WRIA 14 Freshwater Strategy Habitat Prioritization Tool

User's Guide

October 15 2021

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TABLE OF CONTENTS

1.0 Overview

This document serves two distinct purposes:

A) Provides an explanation for how to use the Water Resource Inventory Area (WRIA) 14 Freshwater Strategy Habitat Prioritization Tool (FSHPT), both for sponsors planning habitat conservation and restoration projects, as well as for Lead Entity Committee members to evaluate these projects; and

B) Provides details on the methods and data used to create FSHPT.

1.1.1 What is the tool?

The FSHPT is a decision-support tool presented as a webmap, that identifies priority geographies for salmon habitat conservation and restoration, while providing information about absolute and relative indicators of existing habitat condition and salmon resources across and within watersheds (including watershed subdivisions, or reaches). The FSHPT serves as a decision-support tool in a few primary ways:

A) To help project sponsors identify and prioritize geographies for which to invest in habitat restoration and conservation projects, and identify the types of actions needed to address the most deficient key ecological attributes (KEAs) of the reach or watershed. The webmap and the underlying data framework that support it provide a list of key information about geographic priority, details regarding habitat condition, and priority areas.

B) To help members of the WRIA 14 Lead Entity Committee, particularly its Technical Advisory Group (TAG), identify key traits and context related to projects proposed for Salmon Recovery Funding Board (SRFB) grant rounds. The webmap helps provide information for the TAG to utilize to evaluate projects (see 3.2), and helps the TAG with a broader contextual understanding of WRIA-, watershed- and reach-scale relative priorities and habitat characteristics.

C) To provide a general accounting to the regional salmon recovery community and the broader public of the sound and strategic planned use of public funds from the WRIA 14 Lead Entity SRFB (and PSAR) funding allocations.

1.1.1 The process

This tool was created based on a partnership between the WRIA 14 Lead Entity Committee and Environmental Science Associates (ESA). ESA led conceptual development of the underlying prioritization framework, supported and implemented by the Lead Entity Coordinator, and guided by the Lead Entity Committee. Project development occurred over the course of six months (October 2020 to March 2021), with a series of five workshops with the WRIA 14 Lead Entity Committee. The Committee and ESA partnered to build the decisions and analysis that undergirds the FSHPT.

1.1.2 Relationship to other planning efforts

The FSHPT spatial tool that incorporates and combines the work of previous versions of freshwater habitat planning efforts for this geography and jurisdiction (WRIA 14 Lead Entity Committee [Committee]), and complements nearshore and other regional planning efforts and tools. A summary of a subset of these are listed below:

1.1.2.1 WRIA 14 Freshwater planning

- *Salmon Habitat Protection and Restoration Plan for WRIA 14, Kennedy Goldsborough (or Freshwater Strategy), 2004.*
  Identifies and prioritizes projects/program that protect/restore habitat by watershed. Information used to generate this 2004 report has now been presented spatially in an interactive web tool (the FSHPT), and updated with newer information where appropriate or feasible.
  https://www.masoncd.org/wria-14-guiding-docs.html

- *WRIA 14 Freshwater Habitat Strategy Update; Phase 1: Existing Conditions Summary Report, 2020.*
  Provides updated information to supplement 2004 strategy with newer data (more recent & novel sources), and helps clarify data gaps and needs going forward.
  https://www.masoncd.org/wria-14-guiding-docs.html

- *WRIA 14 Fish Passage Barrier Prioritization Tool, South Puget Sound Salmon Enhancement Group, expected: 2021.*
  A tool to specifically identify and prioritize fish passage barrier removal projects in WRIA 14. Project sponsors can identify projects from this tool and then apply to SRFB and/or other funding sources (e.g. FBRB). The LE Committee will then integrate results from the fish passage prioritization tool into scoring criteria for TAG project ranking, likely by end of 2021. Thus, this tool will complement the FSHPT to identify important fish passage barriers. The FSHPT will provide the added benefit of identifying relative priority geographies for which to invest in restoration and conservation projects generally, and also provide linked information to appropriate action types in each area.

1.1.2.2 WRIA 14 Nearshore planning

- *Nearshore Project Selection Tool (NPST), Squaxin Island Tribe.*
  This tool identifies priority nearshore habitat areas for juvenile salmonids. The NPST evaluates the presence of attributes that promote habitat quality and produces a spatial representation of areas of the South Sound nearshore where protection and restoration projects would most benefit juvenile salmon. This tool is currently being updated.

- *Coastal Catchment Analysis, Squaxin Island Tribe.*
  The Catchment Assessment utilizes data from a number of sources to provide a strategic restoration and conservation framework for the nearshore. Using the shoreline and upland catchment evaluation, the tool identified geographic priorities for protection, conservation, restoration and enhancement actions.
  https://maps.squaxin.us/portal/apps/webappviewer/index.html?id=14a95765cd1b4777a78f4e207d03e558

1.1.2.3 Regional planning related to WRIA 14 Lead Entity

- *South Sound Strategy*
  The Alliance for a Healthy South Sound serves as the lead initiating organization for implementation of the Puget Sound Partnership's Action Agenda. In support of this effort, the South Sound Strategy (SSS) was developed. The SSS is a science-based resource that identifies key regions in South Puget Sound, the ecological function of these areas, development pressures affecting these functions and strategies for protecting and improving species and habitat. The Strategy sets out numeric targets for protection and improvement and juxtaposes them with recommendations generated from the NPST and the Catchment Assessment.
  http://www.healthysouthsound.org/south-sound-strategy

- *WRIA 14 Watershed Restoration and Enhancement Plan*
  The Streamflow Restoration Act (RVW 90.94) led to a planning effort for WRIA 14 to offset potential impacts to flows associated with new permit-exempt domestic water use. A final plan is available here: https://www.ezview.wa.gov/site/alias__1962/37326/watershed_restoration_and_enhancement_-_wria_14.aspx

- *Puget Sound Watershed Characterization project*
  The Puget Sound Watershed Characterization project is another regional planning effort that informs watershed planning, with water assessments related to metrics around water flow and water quality, as well as habitat assessments and hydrologic conditions index. Data from this project informed development of aspects of the FSHPT.
  https://ecology.wa.gov/Water-Shorelines/Puget-Sound/Watershed-characterization-project

Please see the WRIA 14 Lead Entity Process Guide, found on the WRIA 14 Website, here for more information concerning Committee operations and other descriptions of the efforts described above: https://www.masoncd.org/salmon-recovery-committee-wria-14.html

2.0 Introduction to the tool

2.1 How to use the Webmap

2.1.1 Overview

Please use the following link to access the FSHPT webmaps contained with the Salmon Recovery Strategy GeoPortal. https://wacds.maps.arcgis.com/apps/webappviewer/index.html?id=d83a1ccd82cf4556bc1d1cf9150b3313 An ArcGIS Online account is not needed. The geodatabase is also available for download.

2.1.2 Contents

Currently, the existing layers are displayed and can be enabled/disabled by the user in the Salmon Recovery Strategy GeoPortal. The FSHPT layers are focused on the Freshwater tab, with some corresponding reference information in the Reference tab. The Nearshore and Projects tab provide supplemental information about nearshore project tools (separate from this effort, created by the Squaxin Island Tribe), while the Projects tab provides a list of information about projects in the Salmon Recovery Portal for WRIA 14.

Layer Name	Description/features
Freshwater	
Freshwater Strategy Habitat Prioritization Tool data	A map of reaches with information on attributes related to restoration/conservation priority, habitat condition, salmon resources, etc. This is the primary data layer for which to glean information. Clicking on reaches in this layer will generate a relevant pop-up with reach information.
FSHPT Restoration Priorities	Using base reach prioritization dataset, highlights restoration priority areas visually, by identifying tier priority by colors across reaches.
FSHPT Conservation Priorities	Using base reach prioritization dataset, highlights conservation priority areas visually, by identifying tier priority by colors across reaches.
Nearshore	
Nearshore Project Selection Tool (NPST) Benefit – All Salmonid	This layer is from Squaxin Island Tribe's Nearshore Project Selection Tool. This layer and symbology identifies medium-high and high priority areas for benefits to salmonids. Please see here for source information. http://maps.squaxin.us/portal/apps/webappviewer/index.html?id=14a95765cd1b4777a78f4e207d03e558
NPST Action Strategies - Conservation	This layer is from Squaxin Island Tribe's Nearshore Project Selection Tool. This layer and symbology identifies areas for which conservation efforts are suggested to be prioritized. Please see here for source information. http://maps.squaxin.us/portal/apps/webappviewer/index.html?id=14a95765cd1b4777a78f4e207d03e558
NPST Action Strategies - Restoration	This layer is from Squaxin Island Tribe's Nearshore Project Selection Tool, the updated version of which will be released planned in late 2021. This layer and symbology identifies areas for which restoration efforts are suggested to be prioritized. Please see here for source information. http://maps.squaxin.us/portal/apps/webappviewer/index.html?id=14a95765cd1b4777a78f4e207d03e558
TBD	To be included in the future: Nearshore Zones and link to Coastal Catchment Tool. Old version of Squaxin Island's tools can be found here: http://maps.squaxin.us/portal/apps/webappviewer/index.html?id=14a95765cd1b4777a78f4e207d03e558
Projects	

WRIA 14 Projects	A map of projects completed or in-progress in WRIA 14, from the Salmon Recovery Portal for the WRIA 14 Lead Entity. Up to date as of August 2021.
Reference information	
Streams	A map of streams from the National Hydrography Database (USGS)
FSHPT reach labels	A label layer that indicates reaches. See Reaches.
FSHPT reaches	A map of the reaches. Small independent tributary reaches are represented in gray and not generally attributed with much watershed-specific data.
FSHPT watershed labels	A label layer that indicates watersheds. See Watersheds.
FSHPT watersheds	A map of the reaches. Small independent tributary reaches are represented in gray and not generally attributed with much watershed-specific data.
Basemap	Default: topographic. Can be altered to alternately display imagery, grey terrain etc. by selecting the Basemap tab on the top left.

