STREAM INVENTORY REPORT

Switchback Gulch

WATERSHED OVERVIEW

Switchback Gulch is a tributary to the Noyo River (Figure 1). Elevations range from 160 feet at the mouth of the creek to 1,200 feet in the headwater areas. Switchback Gulch's legal description at the confluence with the Noyo River is T18N R16W Sec14. Its location is 39°25'23"N. latitude and 123°37'4"W. longitude according to the USGS Northspur 7.5 minute quadrangle.

HABITAT INVENTORY RESULTS

The habitat inventory of August 19, 1996, was conducted by Dave Wright. The total length of surveyed stream in Switchback Gulch was 1,469 feet (.28 miles, .45 KM) (Table 1). There were no side channels in this creek.

Switchback Gulch consists of one reach: A B3 for the entire length of surveyed stream.

Table 1 summarizes the Level II riffle, flatwater and pool habitat types. By percent occurrence riffles comprised 33%, flatwater 30% and pools 37% of the habitat types (Graph 1). By percent total length, riffles comprised 36%, flatwater 54% and pools 10% (Graph 2).

Eight Level IV habitat types were identified and are summarized in Table 2. The most frequently occurring habitat types were step runs, 30%, low gradient riffles, 27% and plunge pools, 13% (Graph 3). The most prevalent habitat types by percent total length were step runs at 54%, low gradient riffles at 30%, and high gradient riffles at 6% (Table 2).

Table 3 summarizes main, scour and backwater pools which are Level III pool habitat types. Scour pools were most often encountered at 82% occurrence and comprised 78% 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 pools with depths of three feet (0.91m) or greater are considered optimal for fish habitat. In Switchback Gulch, none of the 11 pools 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, 50% had a value of 3 and 50% had a value of 4 (Graph 5).

Of the Level II habitat types, pools had the highest mean shelter rating at 31 (Table 1). Of the Level III pool habitat types, scour pools had the highest mean shelter rating at 43 (Table 3).

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Of the 11 pools, 27% were formed by large woody debris (LWD): 27% by logs and 0% by root wads (calculated from Table 4).

Table 6 summarizes dominant substrate by Level IV habitat types. Of the low gradient riffles fully measured, 33% had small cobble as the dominant substrate (Graph 6).

Mean percent closed canopy was 88%: 84% coniferous trees and 4% 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 75% while mean percent left bank vegetated was 71%. Grass was the dominant bank vegetation type in 71% of the units fully measured. The dominant substrate composing the structure of the stream banks was Cobble/Gravel found in 67% 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.

When reviewing Switchback Gulch data it is important to consider the short distance surveyed. The survey was limited to approximately 1,469 feet with only 30 units; therefore, many of the determinations for the indicated parameters were based on only one or two completely measured units. Determinations based on such a limited sample size may lack statistical validity and therefore are of questionable analytical value.

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 percentage by length at 30% and 54% 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 moderate percentage of the stream by both percent occurrence and length at 33% and 36% respectively. Pools comprised a moderate percentage by percent occurrence and a low percentage by length at 37% and 10% 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 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

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Graph 4 on maximum depth in pools was used to determine percent of primary pools. Switchback Gulch, a third order stream, is comprised entirely of shallow pools with none 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 31. Of the Level III habitat types Scour Pools had the highest shelter rating at 43. 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 Switchback Gulch was 27%. 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-rootwad enhanced, backwater pool-log formed, and backwater pool-rootwad 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 Switchback Gulch.

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 Switchback Gulch 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 84% and deciduous trees 4% of the canopy. The significance of this is that wood from coniferous species does not deteriorate as rapidly as wood from alders 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 Switchback Gulch, 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 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.

Substrates 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 Switchback Gulch, 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.

Substrate

In Switchback Gulch, 33% of the low gradient riffles had small cobble as the dominant substrate. The relatively low concentration of small cobble in riffles indicates that there is a insufficient amount of substrate available as potential spawning habitat in this creek. It is important to consider 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, Switchback Gulch appears to have a relatively low percentage of primary pools, low shelter values, high embeddedness values and insufficient substrate for spawning. However, this stream also appears to have sufficient canopy and LWD formed pools.

RECOMMENDATIONS

1) Due to marginal habitat and small size of this creek, the net results of any expense or effort directed towards creek restoration, other than maintaining good canopy cover, would not be cost effective.

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:
39’	One 50mm steelhead observed.
168’	Large log jam, possible fish barrier.
273’	No fish observed (NFO).
549’	NFO.
640’	Left bank failure measures 10' high x 5' long.
876’	NFO.
996’	Cross-members to old railroad completely cover creek.
1469’	End of survey due to diminished habitat. Habitat appears to have too much gradient and not enough water, few pools (units 25 through 30).

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