

# **Fish Passage Inventory**

## **2014-2016 Survey Report**

*Wind River Watershed*  
*With Appendices on:*  
*Columbia River Tributaries*  
*Upper White Salmon River*

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## INTRODUCTION

The Wind River watershed is home to native, wild populations of coho, winter steelhead, summer steelhead, fall Chinook, chum, as well as pacific lamprey and coastal cutthroat trout. Undersized or perched culverts, channel-spanning dams, and unscreened outtakes can all pose a threat to the movement of fish. Fish passage barriers common in the Wind River watershed include forest road crossings, and residential and county road crossings. These barriers prevent both resident and anadromous fish species from accessing vital spawning, rearing, and refuge habitat. Restoring access to these previously blocked habitats is a statewide priority.

Underwood Conservation District (UCD) encompasses all of Skamania County and the western portion of Klickitat County, up to the Klickitat River. UCD works with willing landowners and numerous partners to develop and implement conservation and restoration improvements to natural resources. The Wind River watershed, the White Salmon River watershed, and numerous other tributaries to the Columbia River on the Washington side are within the boundaries of the District. Specifically, in the Wind River watershed UCD has partnered with US Forest Service (USFS), Washington Department of Fish and Wildlife (WDFW), US Geological Survey-Columbia River Research Laboratory (USGS), and Bonneville Power Administration (BPA) for over two decades to assist with steelhead population monitoring and habitat restoration work.

In 2009, with funding from Salmon Recovery Funding Board (SRFB), National Oceanic and Atmospheric Administration (NOAA) and American Rivers, UCD technicians surveyed and completed design work on an unnamed tributary to the Wind River, informally called Cannavina Creek. The goal of the assessment was to evaluate passage and prioritize restoration work at that individual site. However, it was unknown how the Cannavina passage barriers ranked within the entire watershed. To give the results of that individual survey meaning within the larger watershed, UCD realized the need for a comprehensive fish passage inventory throughout the privately owned lands of the Wind River basin. In 2014, UCD was awarded a grant from Washington Department of Natural Resources (WA DNR) to compile an inventory of passage barriers, hazards, and habitat restoration opportunities in the Wind River watershed, and other watersheds within the district including tributaries to the Columbia River, and the upper (non-anadromous) tributaries to the White Salmon River, based on existing data and data gaps.

In 2011, UCD technicians completed the *White Salmon River Watershed Anadromous Fish Passage Inventory (WS FPI)*, a SRFB-funded comprehensive survey of potentially anadromous streams in the White Salmon River watershed, in anticipation of the removal of Condit Dam, a long-standing fish passage barrier on the mainstem White Salmon River. The WS FPI identified the top ten priority projects for restoring fish passage in tributaries upstream of the former dam site. That inventory has proven to be a valuable tool in project development, and to date, UCD has replaced the top two barriers identified in the inventory; two others on the top ten list are currently in development.

Until now, a comprehensive fish passage barrier inventory had not been conducted throughout the Wind River watershed. Partial barrier inventories in the Wind River watershed include the Cannavina/Whisky Creek survey completed by UCD in 2009, occasional Washington Department of Fish and Wildlife (WDFW) assessments of individual culverts which are evaluated for specific mitigation projects, and a 2001 survey by the U.S. Forest Service on Forest Service lands. Data collected in this UCD 2014-2016 fish passage inventory provides much needed information on where to prioritize passage improvements and habitat restoration projects and aids future strategic planning in the watershed.

The primary project objectives of the 2014-2016 Fish Passage Inventory were to:

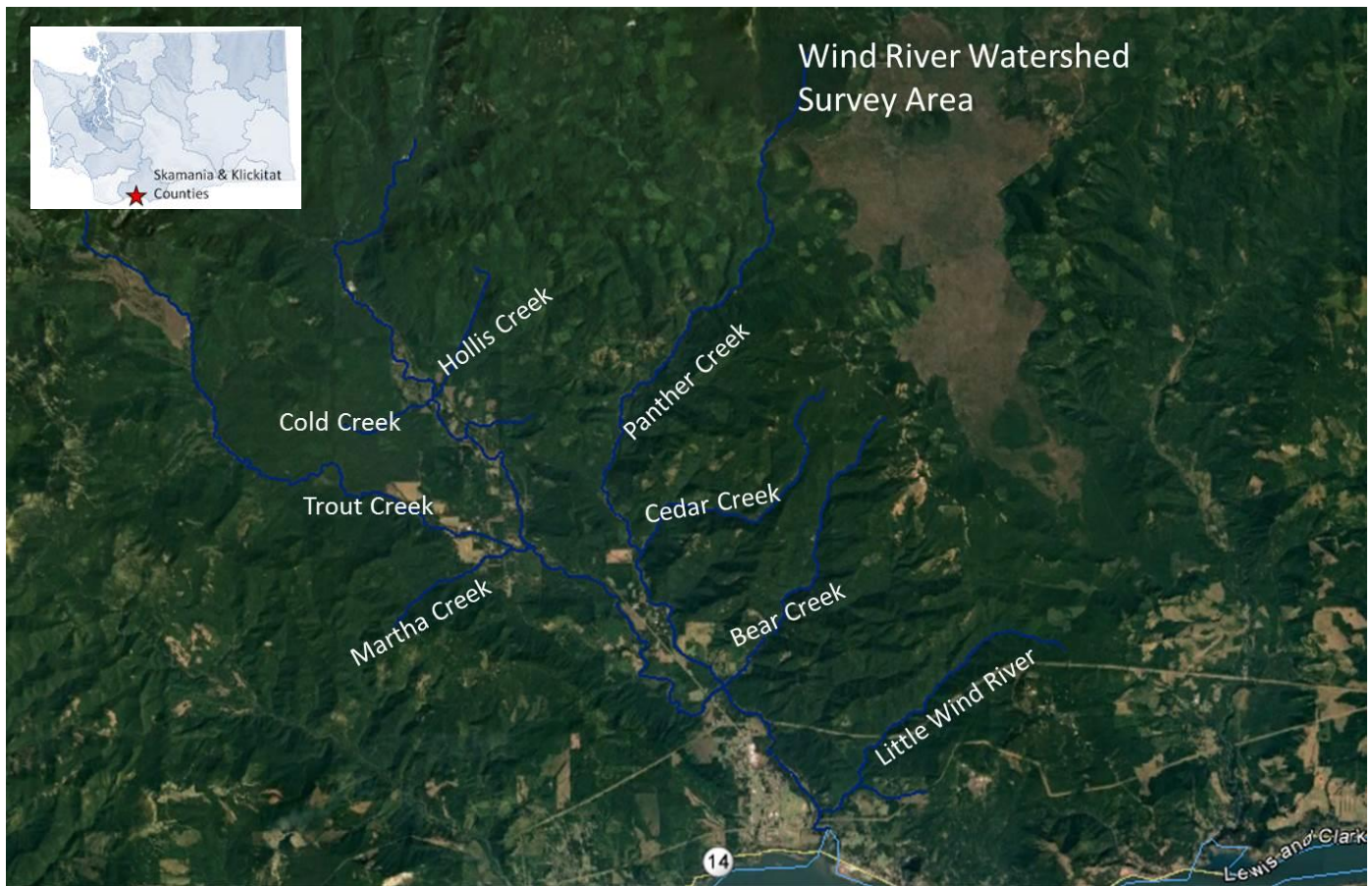
1. Identify and assess passage barriers and hazards in anadromous fish bearing streams of the Wind River watershed, using the WDFW Fish Passage and Diversion Screening Assessment and Prioritization Manual.
2. Prioritize fish passage barriers for removal based on potential habitat quality, species utilization, production, and mobility, along with percentage passage improvement, and cost.
3. Compile existing information, identify data gaps, and collect fish passage information in the Columbia tributaries of Skamania County and upper (non-anadromous) tributaries to the White Salmon River.
4. Identify stream and riparian habitat restoration projects to improve salmonid habitat throughout the UCD boundaries.
5. Enter and submit collected fish passage data to the WDFW Fish Passage and Diversion Screening Inventory Database (FPDSI), and the US Fish and Wildlife Service (US FWS) database.
6. Produce a report detailing fish passage barriers, instream features and habitat restoration opportunities.

