25%, and mid-channel pools 7%.
A total of 60 pools were identified (Table 3). Scour pools were the most frequently encountered, at 58%, and comprised 60% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Seven of the 60 pools (12%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 60 pool tail-outs measured, 19 had a value of 2 (31.7%); 3 had a value of 3 (5.0%); and 38 had a value of 5 (63.3%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate. The dominant substrate composition for the 38 pool tail-outs that had a embeddedness value of 5 was gravel too small to be suitable for spawning.

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 habitat types had a mean shelter rating of 10, flatwater habitat types had a mean shelter rating of 14, and pool habitats had a mean shelter rating of 25 (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 38. Main channel pools had a mean shelter rating of 11 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris and undercut banks are the dominant cover types in Panther Gulch. Graph 7 describes the pool cover in Panther Gulch. Undercut banks are the dominant pool cover types followed by large and small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 97% of pool tail-outs while large cobble was the next most frequently observed substrate type, at 3%.

The mean percent canopy density for the surveyed length of Panther Gulch was 95%. The mean percentages of deciduous and coniferous trees were 50% and 50%, respectively. Graph 9 describes the mean percent canopy in Panther Gulch.

For the stream reach surveyed, the mean percent right bank vegetated was 83%. The mean percent left bank vegetated was 80%. The dominant elements composing the structure of the stream banks consisted of 78.6% sand/silt/clay, 11.9% bedrock, and 9.5% cobble/gravel (Graph 10). Deciduous trees were the dominant vegetation type observed in 36% of the units surveyed. Additionally, 50% of the units surveyed had coniferous trees as the dominant vegetation type, and 14.3% had brush as the dominant vegetation (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Six sites were electrofished for species composition and distribution in Panther Gulch on October 19, 1999. The water temperature taken at 4:45pm was 51 degrees Fahrenheit. Air temperature was 45 degrees Fahrenheit. The sites were sampled by Michelle Gilroy (DFG) and Toni Beaumont (WSP/AmeriCorps).

The first site sampled included habitat unit 11, a mid-channel pool, with log cover, approximately 414 feet from the confluence with Hayworth Creek. The site yielded 1 young-of-the-year steelhead and 1 salamander.

The second site included habitat unit 16, a mid-channel pool, located approximately 665 feet above the creek mouth. The site yielded 3 salamanders.

The third site sampled included habitat unit 18, a mid-channel pool, with root wad cover, located approximately 826 feet above the creek mouth. The site yielded no fish.

The fourth site sampled included habitat unit 20, a mid-channel pool, with root wad cover, located approximately 933 feet above the creek mouth. The site yielded 1 young-of-the-year steelhead.

The fifth site sampled included habitat unit 24, a mid-channel pool with root cover, located approximately 1,038 feet above the creek mouth. The site yielded no fish.

The sixth site sampled included habitat unit 31, a lateral scour pool - bedrock formed, located approximately 1,389 feet above the creek mouth. The site yielded 1 young-of-the-year age class steelhead.

The following chart displays the information yielded from these sites:

Date	Site #	Approx. Dist. from mouth (ft.)	Hab. Unit #	Hab. Type	Reach #	Channel type	Steelhead YOY	1+	2+
10/19/1999	1	414	11	MCP	1	F4	1	0	0
10/19/1999	2	665	16	MCP	1	F4	0	0	0
10/19/1999	3	826	18	MCP	1	F4	0	0	0
10/19/1999	4	933	20	MCP	1	F4	1	0	0
10/19/1999	5	1,038	24	MCP	1	F4	0	0	0
10/19/1999	6	1,389	31	LSBK	1	F4	1	0	0

DISCUSSION

Panther Gulch is an F4 channel type for the entire 5,693 feet of stream surveyed. The suitability of F4 channel types for fish habitat improvement structures is as follows: good for bank-placed boulders; fair for plunge weirs, single and opposing wing-deflectors, channel constrictors, and log cover; poor for boulder clusters.

The water temperatures recorded on the survey day of August 8, 1999, ranged from 56 to 59 degrees Fahrenheit. This is a good water temperature range for salmonids. Air temperatures ranged from 57 to 77 degrees Fahrenheit. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 78% of the total length of this survey, riffles 4%, and pools 18%. Twelve percent of the pools had a maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width.

