3.0 Channel Habitat Typing

Channel habitat typing is a method of categorizing stream reaches according to gradient, size and valley form. Streams are grouped which display similar physical characteristics and respond in predictable patterns to natural and human-caused modifications. With this information, we can begin to evaluate which portions of the watershed have the highest potential for fish utilization and restoration opportunities. Drawing on several existing stream classification systems, GWEB (1999) has described channel types for Oregon streams called Channel Habitat Types (CHTs).

CHTs are grouped together based on stream gradient, channel confinement, and stream size. The groupings for this assessment are based on the *Channel Type User Guide Tongass National Forest (*Paustin et al. 1992) as provided by GWEB (1999). It is important to consider that these are general groupings and individual reaches cannot be managed as isolated segments. Activities taking place in one part of the watershed can affect stream reaches in a different part of the watershed, either upstream, downstream or on adjacent lands. Also, the underlying geology and climate greatly influence the type and magnitude of a channel's response to inputs of large, woody debris, retention of sediment, streambank stability, and stream flows. Therefore, stream habitats with different characteristics can form within each CHT.

Channel Habitat Type Descriptions

The CHTs present in the Nehalem River watershed are described below as according to GWEB (1999) guidelines.

Low Gradient, Large Floodplain (FP2 and FP3)

Streams classified as FP2 and FP3 have similar characteristics. Both consist of mainstem, meandering streams with a gradient of less than 2%. The segments may be single or split channels with broad, well-defined floodplains. FP2 consists of medium to large streams, and FP3 consists of small streams. The substrate generally consists of gravel and sand to cobble. These channel types provide important anadromous salmon (coho, steelhead, chinook, and sea run cutthroat trout) spawning and rearing grounds, as well as a migration corridor and is important for resident salmon (cutthroat trout) spawning, rearing and overwintering.

Sensitivity Rating: High

Explanation of Sensitivity Ratings: Channel types respond differently to factors which impact channel development such as land use activities and restoration efforts. Usually, the unconfined or moderately confined channel reaches are more responsive to changes in stream flow than those confined by the terrain, sediment supply, or addition of large woody debris. For the purposes of this analysis, stream reaches whose characteristics and form are easily altered are classified as highly sensitive. These segments would be expected to respond well to restoration efforts. At the other end of the spectrum, are channels which are not easily altered and are classified as having low sensitivity. These segments are not likely to respond well to restoration activities.

Low Gradient, Moderately Confined (LM)

Streams classified as LM consists of medium to large streams which have floodplains limited by alternating hillslopes and terraces. The streams have a gradient less than 2%. The substrate is fine gravel to bedrock. The streams provide potential anadromous spawning and rearing habitat and resident fish spawning, rearing and overwintering grounds.
Sensitivity Rating: High

Low Gradient, Confined (LC)

Streams classified as LC consists of relatively straight, medium to large sized channels with limited floodplains. The stream segments have gradients of less than 2%. The substrate is generally boulders, cobble and bedrock. These stream segments provide potential anadromous salmon spawning and rearing habitat and resident fish spawning, rearing and overwintering grounds.
Sensitivity Rating: Moderate

Moderate Gradient, Moderately Confined (MM)

Streams classified as MM consists of single channels with low to moderate sinuosity. These channels usually are contained within a narrow valley with some room for a floodplain or have narrow terrace development. The stream gradient is between 2% and 8% and stream size is usually medium to large. The substrate consists of gravel or small boulders. These reaches provide potential steelhead and coho spawning and rearing habitat and potential pockets of suitable habitat for chinook. Potential spawning, rearing, and overwintering habitat may be present for resident fish.
Sensitivity Rating: High

Moderate Gradient, Confined (MC)

MC consists of single, relatively straight channels or channels which conform to hillslope controls. These channels are usually confined to gentle or narrow V-shaped valleys with little to no floodplain development. The stream gradient is 2% to 4% and the stream size is variable and the dominate substrate is gravel to bedrock. These reaches provide potential steelhead and coho spawning and rearing habitat and potential pockets of suitable habitat for chinook. Potential spawning, rearing and overwintering habitat may be present for resident fish.
Sensitivity Rating: Moderate

Moderate Gradient, Headwater (MH)

MH consists of straight to low sinuosity channels in open, gentle V-shaped valleys. The stream gradient is 1% to 6% and the stream size is small. The substrate is sand, cobble, and bedrock. Boulders may be present from surrounding slopes reaches provide potential steelhead and coho spawning and rearing habitat and potential pockets of suitable habitat for chinook. and

soils. These reaches provide potential steelhead and coho spawning and rearing habitat and potential pockets of suitable habitat for chinook.
Sensitivity Rating: Moderate

Steep, Moderately Confined (SM)

SM is not defined by GWEB (1999). This channel type was added due to the significant amount of channel in unconfined or moderately confined terrain at greater than an 8% gradient for the Nehalem River watershed. These channels are variable in size and are not confined by valley walls. If accessible, the lower gradient areas provide limited rearing habitat for anadromous salmon and limited rearing and spawning habitat for resident fish.
Sensitivity Rating: Low

Moderately Steep, Narrow Valley (MV)