## **PROJECT SCOPE**

The UCD Fish Passage Inventory aimed to survey the potentially anadromous fish habitat in the Wind River basin for streams with private ownership, the upper White Salmon River above anadromous access, and anadromous tributaries to the Columbia River within the boundaries of Underwood Conservation District. Information for the upper White Salmon River can be found in Appendix A and Columbia River tributaries can be found in Appendix B. Potentially anadromous streams were initially identified using WDFW SalmonScape and WA DNR “F” type stream layers and included streams thought to have low gradient (less than 20 percent) and scour line width greater than 1 meter. The survey area within the Wind River basin included the mainstem Wind River, the Little Wind River, Trout, Martha, Hollis, Cold, Bear, Panther and Cedar Creeks, as well as several unnamed tributaries feeding into the mainstem at river mile (RM) 9.75, 12.13, 17.9 and 18.2. Unnamed tributaries feeding into the above streams were also surveyed, and are included in habitat numbers. Named tributaries are listed separately.

Stream survey details, including habitat data, observational information, barrier determination, and habitat restoration opportunities were compiled and summarized; these details are included in this report and its appendices. Barrier data was submitted to both WDFW and US FWS for inclusion in their respective databases.

As described below, streams were walked from the mouth to the end of natural fish passage, where landowner permission and time allowed; in total over 17 miles of stream were walked throughout the Wind River watershed. In some streams, the end of fish passage was not determined due to the lack of landowner permission to access lands or due to limited time and resources. To get a better idea of the amount of potential habitat beyond the surveyed streams, technicians estimated habitat using remote sensing and other existing data, including aerial photos, LiDAR, WDFW Salmonscape and WA DNR “F” type stream layers. The map below shows the Wind River basin study area.



**FIGURE 1. MAP OF THE WIND RIVER WATERSHED FISH PASSAGE INVENTORY AREA.**

### **PRE-SURVEY WORK**

Beginning in July 2014, UCD technicians prepared for the inventory by gathering and reviewing previous stream habitat and passage information collected in the watershed; and identifying areas where more information was needed (see list of resources consulted below). They also compiled a list of all of the landowners throughout the survey area and began working to establish permission for physical stream surveys. There were approximately 100 different landowners contacted within the Wind River basin.

### **EXTERNAL DATA COLLECTION AND SYNTHESIS**

The Wind River watershed has been the focus of numerous studies conducted by state and federal agencies, as well as local groups. In an effort to minimize a duplication of efforts, and in order to gain a holistic sense of land-use, ecology, limiting factors, and past restoration efforts in the watershed, UCD technicians compiled existing stream and passage data, including limiting factors and data needs. While UCD's focus was on the privately-owned lands, partner agencies such as the USFS and WDFW have also compiled fish passage information. The following reports and GIS layers were reviewed and utilized in planning the Fish Passage Inventory:

- ❖ Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan, Vol. II P, Wind Subbasin, Lower Columbia Fish Recovery Board, 2010.
- ❖ Salmon and Steelhead Habitat Limiting Factors in WRIA 29, Washington Conservation Commission.

- ❖ The 2011-2013 Wind River Stream Survey Report, Gifford Pinchot National Forest, Mt. Adams Ranger District, USFS.
- ❖ Skamania County 2015 GIS Layers: Landowner Parcels, Roads, Waterways, and Railroads; Rick Hollatz, GIS Coordinator, Skamania County, Washington.
- ❖ Washington State Watercourse (WC) Hydrography layer, Washington Department of Natural Resources.
- ❖ StreamStats National Application, US Geological Survey
- ❖ SalmonScape, Washington Department of Fish and Wildlife
- ❖ Wind River LiDAR layers, Oregon Department of Geology and Mineral Industries
- ❖ Underwood Conservation District Project Files

## **OUTREACH PROCESS & LANDOWNER PERMISSION**

Underwood Conservation District provides financial and technical assistance to voluntary landowners who are interested in improving their current land use methods in an effort to shift to best management practices. Because of the voluntary nature of UCD's work and the goals of the Fish Passage Inventory, it was of utmost importance that all landowners willingly grant permission for UCD to access sections of streams that run through their property. The decision was made that all surveys would be preceded by landowner permission, preferably in writing.

Landowners were mailed an informational brochure outlining the project and a permission slip with a self-addressed, stamped envelope to return to UCD. Landowners were encouraged to join in the stream survey across their property if interested, and several landowners did join UCD technicians. 66% of residents contacted for permission responded to UCD's request for survey; of those 66%, 88% granted permission to survey, while the remaining 12% declined permission. As needed, technicians followed up with phone calls and/or email correspondence.

Once landowner permission was granted to access sections of stream, surveys were scheduled and streams were walked to identify, assess, map, and document all passage barriers, hazards and habitat restoration opportunities. Stream surveys were conducted in 2014, 2015 and 2016. As surveys progressed, information gathered was recorded and provided back to landowners for review as requested.

## **STREAM SURVEY PROTOCOL**

The Fish Passage Inventory was conducted using WDFW's *Fish Passage and Surface Water Diversion Screening Assessment and Prioritization* protocol. This protocol allows for uniform assessment and prioritization of fish passage barriers and surface water diversions throughout the state of Washington.

## **STREAM SURVEYS**

In order to quantify fish use and habitat for prioritizations of anadromous barriers, WDFW protocol recommends full surveys of all streams to the end of fish passage. WDFW defines the end of fish passage on a stream only where a natural barrier is detected. Natural barriers are defined as either a sustained stream gradient higher than 20% for 160 meters, a sustained stream gradient higher than 16% for 160 meters in combination with an ordinary high water width of less than 0.6 meters, or a waterfall with a height >3.7 meters<sup>1</sup>.

Stream survey protocol differs depending on whether or not man-made features are encountered in the stream. A man-made barrier is any feature with a drop of  $\geq 0.24$  meters or a slope of  $\geq 1$  percent. More in-depth assessments can also identify culverts as barriers based on velocity and/or depth. WDFW fish passage parameters are based on the ability of a six-inch trout to safely pass a feature 90% of the year. In streams where man-made passage barriers are not present, protocol calls for an *observational survey*, which involves walking the stream and recording basic habitat characteristics

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<sup>1</sup> Washington Department of Fish and Wildlife. 2009. Fish Passage and Surface Water Diversion Screening Assessment and Prioritization Manual. Washington Department of Fish and Wildlife. Olympia, Washington.

such as canopy and instream cover, dominant flora species and water temperature. However, when a man-made feature is encountered and determined to be a barrier, technicians conduct a *habitat survey* upstream of the barrier until a natural barrier is detected. During a habitat survey, data such as habitat unit type (rapid, riffle, pool, pond), length, depth, wetted width, ordinary high water width and substrate (boulder, cobble, gravel, fines) of the stream channel are collected.

Stream surveys are divided into reaches based on similar habitat characteristics. Reach breaks are established at significant habitat type changes. Habitat changes occur when tributaries contributing 20 percent or more of the flow enter the stream, the sustained gradient shifts at 1, 3, 5, 7, 12 or 16 percent, or drastic changes in bed form, channel size, flow, or man-made barriers exist.

