STREAM INVENTORY REPORT

Asbill Creek

INTRODUCTION

A stream inventory was conducted during the summer of 1996 on Asbill Creek. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Asbill Creek.

There is no known record of adult spawning surveys having been conducted on Asbill Creek.

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

Asbill Creek is a tributary to the North Fork Eel River, a tributary to the Eel River, which drains to the Pacific Ocean. It is located in Mendocino County, California. Asbill Creek's legal description at the confluence with the North Fork Eel River is T24N R13W S18. Its location is 39.9319 degrees north latitude and 123.3639 degrees west longitude. Asbill Creek is a third order stream and has approximately 8.5 miles of blue line stream according to the USGS Mina 7.5 minute quadrangle. Asbill Creek drains a watershed of approximately 8.6 square miles. Summer base flow is approximately 0.5 cubic feet per second (cfs) at the mouth, but over 15 cfs is not unusual during winter storms. Elevations range from about 1,000 feet at the mouth of the creek to 3,400 feet in the headwater areas. Mixed hardwood forest and grassland dominate the watershed. The watershed is in private and tribal ownership and is managed for rangeland and for rural development. Vehicle access exists via an unimproved road just south of the Mina Road bridge across the North Fork Eel River. Contact the Round Valley Tribal Council Office for access permission and more explicit directions to the mouth of Asbill Creek.

METHODS

The habitat inventory conducted in Asbill Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi and Reynolds, 1991 rev. 1994). The Pacific Coast Fisheries, Wetlands, and Wildlife Restoration Association (PCFWWRA) members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). Asbill Creek personnel were trained in May, 1996, by Scott Downie and Ruth Goodfield. This inventory was conducted by a two-person team.

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SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach (Hopelain, 1994). 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. Habitat unit types encountered for the first time are further 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 Asbill 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.

2. Channel Type:

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

3. Temperatures:

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". Asbill 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. All units were measured for mean length; additionally, the first occurrence of each unit type and a randomly selected 10% subset of all units were sampled for all features on the

sampling form (Hopelain, 1995). Pool tail crest depth at each pool unit was measured in the thalweg. 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 Asbill 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). Additionally, a rating of "not suitable" (value 5) was assigned to tail-outs deemed not suitable 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. 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 Asbill Creek, a standard qualitative shelter value of 0 (none), 1 (low), 2 (medium), or 3 (high) was assigned according to the complexity of the cover. Thus, shelter ratings can range from 0-300 and are expressed as mean values by habitat types within a stream.

7. Substrate Composition:

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

8. Canopy:

Stream canopy density was estimated using modified handheld spherical densiometers as described in the *California Salmonid Stream Habitat Restoration Manual*, 1994. Canopy density relates to the amount of stream shaded from the sun. In Asbill Creek, an estimate of the percentage of the habitat unit covered by canopy was made from the center of approximately every third unit in addition to every fully-described unit, giving an approximate 30% sub-sample. In addition, the area of canopy was estimated ocularly into percentages of coniferous or 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 Asbill Creek, the dominant composition type (options 1-4) and the dominant vegetation type (options 5-9) 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

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covered by vegetation was estimated and recorded.

DATA ANALYSIS

Data from the habitat inventory form are entered into *Habitat*, a dBASE 4.2 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 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 Lotus 1,2,3. Graphics developed for Asbill Creek 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
- Percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

The habitat inventory of August 27, 1996 was conducted by Dave Smith and Ray Bevitori (PCFWWRA). The total length of the stream surveyed was 2,897 feet with an additional 254 feet of side channel.

Flow was estimated to be 0.5 cfs during the survey period.

Asbill Creek is a B4 channel type for the entire 2,897 feet of stream reach surveyed. B4 channels are moderately entrenched, moderate gradient, riffle dominated channels with stable banks and gravel-dominant substrates.

Water temperatures taken during the survey period ranged from 56 to 57 degrees Fahrenheit. Air temperatures ranged from 61 to 68 degrees Fahrenheit.

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Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 52% riffle units, 31% flatwater units, and 17% pool units (Graph 1). Based on total length of Level II habitat types there were 68% riffle units, 24% flatwater units, and 8% pool units (Graph 2).

Four Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were low gradient riffles, 52%; runs, 31%; and mid-channel pools, 14% (Graph 3). Based on percent total length, low gradient riffles made up 68%, runs 24%, and mid-channel pools 7%.

A total of seven pools were identified (Table 3). Main channel pools were most frequently encountered at 86% and comprised 91% of the total length of all pools (Graph 4).

