

CHAPTER 3

CHANNEL HABITAT TYPE CLASSIFICATION

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INTRODUCTION

Stream channels are shaped by multiple factors. These include geologic conditions, climate, local weather, and biologic inputs into the stream. Streams have variable sensitivities to physical change depending upon the combination of stream channel conditions. These changes are most specific to the addition or removal of large woody debris (LWD), riparian condition, fine sediment, coarse sediment, and peak flow.

By determining Channel Habitat Types (CHTs), an evaluation of watershed stream channel conditions is possible. Stream sensitivities to physical changes are readily determined once CHTs have been classified. CHT classifications provide an understanding of the impact of watershed land use practices and management of streams. The receptiveness of a stretch of stream to restoration activities is also determined by classifying CHTs.

METHODS

CHT classification for streams within the SBW are based on three criteria:

- Stream Gradient Class;

- Channel Confinement; and
- Stream Size.

Stream Channel Gradient Class

Channel gradient is defined as the change in elevation divided by the length of any given stream segment (Elevation/Stream Length). A combination of two analytical methods to characterize channel gradient classes for streams within the SBW was used. The ArcGIS Spatial Analyst Extension was employed to generate “Percent Slope” coverage for the entire watershed area utilizing 10-Meter Digital Elevation Models (DEMs). The percent slope coverage was then reclassified and symbolized using the six channel gradient classes described in OWEB (1999). Symbolized gradient classes of the percent slope coverage provided an initial tool for distinguishing variations in channel gradient along streams of interest. In addition, Spatial Analyst was used to generate contour lines at twenty-foot intervals for the entire watershed area. These were then used as a complimentary method for determining channel gradient classes utilizing methods described in the OWEB (1999), i.e., the distances between contour lines and the number of contour lines per 1,000 feet of stream channel.

In order to prevent an unmanageable number of stream segments and simplify the process for stream segmentation based on channel gradient, OWEB guidelines were followed. General guidelines included:

- Stream segments were a minimum of 1,000 feet in length and spanned a minimum of three contour lines;
- Stream segment breaks were located at the confluences of tributaries; and
- Major waterfalls were segregated regardless of their length.

Exceptions to these guidelines existed where frequent variations in gradient were observed over short distances and were segmented accordingly.

Stream Channel Confinement

Channel confinement is defined as the ratio of the bank full width to the width of the modern flood plain. Utilizing available desktop references such as topographic maps (which do not provide adequate resolution), channel confinement is difficult to determine, especially for lower-gradient streams.

EMS utilized a combination of visual analytical methods for determining/estimating channel confinement for streams within the SBW. Specific methods include:

- Observing topography and stream geometries on both the percent slope Geographic Information Systems (GIS) coverage and United States Geological Survey (USGS) 7.5-minute quadrangles; and
- Analyzing contour line geometries utilizing methods described in the OWEB manual (Step 3; OWEB, 1999).

Stream Size

Oregon Department of Forestry (ODF) Stream Classification maps were used to determine stream size. The information from these maps was combined with the GIS data regarding stream gradient class and channel confinement to determine the channel habitat type classifications.

Channel Habitat Type Assignment

Channel Habitat Types were assigned based on stream channel gradient classes and channel confinement. Stream segments were selected based on CHT criteria described in OWEB, 1999 and classified accordingly. Stream segments were then symbolized based on their CHT designation and displayed on the CHT map (Figure 3-1).

CHANNEL HABITAT TYPES

All possible CHTs, as defined by the OWEB, are listed in Table 3-1. Those CHTs which are present in the SBW are described later in this chapter.

Channel habitat type sensitivity is based on the responsiveness of a channel to the addition or removal of LWD, riparian condition, fine sediment, coarse sediment, and peak flows (Table 3-2). Each channel habitat type occurring in the SBW has had a sensitivity determined for each of the above listed criteria as well as overall sensitivity. Table 3-3 shows the sensitivity rating for the channel habitat types occurring in the SBW.

