STREAM INVENTORY REPORT

Unnamed Tributary to Larabee Creek

INTRODUCTION

A stream inventory was conducted during the spring of 2000 on an Unnamed Tributary to Larabee Creek in the Eel River basin. The 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 Unnamed Tributary to Larabee Creek. 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 anadromous salmonids. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Unnamed Tributary to Larabee Creek is tributary to Larabee Creek, tributary to the mainstem Eel River, located in Humboldt County, California. The Unnamed Tributary to Larabee Creek's legal description at the confluence with Larabee Creek is T01 R04E S35. Its location is 40°19′57″ North latitude and 123°41′16″ West longitude. The Unnamed Tributary to Larabee Creek is a first order stream and has approximately 1.4 miles of intermittent stream according to the USGS Blocksburg 7.5 minute quadrangle. The Unnamed Tributary to Larabee Creek drains a watershed of approximately 0.43 square miles. Elevations range from about 1,000 feet at the mouth of the creek to 2,000 feet in the headwater areas. Douglas fir forest and oak grassland dominate the watershed. The watershed is privately owned and is managed for timber production and rangeland. Vehicle access exists via the Alderpoint Road, at the Kay Ranch, #33875. The tributary enters Larabee Creek in the northeast corner of Section 35 of Township 1, Range 4E on the 7.5 minute Blocksburg quadrangle.

METHODS

The habitat inventory conducted in the Unnamed Tributary to Larabee Creek follows the methodology presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al., 1998). The AmeriCorps Watershed Stewards Project (AmeriCorps/WSP) Member and California Department of Fish and Game (DFG) Scientific Aid that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game. 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, 1995). 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, dominant substrate composing the pool tail crest, and embeddedness. 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 methodology and data sheet have been developed for use in California stream surveys and can be found in the California Salmonid Stream Habitat Restoration Manual. This protocol was used in the Unnamed Tributary to Larabee Creek to record measurements and observations. There are nine components to the inventory data sheet.

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". Unnamed Tributary to Larabee 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 the Unnamed Tributary to Larabee 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) 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, 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 the Unnamed Tributary to Larabee 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. 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 the Unnamed Tributary to Larabee

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 the Unnamed Tributary to Larabee Creek, 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 was estimated and recorded.

BIOLOGICAL INVENTORY

Biological sampling during stream inventory is used to determine fish species and their distribution in the stream. In the Unnamed Tributary to Larabee Creek, fish presence was observed from the stream banks. These sampling techniques are discussed in the California Salmonid Stream Habitat Restoration Manual.

SUBSTRATE SAMPLING

Gravel sampling is conducted using a 9 inch diameter standard McNeil gravel sampler. Sample sites are identified numerically beginning at the most upstream site in the stream. Gravel samples are separated and measured to determine respective percent volume using five sieve sizes (25.4, 12.5, 4.7, 2.37, and 0.85 mm; Valentine, 1995).

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

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Graphics are produced from the tables using Quattro Pro. Graphics developed for the Unnamed Tributary to Larabee 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 the pool tail outs
- 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 April 5, 2000, was conducted by Karen Bromley and Chris Ramsey (AmeriCorps/WSP and DFG). The total length of the stream surveyed was 3,012 feet with an additional 0 feet of side channel.

Flow was measured at the bottom of the survey reach with a Marsh-McBirney Model 2000 flowmeter at 0.21 cfs on April 5, 2000.

The Unnamed Tributary to Larabee Creek is an B4 channel type for the first 2,407 feet and an A3 channel type for the last 605 feet of stream surveyed. B4 channel types are moderately entrenched, moderate gradient, riffle dominated gravel channels with infrequently spaced pools, very stable plan and profile, and stable banks. A3 channel types are steep, narrow, cascading, cobble channelled step-pool streams with high energy/debris transport associated with depositional soils.

Water temperatures taken during the survey period ranged from 52° to 54° F. Air temperatures ranged from 57° to 69° F.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 15% riffle units, 42% flatwater units, and 42% pool units (Graph 1). Based on total length of Level II habitat types there were 39% riffle units, 51% flatwater units, and 8% pool units (Graph 2).

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Ten Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were runs, 27%; plunge pools, 23%; and step runs, 15% (Graph 3). Based on percent total length, runs made up 36%, low gradient riffles, 32%, and step runs, 15%.

A total of 20 pools were identified (Table 3). Scour pools were the most frequent Level III pool type encountered at 90% and comprised 84% 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. Two of the 20 pools (10%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 20 pool tail-outs measured, 6 had a value of 1 (30.0%); 11 had a value of 2 (55.0%); 2 had a value of 3 (10.0%); none had a value of 4 (0.0%) and 1 had a value of 5 (20.0%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate and a value of 5 indicates the tail-out is not suitable for spawning. In Unnamed Tributary to Larabee Creek, 1 of the 1 pool tail-outs which were valued at 5 were unsuitable for spawning due to the tail-out being comprised of boulder.

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 8, flatwater habitat types had a mean shelter rating of 9, and pool habitats had a mean shelter rating of 8 (Table 1). Of the Type III pool types, the scour and and main channel pools had the highest mean shelter rating at 8 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Small woody debris is the dominant cover type in the Unnamed Tributary to Larabee Creek. Large woody debris is present in most habitat types but is not abundant. Graph 7 describes the pool cover in Unnamed Tributary to Larabee Creek.

Table 6 summarizes the dominant substrate by habitat type. Gravel was the dominant substrate observed in 14 of the 20 pool tail-outs measured (70%). Small cobble was the next most frequently observed dominant substrate type and occurred in 25% of the pool tail-outs (Graph 8).