MV channels are confined by adjacent moderate to steep hill slopes. High flows are generally contained within the channel banks. A narrow floodplain, one channel width or narrower may develop locally. The stream gradient varies between 3% and 10% and stream size is small to medium. The substrate is mainly small cobble to bedrock. This channel type provides potential steelhead, coho, and sea-run cutthroat spawning and rearing habitat. Potential spawning, rearing, and overwintering habitat may be available for resident fish.
Sensitivity Rating: Moderate

Steep, Narrow Valley (SV) and Very Steep Headwater (VH)

SV and VH have similar characteristics, except VH is steeper. A single, straight channel tightly confined by a steep, narrow V-shaped valley is typical. The stream gradient for SV is 8%-16% and greater than 16% for VH. Stream size is small to medium with large cobble to bedrock substrate. Lower gradient areas may provide some anadromous salmon rearing habitat and limited spawning and rearing habitat for resident fish.
Sensitivity Rating: Low

Methodology

- Stream reaches were initially divided according to gradient classes using GIS and a digital elevation model. The classes are <1%, 1-2%, 2-4%, 4-8%, 8-16%, and >16%. In order to represent stream gradients using GIS, map queries using grid cells were done. The stream gradient map is not shown in this manual due to the small size of the grid cells used (each cell represents 100 square feet). At the scale used for the manual maps, the differences in stream gradient cannot be seen.
- Channel confinement was determined by viewing 40 ft contours and their relationship to the individual stream segments. Contours crossing the reach horizontally or nearly horizontal were classified as unconfined. Contours crossing the reach in a *U* shape (or approximately right angles), with some room for narrow floodplain development, were classified as moderately confined.

Contours intersecting the stream segment in a *V* shape, with little room for floodplain development, were classified as confined. See figure 3-1.

- Figure 3-1

Figure 3-1

- Stream sizes were obtained directly from Oregon Department of Forestry Stream Classification Maps. The stream segments are categorized as small, medium, or large based on average annual streamflow. Small streams have an annual flow of 2 cubic feet per second (cfs) or less. Medium streams have an average annual flow between 2 and 10 cfs. Large streams have an average flow of 10 cfs or greater (ODF, 1994). See figure 3-2.
- After categorizing stream segments by similar gradient, confinement, and size, CHTs were identified for the watershed based on the GWEB (1999) channel type classifications. The CHTs are presented in GIS by using map queries and grid cells. Like stream gradients, the difference in grid cells is difficult to determine at the scale of the manual maps. See large folded map insert for CHTs.
- CHT sensitivity was rated as low, moderate, or high according to GWEB (1999) guidelines.
  High sensitivity: FP2, FP3, LM, MM
  Moderate sensitivity: MV,MH, MC, LC.
  Low sensitivity: VH, SV, SM

GIS was used to identify the sensitivity category for each stream segment. If more than one level of sensitivity was apparent along the length of an individual reach, the rating was determined by the sensitivity level which was most representative of the reach. See figure 3-3.

Field Verification

Field surveys of fish habitat characteristics was done by ODFW between 1993 and 1995 on many of the major tributaries of the Nehalem River. In addition, field verification of 50 sites was conducted by Portland State University and the Upper and Lower Nehalem River Watershed Councils. Comparisons between data collected in the field were made with the GIS data collected from various agencies (including ODFW, SSCGIS, and USGS) and used for this analysis. The comparisons correlated approximately 90% of the time.

Channel Habitat Type Sensitivity Results

Of the 935 linear miles of streams in the watershed (1:100,000 scale), 440.9 miles (47.1%) were rated highly sensitive to changes. This category includes much of the mainstem Nehalem River and the major tributaries. Moderately sensitive reaches comprised 278.6 miles (29.8%) and reaches with low sensitivity comprised 215.7 miles (23.1%).

The subwatersheds each have approximately 50% of their channel lengths classified as highly sensitive with the exception of the Salmonberry River subwatershed which is predominately Coast Range (See Table 3-1). The reaches in this area are approximately 19% highly sensitive and 45% are considered to have low sensitivity.

Table 3-1. Percentages of CHT Sensitivity Ratings by Subwatershed

Subwatershed	Sensitivity Rating		
	High	Moderate	Low
Cook Creek	50.8%	29.2%	20.0%
NF Nehalem River	54.2%	26.1%	19.7%
Lower Nehalem River	45.6%	37.2%	17.2%
Middle Nehalem River	52.2%	25.9%	21.9%
Upper Nehalem River	48.1%	27.0%	24.9%
Salmonberry River	19.1%	36.1%	44.8%

Data Source: PSU, 1999

Data Gaps

If restoration projects are contemplated, field visits should be conducted to verify current conditions. Channel characteristics change periodically due to altered hydrology and associated factors such as sinuosity of the stream and sediment transport and deposition.

At the time of this analysis, a GIS stream coverage in a 1:24,000 scale was not available. Contours derived from the 1:24,000 scale DEM were used with a 1:100,000 scale stream coverage which is not as accurate as using the same scale maps. Reliable, 1:24,000 scale stream coverages should be available in the next year or so.

References

Governor's Watershed Enhancement Board (GWEB). 1999. *Draft Oregon Watershed Assessment of Aquatic Resources Manual, January, 1999.* Salem, Oregon.

Oregon Department of Forestry. 1994. *Landowner/Operator Manual*.

Paustian, S. (editor), et al. 1992. *Channel Type Users Guide for the Tongass National Forest, Southeast Alaska.* US Department of Agriculture Forest Service, Alaska Region, R10 Technical Paper 26.