Insert Figure 3-1 (11x17)

**Table 3-1
Channel Habitat Types (CHT)**

Code	CHT Name	Gradient	Channel Confinement	Size
ES	Small Estuary	<1%	Unconfined to moderately confined	Small to medium
EL	Large Estuary	<1%	Unconfined to moderately confined	Large
FP1	Low Gradient Large Floodplain	<1%	Unconfined	Large
FP2	Low Gradient Medium Floodplain	<2%	Unconfined	Medium to Large
FP3	Low Gradient Small Floodplain	<2%	Unconfined	Small to medium
AF	Alluvial Fan	1-5%	Variable	Small to medium
LM	Low Gradient Moderately Confined	<2%	Moderately Confined	Variable
LC	Low Gradient Confined	<2%	Confined	Variable
MM	Moderate Gradient Moderately Confined	2-4%	Moderately Confined	Variable
MC	Moderate Gradient Confined	2-4%	Confined	Variable
MH	Moderate Gradient Headwater	1-6%	Confined	Small
MV	Moderately Steep Narrow Valley	3-10%	Confined	Small to medium
BC	Bedrock Canyon	1->20%	Confined	Variable
SV	Steep narrow Valley	8-16%	Confined	Small
VH	Very Steep Headwater	>16%	Confined	Small

Source: Oregon Watershed Assessment Manual (GWEB, 1999)

**Table 3-2
Channel Sensitivity**

Sensitivity	LWD	Fine Sediment	Coarse Sediment	Peak Flows
High	Critical element in maintenance of channel form, pool formation, gravel trapping/sorting, and bank protection.	Fines are readily stored with increases in available sediment resulting in widespread pool filling and loss of overall complexity of bed form.	Bedload deposition dominant active channel process; general decrease in substrate size, channel widening, conversion to planebed morphology if sediment is added.	Nearly all bed material is mobilized; significant widening or deepening of channel.
Moderate	One of a number of roughness elements present; contributes to pool formation and gravel sorting.	Increases in sediment would result in minor pool filling and bed fining.	Slight change in overall morphology; localized widening and shallowing.	Detectable changes in channel form; minor widening, scour expected.
Low	Not a primary roughness element; often found only along channel margins.	Temporary storage only; most is transported through with little impact.	Temporary storage only; most is transported through with little impact.	Minimal change in physical channel characteristics, some scour and fill

Source: Oregon Watershed Assessment Manual (GWEB, 1999)

**Table 3-3
Channel Habitat Type Sensitivity Rating**

CHT	LWD	Fine Sediment	Coarse Sediment	Peak Flow
FP1	Moderate to High	Moderate	High	Low to Moderate
FP2	High	Moderate	High	Low to Moderate
FP3	High	Moderate to High	High	Low
LM	Moderate to High	Moderate to High	Moderate to High	Moderate
LC	Low to Moderate	Low	Moderate	Low to Moderate
MM	High	Moderate	Moderate to High	Moderate
MC	Low	Low	Moderate	Moderate
MH	Moderate	Moderate	Moderate to High	Moderate
MV	Moderate	Low	Moderate	Moderate
SV	Moderate	Low	Low to Moderate	Low
VH	Moderate	Low	Low to Moderate	Low

Source: Oregon Watershed Assessment Manual, GWEB 1999

Description of Channel Habitat Types and Sensitivities in the Seven Basins Watershed

The following CHT descriptions are taken from the OWEB (1999).

FP1: Low Gradient Large Floodplain Channel

FP1 channels have less than or equal to 1% stream gradient. They are located in the lowlands and valley bottoms of large watersheds. The channel tends to be sinuous and unconstrained. Sloughs, oxbows, wetlands, and abandoned channels are common in these stream systems. Systems of this size have the capability of moving large amounts of sediment during high water events. This

results in channel migration and the formation of new channels. LWD sensitivity is moderate to high. This system is moderately sensitive to the addition of fine sediments and highly sensitive to coarse sediments. FP1 channels have low to moderate sensitivity to peak flows. The overall channel habitat sensitivity is high in these systems. FP1 channels are important for coho, steelhead, rainbow, and cutthroat spawning and rearing.