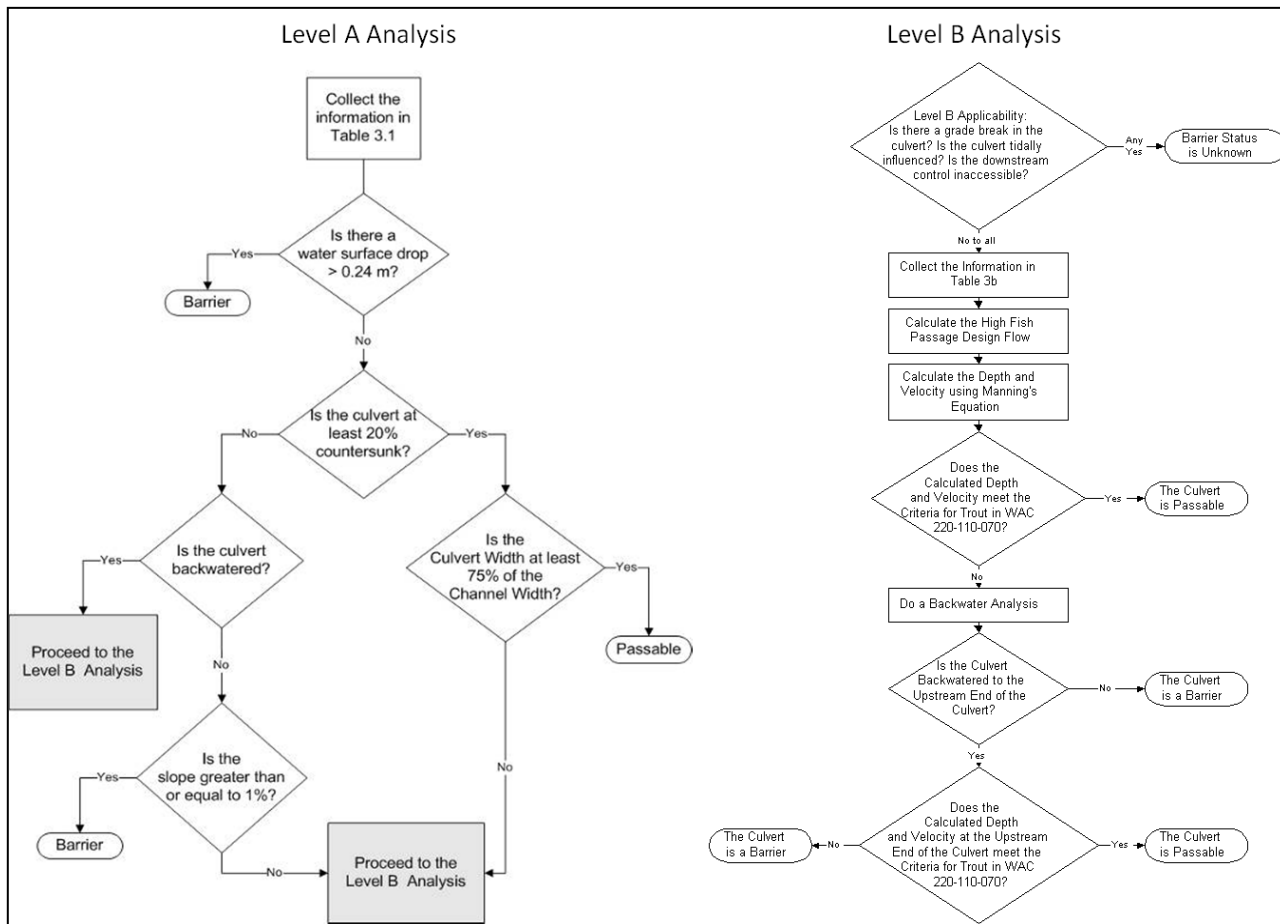
All references to right and left bank are from the perspective of looking downstream.

### **FEATURE ASSESSMENTS**

In the case that a man-made feature such as a culvert, dam, or irrigation outtake is encountered, technicians assess the feature to determine whether or not it poses a barrier or hazard to fish passage.

Depending on the type of feature, WDFW requires different information to be collected. For culverts, a Level A assessment is performed first. The Level A assessment is comprised of measuring the physical characteristics including the slope of the culvert as well as any drop height (change in water surface elevation as water flows through the culvert). Using the WDFW protocol, a Level A survey establishes if the feature is a barrier due to its slope or drop height. If the culvert does not present either a slope or a surface water drop barrier, a Level B survey is conducted, which determines the passability of the culvert based on high water elevation and the velocity of water passing through the culvert at a variety of different flows.

The flow charts below illustrate the WDFW protocol for Level A and Level B culvert assessments. This protocol presents a streamlined method of establishing passability and is sufficient in most cases; however, in some cases the Level A and Level B surveys need to be supplemented by other surveys to gain a more in-depth assessment. For instance, additional surveys may be warranted when there are multiple culverts transporting the flow or there is a grade break in the culvert.



**FIGURE 2. WDFW CULVERT ASSESSMENT FLOW CHARTS DETAILING LEVEL A AND LEVEL B CULVERT ASSESSMENT PROTOCOLS.**

Surface water diversions are also assessed when encountered instream, with the intention of gathering physical information on the diversion and determining if the diversion meets state screening requirements. Ideally, flow is measured or estimated in order to help prioritize unscreened diversions for screening efforts. Flow can be documented if there is a staff gauge and known flow rating curve, an in-line flow meter, an open diversion ditch in which to measure flow, or if there is a pump and the diameter of the outtake pipe is known.



## STREAM SURVEY FINDINGS

The following pages summarize instream and riparian habitat information gathered. Additional barrier assessment data is provided in Appendix C; stream notes detailing each mile of habitat surveyed are available through UCD.

**TABLE 1. SUMMARY OF POTENTIAL HABITAT, BLOCKED HABITAT AND BARRIERS FOR THE WIND RIVER WATERSHED.**

Stream	Fish Use	Estimated Habitat*	Estimated Blocked Habitat**	Number of Artificial Barriers
<b>Wind River Basin</b>				
Little Wind River	Coho, steelhead, Chinook, resident salmonids	5	0	0
Berge Creek	Resident salmonids	1.8	1.8	0
Bear Creek	Resident salmonids	9.3	6.85	1 culvert, 1 dam
Panther Creek	Steelhead, resident salmonids	12	0	0
Cedar Creek	Steelhead, resident salmonids	7.7	0	0
Trout Creek	Chinook, steelhead, resident salmonids	19.5	0	0
Martha Creek	Steelhead, resident salmonids	2	0	0
Cold Creek	Steelhead, resident salmonids	2.5	2.3	2 culverts
Hollis Creek	Steelhead, resident salmonids	1.2	1	1 culvert
Warren Gap Rd Creek	Steelhead, resident salmonids	0.8	0.5	3 culverts
Whisky Creek	Steelhead, resident salmonids	1.7	1.3	1 culvert
Whisky Creek Trib	Steelhead, resident salmonids	0.8	0.7	2 culverts
Cannavina Creek	Steelhead, resident salmonids	2.5	0	2 previous barrier culverts mitigated in 2015 by UCD project
Tributary at RM 18.2	Steelhead, resident salmonids	0.5	0.3	≥1 culverts
Tributary at RM 17.9	Steelhead, resident salmonids	1.7	1.3	≥1 culverts

\* Number of estimated stream miles derived from stream surveys, WDFW SalmonScape, LiDAR & DNR "F" type map layers

\*\*Number of estimated stream miles blocked to fish due to man-made barriers. Based on total Estimated Habitat miles.

## MAINSTEM WIND RIVER

**DRAINAGE BASIN:** 224 mi<sup>2</sup>

**NUMBER OF BARRIERS:** 0; Shipperd Falls was historically a barrier to all species except for steelhead. A fish ladder was installed in the 1950's, providing passage to additional species. The fish ladder is actively managed by WDFW.

**TYPE OF SURVEY:** No field survey completed; compilation of existing data, coordination with agency partners to provide and receive data on habitat characteristics, limiting factors, and potential projects.

**HABITAT CHARACTERISTICS:** The Wind River flows from its headwaters in McClellan Meadows approximately 31 miles to its confluence with the Columbia River. Conditions and morphology vary greatly over the basin, from low gradient alluvial reaches in the middle Wind River to the steep canyon reaches of the lower river. The river has high-energy flows and historic land-use has

**LIMITING FACTORS:** Disconnection from the floodplain, simplified channel morphology, lack of habitat complexity, lack of rearing habitat in the middle reaches, lack of LWD.

**POTENTIAL RESTORATION PROJECTS:** Many potential restoration projects have been identified on the mainstem Wind River. There is a recent and ongoing effort by the Wind River Work Group and the Lower Columbia Fish Recovery Board (LCFRB) to identify and prioritize projects that benefit fish use. More information on that effort, including project lists, can be found on the LCFRB website at <http://www.lcfrb.gen.wa.us/#!wind-river-workgroup/cv7s>.

**LITTLE WIND RIVER** (*Enters the Wind River at RM 1.08 from the left bank*)

**DRAINAGE BASIN:** 9.35 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 4.1

**NUMBER OF BARRIERS:** 0

**TYPE OF SURVEY:** Observation

**HABITAT CHARACTERISTICS:** Riffle pool habitat, good canopy cover with dominant species of red alder, Douglas fir, bigleaf maple and western redcedar. Moderate instream cover, high pool frequency but not many deep pools. Long reaches of riffle habitat. Moderate gradient, average 5.5%.