2.1.3 Functionality

There are multiple ways to view key information for the FSHPT layers within the GeoPortal Freshwater tab:

A) Examine the webmaps visually. Turning on the "Restoration Priorities" and "Conservation Priorities" layer identifies restoration and conservation priority areas, respectively, by color tier. The "Freshwater Strategy Habitat Prioritization Tool data" layer is the main layer for reach-specific information.

B) Using the pop-up window functionality. Clicking on a reach polygon in the "Freshwater Strategy Habitat Prioritization Tool data" layer will generate reach-specific information, highlighting key information about action priority, existing habitat conditions, salmon resources and more. This is a simple, quick and straightforward alternative to (C). Below (C) is a listing of the pop-up attribute features.

C) Click the "Show Table" icon underneath the Reach Prioritization layer to see the full list of attributes. This can be cross referenced with the data dictionary listed in the Appendix. This data is also downloadable.

Pop-up description:

POP-UP LABEL	**DESCRIPTION**	**FIELD IN ATTRIBUTE TABLE**
Reach	Sub-division of a larger watershed	{Reach}
Watershed	Named watershed in WRIA 14	{Watershe_1}
Restoration priority	Relative bin of restoration priority	{Rest_rec}
Conservation priority	Relative bin of conservation priority	{Prot_rec}
Watershed information		
Area of reach	Area of reach in square miles	{Reach_area_index}
Area of watershed	Area of watershed in square miles	{Watershed_area_sqmi}
Salmon resources		
Salmon abundance (reach)	Relative bin of salmon population	{Reach_Salmon_pop}

Salmon abundance (watershed)	Relative bin of salmon population	{Watershed_Salmon_pop}
Species present	Species present	
Anadromous length in reach	Miles of anadromous salmonid habitat access	{Anad_Length_mi}
Existing Conditions	Measures of existing habitat condition	
Overall bin	Overall existing conditions score	{Exist_Hab_Bin}
KEA weighted scores – stream temp	KEA weighted score	{Form_Temp_sc}
KEA weighted scores – sediment	KEA weighted score	{Form_Sed_Sc}
KEA weighted scores – stream complexity	KEA weighted score	{Form_Complex_Sc}
Stream temp – indicator bin	Summary indicator from strategy Ph. 1	{Temp_Ind}
Stream temp – riparian canopy	Sum of proportions of med. and tall trees	{Rip_T_MT}%
Stream temp – 303(d) listed for temp	Listed stream for high stream temps	{303d_listed}
Sediment – indicator bin	Summary indicator from strategy Ph. 1	{Sediment_Ind}
Water quality index – sed. degradation	Category assignment based on data source (PSWCP)	{WQSed_Cat}
Stream Complexity	Summary indicator from strategy Ph. 1	{StreamComplexity_Ind}
Salmon habitat index	Index based on data source (PSWCP), surrogate for habitat complexity	{WHI_Cat}
Recommended actions		
Limiting KEAs		
High priority actions to address stream temperature	Actions that have the highest impact on stream temperature from the critical actions table (see page 11-12) are listed here. High priority actions are only listed here when stream temperature is listed as a limiting KEA.	{Rest_actions_rec_temp} {Consv_actions_rec_temp}
High priority actions to address sediment	Actions that have the highest impact on sediment from the critical actions table (see page 11-12) are listed here. High priority actions are only listed here when sediment is listed as a limiting KEA.	{Rest_actions_rec_sed} {Consv_actions_rec_sed}
High priority actions to address stream complexity	Actions that have the highest impact on stream temperature from the critical actions table (see page 11-12) are listed here. High priority actions are only listed here when stream complexity is listed as a limiting KEA.	{Rest_actions_rec_complex} {Consv_actions_rec_complex}
Pressures/threats		
Land use trend (2006-11) in acres	Change in land class	{Total_Dvlpd_Chg}, {Total_Forest_Chg}, {Total_Wetland_Chg}
Proportion of reach in UGA	Proportion of reach area within an urban growth boundary.	{Porp_UGARAC}
Climate Change	Information forthcoming in a future phase update.	TBD.

Please see Appendix for more information regarding source information, descriptors and methodology for the various components/metrics listed in the above table.

Note that reaches in gray represent watersheds or reaches not identified by the tool, often small coastal independent tributaries. The Committee recognizes that many of these tributaries have significant ecological value and some potential restoration and conservation priorities, but are in part limited by data gaps. These

tributaries are identifiable in the tool, but generally lack data for individual reaches/watersheds. (While data poor, these areas are still identified to have considerable value for freshwater habitat – projects in these areas will be reviewed by the committee on a case by case basis to compare how these projects may fit into the overall prioritization tool framework.)

2.2 Guidance for project sponsors

2.2.1 Where might project sponsors desire to invest?

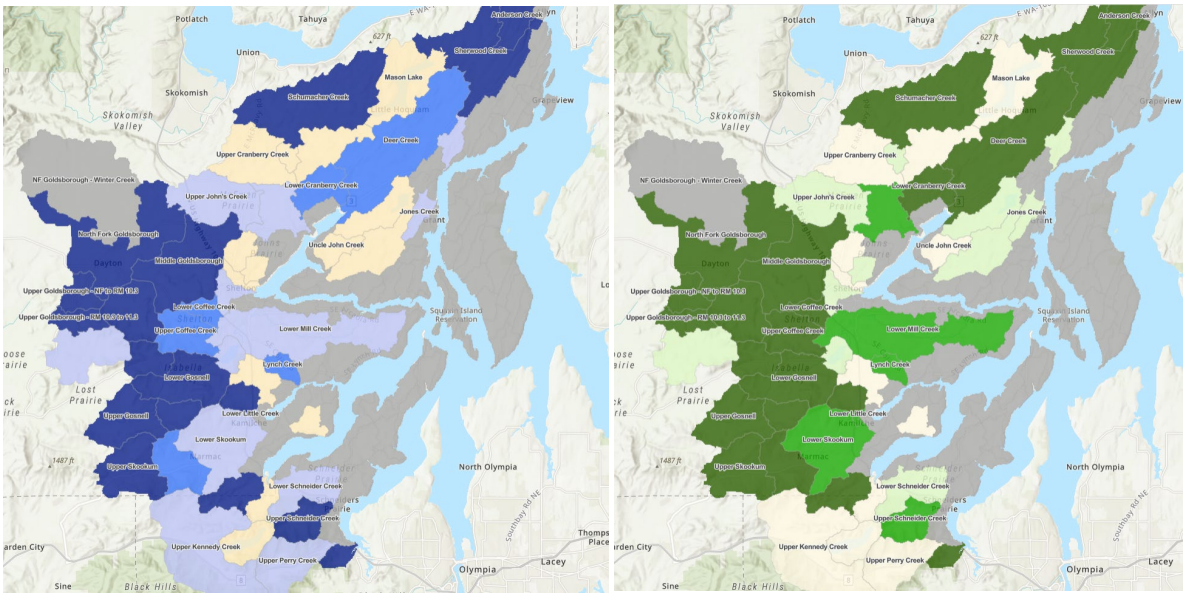
This tool helps project sponsors understand and identify potential relative geographic priorities for investment in restoration and conservation priorities throughout WRIA 14. The scaled metrics for restoration (blue) and conservation (green) priorities help point project sponsors to where project development and investment is most needed.

Clicking on a given reach in the main prioritization layer will yield presentation of the relative priority for restoration or conservation actions (shown below):

Example pop-up excerpt for a given reach

Alternately, priorities of reaches can be compared regionally by looking at the “restoration priorities” or “conservation priorities” layers.

Map of restoration (right) and conservation (left) priorities by reach (darker colors indicate higher priority).