FP2: Low Gradient Medium Floodplain Channel

FP2 channels have less than or equal to 2% stream gradient. They are located in broad, flat valley bottoms with single to multiple channels and can be sinuous. Alluvial fans and dissected foot slopes are likely to be found in direct proximity to FP2 channels. Extensive gravel bars, terraces, and riparian areas are commonly associated with these channels. FP2 channels are unconfined and considered large to medium size streams within Oregon. These channels are located in the middle to lower end of the drainage basin and are dominated by sand to cobble substrate. Channel sensitivity to LWD presence is high. Moderate sensitivity to fine sediments and high sensitivity to coarse sediments are exhibited in these systems. Peak flow sensitivity is low to moderate in FP2 channels. Overall channel habitat sensitivity is high in these systems. FP2 channels are important for coho, steelhead, rainbow, and cutthroat spawning and rearing.

FP3: Low Gradient Small Floodplain Channel

FP3 channels are located in broad valley bottoms and flat lowlands. They are associated with the toes of foot slopes or hill slopes within valley bottoms of larger channel systems. FP3 channels are typically fed by high gradient streams. Many times they are found downstream of alluvial fans and contain wetlands. The stream gradient in these channels is less than or equal to 2%. The channel confinement is moderate to unconfined and the channel pattern

consists of single to multiple channels. Dominant substrates in FP3 channels range from sand to small cobble. These channels are considered small to medium in Oregon. The sensitivity to LWD presence is high. Moderate to high sensitivity to fine sediments and high sensitivity to coarse sediments are exhibited in these systems. Peak flow sensitivity is low in FP3 channels. Overall channel habitat sensitivity is high in these systems. FP2 channels are important for coho, steelhead, rainbow, and cutthroat spawning and rearing.

LM: Low Gradient Moderately Confined Channel

LM channels have low gradient reaches and are confined within low terraces and/or hill slopes. Narrow floodplains which are approximately two to four times the width of the active channel are often present. The stream gradient in these channels is less than 2%. The channel confinement is variable. Dominant substrates in LM channels range from fine gravel to bedrock. These channels are considered medium to large in Oregon. The sensitivity to LWD presence is moderate to high. Moderate to high sensitivity to fine sediments and coarse sediments are exhibited in these systems. Peak flow sensitivity is also moderate to high in LM channels. Overall channel habitat sensitivity is moderate in these systems. LM channels are potential habitat for coho, steelhead, rainbow, and cutthroat spawning and rearing.

LC: Low Gradient Confined Channel

LC channels are incised or contained within gentle landforms such as hill slopes on one side of the channel and lowlands on the other. Stream bank terraces are often present and found above current floodplains. The stream gradient in these channels is less than 2%. Channel confinement by hill slopes or high terraces is typical. Dominant substrates in LC channels include boulder, cobble, bedrock with pockets of sand, gravel, and cobble. These channels are considered medium to large in Oregon. The sensitivity to LWD

presence is low to moderate. Low sensitivity to fine sediments and moderate sensitivity to coarse sediments are exhibited in these systems. Peak flow sensitivity is low to moderate in LC channels. Overall channel habitat sensitivity is moderate in these systems. LC channels are potential habitat for coho, steelhead, rainbow, and cutthroat spawning and rearing.

MM: Moderate Gradient Moderately Confined Channel

MM channels have alternating valley terraces and/or mountain-slopes which are adjacent. Foot-slopes and hill slopes are also common. All of these land forms limit channel migration and floodplain development. Narrow floodplains may be present. These usually alternate from bank to bank. The stream gradient in these channels is generally 2-4%. The channel confinement is variable. Dominant substrates in MM channels range from fine gravel to small boulders. These channels are considered medium to large in Oregon. The sensitivity to LWD presence is moderate to high. Moderate sensitivity to fine sediments and moderate to high sensitivity to coarse sediments are exhibited in these systems. Peak flow sensitivity is moderate in MM channels. Overall channel habitat sensitivity is high in these systems. MM channels produce limited habitat for coho spawning and rearing. These channels also provide potential steelhead spawning and rearing habitat.

MC: Moderate Gradient Confined Channel

MC channels are located in narrow valleys and have developed minimal river terraces. Hill slopes and mountain slopes provide the valley walls. The stream gradient in these channels is generally 2-4%, but may vary from 2-6%. Dominant substrates in MC channels range from coarse gravel to bedrock. These channels vary in size. The sensitivity to LWD presence is low. Low sensitivity to fine sediments and moderate sensitivity to coarse sediments are exhibited in these systems. Peak flow sensitivity is moderate in MC channels.