**LIMITING FACTORS:** Lack of LWD, lack of deep pools, lack of complexity. Younger riparian corridor in many reaches. Minimally connected floodplain.

**POTENTIAL PROJECTS:** Placement of log structures, restoration of pool habitat, riparian planting of conifers throughout all reaches.

**BERGE CREEK** (*Enters the Little Wind River at RM 1.0 from the left bank*)

**DRAINAGE BASIN:** 0.9 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 0.0

**NUMBER OF BARRIERS:** 0; at least a partial barrier to anadromy at confluence with Little Wind River, and full barrier at waterfall at RM 0.02.

**TYPE OF SURVEY:** Observation

**HABITAT CHARACTERISTICS:** Good riparian cover with dominant species Douglas fir, bigleaf maple. Good instream cover and wood debris. High percentage of fines, very steep banks. Some erosion and invasive species around pipeline crossing nd easement.

**LIMITING FACTORS:** High percentage of fine sediment, lack of deep pools

**PANTHER CREEK** (*Enters the Wind River at RM 4.6 from the left bank*)

**DRAINAGE BASIN:** 42.54 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 12 mi

**NUMBER OF BARRIERS:** 0

**TYPE OF SURVEY:** Observation

**HABITAT CHARACTERISTICS:** Generally low gradient stream. Lower reaches have large areas of bedrock. Moderate canopy cover through most of the reaches, dominant canopy is Douglas fir, red alder, and western redcedar.

**LIMITING FACTORS:** Lacks LWD, lacks deep pools, recreation impacts from dispersed camping. Some areas of heavy bank erosion.

**POTENTIAL PROJECTS:** No fish passage issues. Recreation impacts in the upper reaches (above Cedar Creek), middle reaches have simplified habitat that could benefit from habitat-forming structures, large wood, etc.

**BEAR CREEK** (*Enters Panther Creek at its confluence with the Wind River from the left bank*)

**DRAINAGE BASIN:** 14.78 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 0.3 mi; plus an estimated additional 9.5 mi of resident fish habitat

**NUMBER OF BARRIERS:** 2 barriers above anadromy

**TYPE OF SURVEY:** Observation and Habitat

**HABITAT CHARACTERISTICS:** The lower reach of Bear Creek is characterized by steep (vertical) and close canyon walls, many large boulders, and good canopy cover. Dominant canopy: Douglas fir, alder, and vine maple. The middle section is characterized by steep banks, bedrock substrate with little cobble/gravel and has dominant canopy of alder, western redcedar, and Douglas fir. Gravels are low, as is LWD. Some bedrock sections, one small (~1m) falls at RM 0.15, and one large (~4.7m) barrier falls at RM 0.3.

**LIMITING FACTORS:** lack of deep pools in the middle reaches, low riparian cover in privately owned residential stretch, lack of LWD, lack of gravel, lack of instream cover

**POTENTIAL PROJECTS:** Restore fish passage at the Skamania PUD municipal water diversion dam at RM 2.45, restore fish passage at the USFS culvert at RM 2.25 (damage at the inlet presenting a partial barrier to fish passage), habitat work to create complexity throughout the middle reach, riparian planting through the neighborhood reach.

### **CEDAR CREEK** (*Enters Panther Creek at RM 3.5 from the left bank*)

**DRAINAGE BASIN:** 6.26 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 7.7

**NUMBER OF BARRIERS:** 0

**TYPE OF SURVEY:** Observation

**HABITAT CHARACTERISTICS:** Cedar Creek enters Panther Creek at RM 3.5. Cedar Creek flows through a relatively confined valley, to its confluence with Panther Creek. The majority of Cedar Creek lies on USFS land, with the lower ~0.6mi flowing through privately owned land. The lower 0.6mi of Cedar Creek is characterized by low stream gradient, and a cobble gravel streambed. Canopy cover is high throughout Cedar Creek and consists of western redcedar, Douglas fir, vine maple and alder.

**LIMITING FACTORS:** Landowner alterations to streambed, lack of gravels in some reaches, lack of LWD, areas of erosion noted.

**POTENTIAL PROJECTS:** Several landowners have created small rock dams, some channel-spanning, presumably for summer recreation. Outreach to these landowners about the potential implications to fish passage, increased water temperature, and sediment transport could help reduce or eliminate these features. Increase habitat complexity by adding LWD.

### **TROUT CREEK** (*Enters the Wind River at RM 10.8 from the right bank*)

**DRAINAGE BASIN:** 33.7 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 19.5

**NUMBER OF BARRIERS:** 0

**TYPE OF SURVEY:** Observation

**HABITAT CHARACTERISTICS:** In the reaches below the former Hemlock Dam, Trout Creek is dominated by bedrock and boulders. Gravels are low, presumably as a result of being sediment-starved for many years as the dam blocked sediment transport. Dominant canopy consists of Douglas fir, alder, vine maple, with generally low canopy cover. Average scour line width is 15.5 meters, with poor spawning habitat (lack of gravels) and fair-poor rearing habitat (good pools but low cover).

**LIMITING FACTORS:** Lack of LWD, lack of gravels for spawning, and lack of instream cover.

**POTENTIAL PROJECTS:** No fish passage issues. Add large wood to capture gravels and add instream cover between RM 0.65 and RM 1.2. See also identified projects by the USFS and others in the Wind River Habitat Strategy (see entry for Mainstem Wind River).

### **MARTHA CREEK** (*Enters Trout Creek at RM 0.45 from the right bank*)

**DRAINAGE BASIN:** 3.23 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 2.2

**NUMBER OF BARRIERS:** 0

**TYPE OF SURVEY:** Observation

**HABITAT CHARACTERISTICS:** Martha Creek is characterized by riffle-pool habitat. Flows in sections of Martha Creek in the lower reaches go subterranean in the summer months. In these reaches, fish of 3-4" as well as many fry were observed in isolated pools. Dominant canopy consists of Douglas fir and red alder, with some western hemlock and western redcedar. Several reaches with high-cut, actively eroding banks. One reach observed bedrock cascade for ~20m.

**LIMITING FACTORS:** Unstable right bank for much of the observed stream. Lack of deep pools, lack of LWD for most observed sections, low/ sub-surface summer flows resulting in entrapment.

**POTENTIAL PROJECTS:** Address high cut banks, riparian buffer restoration on LB around RM 0.7, add habitat complexity throughout to create large pools for over-summering fish.

### **CANNAVINA & WHISKY CREEKS** (*Enters the Wind River at RM 13.5 from the left bank*)

**DRAINAGE BASIN:** 3.24 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 5

**NUMBER OF BARRIERS:** 3

**TYPE OF SURVEY:** Habitat

**HABITAT CHARACTERISTICS:** Low/sub-surface summer flows in some reaches. Generally low gradient, with low to moderate canopy cover in the lower reaches. Dominant canopy is Douglas fir, red alder and bigleaf maple. Many reaches with good instream cover and LWD.

**LIMITING FACTORS:** Low or sub-surface flows in summer, invasive plant species, high percentage of fines and reaches of high erosion throughout.

**POTENTIAL PROJECTS:** Restore fish passage at 2 culverts on tributary to Whisky Creek at RMs 0.19 and 0.29; restore fish passage at 1 culvert on Whisky Creek at RM 0.39.

### **COLD CREEK** (*Enters the Wind River at RM 14.8 from the right bank*)

**DRAINAGE BASIN:** 2.98 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 2.5

**NUMBER OF BARRIERS:** 2

**TYPE OF SURVEY:** Habitat

**HABITAT CHARACTERISTICS:** Upstream of Szydlo Rd, Cold Creek runs through a wetland complex with good canopy cover. Excellent rearing habitat. High percentage of fines, as expected in a low-gradient, wetland channel.

**LIMITING FACTORS:** Poor spawning habitat due to high percentage of fines and lack of spawning gravels.

**POTENTIAL PROJECTS:** Restore full fish passage at the Szydlo Rd culvert (RM 0.2). Continue to work toward relationship-building with downstream landowner to assess any downstream features, as well as the entrance of Cold Creek to the Wind River.