Restoration and conservation priorities are binned on a scale that ranges from low to medium to high to highest, based on combinations of existing habitat conditions and salmon resources. “Highest” ranking

reaches represent the greatest need or best investment in restoration and conservation actions (some reaches with the highest quality existing conditions are not ranked as highest for restoration because these reaches are assumed to be in relatively pristine condition with little room for significant improvement). See Appendix A for more details. Under this ranking system, sponsors are encouraged to focus on investment in reaches or watersheds with a "highest" or "high" ranking for conservation or restoration. See also the Appendix for a matrix of reach-scale results for restoration and conservation comparison.

The LE Committee understands that while these designations signify broad suggestions in relative reach priorities, investment across the WRIA is needed for multi-species salmon recovery. SRFB grant round scoring criteria for the TAG (see 2.3) includes mechanisms to account for high-value projects in low-priority areas. Sponsors may decide to invest in relatively lower priority reaches when considering high-leverage projects that address the most limiting key ecological attributes of a reach (see below), large-scale multi-reach projects, programmatic projects or fish passage barrier removal projects (see 2.3).

2.2.2 What type of projects might project sponsors desire to choose?

Understanding the most limiting key ecological attributes (KEAs), or habitat conditions, are important in selecting and developing habitat restoration and conservation projects. Looking under "recommended actions" can help articulate the types of projects appropriate in different locales.

On the pop-up for the Reach Prioritization layer, the KEA scores identify the scores scaled from 0 (low) to 1 (high) for three relevant Key Ecological Attributes – sediment, stream temperature, stream complexity. Sponsors can examine and compare the KEAs. Limiting KEAs are identified numerically; KEA values are labeled as limiting if they are the lowest value relative to their peer KEA values, or less than 0.5 out of 1.

Priority actions (suggested project/action types) are then listed in the "High priority actions" sections for each KEA. These are example actions/types of projects that are suggested to be the most salient in helping address the given limiting KEA. High priority actions are only listed in this section when KEAs are listed as a limiting. An absence indicates that a KEA is not as limiting in this area.

To see the full list of actions, please consult the Critical Actions table on page 10-11 to serve as a reference document to correspond with high-leverage project types to help address KEA drivers and encourage process-based restoration where feasible. The LE Committee recognizes that this table may not be complete, and not all action types may always apply to all geographies. If multiple KEAs are similarly low scoring, actions might be desired to be taken to benefit each or all collectively. WRIA 14 Lead Entity TAG members can potentially help provide additional guidance to project sponsors during or after project development on the highest leverage/most appropriate actions per reach based on available data.

Critical actions table

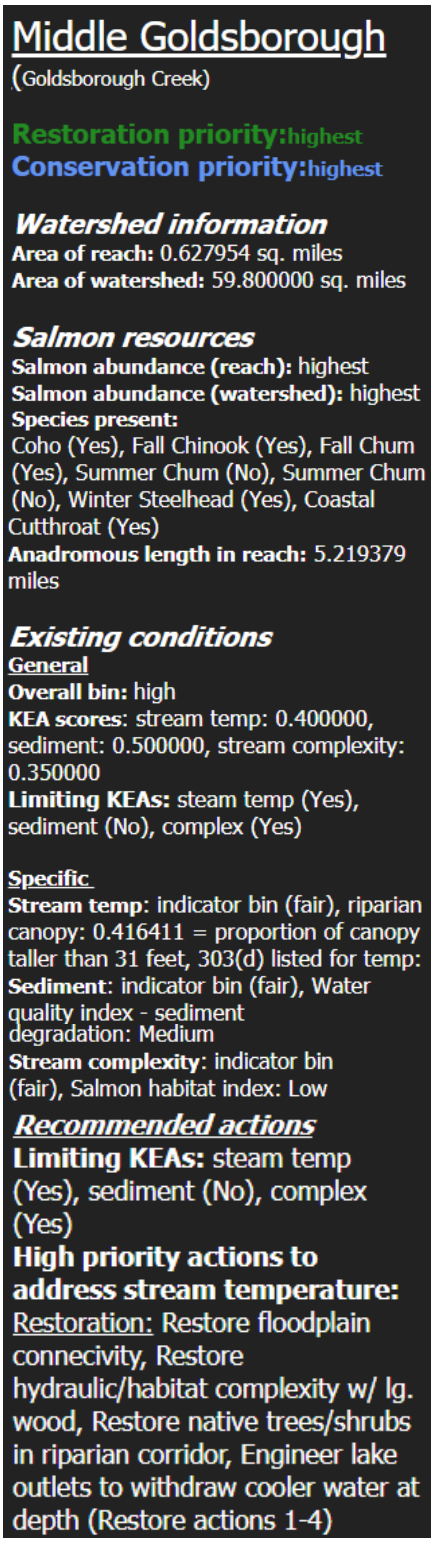
The following table identifies a list of important actions for affecting KEA values or existing habitat conditions, broken into restoration and conservation actions. Values of high (H), medium (m), and low (l) refer to the target benefit of each action type. That is to say, for a given action, an H under Stream Temperature would mean that there is a high impact for that KEA – restoring floodplain connectivity would do much to help stream temperature, for instance, and have moderate impact for improving the sediment KEA condition.

Action Code	Action Name	Stream Temperature	Sediment	Stream Complexity

Restore-1	Restore floodplain connectivity	H	M	H
Restore-2	Restore hydraulic and habitat complexity using large wood placement and other techniques	H	M	H
Restore-3	Restore native trees and shrubs in riparian corridor	H	M	H
Restore-4	Engineer lake outlet structures to withdrawal cooler water at depth during summer months	H	L	L
Restore-5	Livestock fencing and other livestock management to reduce stream and riparian impacts	M	H	M
Restore-6	Re-create side channel and off-channel habitats	M	M	H
Restore-7	Berm/dike removal	M	M	H
Restore-8	Remove invasive non-native vegetation	M	M	H
Restore-9	Prevent illegal water withdrawals	M	L	M
Restore-10	Reduce major fine sediment inputs when known to be a priority problem	L	H	M
Restore-11	Replace water crossing restricting channel migration and geomorphic processes	L	M	H
Restore-12	Remove water crossings restricting fish passage	L	M	M
Restore-13	Install pond levelers to alleviate flooding concerns related to beaver dams	L	L	H
Restore-14	Remove invasive predators, especially in lakes	L	L	L
Restore-15	Remove debris from stream corridor and banks	L	L	M
Protect-1	Protect riparian corridors	H	H	M
Protect-2	Protect floodplains	H	M	M
Protect-3	Protect instream flows	H	L	M
Protect-4	Protect cold water sources	H	L	L
Protect-5	Protect wetlands	M	M	H

2.2.3 Planning using pop-up information

An example of project planning based on the webmap pop-up information is described below, with screenshot left:



In this example, the Middle Goldsborough reach is listed as "highest" for **restoration priority** and **conservation priority**. This means it is in the highest tier of reaches recommended for investment in restoration and protection projects. We can also observe the species present in this reach and its relative rankings for salmon resources and existing habitat conditions. These features can help confirm and justify project investment decisions.

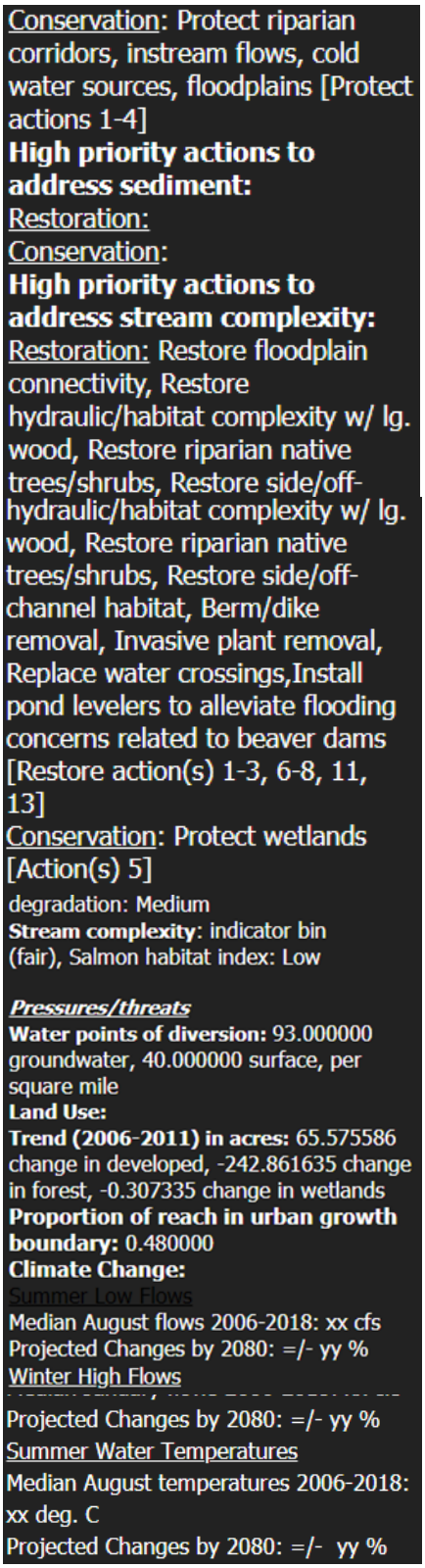
Understanding **species present** can help inform habitat project development/design and implementation goals, while **watershed/reach size** and **anadromous length** can help inform long-term potential of the system to support salmonids (though the anadromous length metric generally represents fish access downstream of barriers).

