



Memorandum

To: Upper Columbia Salmon Recovery Region and Chelan County NRD
From: Casey Baldwin, RTT Chairperson (509-664-3148 baldwcmb@dfw.wa.gov)
Date: 27 October 2008
Subject: Barrier Prioritization Framework

Introduction

The Upper Columbia Regional Technical Team (RTT) has provided technical review of habitat restoration projects proposed for funding from various entities including the Salmon Recovery Funding Board (SRFB), the Community Salmon Fund (CSF), and the HCP Tributary Funds of the Mid-Columbia Public Utility Districts. Past project review sessions revealed uncertainty regarding which culverts/diversions were considered a priority for repair based on their potential biological benefit. Additionally, Chelan County Natural Resource Department (CCNRD) has asked the RTT for direction on culvert-replacement priorities for funding from the Bonneville Power Administration (BPA) through the Northwest Power Planning Council's Fish and Wildlife Program. These processes clarified the need for a standardized and systematic approach to prioritizing barrier-correction projects throughout the Upper Columbia. The RTT started this effort in 2006 and developed a draft document describing a prioritization method using the Wenatchee Subbasin as an example. In January of 2008, the CCNRD requested that the RTT finalize the barrier-prioritization framework and complete our evaluation of the priority level of known artificial barriers in the anadromous zone of the Wenatchee and Entiat watersheds.

Various projects and agencies have evaluated barriers to fish migration through conducting inventories and estimating the severity of the obstruction and the habitat quality and quantity above the barrier (USFS district and Forest level barrier assessments; WDFW 2000; Schmidt and Canning 2005; Schmidt 2006; Harza 2000; PWI 2003; Arterburn et al. 2007). None of these efforts were inclusive of all life stages for the three listed species (spring Chinook, steelhead, and bull trout) throughout their entire range in the Upper Columbia Recovery Region. Therefore, there is no single assessment available to quantitatively determine the biological benefit and prioritization of barrier-correction projects in the Upper Columbia Region. Additionally, the Salmon Recovery Plan (UCSRB 2007) calls for the repair of all man-made barriers in the anadromous zone, but provides no prioritization or timelines for completion of repairs, nor does it place barrier corrections within the context of overall habitat-restoration priorities. Thus, it is unclear which barrier-correction projects should proceed in the near term versus those that can/should follow other higher priority actions.

Our goal was to develop a framework that uses a wide variety of available information to develop prioritized lists of culverts/obstructions for correction throughout the Upper Columbia salmon recovery region. To accomplish this goal we first needed to derive a method to determine the relative biological benefit of repairing or replacing culverts or diversions that would combine existing regional inventories and assessments, incorporate the Viable Salmonid Population (VSP) guidelines from the Interior Columbia Technical Recovery Team as well as the Salmon Recovery Plan (ICTRT 2007; UCSRB 2007).

Methods

Our methods intended to accomplish the following goals:

- 1) Incorporate information available from a variety of existing assessments.
- 2) Qualitatively or quantitatively update or enhance existing inventories and assessments.
- 3) Develop objective criteria to justify the priority level of each culvert/obstruction
- 4) Incorporate contribution to achieving VSP status.
- 5) Consider multiple life stages of all three listed species.
- 6) Provide flexibility to incorporate extenuating circumstances (*for example, a culvert might rank out as high priority but it might be on a road that is being considered for decommissioning*).

Due to issues of scale, we prioritized obstructions on 4th – 6th order or larger streams (Strahler 1:100k classification) separately from smaller (1st-3rd order) streams. We determined that any obstruction on a 4th – 6th order stream (Strahler 1:100k classification) that prevents or inhibits a measurable level of passage and access to historic spawning or rearing habitat in the Upper Columbia should be a high priority for restoration. Our focus in this paper is developing a transparent and qualitative method of prioritizing obstructions in small streams (1-3 order, Strahler 1:100k classification).

