STREAM INVENTORY REPORT

Two Log Creek

WATERSHED OVERVIEW

Two Log Creek is a tributary to the Big River (Figure 1). Elevations range from 100 feet at the mouth of the creek to 800 feet in the headwater areas. Two Log Creek's legal description at the confluence with the Big River is T17N R16W Sec22. Its location is 39°19'13"N. latitude and 123°36'37"W. longitude according to the USGS Comptche 7.5 minute quadrangle.

HABITAT INVENTORY RESULTS

The habitat inventory of June 18, 1996 through June 24, 1996, was conducted by Diana Hines and Dave Wright. The total length of surveyed stream in Two Log Creek was 16,009 feet (3.0 miles, 4.9 KM) (Table 1). There were no side channels in this creek.

Flow measured at the mouth of Two Log Creek in June 1996 was .119 cubic feet per second (cfs).

Two Log Creek consists of three reaches: An F4 for the first 5,766 feet, an B3 for the next 9,221 feet and an B4 for the remaining 1,061 feet.

Table 1 summarizes the Level II Riffle, Flatwater and Pool Habitat Types. By percent occurrence Riffles comprised 20%, Flatwater 25% and Pools 55% of the habitat types (Graph 1). By percent total length, Riffles comprised 13%, Flatwater 32% and Pools 55% (Graph 2).

Fifteen Level IV Habitat Types were identified and are summarized in Table 2. The most frequently occurring habitat types were Mid-Channel Pools 23%, Low Gradient Riffles 16% and Lateral Scour Bedrock Pools 10% (Graph 3). The most prevalent habitat types by percent total length were Mid-Channel Pools at 23%, Step Runs 19% and Low Gradient Riffles 12% (Table 2).

Table 3 summarizes Main, Scour and Backwater pools which are Level III Pool Habitat Types. Scour pools were most often encountered at 54% occurrence and comprised 55% 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 three feet (.91 m) or greater are considered optimal for fish habitat. In Two Log Creek, 37 of the 228 pools (16%) had a depth of three feet or greater (Graph 4).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the pool tail-outs measured, 0% had a value of 1, 0% had a value of 2, 6% had a value of 3 and 93% had a value of 4 (Graph 5).

Two Log Creek

Of the Level II Habitat Types, Pools had the highest mean shelter rating at 71 (Table 1). Of the Level III Pool Habitat Types, Backwater Pools had the highest mean shelter rating at 100 (Table 3).

Of the 228 pools, 11% were formed by Large Woody Debris: 1% by logs and 10% by root wads (calculated from Table 4).

Table 6 summarizes dominant substrate by Level IV Habitat Types. Of the Low Gradient Riffles fully measured, 60% had gravel and 20% had small cobble as the dominant substrate (Graph 6).

Mean percent closed canopy was 85%: 46% coniferous trees and 39% deciduous trees. Mean percent open canopy was 15% (Graph 7, calculated from Table 7).

Table 7 summarizes the mean percent substrate/vegetation types found along the banks of the stream. Mean percent right bank vegetated was 69% while mean percent left bank vegetated was 73%. Coniferous trees were the dominant bank vegetation type in 49% of the units fully measured. The dominant substrate composing the structure of the stream banks was Sand/Silt/Clay, found in 79% of the units fully measured.

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 in need of enhancement so appropriate conditions for Two Log Creek can be obtained over time.

Level II habitat types by percent occurrence and length

Flatwater habitat types comprised a moderate percentage of the units by both percent occurrence and length at 25% and 32% respectively (Table 1 and Graph 1). These unit types usually do not provide optimal spawning or rearing habitat for salmonids. Riffle habitat units comprised a low percentage of the stream by both percent occurrence and length at 20% and 13% respectively. Pools, however, comprised a much higher percentage by both percent occurrence and length at 55% each. Riffles usually provide good spawning habitat while pools provide important rearing habitat. In addition, Mundie (1969) reported that invertebrate food production is maximized in riffles while pools provide an optimum feeding environment for coho. In fact, the most productive streams are those consisting of a pool to riffle ratio of approximately one to one (Ruggles 1966).