Existing conditions, reported both generally and specifically, can help inform what conditions are currently deficient and inspire ideas for what types of actions might address these gaps. In this particular case, for example, we can see the most limiting factors (lowest **KEA** scores or those below 0.5/1.0) are stream temperature and stream complexity, though the scores are all somewhat close. Restoration or conservation actions could be designed to target any or all of these limiting KEAs; given how close the scores are for each KEA suggests that all could benefit from significant improvement.

Next, looking at the Recommended Actions section, **Limiting KEAs** are summarized again for convenience. Next, the **high priority actions** to address stream temperature, stream complexity and sediment KEAs are listed. These actions indicate the highest leverage types of actions/projects to address the most limiting KEAs in each watershed/reach. These priority actions are listed for both restoration and conservation opportunities. These values only show up if a KEA is indeed limiting – an absence indicates priority actions for this KEA are less of a desired emphasis. The full list of priority actions regardless can be found on the **critical actions table** on pages 11-12.

To focus on one KEA for the moment, stream complexity (the lowest scoring unweighted component, or lowest KEA), a quick look at the recommended actions (or at the critical actions table on the previous pages) suggests that actions such as restoring floodplain connectivity and riparian cover are types of projects that could help address this most limiting factor. Other more specific components of existing conditions, such as **stream temp**

- riparian canopy, can be used to better understand opportunities and priorities for restoration or conservation actions in the watershed.



Pressures and threats, such as **land use trend** and **water points of diversion,** help inform the sponsor of longer term stressors in the watershed or reach, to inform the potential urgency or alternately resiliency of potential restoration or conservation actions. Climate-related metrics will be filled out here as part of a later phase effort.

A project sponsor could then consider all of this information establishing general action type and geography, consult with potential project partners or willing landowners, and perform field reconnaissance as needed, to further refine location geography and project design and implementation considerations.

2.2.4 How else may this tool be of use?

Using the guidance from the first two headings above, project sponsors can engage in long term planning, and propose the most effective projects in the highest priority areas over time. This project development can inform, then, development of the Four Year Workplan and Planned Project Forecast List, and demonstrate a cohesive vision for salmon recovery to the public, other sponsors, state agencies and the legislature through a list of high-leverage restoration and conservation projects.

2.2.5 What about other projects?

Planning and monitoring projects are not included in the framework of the FSHPT. The LE Committee acknowledges and values the importance of these projects to help update and further refine the FSHPT and identification of existing habitat conditions, salmon resources and progress toward to-be-determined salmon recovery targets. Planning projects may be good candidates to fill data gaps identified in the tool or in supporting/associated strategy update documentation.

2.3 Guidance for project evaluators

The WRIA 14 Lead Entity Committee is currently updating its TAG scoring criteria to reflect prioritization and action type. This section will be updated once this process has been completed. Conceptually, the webmap will identify geographic priority of the reach, most limiting key ecological attributes and other relevant information to help technical evaluators with project review.

3.0 Planning for updates and next steps

3.1 Updating the tool

Updates to the tool would allow for newer information to more accurately reflect existing habitat conditions, salmon resources, and by consequence, priority areas and other specific metrics within the tool. Additionally, updates to the tool could involve novel analyses using new data (incorporating new information to fill current data gaps). Such updates would also enable the Lead Entity Committee to more accurately evaluate projects based on more objective information.

To update the tool, analysis or analyses would have to be re-run, and then webmaps and associated files would have to be updated accordingly to reflect both the new raw and new analyzed data. The available data and methods utilized to develop the FSHPT are described in the Appendices, so that the process of prioritizing watersheds and reaches can be replicated if the tool is supplemented with additional data. The data dictionary in Appendix B identifies all of the fields and data sources, while Appendix A identifies how certain key fields were calculated. For example, if an updated layer concerning land conversion were to become available, analyses related to land cover conversion of developed areas, forests and wetlands could be re-analyzed using methods and sources described in the appendices. This would in turn lead to potential changes in the "trends" sub-category, currently 15% of the total existing conditions score, which would then lead to potential changes in the ranking of reaches in the restoration and conservation priority bins. The Lead Entity Committee could then note and review any deviations from prior rankings/bins, then project sponsors would adjust planning priorities if any reaches' priorities were to be up/down-graded, and project evaluators (members of the TAG) would also note these changes as they incorporate information from the tool when scoring individual projects for the SRFB grant round.

Updating the tool as novel dataset(s) or analyses become available will depend on (a) data availability and knowledge of such, (b) timing and committee interest/capacity to discuss and decide on modifying the tool's inputs and thus potentially change reach priorities during or between grant rounds, (c) lead entity coordinator time capacity to lead updates to this tool, or financial capacity to support a consultant to lead or support these updates.

3.2 Next steps

3.1.1 TAG Criteria

The Committee is in the process of updating its Technical Advisory Group (TAG) scoring criteria – the rubric by which the TAG evaluates projects proposed in each WRIA 14 SRFB grant round – to incorporate components of the FSHPT. This work is planned to be finalized before Grant Round 2022.

3.1.2 Data gaps and target setting

Key data gaps remain, including around important subjects such as Steelhead presence and distribution, sediment and geomorphological data, and more. The Lead Entity Committee will consider these needs as it charts a path forward in prioritizing its funding, and potentially update the tool with any filled data gaps via a process described in the preceding paragraphs. The next planned phase of the broader strategy update process (see 1.1) will likely involve an exercise in setting restoration and conservation habitat recovery targets.

3.1.3 Planning for climate change

Placeholder information has been provided in the tool for now. A future phase of this project will aim to update its components.

4.0 Appendix A: Methods

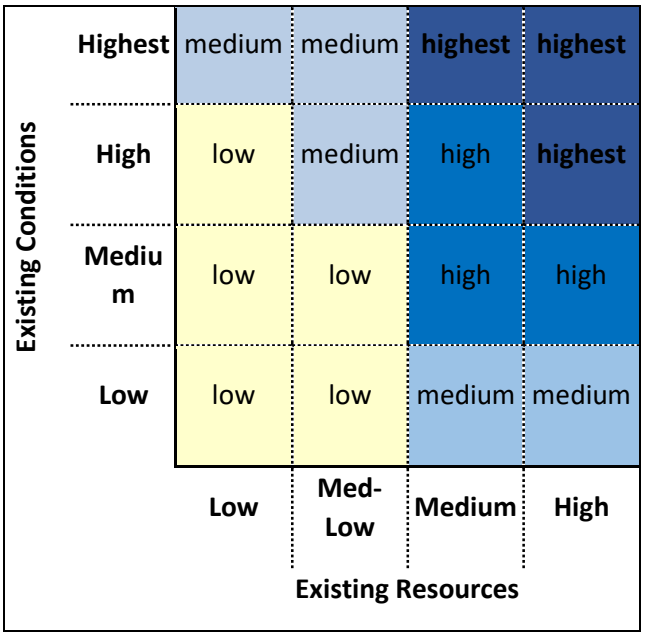
4.1 Overview

Framework has two primary components:

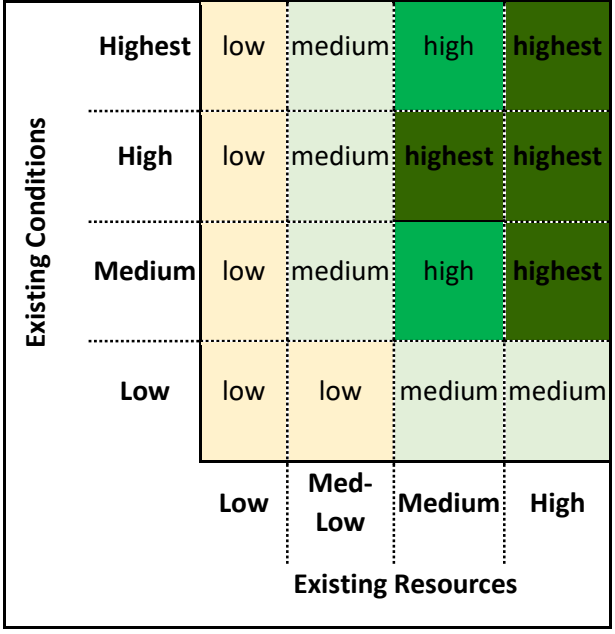
- Existing Habitat Conditions
- Existing Salmonid Resources

The framework uses a scoring and categorization system to bin Existing Habitat Conditions and Existing Salmonid Resources into bins of Highest, High, Medium, and Low. Putting those bins on a two-axis graph creates a 4-by-4 matrix into which distinct management strategies for restoration and conservation can be assigned. The proposed restoration and conservation priority tiers are shown in the figures below.