The framework that we developed for prioritizing fish-passage obstructions on small streams includes both fine-scale/local considerations as well as broad-scale prioritization implications for contributing to VSP attributes. Additionally, we recognized the importance of reserving options based on other information that did not fit into either one of those categories, or did fit into one or both of the categories but should supercede our attempt to standardize and quantify the information that went into each category.

For the broad-scale analysis, our goal was to incorporate the spatial structure and diversity guidance from the ICTRT by evaluating whether each tributary was a part of a major or minor spawning area for each of the three listed species (UCSRB 2007; ICTRT 2007). Bull trout major and minor spawning areas were not defined by the TRT intrinsic potential analysis so we made a qualitative decision on the classification of each area for bull trout. For each species, we assigned two points for a major spawning area, one point for a minor spawning area, and zero points if the subwatershed was not within the boundaries of a major or minor spawning area, total points were then summed within each subwatershed. Three tiers were established, with subwatersheds that scored from four to six points in Tier 1, two to three points in Tier 2, and zero to one points in Tier 3.

The next step was to determine whether providing access to the blocked area would, by itself, improve the population risk-level for spatial structure or diversity. If the answer was yes, the barrier restoration was automatically considered high priority. Second, we considered the potential contribution to population-level abundance and productivity (quantity of spawning and rearing habitat). The barrier-removal project was automatically considered high priority if the barrier blocked a quantity of habitat that was necessary for the population to reach VSP abundance thresholds defined by the ICTRT (ICTRT 2007). We recognized that a quantitative

analysis might be necessary to justify this conclusion; however, we initially made these decisions based on professional judgment and recommend implementing quantitative analyses as needed. We also reserved the option of reducing the priority if the habitat above the barrier was degraded to the point that productivity (smolts/redd or egg-to-smolt survival) of the population might decline if access was provided without first conducting habitat restoration.

A finer scale analysis was needed to refine priorities within major spawning areas or between spawning areas with similar priority levels. To accomplish this, we considered the number of listed species that would utilize the habitat upstream of the barrier at two different life stages (adult spawning and juvenile rearing). We also factored in the quantity and quality of habitat above the barrier by estimating the linear distance of stream above the barrier and whether it was low gradient (<4%), high gradient (>4%), or substantially degraded. The 4% break was based on a broad-scale analysis by the ICTRT that showed considerable increases in redd density in stream gradients less than 4%.

We recognized that using the area (length x width), rather than linear distance, would have been a more accurate method for evaluating the quantity of habitat for spawning and rearing above the barrier. However, several factors lead us to conclude that linear distance would be adequate for the purposes of this framework. First, there was a lack of data on stream widths for many small streams. Second, the assessment was limited to small-order streams so the variability in stream widths was minimized. Additionally, there was uncertainty regarding the end point of potential distribution in many cases so estimating area, rather than linear distance, would increase the error in these estimates exponentially.

Finally, we determined that seasonal spawning and rearing in intermittent streams should get some consideration, if there is adequate rearing habitat in upstream or downstream perennial reaches (particularly for steelhead because they spawn and migrate during spring runoff). In many cases, there is/will be no data for the presence, density, or probability of successful rearing in the areas upstream of a barrier. For these cases, we recommend evaluation of the flow, habitat conditions, and fish presence before finalizing the prioritization or proceeding with correcting the potential obstruction.

Stream segments with less than 4% gradient above the barrier were rated as high, moderate, or low priority according to the species use and linear distance matrix in Table 1, assuming there was low to moderate levels of habitat degradation upstream of the barrier. Stream segments with greater than 4% gradient above the barrier, or less than 4% gradient but with moderate levels of habitat degradation were rated as moderate or low priority according to the species use and linear distance matrix in Table 2.

In North Central Washington, the US Forest Service staff completed an analysis of subwatershed conditions (6th HUC) for the Okanogan-Wenatchee and Colville National Forests to be used for upcoming Forest Plan revision. The percentage of roads in a sub-watershed within the riparian area was used to evaluate channel constriction.

