

STREAM INVENTORY REPORT

East Branch Little North Fork Big River

WATERSHED OVERVIEW

East Branch Little North Fork Big River is a tributary to the Little North Fork Big River (Figure 1). Elevations range from 200 feet at the mouth of the creek to 800 feet in the headwater areas. East Branch Little North Fork 's legal description at the confluence with Little North Fork Big River is T17NR16WSec08. Its location is 39°20'54"N. latitude and 123°40'54"W. longitude on the USGS Mathison Peak 7.5 minute quadrangle.

HABITAT INVENTORY RESULTS

The habitat inventory of June 26, 1996 through June 28, 1996, was conducted by Diana Hines and Dave Wright. The total length of surveyed stream in East Branch Little North Fork Big River was 10,257 feet (1.9 miles, 3.1 KM) (Table 1). There were no side channels in this creek.

Flow measured at the mouth of East Branch Little North Fork Big River on June 26, 1996 was 0.43 cubic feet per second (cfs).

East Branch Little North Fork consists of two reaches: B3 for the first 6,595 feet and F4 for the remaining 3,662 feet.

Table 1 summarizes the Level II Riffle, Flatwater and Pool Habitat Types. By percent occurrence Riffles comprised 10%, Flatwater 34% and Pools 55% of the habitat types (Graph 1). By percent total length, Riffles comprised 7%, Flatwater 53% and Pools 40% (Graph 2).

Thirteen Level IV Habitat Types were identified and are summarized in Table 2. The most frequently occurring habitat types were Mid Channel Pools 38%, Step Runs 20% and Low Gradient Riffles 10% (Graph 3). The most prevalent habitat types by percent total length were Step Runs at 41%, Mid Channel Pools 29% and Runs 7% (Table 2).

Table 3 summarizes Main, Scour and Backwater pools which are Level III Pool Habitat Types. Main pools were most often encountered at 70% occurrence and comprised 73% 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 (.61 m) or greater are considered optimal for fish habitat. In East Branch Little North Fork , 62 of the 172 pools (36%) had a depth of two feet or greater (Graph 4).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the pool tail-outs measured, 1% had a value of 1, 1% had a value of 2, 11% had a value of 3 and 88% had a value of 4 (Graph 5).

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Of the Level II Habitat Types, Riffles had the highest mean shelter rating at 82 (Table 1). Of the Level III Pool Habitat Types, Scour pools had the highest mean shelter rating at 69 (Table 3).

Of the 172 pools, 7% were formed by Large Woody Debris: 5% by logs and 2% by root wads (calculated from Table 4).

Table 6 summarizes dominant substrate by Level IV Habitat Types. Of the Low Gradient Riffles fully measured, 100% had gravel as the dominant substrate (Graph 6).

Mean percent closed canopy was 88%: 71% coniferous trees and 17% deciduous trees. Mean percent open canopy was 12% (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 73% while mean percent left bank vegetated was 82%. Coniferous 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 Sand/Silt/Clay found in 87% 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 East Branch Little North Fork Big River 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 percent occurrence and a high percent by length at 34% and 53% 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 10% and 7% respectively. Pools, however, comprised a higher percentage by both percent occurrence and length at 55% and 40% 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).

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Pool Depth

According to Flosi and Reynolds (1994), a stream with 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 graph 4 on maximum depth in pools was used to determine percent of primary pools. East Branch Little North Fork Big River, a third order stream, is comprised mainly of shallow pools with only 10%% 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 Riffles had the highest shelter rating at 82. Of the Level III habitat types Scour Pools had the highest shelter rating at 69. 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. In East Branch Little North fork 7% of the pools 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). 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 East Branch Little North Fork Big River.

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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 East Branch Little North Fork Big River was 88%. This is relatively 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 71% and deciduous trees 17% 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 creek and others dominated by coniferous species.

Embeddedness

High embeddedness values (silt levels), such as those found in East Branch Little North Fork Big 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.

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

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Flosi and Reynolds (1994), creeks with embeddedness values of two or higher are considered to have poor quality fish habitat. In East Branch Little North Fork Big River, 99% 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.

Substrate

In East Branch Little North Fork, 100% of the Low Gradient Riffles had gravel as the dominant substrate. The high concentration of gravel in riffles indicates that there is a sufficient amount of substrate available as potential spawning habitat in this creek. While this creek had sufficient substrate for spawning in the riffles surveyed, the overall percentage of riffles in the surveyed portions of the creek was very low at only 10% (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, East Branch Little North Fork Big River appears to have high embeddedness values and 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. There does appear to be a sufficient amount of canopy.

Georgia-Pacific recognizes that there are areas of East Branch Little North Fork Big 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

- 1) East Branch Little North Fork Big River should be managed as an anadromous, natural production watershed.
- 2) Where feasible, design and engineer pool enhancement structures to deepen the number 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

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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.

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):	Comment:
000'	Begin survey at confluence with Little North Fork Big River
3859'	Four pieces lwd over pool
4061'	Young of year (yoy) observed
4456'	Yoy observed
5509'	Yoy observed
6134'	Yoy observed
6336'	Yoy observed
6561'	Channel type changes to an F4
6676'	Tributary entering left bank at 10'
6720'	Gulch along left bank
6814'	Part of canopy is from old RR tressel
7153'	Yoy observed
7358'	Tributary entering right bank at end of pool
7522'	Tributary entering left bank at 88'

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7632'	Tributary entering right bank at end of unit
7978'	Four pieces lwd across pool
8058'	Yoy observed
8426'	Yoy observed
9622'	Substrate is mud
9738'	Substrate very muddy. 1 yoy
9889'	Creek full of orange colored substance (probably bacteria), for last 20 units approximately
10000'	Creek still full of orange substance, substrate very muddy
10073'	Two yoy observed
10195'	Log jam over unit 12'h x 30'l x 12'w, possible fish barrier
10257	End of survey. Old road crossing at end of unit. Walked 93' further and creek became a marsh. Highly embedded, lack of suitable spawning habitat. No fish observed since log jam.