Overall channel habitat sensitivity is moderate in these systems. MC channels provide potential steelhead, rainbow, and cutthroat spawning and rearing.

MH: Moderate Gradient Headwater Channel

MH channels have moderate gradients and are exclusively located in headwater areas. These channels are potentially located above the natural occurrence of anadromous fish. The stream gradient in these channels is generally 1-6%. Dominant substrates in MH channels consist of sand to cobble, bedrock. These channels are considered small in Oregon. The sensitivity to LWD presence is moderate. Moderate sensitivity to fine sediments and moderate to high sensitivity to coarse sediments are exhibited in these systems. Peak flow sensitivity is moderate in MH channels. Overall channel habitat sensitivity is moderate in these systems. MH channels provide potential steelhead, rainbow, and cutthroat spawning and rearing habitat, if they are accessible.

MV: Moderately Steep Narrow Valley Channel

MV channels are moderately steep. Adjacent moderate to steep hill slopes account for the channel confinement. The stream gradient in these channels is generally 4-8%. Dominant substrates in MV channels range from small cobble to bedrock. These channels are considered small to medium in Oregon. The sensitivity to LWD presence is moderate. Low sensitivity to fine sediments and moderate sensitivity to coarse sediments are exhibited in these systems. Peak flow sensitivity is moderate in MV channels. Overall channel habitat sensitivity is moderate in these systems. MV channels have potential steelhead, rainbow, and cutthroat spawning and rearing habitat.

SV/VH: Steep Narrow Valley/Very Steep Headwater Channel

SV and VH channels are very similar and are described together in the Oregon Watershed Assessment Manual of 1999. VH channels are steeper than SV channels. SV channels are located in steep valley bottoms and have steep mountain or hill slopes on both sides of the stream. Vertical steps, cascades, and falls are very common in these systems. VH channels are located in the headwaters of a watershed and extend to ridge tops and summits. The stream gradient in SV channels is 8-16%, VH channels are less than 16%. Dominant substrates in SV/VH channels range from large cobble to bedrock. These channels are considered small to medium in Oregon. The sensitivity to LWD presence is moderate. Low sensitivity to fine sediments and low to moderate sensitivity to coarse sediments are exhibited in these systems. Peak flow sensitivity is low in SV/VH channels. Overall channel habitat sensitivity is low in these systems. SV channels provide limited habitat for anadromous fish rearing and limited spawning and rearing habitat for resident fish. VH channels have very limited resident fish rearing habitat.

ANALYSIS OF CHANNEL HABITAT TYPE DATA

Appendix C contains the complete list of channel habitat type stream miles occurring in each sub watershed. CHTs FP1, FP2, FP3, and MM are considered the most highly sensitive as described in OWEB (1999). CHTs which include LC, LM, MV, MH, and MC, are moderately sensitive. SH and VH CHTs have low sensitivity. Table 3-4 shows the longest CHT lengths present in each sub watershed.

Table 3-5 lists the total stream miles of highly sensitive CHTs occurring in each sub watershed. The percentage of highly sensitive habitat types within each sub watershed is also included in Table 3-5. Rogue River/Snyder Creek contains the greatest total stream miles and greatest percent of highly sensitive

**Table 3-4
Greatest CHT Lengths in Sub Watersheds**

Channel Habitat Type	Sensitivity	Sub Watershed	Stream	Stream Miles
FP1, FP2, FP3	High	Rogue/Snider Creek	Snider Creek	8.51
FP1, FP2, FP3	High	Upper West Fork Evans Creek	West Fork Evans Creek	3.1
MM	High	Evans Creek/Sykes Creek	Sykes Creek	3.42
MM	High	Lower West Fork Evans Creek	Rock Creek	1.47
LC	Moderate	Lower West Fork Evans Creek	West Fork Evans Creek	3.62
LM	Moderate	Evans Creek/Sykes Creek	Evans Creek	8.92
LM	Moderate	Lower Evans Creek	Evans Creek	8.51
LM	Moderate	Upper Evans Creek	Evans Creek	7.46
LM	Moderate	Pleasant Creek	Pleasant Creek	6.15
MV, MH, MC	Moderate	Upper Evans Creek	Evans Creek	7.41
MV, MH, MC	Moderate	Sardine Creek	Right Fork Sardine Creek	6.69
MV, MH, MC	Moderate	Lower West Fork Evans Creek	Salt Creek	5.93
MV, MH, MC	Moderate	Upper Evans Creek	Morrison Creek	5.06
SV	Low	Foots Creek	Middle Fork Foots Creek	2.15
SV	Low	Foots Creek	Right Fork Foots Creek	1.93
SV	Low	Upper Evans Creek	Canon Creek	1.9
SV	Low	Evans Creek/Sykes Creek	Neathammer Gulch	1.86
VH	Low	Rogue/Galls Creek	East Branch Galls Creek	1.87
VH	Low	Foots Creek	Right Fork Foots Creek	1.21