Streams at 3% gradient and lower were weighted as 75% of the score for constriction, and streams above 3% gradient accounted for 25% of the score. Road percentages above 5% for a

sub-watershed received a -1 value. Sub-watersheds with no roads within 30m of a stream received a score of +1. The values were used to rank riparian road constriction from highest to lowest for 297 subwatersheds on the two National Forests. The closer a constriction score came to a value of -1, the greater the assumed intensity of previous anthropogenic activities and the greater the assumed degradation of aquatic habitat (Reiss et al. 2008).

The RTT used this analysis to inform our barrier-prioritization process by assuming that any stream falling in the lowest quartile (25%) for riparian roads was highly degraded. This translated to a USFS riparian road score of -0.11 or lower. This cutoff point provided an important consideration in our process of determining the value of providing full fish passage to each area. However, we recognize that levels of degradation are on a continuum and habitat condition and road location in relation to the stream channel vary throughout a watershed. Therefore, we modified our priority recommendations on a case-by-case basis depending on the locations of obstructions in the watershed relative to the roads.

Conclusions

The steps for determining the priority of each barrier correction should include:

- Assemble all the pertinent information into tables.
- Complete the analysis relevant to the Small Stream Prioritization Matrix.
- Capture additional information and summarize in a brief narrative.
- Formulate conclusions about the overall priority of fixing the obstruction(s).

Reconnecting high-quality habitat is an important component to a subbasin-level restoration strategy (Roni et al 2002). We determined that any obstruction on a 4th – 6th order stream (Strahler 1:100k classification) that prevents or inhibits a measurable level of passage and access to historic spawning or rearing habitat in the Upper Columbia should be a high priority for restoration. In some cases, restoring habitat above a barrier might increase the priority ranking for the barrier correction. In other cases, more information is needed to determine the overall priority of eliminating a particular barrier. It is our opinion that high priority barriers should be repaired as soon as possible and that moderate and low priority barriers should be corrected after taking into account their potential biological benefit relevant to other primary limiting factors, priority action types, and priority watersheds.

Table 1. Small Stream Prioritization Matrix for streams of 1-3 order (Strahler 1:100k classification). This prioritization matrix should be applied in cases where the average gradient is 4 % or less and the habitat has minimal degradation through past or current land-management practices.

Number of Listed Species			Linear distance of potential stream habitat			
Spawning	Rearing	Flow	> 1 km	0.5-1 km	0.25-0.5 km	< 0.25 km
1-3	1-3	Perennial	H	H	M	L
0	1-3	Perennial	M	M	L	L
1	1-3	Not Perennial	M	L	L	L
0	1-3	Not Perennial	L	L	L	L

Table 2. Small Stream Prioritization Matrix for streams of 1-3 order (Strahler 1:100k classification). This prioritization matrix should be applied in cases where the average gradient is greater than 4 %, or the gradient is less than 4 % but the condition of the habitat is moderately degraded due to past or current land-management practices. If the gradient is greater than 4 % and the habitat is substantially degraded, the barrier-correction project should automatically be considered low priority.

Number of Listed Species			Linear distance of potential stream habitat	
Spawning	Rearing	Flow	> 1 km	0-1 km
1-3	1-3	Perennial	M	L
0	1-3	Perennial	L	L
1	1-3	Not Perennial	L	L
0	1-3	Not Perennial	L	L

References:

- Arterburn, J. A., K. Kistler, and C. Fisher. 2007. Barriers to anadromous fish in the Okanogan River Basin. Prepared for: Colville Tribes Department of Fish and Wildlife, Anadromous Fish Division-Omak Office. Omak, Washington.
<http://nrd.colvilletribes.com/obmep/Reports.htm>
- Harza 2000. Chelan County Fish Barrier Inventory. Final Report. Wenatchee Washington.
- ICTRT 2007. Viability criteria for application to interior Columbia Basin salmonid ESUs. Interior Columbia Basin Technical Recovery Team.
www.nwfsc.nao.gov/trt/trt_columbia.cfm
- PWI 2003. Twisp watershed assessment: restoration strategies and action plan. The Pacific Watershed Institute.
- Reiss, D., K. Gallo, L. Norris, D. Konhoff, and L. Croft. 2008. Guidance for evaluating the contribution of National Forest System lands to aquatic sustainability: A process for Region 6 Forest plan revisions.
- Roni, P., Beechie, T. J., Bilby, R. E. Leonetti, F. E., Pollock, M. M., and G. R. Pess. 2002. A review of stream restoration techniques and a hierarchical strategy for prioritizing restoration in Pacific Northwest watersheds. North American Journal of Fisheries Management 22:1-20.
- Schmidt, T. and A. B. Canning 2006. WRIA 48 Fish passage and diversion screening prioritization, inventory, and habitat assessment report for seven streams in WRIA 48. Habitat Program, Technical Applications Division (TAPPS). Olympia, Washington.
- Schmidt, T. 2006. WRIA 40 Diversion screening and fish passage inventory report. Habitat Program, Technical Applications Division (TAPPS). Olympia, Washington.
- UCSRB 2007. Upper Columbia spring Chinook salmon and steelhead recovery plan. Prepared for the Washington State Governors Salmon Recovery Office by the Upper Columbia Salmon Recovery Board. <http://www.ucsrb.com/UCSRP%20Final%2009-13-2007.pdf>
- WDFW 2000. Fish passage barrier and surface water diversion screening assessment and prioritization manual. Washington Department of Fish and Wildlife. Habitat Program. Salmonid Screening, Habitat Enhancement and Restoration Section (SSHEAR) Olympia, Washington. <http://wdfw.wa.gov/hab/engineer/fishbarr.htm>

Attachment A: Results for the Wenatchee Subbasin, some small tributaries downstream of Wenatchee, and the Entiat Subbasin

We first made a list of all known culvert barriers by combining assessments from county, federal, and state barrier inventories. We then included any available assessment information on the physical characteristics of the barrier and the potential habitat above the barrier.

Our second step in the Wenatchee Subbasin was to determine the major and minor spawning area designations for each of the subwatersheds (Table A.1). We then assessed the importance of restoration of 112 culvert barriers with 21 complexes (two or more culverts on one stream) and determined that four (one culvert complex and three singles) were high or moderate priority (Table A.1). Additionally, three were designated as “need more information” for reasons specified in the accompanying narrative. Supporting information on these and all of the low-ranked culverts can be found in Table A.3. We did not attempt to prioritize within each of the categories (Low, Moderate, or High) and we do not offer a narrative explanation for all of the low-rated culverts / complexes.

Icicle Creek

Icicle Creek is a 4th order stream (Strahler 1:100k classification) at the hatchery so it is automatically **high priority** under our general rules. Icicle Creek was classified as a major spawning area for steelhead, assuming that steelhead historically could get past the boulder field (UCSRB 2007, ICTRT 2007). Reconnection of a Major Spawning Area could have a large effect on all four VSP parameters. Passage at the hatchery is currently provided by USFWS except during the spring Chinook salmon broodstock-collection period. From May 15 through July 7 (annual default period, which is negotiated each year) racks are installed at Structure Five to control passage upstream of the hatchery. Fish traps are operated during this time; however, native fish are passed upstream. The Yakama Nation may also control passage during the fall to collect broodstock for their coho reintroduction program; although that has not happened since 2005, as collections at Dryden Dam have been sufficient. Currently, the USFWS participates in a Bureau of Reclamation led Project Alternatives Solution Study (PASS) process intended to resolve two fish passage impediments at LNFH: 1) the water intake system and 2) restoration of the historic channel area. The PASS technical team, comprised of representatives from various agencies, tribes and NGO's, has developed a preferred alternative for correcting problems with fish passage and entrainment/impingement at the water intake system. The proposed intake will be 1) properly screened, 2) located much closer to the hatchery, and 3) will include a roughened channel to facilitate fish passage between the historic channel and Icicle Creek. Engineers are working on the design of the structure and the NEPA process will commence thereafter. The PASS team is now meeting to resolve the issue of restoration of the historic channel. A major impediment to this effort is the continued use of racks at Structure Five to concentrate spring Chinook at the hatchery to facilitate broodstock collection and the tribal fishery. These racks can be installed and maintained only at relatively low flows, severely limiting the amount of flow that can be released through the historic channel during the trapping period and precluding the restoration of a more normative flow regime - a key element of restoration.

