STREAM INVENTORY REPORT
PUDDING CREEK

WATERSHED OVERVIEW

Pudding Creek is a tributary to the Pacific Ocean (Figure 1). Elevations range from sea level at the mouth of the creek to 1,600 feet in the headwater areas. Pudding Creek confluence location is T19N R17W Sec04, 39° 26’57" N. latitude, 123°45’33" W. longitude on the USGS Fort Bragg 7.5 minute quadrangle.

HABITAT INVENTORY RESULTS

The habitat inventory of September 21 through September 27, 1994, was conducted by Warren Mitchell. The total length of surveyed stream in Pudding Creek was 62,728 feet (11.9 miles, 19.1 KM) (Table 1). Side channels comprised 356 feet of this total. Pudding Creek consisted of one reach of a C4 channel type.

Table 1 summarizes the Level II Habitat Types: Riffle, Flatwater, Pool and Dry. Of the Level II Habitat Types, Riffles comprised 19%, Flatwater 34% and Pools 39% (Graph 1). Of the total survey length, Riffles comprised 9%, Flatwater 54% and Pools 29% (Graph 2).

Fifteen Level IV Habitat Types were identified (Table 2). Of the Level IV Habitat Types, the most frequently occurring were Runs 21% and Low Gradient Riffles 19% (Graph 3). Of the total survey length, Step Runs comprised 37% and Runs 16 % (Table 2).

Table 3 summarizes Main, Scour and Backwater pools which are Level III Pool Habitat Types. Scour pools were most often encountered at 66% occurrence and comprised 62% of the total length of pools.

Table 4 is a summary of maximum pool depths by Level IV Pool Habitat Types. Pools with depths of two feet or greater are considered optimal for fish habitat. In Pudding Creek, 211 of the 320 pools (66%) had a depth of two feet or greater (Graph 4).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 320 pool tail-outs measured, 0% had a value of 1, 1% had a value of 2, 31% had a value of 3 and 67% had a value of 4 (Graph 5).

Of the Level II Habitat Types, Pools had the highest mean shelter rating at 35 (Table 1). Of the Level III Pool Habitat Types, Scour pools and Main pools had shelter ratings of 35 each (Table 3).

Of the 320 pools, 39% were formed by Large Woody Debris: 26% by logs and 13% by root wads (calculated from Table 5).

Table 6 summarizes dominant substrate by Level IV Habitat Types. Of the Low Gradient Riffles fully measured, 99% had gravel as the dominant substrate (Graph 6).

Mean percent closed canopy was 89%: 48% coniferous trees and 41% deciduous trees. Mean percent open canopy was 11% (Graph 7, calculated from Table 7).

Mean percent right bank vegetated was 73% while mean percent left bank vegetated was 72%. Brush occurred most often as bank vegetation at a mean percent of 38 (of units fully measured). Sand/Silt/Clay occurred most often as bank substrate with a mean percent of 97 (of units fully measured) (Table 7).

DISCUSSION

The information gathered in the process of habitat typing will provide Georgia-Pacific with baseline data on the current condition of this creek and the available habitat for salmonids. These data can be used to identify components of the habitat which are in need of enhancement so appropriate conditions for Pudding Creek can be obtained over time.

Pool Depth

According to Flosi and Reynolds (1994), a stream with 50% or more of its total habitat comprised of primary pools is generally desirable. Primary pools are at least two feet deep in first and second order streams and at least three feet deep in third and fourth order streams Pudding Creek had a high percentage (66%) of primary pools indicating favorable depths for salmonids.

Large Woody Debris

The presence of Large Woody Debris (LWD) in streams is a significant component of fish habitat. Woody debris creates areas of low flow, providing a refuge for fish during periods of high flow (Robison and Beschta, 1990). Woody debris also provides cover for fish, lowering the risk of predation. Of the 320 pools in Pudding Creek, 39% were formed by LWD. Whether these numbers are high or low, relative to the needs of salmonids, is difficult to ascertain since the optimum amount of woody debris in streams has not been specified (Robison and Beschta 1990).

The above LWD analysis pertains only to pools formed by logs or root wads as described in Flosi and Reynolds (1994)**:** Lateral Scour Pool Log Enhanced, Lateral Scour Pool Root Wad Enhanced, Backwater Pool Log Formed and Backwater Pool Root Wad Formed. Other pools containing LWD as a component were not included in the calculation. For example, plunge pools may be formed by boulders, bedrock or LWD but are not described as such by habitat unit types. Therefore, the LWD formed pool calculation is limited to four pool types and does not quantify the amount of LWD in Pudding Creek.