Bold = Sub Watersheds show highest CHT sensitivity

**Table 3-5
Total Miles and Percent of Highly Sensitive CHTs
Occurring in Each Sub Watershed**

Sub Watershed	Total Stream Miles of FP1, FP2, FP3, and MM	Percent of Sub Watershed FP1, FP2, FP3, and MM
Upper West Fork Evans Creek	3.1	10.69
Upper Evans Creek	0.74	1.71
Rogue River/Ward Creek	0.65	2.65
Rogue River/Snider Creek	8.73	47.16
Rogue River/Sams Creek	5.259	15.35
Rogue River/Sardine Creek	0	0
Rogue River/Galls Creek	1.16	4.63
Pleasant Creek	1.98	4.49
Lower West Fork Evans Creek	1.99	5.89
Lower Evans Creek	3.11	10.8
Foots Creek	0	0
Evans Creek/Sykes Creek	4.2	8.67

channel habitat in the SBW. Rogue River/Sams Creek contains the second greatest total stream miles and percent of high sensitivity channel habitat. Rogue River/Sardine Creek and Foots Creek do not contain any high sensitivity CHTs. Figure 3-1 shows the distribution of CHTs throughout the entire watershed. Highly sensitive streams generally have gradients which range from <2% to 4%. Such stream gradients are preferred by coho salmon, rainbow trout, steelhead, and chinook salmon. These streams should be a high priority for conservation and restoration efforts within the watershed, as they provide critical habitat for the salmonids of the watershed. FP1, FP2, and FP3 channels have questionable success with regard to riparian enhancement efforts. This is due to the tendency of the stream to move laterally. Side channel improvements to riparian vegetation and increasing shade may

indirectly improve bank stability and stream habitat and be a more efficient means of channel enhancement. MM channels, however, are receptive to enhancement efforts. The addition of LWD and boulders may help to increase habitat diversity in forested areas. Bank stabilization and riparian planting efforts are beneficial to these channels in non forested areas.

Moderately sensitive CHTs are located throughout the SBW. Table 3-6 lists the total stream miles of moderately sensitive CHTs occurring in each sub watershed. All sub watersheds within the SBW contain moderately sensitive CHTs. Many of these sub watersheds are comprised of approximately fifty percent or greater of moderately sensitive CHTs. Lower West Fork Evans Creek has the greatest percentage of moderately sensitive CHTs, but the second greatest total stream miles. Upper Evans Creek has the greatest total stream miles and second greatest percentage of moderately sensitive channel habitat. Sams Creek has the smallest total stream miles and greatest percentage of moderately sensitive CHTs. Moderately sensitive streams generally have gradients which range from <2% to 6%. Such stream gradients are preferred by rainbow trout, steelhead, and chinook salmon. These streams should be a priority for conservation and restoration efforts within the watershed, as they provide critical habitat for many salmonids in the watershed. Riparian enhancement success is variable in these channels. In many instances, livestock access control and riparian plantings create beneficial improvements to the channel.

