STREAM INVENTORY REPORT

"Walters Gulch"

WATERSHED OVERVIEW

The unnamed tributary to Chadbourne Gulch, commonly known as, and herein after referred to as, Walters Gulch is a tributary to Chadbourne Gulch (Figure 1). Elevations range from 80 feet at the mouth of the creek to 600 feet in the headwater areas. Walters Gulch's legal description at the confluence with Chadbourne Gulch is T20N R17W Sec8. Its location is 39°36'45"N. latitude and 123°46'18"W. longitude according to the USGS Inglenook 7.5 minute quadrangle.

HABITAT INVENTORY RESULTS

The habitat inventory of November 15, 1996, was conducted by Dave Lundby. The total length of surveyed stream in Walters Gulch was 1,947 feet (0.37 miles, 0.59 km) (Table 1). There were no side channels in this creek.

Walters Gulch consists of one reach: a G2 for the entire length of surveyed stream.

Table 1 summarizes the Level II riffle, flatwater and pool habitat types. By percent occurrence riffles comprised 38%, flatwater 31% and pools 28% of the habitat types (Graph 1). By percent total length, riffles comprised 22%, flatwater 69% and pools 7% (Graph 2).

Nine Level IV habitat types were identified and are summarized in Table 2. The most frequently occurring habitat types were step runs, 31%, and cascades and low gradient riffles, both at 18% each (Graph 3). The most prevalent habitat types by percent total length were step runs at 69%, cascades at 9% and low gradient riffles at 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 55% occurrence and comprised 42% of the total length of pools.

Table 4 is a summary of maximum pool depths by Level IV pool habitat types. In second order streams, pools with depths of two feet (0.61 m) or greater are considered optimal for fish habitat. In Walters Gulch, none of the 11 pools 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, 0% had a value of 1, 9% had a value of 2, 36% had a value of 3 and 55% had a value of 4 (Graph 5).

Of the Level II habitat types, riffles had the highest mean shelter rating at 66 (Table 1). Of the Level III pool habitat types, scour pools had the highest mean shelter rating at 3 (Table 3).

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Of the 11 pools, none were formed by large woody debris (LWD).

Table 6 summarizes dominant substrate by Level IV habitat types. Of the low gradient riffles fully measured, 100% had small cobble as the dominant substrate (Graph 6).

Mean percent closed canopy was 39%: 0% coniferous trees and 39% deciduous trees. Mean percent open canopy was 61% (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 81% while mean percent left bank vegetated was 83%. Brush was the dominant bank vegetation type in 42% of the units fully measured. The dominant substrate composing the structure of the stream banks was Sand/Silt/Clay, found in 81% 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 Walters Gulch data it is important to consider the short distance surveyed. The survey was limited to approximately 1,947 feet with only 39 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 31% 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 moderate percentage of the stream by both percent occurrence and length at 38% and 22% respectively. Pools comprised a moderate percentage by percent occurrence and a low percentage by length at 28% and 7% 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. Walters

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Gulch, a first order stream, is comprised entirely of shallow pools with none of the pools having a maximum depth of two 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, small woody debris, 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 66. Of the Level III habitat types, scour pools had the highest shelter rating at only 3. 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. There were no pools formed by LWD in Walters Gulch. Based on data from Georgia-Pacific's 1995 Aquatic Vertebrate Study, the only coho salmon 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 or none at all (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 Walters 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 Walters Gulch was 39%. This is very low since a canopy cover of 80% or higher is considered optimum (Flosi and Reynolds, 1994).

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Deciduous trees occupied the entire portion of the canopy; there were no coniferous trees. 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. Since the channel is dominated by deciduous trees and the survey was conducted after the leaf abscission period, it must be noted that canopy levels recorded were probably lower than when the trees were in foliage.

Embeddedness

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

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Substrate

In Walters Gulch, 100% of the low gradient riffles had small cobble as the dominant substrate. The high concentration of small cobble in riffles indicates that there is a sufficient 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, Walters Gulch appears to have insufficient canopy, low shelter values, high embeddedness values and a complete absence of primary and LWD formed pools. This creek does appear to have sufficient substrate for spawning.

RECOMMENDATIONS

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 worth the expended effort.

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:
456	Creek immediately becomes highly entrenched.
1146	Large debris accumulation (LDA) consists of five pieces of LWD. Tributary enters on left bank.
1174	LDA consists of four pieces of LWD.
1590	Possible barrier. Tributary enters on left bank.
1645	Very steep, slope is approximately 4%.
1738	No fish observed (NFO).
1769	NFO.
1812	NFO.

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1843	NFO.
1947	End of survey. Loss of spawning habitat, minimal flow, steep gradient, entrenched, no fish.observed.

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