Description and Purpose of Map

Introduction

In 2005, stakeholders and the Northwest Power and Conservation Council (NPCC) completed separate management plans for 58 tributary watersheds and mainstem segments of the Columbia River Basin. Subbasin plans identify restoration and protection strategies for habitat and fish and wildlife populations in United States portion of the Columbia River system.
This mapping application was designed to show the four most significant aquatic limiting factors (LFs) for the aquatic focal species (Table 1 – see end of document) that were identified and reported during the Subbasin Planning effort (2001-2004). A LF is defined as a habitat factor that limits the production and survival of a focal species. The summary information of the most common four LF categories (flow, temperature, sediment, and obstruction) from the plans was combined and can be displayed across the entire Columbia Basin as one unit so that stakeholders do not have to visit individual reports for the same information.

Subbasin Plan Reports

The Northwest Power and Conservation Council (NPCC; formerly the Northwest Power Planning Council) has a web page for the individual subbasin plans. Please visit the Subbasin Plans and information at the NPCC web site for further information on the effort (http://www.nwcouncil.org/fw/subbasinplanning) and to view each of the plans.

Descriptions of Layers in Map

List of layers in map that are described in detail in this document:

Limiting Factor Temperature

Limiting Factor Obstruction

Limiting Factor Flow

Limiting Factor Sediment

Columbia River NWPCC Subbasins

All other layers are for reference purposes only and will not be described.

Limiting Factor Result Reporting

This interactive map displays the most common four categories of LFs reported in the Subbasin Plan of the river and streams that were modeled for aquatic habitat assessments. The summarized LFs information generally came from the subbasin plans Management Plan section. As the LF data was collected from the subbasin plans for mapping, no attempt was made to crosswalk the terminology, and therefore, the original terms that describe the LFs from each plan are used in this mapper. Some of the LF terms are general and others are more specific to the issue. We only report the summarized information in this mapper. For the raw ratings data per reach see the links at the end of this document. Some subbasins have fewer LFs then others; this is because some subbasin planners only reported three LFs, while others reported many more in their plan results.

Limiting Factor Layers Terms and Definitions

Almost all subbasins plans reported as their most common LF categories; flow, temperature, sediment, and obstructions. Each LF can be viewed in the map individually or with other LF categories. Within a category the type of LF may be different, such as for flow reach by reach the actual LF type or issue may be low flow, or high flow, etc. The LF identified as the issue for a reach is indicated by an "X" in the LF specific field.

As described above, if the same models were used then common terminology and definitions between subbasin plans are likely, but not all subbasin plans reported the same LFs term/type under a category. Terms that seem to describe the same LF type were not crosswalked or combined but are displayed here as they were named and defined in the subbasin plans.

The terms/types of LFs listed and defined by the subbasin planners under each category are listed below:

Temperature Fields:

High Temp - Duration and amount of high summer water temperature that can be limiting to the focal species.

Low Temp - Duration and amount of low winter temperatures that can be limiting to the focal species.

Temp - Duration and amount of high summer water temperature or low winter temperatures that can be limiting to the focal species. General attribute when subbasin plan did not specify whether the issue was with high or low temperatures.

Flow Fields:

High Flow - Frequency and amount of high flow events and the relative survival or performance of the focal species.

Low Flow - Frequency and amount of low flow events and the relative survival or performance of the focal species.

Base Flow – Minimum mean monthly discharge and the relative survival or performance of the focal species.

Flow Var - Pattern and extent of flow fluctuations and the relative survival or performance of the focal species.

Peak Flow - Maximum mean monthly discharge and the relative survival or performance of the focal species.

Flow - The effect of the amount of water present in, or passing through, the stream reach on the relative survival or performance of the focal species. General attribute when subbasin plan did not specify whether the issue was with high, low, base, variation, or peak flows.

Sediment Fields:

Sed Load - The effect of the amount of fine sediment present in, or passing through, the stream reach on the relative survival or performance of the focal species.

Fine Sed – The amount of fine sediment present within the stream, especially in the spawning habitat of the focal species.

Sediment – Natural and/or elevated general sediment loading from undefined source and the relative survival or performance of the focal species. General attribute when subbasin

plan did not specify whether the issue was with sediment load, or fine sediments.