Nineteen of the 60 pool tail-outs measured had embeddedness ratings of 2. Three of the pool tail-outs had embeddedness ratings of 3. Thirty-eight of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. All 38 were unsuitable for spawning due to the dominant substrate being small gravel. Cobble embeddedness measured to be 25% or less, a rating 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Panther Gulch should be mapped and rated according to their potential

sediment yield and control measures should be taken.

Although fifty-eight of the 60 pool tail-outs measured had gravel as the dominant substrate, 38 of the 58 pool tail-outs had gravel too small to be suitable for spawning. Suitable size spawning substrate is limited in Panther Gulch.

The mean shelter rating in riffle habitats was 10. The shelter rating in the flatwater habitats was 14. The shelter rating for pools was 25. A pool shelter rating of approximately 100 is desirable. The cover that now exists is being provided primarily by small woody debris and undercut banks in all habitat types. Additional complex log and root wad cover structure in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 95%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was 83% and 80%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Panther Gulch should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are within the acceptable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August extreme temperature period should be performed for 3 to 5 years.

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

4) Increase the large wood component instream. Most of the existing cover is from small woody debris and undercut banks. Adding high quality complexity with woody cover is desirable.

5) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

COMMENTS AND LANDMARKS

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

0'	Begin survey at confluence with Hayworth Creek. Channel type is an F4.
189'	Log debris accumulation, 5 feet high x 5 feet wide x 5 feet long, containing 4 pieces of large woody debris forming 2 foot plunge.
239'	Small debris accumulation containing 15 pieces of small debris and forming 3 foot plunge.
277'	Flatcar bridge, 28 feet long, 6 feet above channel with associated bank erosion.
414'	Electrofishing site #1.
419'	Small woody debris accumulation.
665'	Electrofishing site #2.
826'	Steep left bank, highly eroded. Electrofishing site #3.
933'	Electrofishing site #4.
945'	Log debris accumulation, 15 feet long x 10 feet wide x 5 feet high.
1,038'	Electrofishing site #5.
1,105'	One and a half foot plunge.
1,222'	Six dead and downed trees in channel.
1,371'	Log debris accumulation, 36 feet long x 8 feet wide, containing 15 pieces of large woody debris, retaining gravel and fine sediment.
1,389'	Electrofishing site #6.
2,174'	Log debris accumulation containing ten pieces of large woody debris, retaining gravel and sediment.
2,620'	Log debris accumulation, 15 feet high x 10 feet long x 6 feet high, retaining gravel and sediment.

2,724'	Old road crossing.
2,769'	Ephemeral tributary enters from left bank.
2873'	Road crossing.
2,931'	Two pieces of large woody debris in channel.
2,963'	Log debris accumulation, 10 feet long x 10 feet wide, with 10 pieces of small woody debris, retaining gravel and fine sediment.
3,024'	Five pieces of woody debris, 5 feet long x 5 feet wide, accumulating gravel and fine sediment.
3,068'	Log debris accumulation, 5 feet long x 5 feet wide, containing 10 pieces of large woody debris accumulating gravel and sediment.
3,221'	Four foot diameter log in channel.
3,235'	Log debris accumulation, 5 feet long x 5 feet wide, containing 10 pieces of large woody debris. Ephemeral tributary enters from right bank.
3,395'	Bridge posts.
3,438'	Left bank failure, 10 feet long x 10 feet high.
3,454'	Log debris accumulation, 20 feet long x 10 feet wide, containing 15 pieces of large woody debris, retaining gravel and fine sediment.
3,735'	Bridge post.
3,891'	Log debris accumulation, 10 feet long x 10 feet wide, containing 10 pieces of large woody debris.
3,947'	Ten pieces of large woody debris spanning channel.
4,104'	Four foot diameter log spanning channel and retaining gravel and fine sediment.
4,360'	Tributary enters from right bank, 56 degrees Fahrenheit water temperature.
4,422'	Log debris accumulation, 10 feet long x 10 feet wide, containing 6 pieces of large woody debris, retaining gravel and sediment.
4,869'	Four pieces of large woody debris spanning channel.

4,901'	Subsurface stream flow.
4,956'	Significant amount of woody debris in channel.
4,967'	Three foot diameter log in channel retaining sediment.
5,009'	Log in channel creating four foot plunge.
5,514'	Log debris accumulation, 10 feet long x 10 feet wide, blocking channel and retaining gravel and fine sediment.
5,615'	Tributary enters from right bank, 57 degrees Fahrenheit water temperature.
5,693'	End of survey. Channel choked with woody debris, causing subsurface stream flow.

REFERENCES

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

LEVEL III and LEVEL IV HABITAT TYPES

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