CONSERVATION **RESTORATION**



The layout of this matrix/these bins were determined by a series of discussions with the LE Committee.



4.2 Summary of methods – primary analyses

This section describes the scoring of each component of the evaluation. This was conducted at the reach scale.

4.2.1 Existing Habitat Conditions

Existing Habitat Conditions are evaluated using three of the four Key Ecological Attributes (KEAs) evaluated at the watershed scale in the Existing Conditions report prepared in Phase 1, in combination with a trend score, which represents pressures in land conversion/development. The fourth KEA, the fish accessibility KEA, noted in previous strategy documents, was omitted from the framework per LE Committee request, given that fish accessibility, by some measures, is more of a metric of habitat access than habitat condition. Fish passage barrier priorities and evaluation metric(s) will be developed by a separate exercise as part of the South Puget Sound Salmon Enhancement Group's WRIA 14 Fish Passage Barrier Inventory.

The metrics used to characterize the condition of each KEA and trend score, the scoring range of each metric, and the calculation of the KEA score are presented in the tables below. The Sediment KEA was weighted less than the other KEAs because the Summary Indicator had many data gaps and the Ecology rating was not as strongly tied to characterizing stream gravels as desired.

4.2.1.1 General Methods

Overall Existing Conditions Score	
A	Temperature KEA
B	Sediment KEA
C	Stream Complexity KEA
Existing Conditions Score = (0.40A + 0.20B + 0.40C) / 5 score range from 0 (no function) to 1.0 (full function)	

Stream Temperature KEA		**Scores**	**Data Sources**
A	Summary Indicator from Phase 1 downscaled to reach scale	Good = 5 Fair = 2 Poor = 0	Phase 1 Existing Conditions Report with modifications from Watershed Characterization virtual workshop and other reports
B	303(d) Listing for Water Temperature (highest 303(d) category for temperature in the reach)	Categories 5, 4a, or 2 = -2 All other areas = 0	Washington Department of Ecology
C	Riparian Vegetation (area within 180 ft on either bank of creek)	≥50% of area taller than 31 ft = 2 40% to 49% = 1 <40% = 0	MCD 2016 Riparian Assessment
D	Surface Water Withdrawals	>5 per sq mi watershed = -2 1 to 5 per sq mi watershed = -1 <1 per sq mi watershed = 0	Washington Department of Ecology Unmapped Water Device Point database
Stream Temperature KEA Score = A + B + C + D adjusted to range of 0 to 5; all scores >5 changed to 5 and all scores <0 changed to 0			

Sediment KEA		Scores	Data Sources
A	Summary Indicator from Phase 1 downscaled to reach scale	Good = 5 Fair = 2 Poor = 0	Phase 1 Existing Conditions Report with modifications from Watershed Characterization virtual workshop and other reports
B	Sediment Degradation	Low Degradation = 5 Medium Degradation = 3 Medium-High Degradation =1 High Degradation = 0	Washington Department of Ecology Puget Sound Watershed Assessment
Sediment KEA Score = (A + B) / 2			

Stream Complexity KEA		Scores	Data Sources
A	Summary Indicator from Phase 1 downscaled to reach scale	Good = 5 Fair = 2 Poor = 0	Phase 1 Existing Conditions Report with modifications from Watershed Characterization virtual workshop and other reports
B	Local Salmonid Habitat Rating	Rating from Ecology Divided by 2; resulting score range is 0 to 5	Washington Department of Ecology Puget Sound Watershed Assessment
Stream Complexity KEA Score = (A + B) / 2			

Developmental pressure was included as a modifier. For reaches with more than 50 percent of the area in urban growth areas or rural activity centers, the restoration priority tier could be no higher than medium priority. This is in consideration of the likelihood of development in those areas which will reduce the likelihood of process-based restoration being effective and sustainable. The reaches with this condition are the three reaches of Shelton Creek and the Lower Goldsborough Creek from river mile 0.0 to 1.6. This approach only changed the priority tier for Lower Goldsborough. The Shelton Creek reaches were already in the medium or low priority tiers for restoration.

4.2.1.2 Detailed Methods

KEAs	Scores	Data Sources	Link	Year (or date accessed)	Detailed methods
Stream temperature					
A. Summary Indicator from Phase 1 downscaled to reach scale	Good = 5 Fair = 2 Poor = 0	Phase 1 Existing Conditions Report with modifications from Watershed Characterization virtual workshop and other reports	Posted on Lead Entity Website here in the Guiding Documents page under strategy materials: https://www.masoncd.org/wria-14-guiding-docs.html	2020	Data notes: • Existing conditions report (Phase 1 of strategy update) has information on baseline existing condition bins. • This information was then "downscaled" by reach, shown and explained the table following this one based on sources listed to left. • These values were then further refined by the committee. The following changes were made: Sherwood from poor to fair; Upper Goldsborough from fair to good • Values were then scaled to scoring to left
B. 303(d) Listing for Water Temperature (highest 303(d) category for temperature in the reach)	Categories 5, 4a, or 2 = -2 All other areas = 0	Washington Department of Ecology	https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d	2014 (accessed 2020)	Data notes: • 303d listings in freshwater streams • Represent varying lengths, not necessarily entire reaches, but sometimes multiple listings per reach ArcGIS/Excel analysis: • Intersect by reach • If multiple listings per reach, then take minimum (e.g. if listed as category 5/4a/2 then entire reach received a -2 value). • Values were then scaled to scoring to left
C. Riparian Vegetation (area within 180 ft on either bank of creek)	≥50% of area taller than 31 ft = 2 40% to 49% = 1 <40% = 0	MCD 2016 Riparian Assessment		2016	Data notes: • Data based on tree canopy height from LIDAR analysis • Binned into classes based on height ArcGIS/Excel analysis: • Intersect by reach • Values were then scaled to scoring to left
D. Surface Water Withdrawals	>5 per sq mi watershed = -2 1 to 5 per sq mi watershed = -1 <1 per sq mi watershed = 0	Washington Department of Ecology Unmapped Water Device Point database	https://appswr.ecology.wa.gov/waterrighttrackingsystem/Map/help/metadata/UnmappedWaterDevicePoints.aspx	(Accessed Fall 2020)	Data notes: • Water withdrawals are GPS points • GPS points are classified as type (e.g. surface, groundwater) ArcGIS/Excel analysis: • Intersect by reach • Tabulation of count by reach • Values were then scaled to scoring to left
Stream temperature KEA score					Stream Temperature KEA Score = (A + B + C + D) / 5 adjusted to range of 0 to 5; all scores >5 changed to 5 and all scores <0 changed to 0
Sediment KEA					
A. Summary Indicator from Phase 1 downscaled to reach scale	Good = 5 Fair = 2 Poor = 0	Phase 1 Existing Conditions Report with modifications from Watershed Characterization virtual workshop and other reports	Posted on Lead Entity Website here in the Guiding Documents page under strategy materials: https://www.masoncd.org/wria-14-guiding-docs.html	2020	Data notes: • Existing conditions report (Phase 1 of strategy update) has information on baseline existing condition bins. • This information was then "downscaled" by reach, shown and explained the table following this one based on sources listed to left. • These values were then further refined by the committee. The following changes were made: Upper Goldsborough from fair to good. • Values were then scaled to scoring to left
B. Sediment Degradation	Low = 5 Medium = 3 Medium-High=1	Washington Department of Ecology Puget Sound	https://ecology.wa.gov/Water-Shorelines/Puget-Sound/Watershe	2013 (accessed 2020; does not use 2019	Data notes: • See source for methods for this index ArcGIS/Excel analysis: • Intersect by reach • Average of rating by reach

<table>
<tr><td></td><td>High = 0</td><td>Watershed Assessment</td><td>d-characterization-project</td><td>update information)</td><td>• Values were then scaled to scoring to left</td></tr>
<tr><td colspan="3">Sediment KEA score</td><td></td><td></td><td>Stream Temperature KEA Score = (A + B) / 2</td></tr>
<tr><td colspan="6">Stream complexity KEA</td></tr>
<tr><td>A. Summary Indicator from Phase 1 downscaled to reach scale</td><td>Good = 5
Fair = 2
Poor = 0</td><td>Phase 1 Existing Conditions Report with modifications from Watershed Characterization virtual workshop and other reports</td><td>Posted on Lead Entity Website here in the Guiding Documents page under strategy materials: https://www.masoncd.org/wria-14-guiding-docs.html</td><td>2020</td><td>Data notes:
• Existing conditions report (Phase 1 of strategy update) has information on baseline existing condition bins.
• This information was then “downscaled” by reach, shown and explained the table following this one based on sources listed to left.
• These values were then further refined by the committee. The following changes were made: Upper Goldsborough from fair to good.
• Values were then scaled to scoring to left</td></tr>
<tr><td>B. Local Salmonid Habitat Rating</td><td>Rating from Ecology Divided by 2; resulting score range is 0 to 5</td><td>Washington Department of Ecology Puget Sound Watershed Assessment</td><td>https://ecology.wa.gov/Water-Shorelines/Puget-Sound/Watershed-characterization-project</td><td>2013 (accessed 2020; does not use 2019 update information)</td><td>Data notes:
• See source for methods for this index
ArcGIS/Excel analysis:
• Intersect by reach
• Average of rating by reach
• Values were then scaled to scoring to left</td></tr>
<tr><td colspan="3">Stream Complexity KEA score</td><td></td><td></td><td>Stream Temperature KEA Score = (A + B) / 2</td></tr>
<tr><td colspan="6">Trend (not part of calculated KEA score)</td></tr>
<tr><td>New Development Acreage in Reach