### **HOLLIS CREEK** (*Enters the Wind River at RM 14.9 from the left bank*)

**DRAINAGE BASIN:** 2.09 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 1.3

**NUMBER OF BARRIERS:** ≥1; no access to downstream reaches

**TYPE OF SURVEY:** Habitat

**HABITAT CHARACTERISTICS:** Riparian cover is good, dominated by big leaf maple, red alder, and Douglas fir. Juvenile abundance of salmonids was very high. Substrate was boulder, cobble, and gravel, with an average of 20% sand. Stream gradient averaged 4.5%. Instream cover was high, but there was a lack of spawning glides or pool tail-outs. Instream cover was composed undercut bank, LWD, and boulders. Good riparian vegetation, no noxious weeds sighted. Healthy understory layer is a mix of vine maple, sword fern, huckleberry, and a myriad of herbaceous species. End of anadromy was observed at a series of bedrock slides, with sheet flow at RM 1.3. However, no fish observed after a waterfall at RM 1.2. The waterfall may not be a permanent barrier (high flows or storm events could shift the logs and boulders that create the falls), but it appeared to be a barrier at the time of survey. Hollis Creek appears to be an

important stream for rearing juvenile salmonids. Good summer flows (even in a drought year), nearly total riparian vegetation cover and instream cover, plus relatively cool water temperatures (14 C at time of survey during mid-summer) make for a valuable refuge for juvenile fish.

**LIMITING FACTORS:** Lack of deep (>3ft) pools with good cover, lack of large wood and other habitat-forming structures. The culvert under the Wind River Hwy is a full barrier to fish passage, due to slope and outfall drop.

**POTENTIAL PROJECTS:** Remove debris at RM 1.0, debris appears to be from an old dam or weir and is still present within the bankfull width of the channel, although not channel-spanning. Also remove broken sections of small diameter pipe that is present on the left bank throughout the lower reaches. Add large wood for habitat complexity.

### **TRIBUTARY AT RM 12.13 (WARREN GAP RD)** *(Enters the Wind River at RM 12.13 from the left bank)*

**DRAINAGE BASIN:** 0.3 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 0.8

**NUMBER OF BARRIERS:** ≥3; no access to downstream reaches

**TYPE OF SURVEY:** Habitat

**HABITAT CHARACTERISTICS:** Good rearing habitat, with high instream cover (woody debris and undercut banks) and high abundance of juveniles noted. High canopy cover and low stream temperature (8.9 degrees C at time of survey).

**LIMITING FACTORS:** High percentage of fines, lack of deep pools, lack of spawning gravels.

**POTENTIAL PROJECTS:** Restore fish passage at 3 culverts, RM 0.25, RM 0.3 and RM 0.5. Additional potential road crossing identified via LiDAR, but no permission to access. Address recreation impacts on USFS land at RM 0.5.

### **BARRIER PRIORITIZATION INDEX**

As a result of this inventory, a total of 32 previously unsurveyed features were determined to be fish passage barriers. In order to prioritize passage improvements for these barriers, habitat data was collected and compiled, and entered into the WDFW Fish Passage Inventory Priority Index database, which prioritizes the barriers based on the amount of habitat gained upstream, proportion of increased passability, species mobility, species production, species condition, and cost. The following equation is used to assign Priority Index for barrier removal.

$$PI = \sum_{\text{All Species}} \sqrt[4]{[(BPH) \times MDC]}$$

*\*PI is the fish passage Priority Index, B is the proportion of passage improvement, P is the annual adult equivalent production potential per square meter, H is the habitat gain in square meters, M is the mobility modifier, D is the species condition modifier and C is a consistent cost modifier.*

### **DATA LIMITATIONS**

Due to time constraints and environmental conditions (2015 experienced a state-wide drought and many of the area streams ran dry well before their usual times), not all streams were able to be surveyed. Where good data exists, remote sensing has informed this inventory in the absence of physical surveys. Recently flown LiDAR, WDFW SalmonScope, WA DNR F-type stream layer, gradient stream layer created by UCD, and numerous other available GIS layers have been used to help establish stream lines, gradients, potential natural barriers, and presumed end of fish use. Using stream layers and gradient filters, many smaller tributaries were discounted from the survey area. Additionally, remote sensing was used to help establish the presumed end of fish use in streams where a complete physical survey was not possible.

Because of lack of landowner permission to access some sections within the survey area, nearly all of the streams surveyed had reaches where habitat data collection was not permitted. As a result, technicians were not able to adequately assign PI numbers to barriers within these streams. PI numbers listed for barriers on Hollis, Cold, and Bear Creeks do not include spawning and rearing habitat values for the entire length of potential habitat; instead, PI values are calculated using only the sections surveyed. This potentially presents a lower PI value, because the full value of

upstream habitat is not included. Similarly, in some streams no downstream access was permitted. This may mean that some natural gradient or feature precludes anadromous access to the stream below the feature assessed.

**DATA EXTRAPOLATION**

For streams where permission was not granted for all reaches and surveyed (public) barriers existed in those reaches, data collected from adjacent habitats was used to extrapolate rearing and spawning habitat for the sections of stream that were not surveyed. Extrapolating this data enabled technicians to assign Priority Index numbers to several barriers that otherwise would not have been possible. Specifically, data was extrapolated for a total of 0.4 miles on the Unnamed tributary at RM 12.13 (Warren Gap).

**TABLE 2. WDFW PRIORITY INDEX FOR TOP TEN IDENTIFIED BARRIERS IN THE WIND RIVER WATERSHED**

Priority Rank	Stream	Feature	Site ID #	WDFW Priority Index	Notes
1	Hollis Creek	Wind River Hwy culvert	600225	17.52	Partial habitat data used for PI
2	Cold Creek	Szydlo Rd culvert	600224	6.66	Partial habitat data used for PI
3	Whisky Creek	Wind River Hwy culvert	600241	5.88	
4	Unnamed tributary at RM 12.13 (Warren Gap)	Wind River Hwy culvert	600200	5.03	Data extrapolated for PI; potential DS barrier not assessed, no downstream check
5	Unnamed tributary at RM 12.13 (Warren Gap)	Culvert under FS 6517000	600201	4.93	Data extrapolated for PI; ≥1 DS barrier, no downstream check
6	Unnamed tributary at RM 12.13 (Warren Gap)	Culvert under FS 6517600	600202	4.3	Data extrapolated for PI; ≥2 DS barriers, no downstream check
7	Bear Creek	Bear Creek Rd culvert	600231	4.19	Not anadromous habitat; partial habitat data used for PI
8	Bear Creek	Skamania PUD municipal water diversion	600232	3.75	Not anadromous habitat; partial habitat data used for PI
9	Whisky Creek Trib	Wind River Hwy culvert	600242	3.64	
10	Whisky Creek Trib	Private road culvert	132101871	3.64	

**NEXT STEPS**

The information gathered in this inventory is intended to be utilized in developing projects that improve instream passage, enhance and support habitat, ecosystem function and land use practices in the watersheds of the District. This report and corresponding database are working documents and should be added to and updated as more information becomes available.

**DATA GAPS**

As mentioned above, landowner permission, environmental conditions, and resources limited the reach of the inventory. Some or all of the data gaps created by these restraints may be filled in the future. Filling habitat data gaps above fish passage barriers would allow for a more comprehensive use of the WDFW Prioritization Index. UCD will work with landowners to acquire further information in attempt to expand the data set in the future as opportunities arise.

**FISH PASSAGE IMPROVEMENTS AND RESTORATION PROJECT DEVELOPMENT**

This inventory has enabled a more thorough review of fish habitat needs in the Wind River watershed and throughout the District. More than 30 previously unsurveyed barriers were identified through this inventory, and many of the tributaries surveyed were found to have multiple fish passage barriers blocking habitat. This inventory also helped inform the presence of natural barriers and the extent of anadromous fish use in tributaries to the Wind, as well as identifying limiting factors for fish production, and proposing habitat restoration work to address those limiting factors. With partners, UCD will continue to pursue high priority restoration projects in the Wind River watershed.

# APPENDIX A

## COLUMBIA RIVER TRIBUTARIES

### INTRODUCTION

There are a number of anadromous tributaries to the Columbia River within the boundaries of the Underwood Conservation District. Due to limited time and resources, this survey focused on those tributaries with known fish passage barriers in Skamania County. Existing habitat and barrier data was compiled for the tributaries, and observational surveys were conducted by UCD technicians.