**Table 3-6
Total Miles and Percent of Moderately Sensitive CHTs
Occurring in Each Sub Watershed**

Sub Watershed	Total Stream Miles of LC, LM, MV, MH, and MC	Percent of Sub Watershed LC, LM, MV, MH, and MC
Upper West Fork Evans Creek	13.53	46.67
Upper Evans Creek	26.97	62.54
Rogue River/Ward Creek	14.27	58.26
Rogue River/Snider Creek	7.93	42.84
Rogue River/Sams Creek	7.58	22.11
Rogue River/Sardine Creek	15.04	69.69
Rogue River/Galls Creek	13.63	54.45
Pleasant Creek	21.72	49.3
Lower West Fork Evans Creek	23.78	70.41
Lower Evans Creek	17.07	59.29
Foots Creek	11.35	32.69
Evans Creek/Sykes Creek	21.08	43.53

Low sensitivity CHTs are present in all sub watersheds of the SBW. Table 3-7 is a listing of the total stream miles and percentage of low sensitivity CHTs present in each sub watershed. Pleasant Creek has the greatest total stream miles and greatest percentage of low sensitivity CHTs. Upper West Fork Evans Creek has the second greatest percentage and third greatest total stream miles of low sensitivity CHTs. Rogue River/Snider Creek has the lowest total stream miles and percent of low sensitivity CHTs. Low sensitivity streams generally have gradients which range from 8% to >16%. These channels provide limited spawning and rearing habitat for steelhead, rainbow trout, and cutthroat trout. Enhancement efforts may not be readily responsive to improvements. However, the establishment and maintenance of riparian areas will add to woody debris within the watershed and improve overall conditions along the channel.

**Table 3-7
Total Miles and Percent of Low Sensitivity CHTs
Occurring in Each Sub Watershed**

Sub Watershed	Total Stream Miles of SV and VH	Percent of Sub Watershed SV and VH
Upper West Fork Evans Creek	7.52	25.94
Upper Evans Creek	5.07	11.75
Rogue River/Ward Creek	4.55	18.57
Rogue River/Snider Creek	0.82	4.43
Rogue River/Sams Creek	2.25	6.56
Rogue River/Sardine Creek	1.56	7.22
Rogue River/Galls Creek	5.24	20.93
Pleasant Creek	13.65	30.98
Lower West Fork Evans Creek	3.98	11.78
Lower Evans Creek	4.88	16.95
Foots Creek	9.13	26.29
Evans Creek/Sykes Creek	10.34	21.35

CONCLUSIONS

CHT classifications provides baseline data that allows for prioritization of monitoring and restoration projects. By understanding the relationship between stream gradient class, channel confinement, and stream size in relation to stream channel sensitivity, the watershed council will be able to make educated decisions regarding riparian enhancement activities.

The data derived from this assessment have not been field verified. Other methods of CHT classification such as those described in Rosgen (1996), require more field oriented procedures and may produce more in depth results

in relation to channel restoration needs. These methods were not used in this assessment due to the length of time needed to conduct such field intensive analysis. However, it may be beneficial for further analysis of the SBW channels to utilize classification methods such as those described by Rosgen (1996) in future efforts at channel classification in the SBW.

Highly sensitive and moderately sensitive CHTs should be a priority for monitoring with regards to LWD, fine sediments, coarse sediments, and peak flows. However, field verification of those stretches of streams identified as being highly or moderately sensitive should be conducted to verify that the classifications are accurate.

DATA GAPS

A variety of data gaps exist for CHT classifications within the SBW. They are as follows:

- Channel confinement designations have not been determined;
- Field verification has not been conducted for any channel habitat type classifications; and
- Channel habitat type classifications should be compared to the Riparian Assessment of the entire watershed upon its completion.

ACTION PLAN RECOMMENDATIONS

An action plan should be developed to prioritize projects for the Seven Basins Watershed Council. The following is a list of recommendations to be incorporated in the action plan with regard to CHT classifications.

- Channel confinement designations should be determined;

- Field verification should be conducted for the channel confinement designations once completed;
- Highly sensitive and moderately sensitive CHTs should be prioritized for monitoring efforts with regards to LWD, fine sediments, coarse sediments, and peak flows;
- Field verification should be conducted for all CHT classifications;
- Conduct stream surveys to identify CHTs in unsurveyed areas; and
- A database should be assembled to efficiently manage future data. A GIS component should be used with this database in order to make it fully functional, accessible, and current.

REFERENCES CITED

Oregon Watershed Enhancement Board (OWEB), *Oregon Watershed Assessment Manual*, 1999.

Rosgen, D.L., *Applied River Morphology, Wildland Hydrology*, Colorado, 1996.