Canopy

There are two important benefits of canopy cover in coastal streams. Canopy keeps stream temperatures cool as well as providing nutrients in the form of leaf litter and organic material (Bilby 1988). Mean percent canopy cover for Pudding Creek was 89%. This is relatively high since a canopy cover of 80% or higher is considered optimum, Flosi and Reynolds (1994).

Coniferous trees occupied a slightly larger portion of the canopy than did deciduous trees. This is beneficial for two reasons. The first is coniferous canopy provides shade year round. The second is wood from alder and most other deciduous species deteriorates more rapidly than wood from coniferous species (Sedell, *et al*. 1988). This would leave less LWD in the stream available for fish cover and LWD formed pools.

Substrate

Since salmon generally create redds at the heads of riffles, we were mainly concerned with the dominant substrate in these units. Bjornn and Reiser (1991) reported substrate between .50 and 4.0 inches (1.3 - 10.2 cm) is suitable spawning habitat for Coho. The scale used to determine gravel size in this habitat survey was .08-2.5 inches which was similar to the above range. The majority of the Low Gradient Riffles in Pudding Creek (99%) had gravel as the dominant substrate. The high presence of gravel in riffles indicates that there is a sufficient amount of substrate available as potential spawning habitat throughout the watershed.

Embeddedness

Though there are sufficient levels of the necessary substrate for spawning habitat, the high embeddedness values found throughout Pudding Creek could hinder the survival of the eggs deposited in the redds. High silt levels reduce water circulation within the substrate, thus lowering the oxygen levels needed by salmonid eggs (Sandercock, 1991).

Substrate embedded with silt in varying degrees were given corresponding values as follows: 0-25%= value 1, 26 - 50% = value 2, 51 - 75% = value 3 and 76 - 100% = value 4. According to Flosi and Reynolds (1994), creeks with embeddedness values of two or higher are considered to have poor quality fish habitat. In Pudding Creek, 100% of the pool tail-outs measured had embeddedness values of two or more.

It is important to consider, however, that the above embeddedness values were obtained in the summer during low flow conditions. In winter and spring, flows are usually higher due to the rainy season and the lowered evapotranspiration of the trees. This higher flow probably decreases the amount of fines allowed to settle. As a result, winter and spring flows would yield lower embeddedness values than in the summer.

Overall, Pudding Creek appears to provide suitable habitats for anadromous salmonids. Pudding Creek is expected to improve overtime as this river system approaches its natural equilibrium. Georgia-Pacific will attempt to enhance this approach through sound management practices and restoration and enhancement projects.

RECOMMENDATIONS

Pudding Creek should be managed as an anadromous, natural production watershed.

Mean percents of cover types in pools have not yet been calculated. However, upon completion of these calculations, insufficient woody debris cover types in pools need to be identified and prioritized. Pools lacking in woody debris cover types should be augmented with recruitment of woody debris.

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 sediment entering the watershed. In addition, sediment sources related to road systems need to be identified, mapped and treated according to their potential for sediment yield to the watershed.

Increase the canopy in Pudding Creek by planting willow, alder, redwood and Douglas-fir along the watercourses where shade canopies are not at acceptable levels. Planting efforts need to be coordinated to follow bank stabilization or upslope erosion control projects.

Log debris accumulations retaining large quantities of fine sediment should be modified carefully, over time, to avoid excessive sediment loading in downstream reaches.

SURVEY MEMOS

The following memos were taken in the field at the time of survey. All distances are approximate and measured in feet from the confluence.

PUDDING CREEK

1317	seep enters LB 54 degrees
4227	RBA site PUD 1
5751	SWDA 20'WX18'LX5'H concentrated on left bank
9990	4 1-2' diameter fallen trees adjacent to the pool.. for enhancement?
10306	SWDA
11347	LWDA 23'WX13'LX3'H retaining gravel
13333	First bridge crossing
17751	5 1-2' diameter logs on LB good for project
18316	bridge crossing at 198'
19105	LB failure 8'HX25'L
36709	bridge crossing
45991	hobo temp site
54707	SWDA
55736	SWDA
55827	SWDA
59903	LWDA retaining fines
60014	YOY observed
61701	LWDA
62371	END OF ANADROMY. Creek forks and both go A1 channel types

D.L.