Table 4 summarizes maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. All seven of the pools encountered had a depth of two feet or greater (Graph 5). Only one had a depth of three feet or greater.

The depth of cobble embeddedness was estimated at pool tail-outs. Of the seven pool tail-outs measured, one had a value of 2 (14%); and six had a value of 3 (86%); (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

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 habitat types had a mean shelter rating of 64, and riffle habitats had a mean shelter rating of 23 (Table 1). Of the pool types, the main channel pools had the highest mean shelter rating at 73. Scour pools had a mean shelter rating of 15 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover type in Asbill Creek and are extensive. Large and small woody debris are lacking in nearly all habitat types. Graph 7 describes the pool cover in Asbill Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in all of the low gradient riffles measured (100%).

The mean percent canopy density for the stream reach surveyed was 74%. The mean percentages of deciduous and coniferous trees were 100% and 0%, respectively (Graph 9).

For the stream reach surveyed, the mean percent right bank vegetated was 68%. The mean percent left bank vegetated was 78%. The dominant elements composing the structure of the stream banks consisted of 68% cobble/gravel, and 32% sand/silt/clay (Graph 10). Brush was the dominant vegetation type observed in 9% of the units surveyed. Additionally, 91% of the units surveyed had deciduous trees as the dominant vegetation type, including down trees, logs, and root wads (Graph 11).

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<u>DISCUSSION</u>

Asbill Creek is a B4 channel type for the entire 2,897 feet of stream surveyed. The suitability of B4 channel types for fish habitat improvement structures is as followed: excellent for low-stage plunge weirs, boulder clusters, and bank-placed boulders; and good for medium-stage plunge weirs.

The water temperatures recorded on the survey day August 27, 1996 ranged from 56 to 57 degrees Fahrenheit. Air temperatures ranged from 61 to 68 degrees Fahrenheit. This is a good water temperature range for salmonids. However, 68 degrees Fahrenheit, if sustained, is near the threshold stress level for salmonids. This does not seem to be the case here, and Asbill Creek seems to have temperatures favorable to salmonids. To make any further conclusions, temperatures need to be monitored throughout the warm summer months, and more extensive biological sampling needs to be conducted.

Flatwater habitat types comprised 24% of the total length of this survey, riffles 68%, and pools 8%. The pools are relatively shallow, with only one of the seven (14%) pools having a maximum depth greater than three feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream 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. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Six of the seven pool tail-outs measured had embeddedness ratings of 3 or 4. None had an embeddedness rating of 1. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. In Asbill Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures taken.

The mean shelter rating for pools was low with a rating of 64. The shelter rating in the flatwater habitats was lower at 20. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is provided primarily by boulders in all habitat types. Additionally, whitewater contributes 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 structures provide rearing fry with protection from predation, rest from water velocity, and also divide territorial units to reduce density related competition.

All of the low gradient riffles measured had gravel or small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean percent canopy density for the stream was 74%. This is a relatively moderate percentage of canopy. In general, re-vegetation projects are considered when canopy density is less than 80%.

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The percentage of right and left bank covered with vegetation was moderate at 68% and 78%, respectively. In areas of stream bank erosion or where bank vegetation is at unacceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Asbill Creek 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 temperature extreme period should be performed for 3 to 5 years.

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

4) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from boulders. Adding high quality complexity with woody cover is desirable and in some areas the material is locally available.

PROBLEM SITES AND LANDMARKS

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

Position (ft):	Comments:
0'	Start of survey at confluence with the North Fork Eel River. Channel type is a B4 for the entire 2897' of stream surveyed.
392'	Fish habitat improvement structure site; channel constrictor appears to be in good condition and appears to meeting objective.
1584'	Young-of-the-year (YOY) salmonids observed in the stream by surveyors.
2897'	Surveyors had problems with access permission granted by tribal authorities being accepted by residents. End of survey.

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REFERENCES

Flosi, G., and F. Reynolds. 1994. California salmonid stream habitat restoration manual, 2nd
     edition. California Department of Fish and Game, Sacramento, California.

Hopelain, J. 1995. Sampling levels for fish habitat inventory, unpublished manuscript.
     California Department of Fish and Game, Inland Fisheries Division, Sacramento,
     California.

Valentine, B. 1995. Stream substrate quality for salmonids: guidelines for sampling, processing,
     and analysis, unpublished manuscript. California Department of Forestry and Fire
     Protection, Santa Rosa, California.

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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