Pool Depth

According to Flosi and Reynolds (1994), a stream with at least 50% 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 order streams. The information from

Two Log Creek

Graph 4 on maximum depth in pools was used to determine percent of primary pools. Two Log Creek, a fourth order stream, is comprised mainly of shallow pools with 16% of the pools having a maximum depth of three feet or greater.

Instream Shelter

Instream shelter ratings are derived from two measurements: instream shelter complexity and instream shelter percent cover. The first is a value rating which provides a relative measure of the quality and composition of the shelter, and the second is a measure of the area of a habitat unit covered by shelter. The various types of instream shelter include LWD, SWD, boulders, root wads, terrestrial vegetation, aquatic vegetation, bedrock ledges and undercut banks. Of the Level II habitat types Pools had the highest shelter rating at 71. Of the Level III habitat types Backwater Pools had the highest shelter rating at 100. The first value is low while the second is high as shelter values of 80 or higher are considered optimal for good rearing habitat (Flosi and Reynolds 1994).

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. The percent of pools formed by LWD in Two Log Creek was 11%. 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). However, based on data from Georgia-Pacific's 1995 Aquatic Vertebrate Study, the only coho found in the Ten Mile River Basin were in stream reaches where approximately 50% of pools were formed by large woody debris. Those reaches that did not support coho had a significantly lower percentage of pools formed by large woody debris (Ambrose et al, 1996). This suggests that a low percentage of LWD formed pools could adversely affect juvenile Coho Populations (C.S. Shirvel 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 total amount of LWD in Two Log 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 the Two Log Creek was 85%. This is relatively high since a canopy cover of 80% or higher is considered optimum, Flosi and Reynolds (1994).

Two Log Creek

Coniferous trees occupied a larger portion of the canopy than did deciduous trees. Coniferous trees comprised 46% and deciduous trees 39% of the canopy. The significance of this is that wood from alder and most other deciduous species deteriorates more rapidly than wood from coniferous species (Sedell, *et al*. 1988). Therefore, more LWD would be available in the future for fish cover and LWD formed pools in this creek and others dominated by coniferous species.

Embeddedness

High embeddedness values (silt levels), such as those found in Two Log Creek, have been associated with many negative impacts to salmonids. These negative impacts can be observed in important environmental components of salmonid habitat, such as pool habitats, dissolved oxygen levels and water temperatures.

The impact high silt levels have on pool habitat is that they fill in and eventually eliminate pools. As already mentioned, pools provide important habitat for rearing salmonids.

High silt levels also impact oxygen levels in the water. They do so by reducing water circulation within the substrate, thus lowering the oxygen levels needed by salmonid eggs (Sandercock, 1991). This can hinder the survival of the eggs deposited in the redds, as well as the survival of juvenile salmonids.

Water temperature is impacted by high silt levels in several ways. Hagans et al (1986) reported the following impacts to water temperatures: 1) the loss of a reflective bottom; 2) darker sediment (as opposed to clean gravels) storing heat from direct solar radiation which is then transferred to the water column; and 3) a reduction in the flow of water through the substrate interstitial spaces thereby exposing more of the water column to direct solar radiation.

Another means by which water temperatures are increased is through the widening of stream channels: over time, high silt levels increase the substrate surface level of the creek, resulting in a wider, shallower stream channel (Flosi and Reynolds, 1994). In shallow streams more surface area is exposed to the sun relative to the volume of water, leading to an increase in solar heating which in turn leads to higher water temperatures.

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 Two Log 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 can carry away some of the previously deposited silt to sites further downstream. Therefore, embeddedness values may fluctuate throughout the year along different sections of the stream.

Two Log Creek

Substrate

In Two Log Creek, 60% of the Low Gradient Riffles had gravel and 20% had small cobble as the dominant substrate. The relatively high concentration of gravel and small cobble in riffles indicates that there is a sufficient amount of substrate available as potential spawning habitat in this creek. While this river had sufficient substrate for spawning in the riffles surveyed, the overall percentage of riffles in the surveyed portions of the creek was low at 20% (Table 1). Subsequently, there may be a lack of sufficient spawning habitat in this creek. Another point to consider is that regardless of the amount of substrate or spawning habitat available, this habitat may not be suitable for salmonids if it is highly embedded.

