STREAM INVENTORY REPORT
KASS CREEK

WATERSHED OVERVIEW

Kass Creek is a tributary to the Noyo River (Figure 1). Elevations range from 100 feet at the mouth of the creek to 800 feet in the headwater areas. Kass Creek’s legal description at the confluence with the Noyo River is T18N R17W Sec14. Its location is 39°25'5"N. latitude and 123°42'38"W. longitude according to the USGS Noyo Hill 7.5 minute quadrangle. Kass Creek drains a watershed of approximately 1,502 acres.

HABITAT INVENTORY RESULTS

The habitat inventory of July 29, 1996 through September 19, 1996, was conducted by Diana Hines and Dave Wright. The total length of surveyed stream in Kass Creek was 15,990 feet (3.0 miles, 4.8 KM) (Table 1). There were no side channels in this creek. Flow measured at the mouth of Kass Creek on 7/27/96 was .14 cubic feet per second (cfs).

Kass Creek consists of two reaches: A G3 for the first 9,061 feet and a B4 for the remaining 6929 feet.

Table 1 summarizes the Level II Riffle, Flatwater and Pool Habitat Types. By percent occurrence Riffles comprised 18%, Flatwater 31% and Pools 50% of the habitat types (Graph 1). By percent total length, Riffles comprised 9%, Flatwater 62% and Pools 27% (Graph 2).

Sixteen Level IV Habitat Types were identified and are summarized in Table 2. The most frequently occurring habitat types were Step Runs 26%, Low Gradient Riffles 17% and Mid-Channel Pools and Corner Pools both at 13% each (Graph 3). The most prevalent habitat types by percent total length were Step Runs at 60%, Low Gradient Riffles 9% and Corner Pools 8% (Table 2).

Table 3 summarizes Main, Scour and Backwater pools which are Level III Pool Habitat Types. Scour pools were most often encountered at 72% occurrence and comprised 75% 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 Kass Creek, 16 of the 123 pools (13%) 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, 2% had a value of 2, 29% had a value of 3 and 69% had a value of 4 (Graph 5).

Of the Level II Habitat Types, Pools had the highest mean shelter rating at 36 (Table 1). Of the Level III Pool Habitat Types, Main Channel Pools had the highest mean shelter rating at 58 (Table 3).

Of the 123 pools, 31% were formed by Large Woody Debris (LWD): 24% by logs and 7% 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 92%: 24% coniferous trees and 68% deciduous trees. Mean percent open canopy was 8% (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 79% while mean percent left bank vegetated was 71%. Deciduous 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 50% 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 Kass 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 percent occurrence and a high percentage by length at 31% and 62% 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 9% respectively. Pools, however, comprised a higher percentage by both percent occurrence and length at 50% and 27% 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 Graph 4 on maximum depth in pools was used to determine percent of primary pools. Kass Creek, a third order stream, is comprised mainly of shallow pools with only 13% 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 36. Of the Level III habitat types Main Channel Pools had the highest shelter rating at 58. 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 Kass Creek was 31%. 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 Kass 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). 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 Kass Creek was 92%. This is high since a canopy cover of 80% or higher is considered optimum, Flosi and Reynolds (1994).

Deciduous trees occupied a larger portion of the canopy than did coniferous trees. Deciduous trees comprised 68% and coniferous trees comprised 24% 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, less LWD would be available in the future for fish cover and LWD formed pools in this creek and others dominated by deciduous species.

Embeddedness

High embeddedness values (silt levels), such as those found in Kass 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 Kass 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.

Substrate

In Kass Creek, 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 low at 18% (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, Kass Creek appears to have a relatively high percentage of LWD formed pools as well as sufficient canopy. However, this stream also appears to have low shelter values, a low percentage of primary pools 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 Kass 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

Kass Creek 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.

Shelter values throughout Kass Creek 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.

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.

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.

108 Confluence with South Fork Noyo and bridge at 20'
1112 Hobo temp pool

2412 Approximately 12 steel head (STHD), one at 200mm
2964 Five coho observed
3567 Three (young of year) yoy observed
4091 Eight yoy observed, two coho
4158 Approximately 4 one inch salamander observed
4660 Two coho observed
4778 Log jam over pool 15'w x 10'l x 3'h
5389 Log jam over pool 10'w x 6'h x 4'l mostly lwd
5918 Tributary entering left bank at 203'
6020 Three yoy observed
6757 Three coho observed
7122 Log jam over creek at 96' into unit, 6'h x 15'w x 8'l mostly lwd
7964 Tributary entering left bank at end of unit
8110 Five yoy observed, one coho observed
8267 Four yoy observed
9061 Channel type here
9354 Three coho observed
9407 Eight yoy observed. channel contains abundance of orange bacteria
9571 Three yoy observed
9752 Log jam over pool 5'h x 8'w x 4'l
9975 Three coho observed
10179 Two coho observed
10227 Tributary entering left bank at end of unit
10295 Seven foot plunge from top of fall to surface of water, pool four feet deep, bank failure along both sides of creek, looks like large "head cut," possible fish barrier.
10313 Five yoy observed, three coho observed
10560 Two yoy observed
10832 One yoy observed
11170 Four coho observed
11399 Four coho observed
11552 Two yoy observed
12075 Two coho observed
1262 Six yoy observed
12655 Bank failure along left bank 30'l x 18'h
12747 Bridge over unit at 55'
13184 Tributary entering left bank at 259'
13204 Three yoy observed
13700 Three yoy observed
13823 Four inch salmonid observed

14107 Two coho observed
14287 Log jam over pool 7'w x 6'h x 8'l mostly lwd
14604 Culvert - 25’ long, possible fish barrier
15018 One yoy observed
15167 Possible fish barrier: 5’5” plunge
15213 Possible channel change
15328 Creek has become marshy, substrate muddy
15960 Riffle ends in what would probably be plunge pool in higher flows. bank failure along both sides, 5'5" plunge, depth of pool about one foot. above this creek is dry. water has gone subsurface. creek above is about two feet wide, mud for substrate.
15990 End of survey, End of Anadromy due to diminished habitat. Creek here about one foot wide, substrate still mud. No fish observed for about 900 feet. Creek highly embedded. No more habitat available. Creek has been full of orange bacteria throughout most units since culvert. Flow very minimal.

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