Forest Acreage Converted in Reach</td><td>Change in acreage</td><td>NWIFC (NOAA CCAP)</td><td></td><td></td><td>Data notes:
• Data represents 30m by 30m resolution in land cover type
• Looked at change of development to non-development classes, and change of forest to non-forest classes. Change in wetland classes was also examined, but was omitted from the trend analysis because of its very minimal absolute changes across the board, and issues with data quality (accuracy in identifying actual wetlands).
• Land use class was determined using the “Class_Name” attribute, and then binned according to the crosswalk in the table to the right.

ArcGIS/Excel analysis:
• Intersect by reach
• Tabulation of area by reach

<table><tr><th>Class category</th><th>Land Use Class</th></tr><tr><td rowspan="3">Forest</td><td>Deciduous Forest</td></tr><tr><td>Mixed Forest</td></tr><tr><td>Evergreen Forest</td></tr><tr><td></td><td></td></tr><tr><td rowspan="4">Developed</td><td>Developed Open Space</td></tr><tr><td>High Intensity Developed</td></tr><tr><td>Low Intensity Developed</td></tr><tr><td>Medium Intensity Developed</td></tr><tr><td></td><td></td></tr><tr><td rowspan="5">Wetland</td><td>Palustrine Aquatic Bed</td></tr><tr><td>Palustrine Emergent Wetland</td></tr><tr><td>Palustrine Forested Wetland</td></tr><tr><td>Palustrine Scrub/Shrub Wetland</td></tr><tr><td>Estuarine Emergent Wetland</td></tr><tr><td></td><td></td></tr><tr><td rowspan="8">Other</td><td>Bare Land</td></tr><tr><td>Cultivated</td></tr><tr><td>Estuarine Aquatic Bed</td></tr><tr><td>Grassland</td></tr><tr><td>Pasture/Hay</td></tr><tr><td>Scrub/Shrub</td></tr><tr><td>Unconsolidated Shore</td></tr><tr><td>Water</td></tr></table></td></tr>
<tr><td>Existing Well Density</td><td>Wells per square mile</td><td>Water point diversion, Department of Ecology</td><td>https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d</td><td>2014 (accessed 2020)</td><td>Data notes:
• Water withdrawals are GPS points
• GPS points are classified as type (e.g. surface, groundwater)
ArcGIS/Excel analysis:
• Intersect by reach
• Wells then calculated by density (number divided by reach area)</td></tr>
</table>

Table of reaches downscaled from Phase 1 Existing Conditions Report

Reach #	Reach Description	Watershed	TEMPERATURE	Source of Reach Temperature Adjustment	SEDIMENT	Source of Reach Sediment Adjustment	HABITAT COMPLEXITY - FINAL ENTRY INTO FRAMEWORK	Source of Reach Habitat Complexity Adjustment	Stream Temperature KEA	Sediment Condition KEA	Habitat Complexity KEA
Camp-1	Campbell Creek	Campbell Creek	poor		fair		fair		Poor (DG)	Fair (DG)	Fair (DG)
County-1	County Line Creek	County Line Creek	fair		fair		fair	Watershed Characterization	Fair (DG)	Fair (DG)	Poor (DG)
Cran-1	Lower Cranberry Creek	Cranberry Creek	fair	Stillwater 2007	fair		good	Watershed Characterization	Poor	Fair (DG)	Fair to Good (DG)
Cran-2	Cranberry Creek - Lake Limerick	Cranberry Creek	poor	Watershed Characterization	fair		fair				
Cran-3	Middle Cranberry Creek	Cranberry Creek	poor	Watershed Characterization	fair		fair	Watershed Characterization			
Cran-4	Upper Cranberry Creek	Cranberry Creek	poor	Watershed Characterization	fair		poor	Stillwater 2007			
Deer-1	Deer Creek	Deer Creek	poor		fair		good		Poor	Fair (DG)	Good (DG)
Golds-1	Lower Goldsborough Creek	Goldsborough Creek	poor		fair		poor	EDT	Fair	Fair	Fair (DG)
Golds-2	Lower Coffee Creek	Goldsborough Creek	fair		fair		fair	EDT			
Golds-3	Upper Coffee Creek	Goldsborough Creek	fair		fair		fair	EDT			
Golds-4	Middle Goldsborough	Goldsborough Creek	fair		fair		fair	EDT			
Golds-5	Upper Goldsborough	Goldsborough Creek	fair	per workgroup discussions	fair		good	Watershed Characterization/ EDT			
Golds-6	North Fork Goldsborough	Goldsborough Creek	good	Watershed Characterization	fair		fair	Watershed Characterization			
Golds-7	NF Goldsborough - Winter Creek	Goldsborough Creek	good		fair		fair	EDT			
Golds-8	Upper Goldsborough - NF to RM 10.3	Goldsborough Creek	good	Watershed Characterization	fair		fair	EDT			
Golds-9	Upper Goldsborough - RM 10.3 to 11.3	Goldsborough Creek	good	Watershed Characterization	fair		fair	EDT			
Golds-10	Upper Goldsborough - RM 11.3 to 14	Goldsborough Creek	good	Watershed Characterization	fair		fair	EDT			
Mill-1	Lower Mill Creek	Mill/Gosnell Creek	poor	Stillwater 2007; Cran Johns Mill Temperature Study	fair		poor	SIT 2015a	Good	Fair	Fair
Mill-2	Mill Creek - Lake Isabella	Mill/Gosnell Creek	poor	Stillwater 2007	fair		poor		Poor	Fair (DG)	Fair
Mill-3	Rock Creek	Mill/Gosnell Creek	fair	Stillwater 2007	fair		good	Stillwater 2007; Mill Creek Action Plan			
Mill-4	Lower Gosnell	Mill/Gosnell Creek	good	Mill Creek Action Plan	fair		fair	Stillwater 2007			
Mill-5	Upper Gosnell	Mill/Gosnell Creek	good	Mill Creek Action Plan	fair		fair	Stillwater 2007			
Mill-6	Mystery Creek	Mill/Gosnell Creek	fair	Stillwater 2007	fair		fair	Stillwater 2007; Mill Creek Action Plan			
Johns-1	Lower John's Creek	Johns Creek	poor	Cran Johns Mill Temperature Study	fair		poor	EDT	Fair	Fair (DG)	Fair (DG)
Johns-2	Upper John's Creek	Johns Creek	fair	Cran Johns Mill Temperature Study	fair	Watershed Characterization	fair	EDT			
Kenn-1	Lower Kennedy Creek	Kennedy Creek	fair		fair	Kennedy Watershed assessment fi	good	Watershed Characterization/Kennedy Watershed assessment fish habitat.pdf	Fair	Fair (DG)	Good (DG)
Kenn-2	Upper Kennedy Creek	Kennedy Creek	fair		fair		good				
Kenn-3	Upper Kennedy Creek - Summit Lake	Kennedy Creek	fair	Watershed Characterization	fair		good				
Mal-1	Malaney Creek	Malaney Creek	poor		fair		fair		Poor (DG)	Fair (DG)	Fair to Good (DG)
Perry-1	Lower Perry Creek	Perry Creek	good		fair		poor	Kennedy Watershed assessment fish habitat.pdf	Good	Fair (DG)	Poor (DG)
Perry-2	Upper Perry Creek	Perry Creek	good		fair		poor				
Schneid-1	Lower Schneider Creek	Schneider Creek	poor	Kennedy Watershed Assessment overview.pdf	poor	Kennedy Watershed assessment fi	poor	Watershed Characterization/Kennedy Watershed assessment fish habitat.pdf	Fair	Fair (DG)	Fair (DG)
Schneid-2	Upper Schneider Creek	Schneider Creek	fair	Kennedy Watershed Assessment overview.pdf	fair		fair	Watershed Characterization/Kennedy Watershed assessment fish habitat.pdf			
Sher-1	Sherwood Creek	Schumacher-Sherwood Creeks	fair	Watershed Characterization	good	Allyn Sherwood Baseline 2002	good	Stillwater 2007	Poor	Fair (DG)	Good (Sherwood) Fair (Schumocher) (DG)
Sher-2	Anderson Creek	Schumacher-Sherwood Creeks	good	Watershed Characterization	fair		fair	Brackensick 2008			
Sher-3	Mason Lake	Schumacher-Sherwood Creeks	poor	Stillwater 2007	fair		poor				
Sher-4	Schumacher Creek	Schumacher-Sherwood Creeks	fair	Stillwater 2007	fair		fair	Stillwater 2007			
Shel-1	Lower Shelton Creek	Shelton Creek	fair		poor		poor		Fair (reconsidered in phase 2)	Poor (DG)	Poor (DG)
Shel-2	Canyon Creek	Shelton Creek	fair		poor		poor				
Shel-3	Upper Shelton Creek	Shelton Creek	fair		poor		poor				
Skook-1	Lower Skookum	Skookum Creek	poor	Watershed Characterization	poor	Watershed Characterization	poor	Watershed Characterization/ EDT	Poor	Poor	Poor (DG)
Skook-2	Lower Little Creek	Skookum Creek	poor		poor		poor	Watershed Characterization/ EDT			
Skook-3	Upper Little Creek	Skookum Creek	fair	Watershed Characterization	poor		fair	Watershed Characterization			
Skook-4	Middle Skookum	Skookum Creek	poor	Watershed Characterization	poor		poor	Watershed Characterization/ EDT			
Skook-5	Upper Skookum	Skookum Creek	fair	Watershed Characterization SIT 2016 LF	poor		good	Watershed Characterization			
Snod-1	Snodgrass Creek	Snodgrass Creek	fair		poor		poor		Fair (DG)	Poor (DG)	Poor (DG)
Uncle-1	Uncle John Creek	Uncle John Creek	poor		poor		poor		Poor (DG)	Poor (DG)	Poor (DG)
Elson-1	Elson Creek	Elson Creek	fair	no data Kuttel	poor	Kuttel	poor	Kuttel	not evaluated	not evaluated	not evaluated
Hia-1	Hiawata Creek	Hiawata Creek	fair	2004 Strategy	poor	2004 Strategy/Kuttel LFA	fair	2004 Strategy	not evaluated	not evaluated	not evaluated
Lynch-1	Lynch Creek	Lynch Creek	fair	no data Kuttel	poor	Kuttel	fair	Watershed Characterization/ Kuttel	not evaluated	not evaluated	not evaluated