### EXTERNAL DATA COLLECTION AND SYNTHESIS

- ❖ Salmon and Steelhead Habitat Limiting Factors in WRIA 29, Washington Conservation Commission.
- ❖ Skamania County 2015 GIS Layers: Landowner Parcels, Roads, Waterways, and Railroads; Rick Hollatz, GIS Coordinator, Skamania County, Washington.
- ❖ Washington State Watercourse (WC) Hydrography layer, Washington Department of Natural Resources.
- ❖ SalmonScape, Washington Department of Fish and Wildlife
- ❖ StreamStats National Application, US Geological Survey
- ❖ Skamania County LiDAR layers, Oregon Department of Geology and Mineral Industries
- ❖ Underwood Conservation District Project Files

### SURVEY FINDINGS

The following pages summarize instream and riparian habitat information gathered from existing data as well as observational surveys by UCD staff.

**TABLE 2. SUMMARY OF POTENTIAL HABITAT, BLOCKED HABITAT AND BARRIERS FOR SELECTED COLUMBIA RIVER TRIBUTARIES.**

Stream	Fish Use	Estimated Habitat*	Estimated Blocked Habitat**	Number of Artificial Barriers
<b>Columbia River Tributaries</b>				
Carson Creek	Sea Run Cutthroat, Coho, Resident Trout, Steelhead	0.3	0.17	1
Collins Creek	Sea Run Cutthroat, Resident Trout, Steelhead	1.2	0.49	2
Kanaka Creek & Tribs	Sea Run Cutthroat, Coho, Resident Trout, Steelhead	4.96	4.86	15 total; 5 on mainstem
Indian Mary Creek	Sea Run Cutthroat, Coho, Resident Trout, Steelhead	2.8	0.55	2
Unnamed (Home Valley)	Sea Run Cutthroat, Coho, Resident Trout, Steelhead	1.29	1.0	5

\* Number of estimated stream miles derived from stream surveys, WDFW SalmonScape, LiDAR & DNR "F" type map layers

\*\*Number of estimated stream miles blocked to fish due to man-made barriers. Based on total Estimated Habitat miles.



**INDIAN MARY CREEK** (*Enters the Columbia River through Franz Lake at RM 136.8 from the right bank*)

**DRAINAGE BASIN:** 2.6 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 2.8

**NUMBER OF BARRIERS:** 2

**SURVEY NOTES AND STREAM CHARACTERISTICS:** No upstream barriers observed. One short reach over 20% gradient and most reaches have limited sized patches of spawning gravel. One reach observed with low gradient and good spawning. Excellent flow and water, stream emerges from ground at 890m upstream of the SR 14 culvert. One barrier downstream of the SR 14 culvert, WDFW Site ID 999796. Downstream the creek empties into Franz Lake, then through a wetland channel into another backwater slough lake off the Columbia River, then into the Columbia River. Some good spawning and chum mapped through the lakes (WDFW, 2007).

**CARSON CREEK** (*Enters the Columbia River at RM 153.5 from the right bank*)

**DRAINAGE BASIN:** 2 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 0.3

**NUMBER OF BARRIERS:** 1

**SURVEY NOTES AND STREAM CHARACTERISTICS:** Stream has high gradient created by bedrock step pools. One reach documented a 30m section of 34% gradient, however, large pools within that section break up gradient. Downstream of the SR 14 highway culvert is another 239m of habitat before the creeks confluence with Columbia R. Upstream of the highway culvert, several cascades and small falls with very limited sizable spawning gravel patches were observed. (WDFW, 2007)

**KANAKA CREEK & TRIBUTARIES** (*Enters the Columbia River at RM 150.7 from the right bank*)

**DRAINAGE BASIN:** 1.94 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 4.96

**NUMBER OF BARRIERS:** 15; 5 barriers on mainstem Kanaka and an additional 10 on tributaries to Kanaka

**SURVEY NOTES AND STREAM CHARACTERISTICS:** Multiple barriers exist on Kanaka Creek and its tributaries. Four bridge crossings are downstream of the first culvert, under SR 14. A fishway exists immediately downstream of culvert. Large boulders make up substantial part of substrate. (WDFW, 2007)

**TRIBUTARY AT RM 155.3 (HOME VALLEY)** (*Enters the Columbia River at RM 155.3 from the right bank*)

**DRAINAGE BASIN:** 1.02 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 1.29

**NUMBER OF BARRIERS:** 7

**SURVEY NOTES AND STREAM CHARACTERISTICS:** Multiple barriers present, poor spawning habitat due to heavy percentage of fines. Upstream reaches go intermittent in midsummer, limiting rearing habitat. (WDFW, 2007)

**COLLINS CREEK** (*Enters the Columbia River at RM 157.9 from the right bank*)

**DRAINAGE BASIN:** 2.43 mi<sup>2</sup>

**MILES OF POTENTIAL ANADROMOUS FISH HABITAT:** 1.2

**NUMBER OF BARRIERS:** 3

**SURVEY NOTES AND STREAM CHARACTERISTICS:** Beaver activity in upper reaches, mature canopy and excellent spawning and rearing habitat. Some reaches with gradient as high as 30% through cascades, however, average gradient is between 8-13%. Anadromous access ends at a barrier waterfall at RM 1.2. (WDFW, 2007)

**TABLE 2. WDFW PRIORITY INDEX FOR TOP TEN IDENTIFIED BARRIERS FOR SELECTED COLUMBIA RIVER TRIBUTARIES**

Priority Rank	Stream	Feature	Site ID #	WDFW Priority Index
1	Kanaka Creek	SR 14 culvert	999221	16.97
2	Kanaka Creek	Kanaka Creek Rd culvert	995004	16.88
3	Kanaka Creek	Loop Rd culvert	994858	16.79
4	Kanaka Creek	Grade control for Williams Gas Pipeline	995003	14.22
5	Collins Creek	SR 14 culvert	991549	12.67
6	Indian Mary Creek	SR 14 culvert	999090	12.08
7	Unnamed trib to Kanaka Creek	Loop Rd culvert	995005	11.51
8	Unnamed (Home Valley)	Wedrick Rd culvert	999881	11.35
9	Unnamed trib to Kanaka Creek	Unnamed road culvert	995047	10.13
10	Kanaka Creek	Loop Rd culvert	995112	10.08

