STREAM INVENTORY REPORT
LITTLE NORTH FORK NOYO RIVER

WATERSHED OVERVIEW

Little North Fork Noyo River is a tributary to the Noyo River (Figure 1). Elevations range from 100 feet at the mouth of the creek to 1000 feet in the headwater areas. Little North Fork Noyo River's legal description at the confluence with the Noyo River is T19N R16W Sec6. Its location is 39°26'42"N. latitude and 123°42'50"W. longitude according to the USGS Noyo Hill 7.5 minute quadrangle.

HABITAT INVENTORY RESULTS

The habitat inventory of August 19, 1996 through August 23, 1996, was conducted by Diana Hines. The total length of surveyed stream in Little North Fork Noyo River was 22,458 feet (4.3 miles, 6.8 KM) (Table 1). There were no side channels in this stream.

Little North Fork Noyo River consists of one reach: F4 for the entire 22,458 feet.

Table 1 summarizes the Level II Riffle, Flatwater and Pool Habitat Types. By percent occurrence Riffles comprised 18%, Flatwater 40% and Pools 42% of the habitat types (Graph 1). By percent total length, Riffles comprised 10%, Flatwater 69% and Pools 20% (Graph 2).

Fifteen Level IV Habitat Types were identified and are summarized in Table 2. The most frequently occurring habitat types were Step Runs 24%, Low Gradient Riffles 17% and Glides 13% (Graph 3). The most prevalent habitat types by percent total length were Step Runs at 60%, Low Gradient Riffles 10% and Glides 7% (Table 2).

Table 3 summarizes Main, Scour and Backwater Pools which are Level III Pool Habitat Types. Pools were most often encountered at 42% occurrence and comprised 20% of the total length of pools.

Table 4 is a summary of maximum pool depths by Level IV Pool Habitat Types. In third order streams or higher, pools with depths of three feet (.91 m) or greater are considered optimal for fish habitat. In Little North Fork Noyo River, 14 of the 125 pools (11%) 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, 1% had a value of 3 and 99% had a value of 4 (Graph 5).

Of the Level II Habitat Types, Pools had the highest mean shelter rating at 57 (Table 1). Of the Level III Pool Habitat Types, Backwater pools had a shelter rating of 60 (Table 3).

Of the 125 pools, 40% were formed by Large Woody Debris (LWD): 25% by logs and 15% by root wads (calculated from Table 4).

Table 6 summarizes dominant substrate by Level IV Habitat Types. Of the Low Gradient Riffles fully measured, 71% had gravel and 14% had small cobble as the dominant substrate (Graph 6).

Mean percent closed canopy was 83%: 46% coniferous trees and 37% deciduous trees. Mean percent open canopy was 17% (Graph 7, calculated from Table 7).

Table 7 summarizes the mean percent substrate/vegetation types found along the banks of the stream. Mean percentage right bank vegetated was 85% while mean percent left bank vegetated was 79%. Deciduous trees were the dominant bank vegetation type in 51% of the units fully measured. The dominant substrate composing the structure of the stream banks was Cobble/Gravel, found in 54% 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 which are in need of enhancement so appropriate conditions for Little North Fork Noyo River can be obtained over time.

Level II habitat types by percent occurrence and length

Flatwater habitat types comprised a high percentage of the units by both percent occurrence and length at 40% and 69% 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 18% and 10% respectively. Pools, however, comprised a higher percentage by both percent occurrence and length at 42% and 20% respectively. 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 composed 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 Graph 4 on maximum depth in pools was used to determine percentage of primary pools. Little North Fork Noyo River, a third order stream, is composed of shallow pools with 11% 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 45. Of the Level III habitat types Backwater Pools had the highest shelter rating at 60. These values are low 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 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 Little North Fork Noyo River was 40%. 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 amount of LWD in Little North Fork Noyo River.

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). This leaf litter, organic material, and their associated nutrients are utilized as a food source by benthic macroinvertebrates (aquatic insects). The macroinvertebrates, in turn, are major food sources for most fish species in forested areas (Gregory et al., 1987). Mean percent canopy cover for the Little North Fork Noyo River was 83%. This is high since a canopy cover of 80% or higher is considered optimum, Flosi and Reynolds (1994).

Coniferous trees occupied a larger portion of the canopy than did deciduous trees. Coniferous trees comprised 46% and deciduous trees 37% of the canopy. Wood from coniferous trees does not deteriorate as rapidly as wood from alder and most other deciduous species (Sedell, *et al*. 1988). Therefore, more LWD would be available in the future for fish cover and LWD formed pools in this stream and others dominated by coniferous species.

Embeddedness

High embeddedness values (silt levels), such as those found in Little North Fork Noyo River, 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.