Sed Fines - Natural and/or elevated fine sediment loading from undefined source and the relative survival or performance of the focal species.

Obstruction Fields:

Conn Pass – Connectivity/Passage all forms of population fragmentation including physical, chemical, or thermal barriers and the relative survival or performance of the focal species.

Hab Conn – Habitat connectivity and amount of discontinuous habitat areas from intermittent surface flow and the relative survival or performance of the focal species.

Connect - Connectivity/Barriers all forms of population fragmentation including physical, chemical, or thermal barriers and the relative survival or performance of the focal species.

Barriers - The effect of physical structures impeding movement of the focal species on its relative survival or performance within a stream reach; structures include dams and waterfalls.

Obstruction – Natural or human caused physical structure or barrier that effects the relative survival or performance of the focal species. General attribute when subbasin plan did not specify whether the issue was with barriers, connectivity related to passage, habitat, or barriers.

Model Field:

Several habitat models were used to assess aquatic habitat and fish production during the subbasin planning process. Most of the subbasin planners used either the Ecosystem Diagnosis and Treatment (EDT) model for anadromous species or the Qualitative Habitat Assessment (QHA) model for resident species; however, in some cases, both models were used within a single subbasin to cover both anadromous and resident species. Additionally, a few subbasin planners used their own models or methods (Unknown) to assess aquatic habitat and fish production in the blocked basins or in Idaho, Table 2 (see end of document).

The terminology for the LFs may not always be consistent, due to the variety of models used for the subbasin planning effort. While the QHA model was meant to be used for resident species, several planners used QHA for salmon and steelhead and planners could adjust the model to their needs, which added to the inconsistent terminology of the QHA models between subbasins.

GeoArea Field:

Most plans summarize Limiting Factors and Priority Actions (actions are not part of this mapper) based on a named Geographic Area (GA) (other terms used for the same concept - Assessment Unit and similar) instead of by individual reach. A few, however, listed LFs per individual reach used in the models. For the LF that was summarized under GAs (a group of reaches); all the reaches under a GA were assigned the same LFs. Not all subbasin planners reported LFs for every GA within the subbasin even if the reaches in the GA were modeled.

HUC Fields:

Three levels of hydrologic unit code (HUC) most commonly used in the Columbia River Basin are presented to identify the level of water drainage area where the reach is found. The smaller

the area/unit the more digits in the code. Larger units are composed of smaller units(subdivisions). Each level represents a range of area on the landscape.

HUC 8 - has the name Subbasin and is level 4 with 8 digits.
HUC 10 - has the name Watershed and is level 5 with 10 digits.
HUC 12 - has the name Subwatershed and is level 6 with 12 digits.

Reach Fields:
Each of the models used for subbasin planning required the planners to identify segments of river of streams or whole stream networks on which to assign different types of limiting factors and rate each reach as to the level of the limiting factors effect. Some models required the river or stream to be divided into smaller units other models worked with a network of streams as a reach. Each reach was assigned a name and a key code. Model results could then be link to each individual reach.

Key - Unique identifier (6 digit code) of subbasin planning reach within the Columbia Basin.
Name - Name of reach used in assessment tools for the subbasin plans.

Columbia River NWPCC Subbasins Layer Terms and Definitions
This is a high resolution dataset delineating the Northwest Power and Conservation Council (NPCC) Subbasin boundaries for planning and reporting purposes and are nested within higher order Ecological Provinces. The planning Subbasins have been in use by the Council for conservation planning purposes since 2001.

This specific dataset was derived from the 6th Level HUCs (HUC_12) National Watershed Boundary Dataset (WBD). The best available version of the WBD from May 2011 was used for this process, however the WBD is continually updated, therefore later versions of the WBD boundaries may not match exactly the boundaries found here. StreamNet is the official developers and repository of the Council's Subbasin spatial data and is periodically updated. Visit StreamNet's data page to get the latest version - https://www.streamnet.org/home/data-maps/gis-data-sets/.