## APPENDIX B

### UPPER WHITE SALMON RIVER WATERSHED (ABOVE ANADROMY)

#### INTRODUCTION

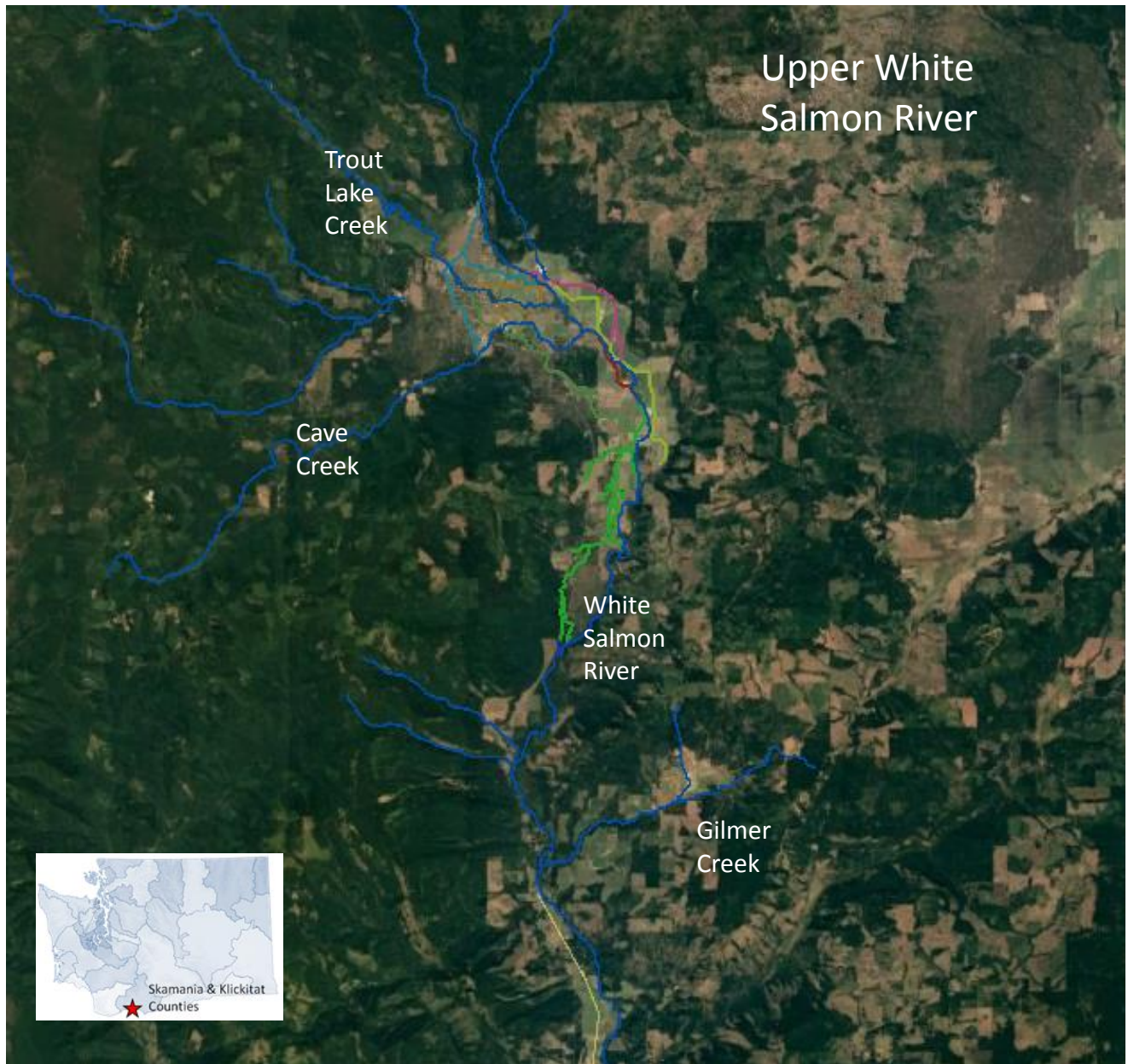
In 2009-2011, UCD completed a comprehensive fish passage inventory, the *White Salmon River Watershed Anadromous Fish Passage Inventory (WS FPI)*, which surveyed all the potentially anadromous streams in the watershed in anticipation of restored fish passage after Condit Dam's removal in October 2011. The end of anadromous access on the White Salmon River occurs at RM 16.9, at a 6.7 meter waterfall (Big Brother Falls). Between RM 16.9 and RM 22.5, the White Salmon River flows through a deep canyon. Above RM 22.5 the White Salmon River flows through the Trout Lake Valley, an area of agriculture and farmland. In June 2012, UCD worked with the Trout Lake Irrigators Group and Anderson Perry & Associates to develop the Trout Lake Reconnaissance Study. The goal of the study was to identify potential upgrades to the Trout Lake valley irrigation ditches. There are eight separate irrigation ditches in the Trout Lake valley, and all lack adequate fish screens at the diversion and return locations. The Reconnaissance Study identified resident Rainbow Trout and Pacific Lamprey as important species that could benefit from fish passage and or habitat projects in the valley. Underwood Conservation District has followed up with the Trout Lake Irrigators Group many times since the Reconnaissance Study. Unfortunately, lack of continued funding to pursue this work as well as the difficulty of consensus in stakeholder groups has delayed further project development.

#### PRE-SURVEY WORK

Physical surveys were not completed on the upper White Salmon streams due to a lack of time and resources, as well as the need to concurrently address irrigation hazards. However, pre-survey work was completed, including compiling landowner lists for outreach, first efforts at identifying streams with potential habitat, and compilation of existing information for barriers on fish-bearing tributaries. However, due to the complicated and comingled nature of the ditches and streams throughout the valley, a comprehensive approach is needed to prioritize restoration needs. An extensive survey for barrier culverts was not completed through this survey, but remains an important project in conjunction with fish screening efforts.

#### EXTERNAL DATA COLLECTION AND SYNTHESIS

- ❖ Klickitat County 2015 GIS Layers: Landowner Parcels, Roads, and Waterways; Kim Gleason, GIS Coordinator Klickitat County, Washington.
- ❖ Washington State Watercourse (WC) Hydrography layer, Washington Department of Natural Resources.
- ❖ SalmonScape, Washington Department of Fish and Wildlife
- ❖ StreamStats National Application, US Geological Survey
- ❖ Trout Lake Reconnaissance Study, prepared by Anderson Perry & Associates, 2012
- ❖ Underwood Conservation District Project Files



**FIGURE 1. MAP OF UPPER WHITE SALMON RIVER WATERSHED, ABOVE ANADROMY. COLORED STREAM LINES ARE IRRIGATION DITCHES.**

# APPENDIX C

## SUPPLEMENTAL WIND RIVER BARRIER DATA

Table 1. UCD feature data for the Wind River watershed

UCD Site ID	WDFW Site ID	Road name	Stream	Trib to	Feature type	Barrier	Passability (%)	Culvert Shape	Material	Span (m)	Rise (m)	Length (m)	Survey Method	Main Barrier Reason
BrCr_01	600228	N/A	Bear Creek	Wind River	falls	NO	100	N/A	N/A	N/A	1	N/A	OTH	N/A
BrCr_03	600230	N/A	Bear Creek	Wind River	bridge	NO	100	N/A	N/A	N/A	N/A	N/A	OTH	N/A
BrCr_02	600229	N/A	Bear Creek	Wind River	falls	YES	0	N/A	N/A	N/A	4.77	N/A	OTH	Water surface drop
BrCr_04	600231	Bear Creek Rd	Bear Creek	Wind River	culvert	YES	67	ELL	CST	4.2	4.6	30.17	LEVEL A	Water surface drop
BrCr_05	600232	N/A	Bear Creek	Wind River	dam	YES	0	N/A	N/A	N/A	N/A		OTH	Water surface drop
Cedar_01	600207	N/A	Cedar Creek	Panther Creek	bridge	NO	100	N/A	wood	N/A	N/A	N/A	OTH	N/A
Cedar_02	600208	N/A	Cedar Creek	Panther Creek	bridge	NO	100	N/A	N/A	N/A	N/A	N/A	OTH	N/A
Cedar_03	600209	N/A	Cedar Creek	Panther Creek	bridge	NO	100	N/A	N/A	N/A	N/A	N/A	OTH	N/A
Cold_01	600224	Szydlo Rd	Cold Creek	Wind River	culvert	YES	33	RND	CST	1.82	1.82	12.8	LEVEL A	Slope
Hollis_01	600225	Wind River Hwy	Hollis Creek	Wind River	culvert	YES	0	RND	CAL	1.82	1.82	18.52	LEVEL A	Slope
LWR_01	600218	Indian Cabin Rd	Little Wind River	Wind River	bridge	NO	100	N/A	PCC	N/A	N/A	N/A	LEVEL A	N/A
LWR_02	600227	N/A	Little Wind River	Wind River	Foot bridge	NO	100	N/A	N/A	N/A	N/A	N/A	LEVEL A	N/A
Martha_01	600221	Trout Creek Rd	Martha Creek	Trout Creek	culvert	UNK	UNK	ARCH	CPC/CAL	3.9	3.5	24.5	LEVEL B REQ.	N/A
Panther_01	600210	Bear Creek Rd	Panther Creek	Wind River	bridge	NO	100	N/A	N/A	N/A	N/A	N/A	OTH	N/A
Panther_02	600239	Cedar Creek Rd	Panther Creek	Wind River	bridge	NO	100	N/A	PCC	N/A	N/A	N/A	OTH	N/A
SF_Cold_01	600240	FS 432	South Fork Cold Creek	Wind River	culvert	YES	33	RND	CST	1.5	1.5	11.59	LEVEL A	Slope
Trout_02	29.0075 1.40	Hemlock Rd	Trout Creek	Wind River	bridge	NO	100	N/A	N/A	N/A	N/A	N/A	OTH	N/A
Trout_01	600216	Trout Creek Rd	Trout Creek	Wind River	bridge	NO	100	N/A	PCC	N/A	N/A	N/A	OTH	N/A
Blackledge_03	600205	CG2300	Unnamed	Wind River	culvert	UNK	UNK	SQSH	CST	1.92	1.5	11.00	LEVEL A	UNK
Blackledge_04	600206	CG2300	Unnamed	Wind River	culvert	UNK	UNK	N/A	N/A	N/A	N/A	N/A	OTH	UNK
Blackledge_01	600203	CG2300	Unnamed	Wind River	culvert	YES	67	SQSH	CST	1.9	1.52	11.98	LEVEL A	Slope
Blackledge_02	600204	CG2300	Unnamed	Wind River	culvert	YES	0	RND	CST	0.62	0.62	10.32	LEVEL A	Slope
FS_432_03	600211	FS 432	Unnamed	Wind River	culvert	YES	0	RND	CST	0.92	0.92	11.57	LEVEL A	Slope
FS_432_06	600212	FS 432	Unnamed	Wind River	culvert	YES	0	RND	CST	0.90	0.9	10.94	LEVEL A	Slope
FS_432_08	600213	FS 432	Unnamed	Wind River	culvert	YES	0	RND	CST	0.62	0.62	9.6	LEVEL A	Slope
FS_432_09	600214	FS 432	Unnamed	Wind River	culvert	YES	0	RND	CST	1.2	1.2	12.77	LEVEL A	Slope
FS_432_10	600215	FS 432	Unnamed	Wind River	culvert	YES	0	RND	CST	0.92	0.92	9.05	LEVEL A	Slope
TR2.5_01	600219	Metzger Rd	Unnamed	Wind River	culvert	YES	0	RND	CAL	2.1	2.1	40.42	LEVEL A	Slope
Trout_trib_01	600220	Hemlock Rd	Unnamed	Trout Creek	culvert	YES	0	RND	CST	0.75LB 0.8 RB	0.75 LB, 0.8 RB	38.71 LB 40.86	LEVEL A	Slope