Overall, Two Log Creek appears to have high embeddedness values and consist of a relatively low percentage of primary and LWD formed pools. In addition, while there was sufficient substrate for spawning, habitat for spawning appeared to be limited. This creek does appear to have sufficient canopy.

Georgia-Pacific recognizes that there are areas of Two Log Creek in need of enhancement and where feasible will attempt to restore those areas over time as part of its long term management plan. The company will also attempt to facilitate a healthy environment for salmonids in this creek through sound management practices.

RECOMMENDATIONS

1) Two Log Creek should be managed as an anadromous, natural production watershed.

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

3) Sources of stream bank erosion should be mapped and prioritized according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediment entering the stream. 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.

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

Two Log Creek

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.

Position (ft):	Comments:
28’	Survey begins at confluence with Big River
199’	Channel type is an F4
390’	Bridge at 13' (begins at end of this unit)
768’	Approximately 6 young of year (yoy) observed
1061’	Hobo temp pool (1061' from confluence). yoy observed
1232’	Yoy observed
1345’	Yoy observed
1940’	Yoy observed
2218’	Yoy observed
2657’	Four yoy coho, 1 yoy steel head (sthd)
2846’	Yoy observed
3465’	Tributary entering left bank at end of unit
3686’	Undercut bank along left bank approximately 4ft long
4039’	Tributary entering right bank at 36'
4232’	Yoy observed
4818’	Four yoy observed, 4 coho
5672’	Tributary entering right bank at 90'. Channel type changes to B3
6138’	Yoy observed
6168’	Bank failure on left bank 15' x 30l contributing gravel and sand
6280’	Log jam along left bank 6'h x 12'w x 6'l lwd and swd

Two Log Creek

6451’	Approximately 10 yoy observed (at least 4 were coho). Log jam over pool 10'h x 18'w x 12'l, mostly lwd
6471’	Bank failure on right bank 20'h x 25'l contributing fines
6583’	Log jam over beginning of riffle 8'h x 12'w x 10'l, includes large root wad and lwd
7280’	Tributary entering left bank at beginning of unit
8140’	Tributary entering right bank at 10' into unit
8432’	Yoy observed
8839’	Yoy observed
9098’	Three inch sthd
9197’	Yoy observed
9616’	Tributary entering right bank at end of this unit
9711’	Bank failure along left bank 25'l x 15'h contributing fines
9901’	Yoy observed
9993’	Bridge crossing at end of pool
10522’	Root mass provides approximately 3' of undercut cover
10694’	Pool has approximately 3' of undercut bank along left bank
11065’	Bridge crossing over creek at end of this unit
11732’	Approximately 2' undercut bank along either side
11815’	Tributary entering left bank at 40'
11916’	Yoy observed
12004’	Two feet of undercut bank along right bank. 3 inch salmonids observed
12049’	Two feet of undercut bank along left bank
12088’	Two yoy coho observed

Two Log Creek

12339’	Yoy observed
12534’	Three feet undercut bank along left bank
12599’	Two feet undercut bank along left bank
12767’	Three inch salmonids observed
12990’	Yoy observed
13259’	Two coho observed
13399’	Tributary entering left bank at end of unit
13485’	Yoy observed
13658’	Three large redwood logs across creek
14301’	Tributary entering right bank at end of pool
14352’	Yoy observed
14695’	Channel type changes to B4
15218’	Log jam over creek 8'h x 2'w x 10'l swd and lwd
15571’	Log jam over creek 10'h x 20'l x 15'w. Creek turns into a marsh after this unit. Marsh is approximately 123'l x 30'w. YOY observed in marsh. We were unable to walk through marsh, we walked around and re-entered at other end.
15588’	Unit goes through marsh, after this unit marsh becomes overgrown with blackberry bushes and we had to walk .2 miles around before marsh ended and we are able to re-enter the creek.
15600’	Yoy observed
15809’	Log jam over creek 40'l x 12'w x 10'h
16009’	End of survey. property line ends here. Tributary enters from right bank through culvert. Approximately 3'h drop to surface of water, could be a fish barrier. Mainstem of creek continues but becomes gradually smaller. Habitat diminishes about 200' further, water is barely flowing, creek is highly embedded.