Note that although the NWPCC called these polygon features Subbasins, not all represent the hydrologic unit code (HUC) level 4 called Subbasin. Several are polygons of drainage areas smaller than the Subbasin at the Watershed and Subwatershed level. The NWPCC simplified the naming convention and calls all of these important water drainage units Subbasins.

Subbasin – Name used by NWPCC for the subbasin feature.
Eco Prov – NWPCC ecological province's name. Several subbasins are nested within a single EP.
NPPC Subs – Number assigned to the subbasin by NWPCC.
CRB - Is the subbasin within the Columbia River Basin? (Y)es or (N)o. The NWPCC is responsible for the Pacific Northwest Subbasin planning and reporting, a large portion of the subbasins in the Pacific Northwest are within the Columbia River Basin compared to coastal basins. This project focused on the Columbia River Basin.

Credits

Original modeling results for limiting factors and reach definitions came from the individual Subbasin Plans where multiple staff from a variety of resource management agencies and tribes modeled habitat and fish response. CRITFC staff was responsible for merging all the spatial features and summarizing attributes into each of the single limiting factor layers.

Other Resources

For subbasin plan raw spatial habitat and fish data used in the models visit the CRITFC web page https://www.critfc.org/fish-and-watersheds/fishery-science/data-resources-for-scientists/critfc-data-download/.

For other subbasin plan spatial data and the model programs visit the StreamNet web page https://www.streamnet.org/home/data-maps/subbasin-datasets/.

Contact

Questions or comments about the mapping application or the information shown therein? Please direct them to Denise Kelsey at CRITFC (email: keld@critfc.org, phone: (503) 238-0667).

Table 1. List of subbasins and the aquatic focal species. Habitat assessments for the focal species habitat were completed and limiting factors were reported.

Subbasin	Steelhead-winter	Steelhead-summer	Chinook-spring	Chinook-summer	Chinook-fall	Coho	Bull trout	Cutthroat	Chum	Sockeye/kokanee	Redband	Rainbow	Pacific Lamprey	Sturgeon	Whitefish	Sculpin	Chub	Brook Trout	Burbot	Bass	Bluegill	Black crappie	Walleye	Yellow Perch
Abernathy	X				X	X			X				X											
Almota		X									X													
Asotin		X	X				X																	
Big White Salmon	X		X		X	X						X												
Boise							X			X	X													
Bruneau							X				X				X									
Burnt											X													
Clackamas	X		X		X	X																		
Clearwater		X	X	X	X		X	X										X						
Coeur d'Alene							X	X		X														
Columbia Estuary	X		X	X	X	X			X				X											
Columbia Gorge Mainstem									X				X	X										
Columbia Gorge Tribs	X					X			X				X											
Coweeman	X				X	X			X				X											
Cowlitz	X		X		X	X							X											
Crab Creek		X		X	X					X										X	X	X	X	X
Deadman		X																						
Deschutes		X	X				X				X													
Elochoman	X				X	X			X				X											
Entiat		X	X	X	X	X	X	X					X											
Fifteenmile	X							X				X	X											
Flathead							X	X																
Germany	X				X	X			X				X											
Grande Ronde		X	X																					
Grays	X				X	X			X				X											
Hamilton-Hardy-Duncan	X				X	X			X				X											
Hood	X	X	X		X		X	X				X	X											
Imnaha		X	X	X	X		X						X											
John Day		X	X				X	X			X													
Johnson Creek	X					X																		
Kalama	X	X	X		X	X			X				X											
Kellogg Creek	X					X																		
Klickitat	X	X	X	X	X	X	X	X																
Kootenai							X	X		X	X			X					X					
Lake Chelan							X	X		X														
Lake Rufus Woods			X	X	X					X		X		X				X						
Lewis	X	X	X		X	X	X		X				X											
Little White Salmon					X				X				X											
Lower Columbia Mainstem	X	X	X		X	X			X				X											
Lower Mid-Columbia Mainstem and Rock Creek		X			X	X								X										
Malheur			X				X				X													
McKenzie			X				X	X									X							
Methow		X	X	X	X	X	X	X																
Mill	X				X	X			X				X											
Okanogan		X	X	X	X		X	X		X														
Owyhee											X													
Palouse		X			X		X					X			X	X		X		X				
Payette							X			X	X													
Pend Oreille							X	X		X					X					X				
Powder							X				X													
Salmon	X	X	X	X	X		X			X														
Salmon Creek	X				X	X			X				X											
San Poil			X	X	X					X	X	X												
Sandy	X		X		X	X			X															
Skamokawa	X				X	X			X				X											
Snake Headwater							X	X							X									
Snake Hells Canyon		X	X	X	X		X				X		X	X										
Snake Lower		X																						
Snake Middle							X																	
Snake Upper							X	X							X									
Spokane				X	X					X	X	X			X					X				
Tenmile		X																						
Toutle	X		X		X	X			X															
Tryon Creek	X					X																		
Tucannon		X	X		X		X																	
Umatilla		X	X		X	X	X				X													
Upper Columbia Mainstem				X	X					X	X	X	X	X					X					
Upper Mid-Columbia Mainstem		X	X	X	X																			
Upper Snake Closed							X	X							X									
Walla Walla		X	X				X																	
Washougal	X	X			X	X			X				X											
Weiser							X			X	X													
Wenatchee		X	X	X	X	X	X	X		X			X											
Willow											X													
Wind	X	X	X		X	X			X				X											
Yakima		X	X		X	X	X			X			X											