Chumstick Creek

Chumstick Creek is a 4th order stream (Strahler 1:100k classification) at the North Road culvert so it is automatically **high priority** under our general rules. The remaining culverts upstream of the North Road are also **high priority** based on greater than 5 km of low gradient habitat for steelhead spawning and rearing. The Chumstick Creek watershed did have a very poor USFS riparian road analysis score (-0.82); however, we believe that the majority of roads causing that low score are upstream of the anadromous reaches of Chumstick Creek. Additionally, Chumstick Creek is considered a major spawning area for steelhead based on intrinsic potential, so it is important for spatial structure considerations in steelhead viability. Additional use by spring Chinook juveniles for rearing is also expected in the lower portions of Chumstick Creek. Chelan County Natural Resource Department and the USFWS are working together to replace the North Road Culvert as well as the remaining passage barriers on private property. The North Road Culvert is scheduled to be replaced in 2009, and it is anticipated that the remaining 13-18 barriers will be replaced in the next several years.

Chiwawa River Tributaries

Goose Creek: Goose Creek was **low priority** based on the conclusion that it could only be used on a very limited basis for juvenile rearing. The RTT is not aware of any surveys that have documented spawning in Goose Creek. Goose Creek has a very high-gradient reach at the mouth, perhaps preventing access from the Chiwawa, it is 7% gradient for 1.6 km upstream of the culvert, and then gradient increases substantially providing no opportunity for access by juvenile salmonids.

Minnow Creek: Minnow Creek was classified as “**need more information**” because it has high densities of brook trout, so passage corrections should be delayed until assessment and/or eradication can occur.

Deep Creek: Juvenile *O. mykiss* have been observed in Deep Creek, but not Chinook (T. Hillman, personal communication). With 9% gradient for approximately ½ km below the first barrier, Deep Creek was considered **low priority**.

Nason Creek Tributaries

Coulter and Roaring Creeks: Steelhead have been observed spawning in Roaring Creek, so existing barriers are not a 100% obstruction to all life stages. Coulter Creek would have been high priority based on over 2 km of low gradient habitat upstream of the first culvert barrier; however, portions of that low-gradient habitat are in the floodplain of Nason Creek and were included in the USBR assessment of Nason Creek. Due to interaction with the Nason Creek floodplain there are some complexities with this site that must be taken into account; therefore we classified it as “**needs more information**”. For a reach-based approach, an access project for Coulter Creek should not proceed unless it is in conjunction with the floodplain reconnection opportunities in this reach.

All other fish barriers in the Nason Creek drainage were above the anadromous zone and therefore not evaluated.

Peshastin Creek Tributaries

Mill Creek: Mill Creek was considered moderate priority based on the Small Stream Prioritization Matrix but the overall priority was reduced to **low**, based on several factors. First, Mill Creek has degradation in the watershed from logging and roads. Unfortunately, the USFS riparian road analysis was not available for Mill Creek; however, based on personal observations the road is generally not infringing on the riparian zone so the majority of impacts are related to high road densities. There was uncertainty regarding water quantity in Mill Creek and inter- and intra-annual flow patterns. Based on the size of the watershed and some personal observations we assumed it has minimal flows in the late summer. Finally, the low gradient (<4%) habitat in Mill Creek occurred in short dispersed segments, which is generally less productive for fish than if it occurred in larger contiguous blocks.

Larson Creek: Larson Creek was considered **low priority** based on several factors. Larson Creek was assumed to go dry seasonally every year and there is not suitable rearing habitat in downstream areas such as lower Peshastin Creek or the Lower Wenatchee mainstem to support juvenile survival if spawning was successful in Larson Creek.