DG = data gap

4.2.2 Existing Salmonid Resources

Salmon resources is a composite measure of salmon abundance, distribution, anadromous stream length, and watershed area. The following describes the approach to evaluating the binning process for assigning values for this category to various reaches/watersheds.

Data used to evaluate salmon resources was drawn from the Washington Department of Fish and Wildlife spawning ground database, which provides some information on abundance, as well as the Statewide Washington Integrated Fish Distribution (SWIFD) dataset, which provides information on salmon abundance.

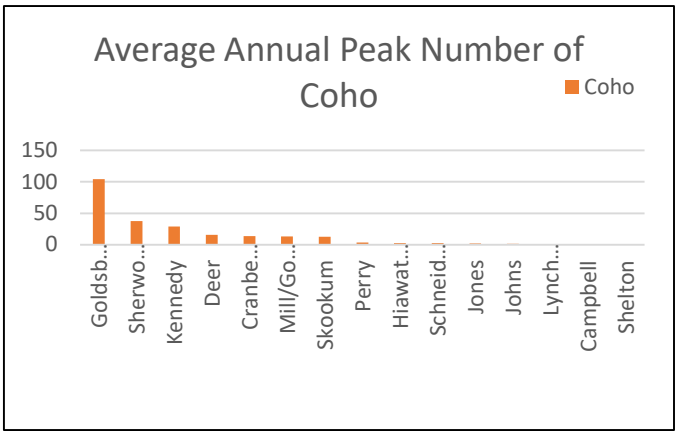
4.2.2.1 Analysis steps

The metric used from the abundance (WDFW spawner data) was the average of the peak annual live count (i.e., the number observed during the spawner survey that year with the highest number of live fish documented since the year 2000). Example spawner data is shown below. In this example, the peak annual live count for 2012 was 6,699.

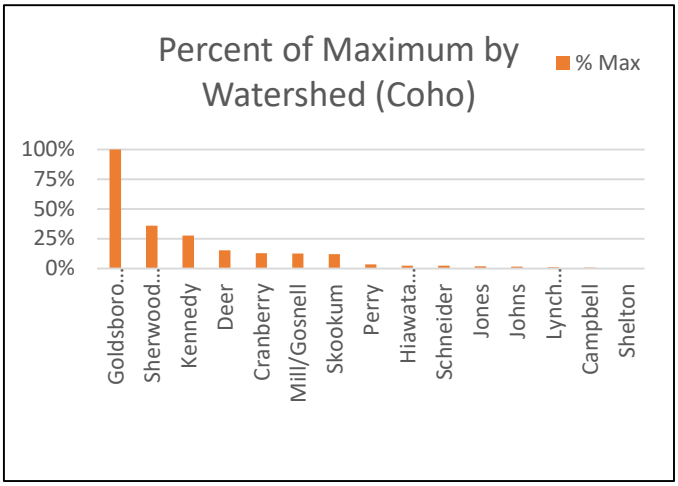
Perry Creek	Live Fall Chum
10/29/2012	28
11/7/2012	898
11/15/2012	2,255
11/28/2012	6,699
12/10/2012	3,272
12/14/2012	819

This analysis was done for all watersheds in WRIA 14 with WDFW Spawning Ground Survey data. Six species/runs had sufficient spawner data: Coho, Fall chum, Summer chum, Fall Chinook, Pink and Coastal Cutthroat Trout. *Note:* Chinook runs, because thought to generally be of hatchery origin and in low spawning numbers if at all, are identified and classified only as present, even if abundance information is available.

Step 1a. Calculate watershed with the maximum average annual peak count, conducted separately for each species/run. See example below for calculation of Coho.



Step 1b. For each watershed, divide its average annual peak count by the maximum average annual peak count.



Step 1c. Assign categories based on percentage of maximum, then repeat for all species/runs.

- Highest = 50% or more of maximum
- High = 25% to 50% of maximum
- Medium = 10% to 25% of maximum
- Low = <10% of maximum

Watershed	Coho	% Max	Category
Goldsborough	104	100%	Highest
Sherwood/Schumocher	38	36%	High
Kennedy	29	28%	High
Deer	16	15%	Medium
Cranberry	13	13%	Medium
Mill/Gosnell	13	13%	Medium
Skookum	12	12%	Medium
Perry	4	3%	Low
Hiawata (Keller)	2	2%	Low
Schneider	2	2%	Low
Jones	2	2%	Low
Johns	2	2%	Low
Lynch (Bishop)	1	1%	Low
Campbell	1	1%	Low
Shelton	0	0%	Low

Step 2. Add in additional presence data from SWIFD. Additional information from SWIFD was used to indicate documented presence of species in additional watersheds/reaches. Chinook was noted as present even if abundance information was available (see above reasoning). See Step 3 for full table incorporating presence information.

Step 3a. Consider smolt data. Data from from Squaxin Island Tribe (2017) Smolt data shown below:

	Goldsborough	Sherwood	Mill / Gosnell	Cranberry	Skookum	Johns
mean	35,323	4,781	3,542	1,595	872	278
min	1,014	2,165	19	71	38	83
max	113,246	10,258	10,597	4,916	2,376	964
count	19	8	17	17	15	5

Step 3b. Incorporation of smolt data. Categories were assigned based on percentage of maximum.

- Calculated percent of maximum
- Assigned to categories
- Highest = >50% max
- High = 25% to 50% of max
- Medium = 10% to 25% of max
- Low = <10% of max

Creek	Coho Smolts
Goldsborough	Highest
Sherwood/Schumocher	Medium
Skookum	Low
Johns	Low
Kennedy	present
Perry	present
Mill/Gosnell	Medium
Cranberry	Low

Step 4. Add in watershed and stream size information, specifically watershed area and anadromous stream length (based on SWIFD). Anadromous length of Mill/Gosnell was largest at 26.3 miles, while watershed area was largest with Goldsborough 59.8 sq. mi.

- Calculated the percent of the maximum began by determining the anadromous stream length and watershed area of each watershed in WRIA 14. The anadromous stream length of each watershed was divided by the longest anadromous stream length in WRIA 14 (Mill/Gosnell). The result was converted from a proportion (e.g., 0.89) to a percent of the maximum (89%). The same steps were taken for the percent of maximum area calculation. Goldsborough was the WRIA 14 watershed with the largest watershed area which was then divided into the area of all other watersheds.