The mean percent canopy density for the stream reach surveyed was 84%. The mean percentages of deciduous and coniferous trees were 94% and 6%, respectively. Graph 9 describes the canopy in Unnamed Tributary to Larabee Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 79.6%. The mean percent left bank vegetated was 76.5%. The dominant elements composing the structure of the stream banks consisted of 0.0% bedrock, 0.0% boulder, 73.9% cobble/gravel, and 26.1% sand/silt/clay (Graph 10). Deciduous trees were the dominant vegetation type observed in 75.0% of the units surveyed. Additionally, 75.0% of the units surveyed had deciduous trees as the

dominant vegetation type, and 2.2% had coniferous trees as the dominant vegetation, including down trees, logs, and root wads (Graph 11).

BIOLOGICAL INVENTORY RESULTS

The surveyors observed juvenile salmonids, probably age 1+ and 2+ steelhead, from the beginning of the survey up to the county road coulvert.

GRAVEL SAMPLING RESULTS

No gravel samples were taken on the Unnamed Tributary to Larabee Creek.

DISCUSSION

The Unnamed Tributary to Larabee Creek is an B4 channel type for the first 2,407 feet and an A3 channel type for the remaining 605 feet of stream surveyed. The suitability of B4 and A3 channel types for fish habitat improvement structures is: B4 are excellent for low-stage plunge weirs, boulder clusters, bank placed boulders, single and opposing wing-deflectors, and log cover. A3 channels are good for bank-placed boulders; fair for plunge weirs, opposing wing-deflectors, and log cover; and poor for boulder clusters and single wing-deflectors.

The water temperatures recorded on the survey day of April 5, 2000, ranged from 52° to 54° F. Air temperatures ranged from 57° to 69° F. This is an excellent water temperature range for salmonids. The Unnamed Tributary to Larabee Creek seems to have water temperatures favorable to salmonids. However, 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 51% of the total length of this survey, riffles 39%, and pools 8%. The pools are relatively shallow, with only 2 of the 20 (10%) pools having 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. Primary pools comprise less than 1% of the total stream length. 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 any needed modification of log debris accumulations (LDA's) in the stream. The LDA's in the system may be retaining needed gravel. Any necessary modifications to them should be done with the intent of metering the gravel out to downstream reaches that will trap the gravel for future spawning use. Therefore, gravel retention features may need to be developed prior to any LDA modification.

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Six of the 20 (30%) pool tail-outs measured had an embeddedness rating of 1, 55% had a rating of 2, 10% had ratings of 3 or 4, and 5% had a rating of 5 and were considered unsuitable for spawning. 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 the Unnamed Tributary to Larabee Creek, sediment sources should be mapped and rated according to their potential sediment yields, and control measures should be taken.

The mean shelter rating for pools was low with a rating of 8. The shelter rating in the flatwater habitats was slightly better at 9. A pool shelter rating of approximately 100 is desirable. The relatively small amount of cover that now exists is being provided primarily by small woody debris in most habitat types. Additionally, undercut banks contribute a small amount. Log and root wad cover structures in the pool and flatwater habitats are needed to improve both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

Nineteen of the 20 (95%) pool tail-outs 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 84%. This is a relatively high percentage of canopy. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 80% and 77%, 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) Unnamed Tributary to Larabee 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) On the day of the survey, stream flow was measured at only 0.21 cfs. The survey noted two potential diversions. These should be checked later in the spring or during the summer to see that they are not causing any problems for fish.

4) The potential for fish passage problems should be further evaluated in this creek. There is channel braiding in the lower reaches. A culvert under the Alderpoint Road is likely impeding fish passage. At least one LDA is retaining sediment, has two 8' drops, and may be a barrier to migration. There are several plunges, one of which was reported as a potential barrier, in this creek. Further bioinventory sampling should be conducted to check for the presence and distribution of salmonids. Fish passage should be improved if necesssary.

5) Inventory and map sources of stream bank 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.

6) There are sections where the stream may be impacted from cattle trampling the riparian zone. If so, then alternatives should be explored with the rancher and developed if possible.

7) Primary pools comprise less than 1% of the total stream length. 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.

8) Increase woody cover in the pools and flatwater habitat units. Most of the existing cover is from small woody debris. Adding high quality complexity with woody cover is desirable.

9) 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.

10) There are several log debris accumulations present on the Unnamed Tributary to Larabee Creek that are retaining sediment. The modification of these debris accumulations may be desirable, but must be done carefully, over time, to meter gravel to downstream spawning sites.

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.

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0'	Begin survey at confluence with Larabee Creek. Channel type is B4. The first 850' has a braided channel.
1104'	Gate crosses creek.
1119'	Gate crosses creek. 1" black PVC pipe enters channel from right bank (RB).
1195'	Cattle tracks observed along channel.
1340'	Wood gate crosses creek.
1435'	Cattle trail crosses creek.
1629'	Small debris accumulation, 14'L x 7'W x 4'H.
1771'	3.5 Diameter culvert creating a 4.5' plunge. Culvert is under Alderpoint Road. Culvert is leaking in rusted out areas. Rust line extends 0.8' up sides. Likely fish barrier.
1846'	PVC pipe running through channel to culvert.
1910'	Cattle trail crosses creek.
2363'	3' plunge.
2390'	4' plunge, possible fish barrier.
2407'	Channel type changes from B4 to A3 (Reach 2).
2538'	Large debris accumulation (LDA) with two 8' plunges, retaining approximately 6' of gravel and fines. No jump pool. Possible fish barrier.
2576'	LDA 20'L x 15'W x 6'H.
2740'	Dry tributary enters unit from RB.
2825'	Boulder creates 3' plunge.
3012'	End of survey due to increasing gradient. Slide on RB, 25'L x 20'H.

REFERENCES

Unnamed Tributary to Larabee Creek

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. *California salmonid stream habitat restoration manual,* 3rd 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.

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**