Scotty Creek: Scotty Creek was considered **low priority** based on several factors. The habitat in Scotty Creek was considered highly degraded based on the presence and extent of dredge mining activities and because the extent that the road infringes on the stream channel and riparian area form and function. The barrier inventory provided by CCNRD lists one culvert barrier in Scotty Creek at RM 1.6 (see table A.3.). However, the RTT is aware of two culvert barriers in Scotty Creek, one at RM 1.2 and a second one at RM 2.2. There is uncertainty regarding potential steelhead distribution that high in the watershed and overlap with resident *O. mykiss*. It is not evident that much biological benefit would be obtained by providing access above the lower culvert barrier. There was no flow at the upper culvert in October of 2008, adding to the uncertainty in the benefits to steelhead.

Ruby Creek: Ruby Creek was moderate priority based on our Small Stream Prioritization Matrix due to 0.29 km of low-gradient habitat and 2.4 km of total potential habitat above the barriers for steelhead and bull trout. However, Ruby Creek has very low flow in late summer (based on personal observations, not quantitative flow monitoring) and a USFS riparian road analysis score of -0.19, putting it into the highly degraded category and making the **overall priority low**.

Derby Canyon Creek: Derby Canyon Creek has 3.8 km of high gradient stream habitat that could potentially support steelhead spawning and rearing. However, the habitat is highly degraded and impacted by development in the lower portions of the watershed, and logging and roads in the upper portion of the watershed. The USFS analysis of subwatershed conditions concluded that Derby Canyon had a riparian road score of -0.10 (~26th percentile), indicating that the overall effect of roads in the stream corridor is relatively high. Derby Canyon Creek is technically part of the Peshastin Creek major spawning area for steelhead, but for spatial structure considerations we classified it as Tier 3 because it is not a tributary to Peshastin Creek and is relatively isolated

from the portions of Peshastin Creek where spawning occurs. For these reasons the Derby Canyon Creek culverts were rated as **low overall priority**.

Mission Creek

Lower Mission Creek: There are several known push-up diversion dams that form seasonal barriers on Mission Creek between the town of Cashmere and the Forest Service boundary near river mile 8 (Mike Rickel, personal communication, SHIAPP database). Any obstruction on mainstem Mission Creek (below Sand Creek) would rank as **high priority** based on its size (4th order, Strahler 1:100k classification). We recommend that the known barriers be corrected and that lower Mission Creek receive a barrier survey to identify and assess all potential barriers.

East Fork of Mission Creek: The East Fork of Mission Creek has six culvert barriers blocking over 2 km of low gradient potential spawning and rearing habitat for steelhead. We classified that habitat as highly degraded because the majority of this stream has been channelized to maintain the road in its current location. The riparian road score for Mission Creek was -0.76 , indicating very high levels of riparian and stream channel degradation due to roads in the riparian and channel migration zone corridor. Consequently, the streambed is highly degraded, numerous locations have no vegetative cover, and there are other ecological degradations such as high brook trout densities. Therefore the culverts are **low priority** for replacement until the primary limiting factors in this portion of the watershed can be addressed.

Brender Creek: Brender Creek has a complex of at least 20 barriers and is highly degraded and channelized as it flows through the town of Cashmere. Brender Creek was not considered to have potential for spawning and was rated as a **low priority** for barrier restoration.

Entiat Subbasin

Stormy Creek: Stormy Creek was rated as a moderate priority by our Small Stream Prioritization Matrix based on 2.5 km of potential rearing habitat for steelhead; however, the overall priority rating was reduced to **low priority** based on several factors. There was uncertainty regarding the upstream end of usable habitat for steelhead, whether or not steelhead would spawn in Stormy Creek, or if Chinook and bull trout would use the lower portion of Stormy Creek for rearing. Stormy Creek was not considered critical to the spatial structure of Entiat steelhead, but considering the small and simple structure of the population it probably has more potential to contribute than a similarly sized stream in a larger more complex population. Although a USFS riparian road analysis score was not available, it is apparent that the road does infringe on stream channel and riparian form and function.