Table 2. Display of subbasin plan information on models used to assess aquatic focal species habitat.

Ecoprovince	Subbasin Plan Name	Subbasin	Watershed Modeled	EDT	Not Full EDT	QHA	Other	Not Modeled
Blue Mountain	Asotin	Asotin	Asotin	X				
Blue Mountain	Asotin	Asotin	Tenmile	X				
Blue Mountain	Grande Ronde	Grande Ronde	Grande Ronde	X				
Blue Mountain	Imnaha	Imnaha	Imnaha			X		
Blue Mountain	Snake Hells Canyon	Snake Hells Canyon	Snake Hells Canyon			X		
Columbia Cascade	Entiat	Entiat	Entiat	X				
Columbia Cascade	Lake Chelan	Lake Chelan	Lake Chelan				X	
Columbia Cascade	Methow	Methow	Methow	X		X		
Columbia Cascade	Okanogan	Okanogan	Okanogan	X				
Columbia Cascade	Upper Middle Columbia	Columbia Upper Middle	Upper Middle Columbia Mainstem			X		
Columbia Cascade	Wenatchee	Wenatchee	Wenatchee			X		
Columbia Gorge	Big White Salmon	Big White Salmon	Big White Salmon	X				
Columbia Gorge	Columbia Gorge	Columbia Gorge	Columbia Gorge	**A few Tribs**				X
Columbia Gorge	Fifteenmile	Fifteenmile	Fifteenmile	X	X	X		
Columbia Gorge	Hood	Hood	Hood	X	X	X		
Columbia Gorge	Klickitat	Klickitat	Klickitat	X	X			
Columbia Gorge	Lower Columbia	Little White Salmon	Little White Salmon					X
Columbia Gorge	Lower Columbia / Wind	Wind	Wind	X				
Columbia Gorge	Lower Columbia, Hood, and Fifteenmile	Columbia Gorge	Columbia Gorge Tribs	split-up in other subbasins		split-up in other subbasins		
Columbia Mountain	Flathead	Flathead	Flathead			X		
Columbia Mountain	Kootenai	Kootenai	Kootenai			X		
Columbia Mountain	No Plan	Bitterroot	Bitterroot					X
Columbia Mountain	No Plan	Blackfoot	Blackfoot					X
Columbia Mountain	No Plan	Clark Fork	Clark Fork					X
Columbia Plateau	Crab	Crab	Crab Creek			X		
Columbia Plateau	Deschutes	Deschutes	Deschutes	X	X	X		
Columbia Plateau	John Day	John Day	John Day	X	X	X		
Columbia Plateau	Lower Middle Columbia	Columbia Lower Middle	Lower Mid-Columbia Mainstem and Rock Creek	**Only Rock Creek**				X
Columbia Plateau	Lower Snake	Snake Lower	Almota	X				
Columbia Plateau	Lower Snake	Snake Lower	Deadman	X				
Columbia Plateau	Lower Snake	Snake Lower	Lower Snake Mainstem	**Only Almota and Deadman**				X
Columbia Plateau	Palouse	Palouse	Palouse					X
Columbia Plateau	Tucannon	Tucannon	Tucannon	X				
Columbia Plateau	Umatilla	Columbia Lower Middle	Willow			X		
Columbia Plateau	Umatilla	Umatilla	Umatilla	X	X	X		
Columbia Plateau	Walla Walla	Walla Walla	Walla Walla	X				
Columbia Plateau	Yakima	Yakima	Yakima	X				
Columbia R Estuary	Lower Columbia	Columbia Estuary	Columbia Estuary Tribs			X		