												RB		
TR9.75_trib_01	600222	Blackledge Rd	Unnamed	Wind River Tributary at RM 9.75	culvert	YES	67	RND	CST	1.3	1.3	14.28	LEVEL A	Slope
TR9.75_trib_02	600223	Trout Creek Rd	Unnamed	Wind River Tributary at RM 9.75	culvert	YES	33	RND	CST	0.9	0.9	12.44	LEVEL A	Slope
WRH_C88	600226	Wind River Hwy	Unnamed	Wind River	culvert	YES	67	RND	CST	0.6	0.6	22.83	LEVEL A	Slope
BrCrRd_C22	600233	Bear Creek Rd	Unnamed	Bear Creek	culvert	YES	33	RND	CST	0.4	0.4	11.16	LEVEL A	Slope
WRH_C63	600234	Wind River Hwy	Unnamed	Wind River	culvert	YES	0	RND	PCC	0.62	0.62	16.02	LEVEL A	Slope
WRH_C50	600235	Wind River Hwy	Unnamed	Wind River	culvert	YES	0	RND	CST	1.8	1.8	not recorded	LEVEL A	Water surface drop
WRH_C81	600236	Wind River Hwy	Unnamed	Wind River	culvert	YES	33	SQSH	CST	1.25	0.85	15.32	LEVEL A	Slope
WRH_C83	600237	Wind River Hwy	Unnamed	Wind River	culvert	YES	0	SQSH	CST	1.3	0.91	19.41	LEVEL A	Slope
SZYD_C29	600238	Szydlo Rd	Unnamed	Wind River	culvert	YES	67	SQSH	CST	1.3	0.72	15.68	LEVEL A	Slope
WH_TRB_02	600242	Wind River Hwy	Unnamed	Whisky Creek	culvert	YES	33	RND	CST	0.77	0.77	14.6	LEVEL A	Water surface drop
LSS_01	600243	Little Soda Springs	Unnamed	Wind River	culvert	YES	67	RND	CST	1.8	1.8	13.68	LEVEL A	Slope
LSS_02	600244	Little Soda Springs	Unnamed	Wind River	culvert	YES	0	RND	CST	0.85	0.85	9.23	LEVEL A	Slope
WH_TRB_01	132101871	Sadie Rd	Unnamed	Whisky Creek	culvert	YES	33	RND	CST	0.6	0.6	11.3	LEVEL A	Slope
WG_01	600200	Wind River Hwy	Unnamed (Warren Gap)	Wind River	culvert	YES	0	RND	PVC	0.62	0.62	19.33	LEVEL A	Slope
WG_02	600201	Warren Gap Rd (GPNF 6517000)	Unnamed (Warren Gap)	Wind River	culvert	YES	0	RND	CST	0.75	0.75	15.61	LEVEL A	Slope
WG_03	600202	GPNF 6517XXX	Unnamed (Warren Gap)	Wind River	culvert	YES	0	RND	CST	0.6	0.6	9.48	LEVEL A	Slope
WH_01	600241	Wind River Hwy	Whisky Creek	Cannavina Creek	culvert	YES	0	RND	CST	1.22	1.22	23.89	LEVEL A	Water surface drop
Wind_03	600217	Hemlock Rd	Wind River	Columbia River	bridge	NO	100	N/A	PCC	N/A	N/A	N/A	OTH	N/A

**Table 2. USFS inventoried barriers for the Wind River watershed**

<u>USFS Road</u>	<u>Milepost</u>	<u>Stream</u>	<u>Shape</u>	<u>Span (m)</u>	<u>Rise (m)</u>	<u>Length (m)</u>	<u>Species</u>	<u>Habitat Length (mi)</u>
6808000	3.50	Bear Creek	Circular	1.83	1.83	29.87	Rainbow Trout	0.1
6500000	6.70	Big Huckleberry Creek	Circular	2.29	2.29	23.16	Rainbow Trout	2.35
6000000	9.50	Black Creek	Pipe Arch (Squash)	1.52	1.22	11.28	Brook Trout	1.05
4200000	3.50	Crater Creek	Circular	0.61	0.61	11.89	Steelhead	0.4
4200000	3.50	Crater Creek	Circular	0.61	0.61	11.89	Rainbow Trout	0.4
4200000	3.50	Crater Creek	Circular	0.61	0.61	11.89	Brook Trout	0.4
6400000	1.90	Dry Creek	Circular	3.45	3.45	22.56	Steelhead	1.1
6400000	1.90	Dry Creek	Circular	3.45	3.45	22.56	Rainbow Trout	6.35
6500000	15.10	Falls Creek	Pipe Arch (Squash)	2.44	1.83	23.16	Brook Trout	2.75
6700000	0.75	Falls Creek	Pipe Arch (Squash)	4.57	2.84	23.77	Brook Trout	4.75
6500000	3.90	Mouse Creek	Circular	1.65	1.65	20.12	Steelhead	3
6801000	0.00	Mouse Creek	Circular	0.91	0.91	11.58	Rainbow Trout	5
6801000	0.00	Mouse Creek	Circular	0.91	0.91	11.58	Other	0.3
6801000	0.70	Mouse Creek Trib.	Circular	2.84	2.84	21.34	Rainbow Trout	0.5
6801000	0.70	Mouse Creek Trib.	Circular	2.84	2.84	21.34	Other	0.5
4200000	4.30	No Name (Trout Creek subwatershed)	Circular	0.76	0.76	9.75	Rainbow Trout	0.7
6500000	6.80	Panther Creek	Circular	1.83	1.83	18.90	Steelhead	0.1
6500000	6.80	Panther Creek	Circular	1.83	1.83	18.90	Rainbow Trout	4
6500030	0.85	Panther Creek Trib	Circular	1.83	1.83	28.96	Rainbow Trout	0.4
6513000	0.40	Panther Creek Trib 1	Circular	0.91	0.91	19.51	Steelhead	0.1
6513000	0.10	Panther Creek Trib 2	Circular	1.02	1.02	12.50	Steelhead	3
4200000	1.60	Pass Creek	Circular	0.61	0.61	10.06	Brook Trout	0.3
4309000	1.00	Planting Creek	Circular	1.22	1.22	16.15	Steelhead	0.1
6513000	1.50	Tenmile Creek	Pipe Arch (Squash)	2.59	1.83	36.58	Steelhead	0.45
4200000	2.50	Trout Creek	Pipe Arch (Squash)	2.44	1.83	9.75	Steelhead	3.3
4200000	2.50	Trout Creek	Pipe Arch (Squash)	2.44	1.83	9.75	Rainbow Trout	4.9
4200000	2.50	Trout Creek	Pipe Arch (Squash)	2.44	1.83	9.75	Brook Trout	2.5
3053030	0.20	Upper Wind River Tributary	Circular	0.91	0.91	11.28	Brook Trout	0.45