High silt levels also impact dissolved oxygen levels. 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.

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 the Little North Fork Noyo River, 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 some of the silt previously deposited to sites further downstream. Therefore, embeddedness values may fluctuate throughout the year along different sections of the stream.

Substrate

In Little North Fork Noyo River, 33% of the Low Gradient Riffles had gravel and 50% had small cobble as the dominant substrate. The relatively high presence of gravel and small cobble in riffles indicates that there is a sufficient amount of substrate available as potential spawning habitat. While this river had sufficient substrate for spawning in the riffles surveyed, the overall percentage of riffles in the surveyed portions of the river was somewhat low at 18% (Table 1). Subsequently, there may be a lack of sufficient spawning habitat in this stream. 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, the surveyed portions of Little North Fork Noyo River appear to have sufficient canopy and a relatively high percentage of LWD formed pools. However, this stream also appears to have a low

percentage of primary pools, low shelter values and high embeddedness values. In addition, while there was sufficient substrate for spawning, habitat for spawning appeared to be limited.

Georgia-Pacific recognizes that there are areas of the Little North Fork Noyo River 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

Little North Fork Noyo River should be managed as an anadromous, natural production watershed.

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.

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.

Shelter values throughout Little North Fork Noyo River could be increased by addition of large logs and root wads, boulder clusters, log and boulder wiers and log and boulder deflectors. These need to be placed carefully to prevent washing out in high flows. The Stream Habitat Restoration Manual, by Flosi and Reynolds, 1994, provides detailed descriptions for restoration efforts.

Log debris accumulations retaining large quantities of fine sediment should be modified if necessary, 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.

517 Six young of year (yoy) observed
595 Seven yoy
745 Log jam over pool 16'w x 5'h x 12'l
822 Four yoy
1140 Four yoy coho, one 6 inch salmonid

1166 Dry tributary entering left bank at beginning of unit. bank failure on left bank 20'l x 7'h contributing gravel and sand
1287 Six yoy coho. 7 yoy steel head (sthd)
1470 Six yoy. lwd log jam 12'l x 3'h x 10'w
1675 Four yoy
1701 Five yoy
2077 Tributary entering right bank at 65'
2147 Four salmonids
3549 Bridge at 38 feet
3606 Gaging station at 8 feet
3752 Dry tributary entering left bank at 67 feet
3809 Hobo temp pool
4607 Five salmonids (60 mm)
4789 Right bank tributary at end of unit
5527 Fifteen salmonids (40-60 mm)
6187 Tributary entering right bank at beginning of unit
6236 Approximately 30 salmonids
6715 Left bank trib at 29 feet
8066 Right bank trib at 83'
8107 Brad Valentine's electofishing station
9194 Dry trib entering right bank at 15'
9214 Wet trib entering right bank at 14'
9373 Four yoy observed
9610 Six yoy observed
9780 Road crossing at 6'
10272 Five yoy observed
10544 Log jam over unit 25'w x 6'h x 9'l
10735 Notched log over pool
10835 Five yoy observed, 2 sthd approximately three inches each
11029 Trib entering right bank at 122'
12006 Trib entering right bank at 142'
12702 Seven yoy observed
12935 Twelve inch pacific giant salamander in pool. 5 yoy observed
13116 Three inch salmonid
13594 Numerous small conifers over creek at 99'; 25'w x 3'h x 17'l
14264 Four yoy observed
14381 Six inch salmonid
14615 Three inch salmonid

15099 Large log jam - possible fish barrier 25'l x 20'w x 5'h. channel type appears to be changing. bank failure along right bank 40'h x 30l contributing gravel and sand at 403'
15643 Log jam over pool 13'w x 8'l x 3'h. 5 yoy observed
16495 Trib entering left bank at 52' not accessible to fish
17107 Trib entering right bank at 417'
17393 Dry trib entering right bank at 186' not accessible to fish
17416 Log jam over pool 15'w x 4'h x 12'l
18354 Road crossing. culvert is 5.6'h x 6' diameter.
18539 Four yoy observed. bank failure along left bank at 25' 15'h x 30'l
19323 Log jam over unit at 75' 20'l x 14'w x 6'h
19924 Much fewer fish observed
19984 Road crossing
20133 Channel type here
20622 Two yoy observed
21031 Three yoy observed, one 3" salmonid
21497 Trib entering left bank at 374' not accessible to fish. old road crossing at 410'
21746 Two yoy observed
22458 End of survey due to diminished habitat and increasing gradient. channel approaching A4, highly entrenched, no pools, creek only 2-3' wide, substrate mostly sand with some gravel. no fish observed for last 700'.

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