Table A.1. Major and minor spawning area designation for various subwatersheds and species in the Wenatchee River Basin, Washington.

Subwatershed / assessment unit	Steelhead	Chinook	Bull trout	MaSA=2; MiSA=1; Neither =0			Sum	Tier
				Steelhead	Chinook	Bull trout		
Chiwawa River	MaSA	MaSA	MaSA	2	2	2	6	1
White River	miSA	MaSA	MaSA	1	2	2	5	1
Little Wenatchee River	miSA	MaSA	MaSA	1	2	2	5	1
Nason Ck	miSA	MaSA	MaSA	1	2	2	5	1
Icicle Creek	MaSA	miSA	MaSA	2	1	2	5	1
Peshastin Ck	MaSA	miSA	MaSA	2	1	2	5	1
Chumstick Ck	MaSA	miSA	NA	2	1	0	3	2
Mission Ck	MaSA	miSA	NA	2	1	0	3	2
Chiwaukum/Skinney	miSA	NA	MaSA	1	0	2	3	2
Upper Wenatchee Mainstem	miSA	miSA	NA	1	1	0	2	2
Beaver Ck	miSA	NA	miSA	1	0	1	2	2
Derby Ck	miSA	NA	NA	1	0	0	1	3
Squilchuck / Stemilt Creeks	miSA	NA	NA	1	0	0	1	3
Rock Island Creek	miSA	NA	NA	1	0	0	1	3
Colockum Creek	miSA	NA	NA	1	0	0	1	3
Tarpiscan Creek	miSA	NA	NA	1	0	0	1	3
Trinidad Creek (Lynch Coulee)	miSA	NA	NA	1	0	0	1	3
Tekison Creek	miSA	NA	NA	1	0	0	1	3
Quilomene/Brushy Creeks	miSA	NA	NA	1	0	0	1	3
Whiskey Dick / Skookumchuck	miSA	NA	NA	1	0	0	1	3
Sand Hollow	miSA	NA	NA	1	0	0	1	3
Johnson Creek	miSA	NA	NA	1	0	0	1	3

Table A.2. Summary of the culvert replacement priorities in the Wenatchee and Entiat subbasins developed by the Regional Technical Team. Only those barriers that were considered high or moderate on the Small Stream Prioritization Matrix are shown here. The remaining culverts in the analysis can be found in Table A.3.

Stream	River km of first barrier	Number of Barriers	Landowner	Estimated linear distance (km) of usable stream above the culvert for at least one listed species	Linear distance upstream of the barrier with <4% gradient and high to moderately functional habitat.	MaSA/MiSA Priority (Tier 1,2,3)	USFS Riparian Road Analysis Score	Small stream prioritization matrix rating	Overall Priority
Icicle Cr.	3.4	1	USFWS	>5	>5	1	NA	NA	High
Chumstick Cr.	0.6	1	County	>5	>5	2	-0.82	NA	High
Chumstick Cr.	3.4	13-18	Private	>5	>5	2	-0.82	High	High
Mission	6.0	2 ?	Private	>5	>5	2	-0.76	High	NMI
Minnow Cr.	0.6	1	County/Private	>5	2.2	1	ND	High	NMI
Coulter Cr.	0.6	2	County/Private	2.6	2.2	1	ND	High	NMI
Mill Cr. (Pesh.)	0.1	1	County/Private	3.8	0.25	1	ND	Moderate	Low
Stormy Cr	0.2	3	County/Private	2.5	?	2	ND	Moderate	Low
Ruby Cr.	0.06	3	USFS	2.4	0.29	1	-0.19	Moderate	Low
Goose Cr.	0.6	2	County/Private	1.6	0.27	1	ND	Moderate	Low
EF Mission	1.2	6	USFS	6.72	0	2	-0.76	Moderate	Low
Derby Cyn Cr.	1.3	3-7	County/Private	3.84	0	3	-0.10	Moderate	Low

Table A.3: See excel spreadsheet

[barrier prioritization Wenatchee RTT 10 27 2008.xls](#)