Columbia R Estuary	Lower Columbia	Elochoman	Elochoman	X				
Columbia R Estuary	Lower Columbia	Grays	Grays	X	X			
Columbia R Estuary	Lower Columbia/ Elochoman	Elochoman	Abernathy	X				
Columbia R Estuary	Lower Columbia/ Elochoman	Elochoman	Germany	X				
Columbia R Estuary	Lower Columbia/ Elochoman	Elochoman	Mill	X	X			
Columbia R Estuary	Lower Columbia/ Elochoman	Elochoman	Skamokawa	X				
Intermountian	Intermountian	Coeur D'Alene	Coeur D'alene			X		
Intermountian	Intermountian	Columbia Upper	Lake Rufus Woods			X		
Intermountian	Intermountian	Columbia Upper	Upper Columbia			X		
Intermountian	Intermountian	Pend Oreille	Pend Oreille			X		
Intermountian	Intermountian	Sanpoil	San Poil			X		
Intermountian	Intermountian	Spokane	Spokane			X		
Lower Columbia	Lower Columbia	Columbia Lower	Lower Columbia Mainstem					X
Lower Columbia	Lower Columbia	Cowlitz	Cowlitz	X				
Lower Columbia	Lower Columbia	Kalama	Kalama	X				
Lower Columbia	Lower Columbia	Lewis	Lewis	X				
Lower Columbia	Lower Columbia	Washougal	Washougal	X				
Lower Columbia	Lower Columbia / Lower Columbia Tribs	Columbia Lower	Lower Columbia Tribs (Hardy-Duncan-Hamilton-Salmon)	X				
Lower Columbia	Lower Columbia/ Cowlitz	Cowlitz	Coweeman	X				
Lower Columbia	Lower Columbia/ Cowlitz	Cowlitz	Toutle	X				
Lower Columbia	No Plan	Sandy	Sandy	X				
Lower Columbia	Willamette	Willamette	Clackamas	X				
Lower Columbia	Willamette	Willamette	Johnson Creek	X				
Lower Columbia	Willamette	Willamette	Kellogg Creek	X				
Lower Columbia	Willamette	Willamette	McKenzie	X				
Lower Columbia	Willamette	Willamette	Tryon Creek	X				
Lower Columbia	Willamette	Willamette	Willamette Mainstem	X				
Middle Snake	Boise, Payette and Weiser	Boise	Boise			X	X	
Middle Snake	Boise, Payette and Weiser	Payette	Payette				X	
Middle Snake	Boise, Payette and Weiser	Weiser	Weiser					X
Middle Snake	Bruneau	Bruneau	Bruneau			X		
Middle Snake	Burnt	Burnt	Burnt			X		
Middle Snake	Malheur	Malheur	Malheur			X		
Middle Snake	Middle Snake	Snake Lower Middle	Snake Lower Middle (Pine Creek)			X		
Middle Snake	Middle Snake	Snake Upper Middle	Snake Upper Middle					X
Middle Snake	Owyhee	Owyhee	Owyhee			X		
Middle Snake	Powder	Powder	Powder			X		
Mountain Snake	Clearwater	Clearwater	Clearwater				X	
Mountain Snake	Salmon	Salmon	Salmon				X	
Upper Snake	Upper Snake	Snake Headwaters	Snake Headwaters					X
Upper Snake	Upper Snake	Snake Upper	Upper Snake					X
Upper Snake	Upper Snake	Snake Upper Closed Basin	Closed Basin (Upper Snake)					X
			Total	**39**	**8**	**28**	**5**	**15**