Creek	% of Maximum Anadromous Length	% of Maximum Area
Goldsborough	89%	100%
Sherwood/Schumocher	92%	55%
Skookum	66%	32%
Johns	35%	17%
Kennedy	16%	33%
Perry	8%	11%
Cranberry	32%	23%
Deer	40%	24.9%
Mill/Gosnell	100%	49.8%
Schneider	26%	12%
Lynch (Bishop)	8%	2%
Shelton	13%	6%
Campbell	10%	8%
Hiawata (Keller)	5%	2%
Jones	5%	2%
Elson	2%	4%
Malaney	10%	6%
County Line	3%	3%
Uncle Johns	7%	3%
Snodgrass	2%	2%

Step 5. Assign salmon resources to categories to each watershed based on salmon spawner abundance category (output of step 1c), smolt abundance category (output of step 3b), and anadromous length and watershed area (step 4). Salmon spawner and smolt abundance categories were evaluated first, then refined based on anadromous length and watershed area.

- First assigned to categories using spawner and smolt information
- Highest = watersheds with “highest” abundance category assigned for spawners or smolts abundance for one or more species/runs
- High = watersheds with “high” or “medium” abundance categories assigned for spawners or smolts abundance for one or more species/runs
- Medium = watersheds with “low” abundance category assigned for spawners or smolts abundance for more than one species/runs
- Low = watersheds with “low” abundance category assigned for spawners or smolts abundance for one or no species/runs
- Refine category assignments if watershed has substantially larger area or anadromous stream length than other watersheds in the originally assigned category. As a result of this step, two watersheds were adjusted based on watershed size (promoted Mill/Gosnell and Malaney to next category higher given their anadromous length and area in comparison to other respectively similarly-ranked streams).

4.2.3 Final Salmon Resources Results

Creek	Spawners							Coho Smolts	Existing Salmon Resources Category	% of Maximum Anadromous Length	% of Maximum Area
	Coho	Fall Chum	Summer Chum	Chinook	Cutthroat	Pink	Winter Steelhead				
Goldsborough	Highest	Low	Low	present	Medium	Highest	present	Highest	Highest	89%	100%
Sherwood/Schumocher	High	Medium	Low	present	Medium	Highest	present	Medium	Highest	92%	55%
Skookum	Medium	Highest		present	Highest		present	Low	Highest	66%	32%
Johns	Low	High	Highest	present	High	Low	present	Low	Highest	35%	17%
Kennedy	High	Highest		present	High		present	present	Highest	16%	33%
Perry	Low	Highest			Medium		present	present	Highest	8%	11%
Mill/Gosnell	Medium	Medium		present	Low		present	Medium	Highest	100%	50%
Cranberry	Medium	High	Medium	present	Medium	Low	present	Low	High	32%	23%
Deer	Medium	Low	Medium	present	Medium	Low	present	present	High	40%	24.9%
Schneider	Low	Medium			Low		present	present	High	26%	12%
Lynch (Bishop)	Low	Medium			Low		present	present	High	8%	2%
Shelton	Low	Low			Low		present	present	Medium	13%	6%
Campbell	Low	Low			present		present	present	Medium	10%	8%
Hiawata (Keller)	Low	Low			present			present	Medium	5%	2%
Jones	Low	Low			present			present	Medium	5%	2%
Malaney	present	Low			present		present	present	Medium	10%	6%
Elson	present	Low			present		present	present	Low	2%	4%
County Line	present	Low			present			present	Low	3%	3%
Uncle Johns	present	present			present		present	present	Low	7%	3%
Snodgrass	present	present			present			present	Low	2%	2%

4.2.4 Additional information on salmon resources – downscaled to reach level

The tables presented in previous pages of this document highlight the existing salmonid resources by watershed. The following table describes additional adjustments to individual reaches based on contextual considerations or habitat considerations. These considerations are detailed in the "adjustments to reaches" column below:

Watershed	Watershed Existing Salmonid Resources	Adjustments to Reaches
Campbell	Medium	None
County Line	Low	None
Cranberry	High	reduced all reaches from Lake Limerick up to Medium
Deer	High	None
Elson	Low	None
Goldsborough	Highest	Changed SF Goldsborough above RM 11.3 to Medium (upstream of documented anadromous salmon, although no barrier preventing anadromous use)
Hiawata	Medium	None
Johns	Highest	Changed Upper Johns to Medium because less important reach with more wetlands than pronounced stream channel
Jones	Medium	None
Kennedy	Highest	Changed Upper Kennedy and Summit Lake to Low because upstream of natural barrier
Lynch	High	None
Malaney	Medium	None
Mill-Gosnell	Highest	Changed Lake Isabella to High because lake only for migration with limited rearing
Perry	Highest	Changed Upper Perry to Low because upstream of natural barrier
Schneider	High	None
Sherwood-Schumocher	Highest	Changed Mason Lake to Medium because lake only for migration with limited rearing
Shelton	Medium	Changed Upper Shelton to Low because of limited fish access
Skookum	Highest	None
Snodgrass	Low	None
Uncle Johns	Low	None

4.3 Summary of methods – additional analyses

4.3.1 Trends (land conversion)

Trends KEA		Scores	Data sources
A	New Development Acreage in Reach	0=If more than 1 acre developed 1=If less than 1 acre developed	NWIFC (NOAA CCAP) land cover
B	New Development Percentage in Reach	0=If more than 1% reach area developed 1= If less than 1% reach area developed	
C	Forest Acreage Converted in Reach	0=If more than 100 acres converted 1=If less than 100 acres converted	
D	Percentage of Reach Converted from Forest	0=If more than 1% reach area converted 1=If less than 1% reach area converted	
E	Existing Well Density	0=If more than 10 wells per square mile 1=If less than 10 wells per square mile	Water point diversion, Department of Ecology

This data is included as reference information and does not affect reach ranking/geographic prioritization.

4.3.2 Climate change

The following attributes are incorporated as placeholder information. This information will be filled out in greater detail in a future phase of work.

<u>Summer Low Flows</u>

- Median August flows 2006-2018: xx cfs
- Projected Changes by 2080: =/- yy %

<u>Winter High Flows</u>

- Median January flows 2006-2018: xx cfs
- Projected Changes by 2080: =/- yy %

<u>Summer Water Temperatures</u>

- Median August temperatures 2006-2018: xx deg. C
- Projected Changes: =/- yy %

4.4 Results by Reach

Reach results based on existing conditions and salmon resources matrix.

PROTECTION	RESTORATION: Low	RESTORATION: Medium	RESTORATION: High	RESTORATION: Highest
Highest			Upper Schneider Creek	Anderson Creek
				Sherwood Creek
				Schumocher Creek
				Middle Goldsborough - RM 1.6 to 6.1
				Upper Goldsborough - RM 6.1 to 8.9
				SF Goldsborough - RM 8.9 to 10.3
				SF Goldsborough - RM 10.3 to 11.3
				NF Goldsborough
				Lower Gosnell
				Mystery Creek
				Rock Creek
				Upper Gosnell
				Upper Little Creek
				Upper Skookum
				Lower Kennedy Creek
				Lower Perry Creek
High			Lynch Creek	Lower Coffee - RM 0.0 to 1.5
				Upper Coffee
				Middle Skookum
				Deer Creek
				Lower Cranberry Creek
Medium	Upper Kennedy Creek	Lower Goldsborough - RM 0.0 to 1.6	Lower John's Creek	
		SF Goldsborough - RM 11.3 to 14	Lower Little Creek	
	Upper Perry Creek	Mill Creek - Lake Isabella	Lower Mill Creek	
		Upper John's Creek	Lower Skookum	
		Hiawata Creek		
		Lower Schneider Creek		
		Jones Creek		
Low	Cranberry Creek - Lake Limerick	Campbell Creek		
	Upper Cranberry Creek	Canyon Creek		
	Lower Shelton Creek	Malaney Creek		
	Upper Shelton Creek	Middle Cranberry Creek		
	County Line Creek			
	Elson Creek			
	Snodgrass Creek			
	Uncle John Creek			
	Upper Kennedy Creek - Summit Lake			
	Mason Lake			

4.5 Reach delineation methods

Reaches were mapped using Washington Department of Ecology's Puget Sound Watershed Assessment Units (AUs), a watershed delineation finer that HUC 12, as a baseline.

Through an exercise identified by the WRIA 14 Lead Entity committee and ESA, a series of reaches within watersheds were identified to correspond with natural barriers, or significant changes in dominant land use, existing habitat conditions, or geomorphological or hydrological conditions.

These reaches generally correspond with Ecology's AUs, though were modified in some cases to combine or split AUs depending on the locational relationship of the reaches as compared to the AUs. In these cases, the new drainage basins at the reach breaks were digitized manually. In some other cases still, a combination of splitting and grouping of AUs was performed to reflect Committee desired reach breaks.

In other cases, AUs were adjusted slightly to place mouth or stream nexus more accurately.

It should be noted that they are some areas of the headwaters of watersheds where reach delineation is difficult, and where headwaters can/do flow in multiple directions given local topography. Best professional judgement was used to determine these headwaters delineations.

Coffee Creek reach was modified to reflect future stream mouth proposed final location of the stream mouth and associated watershed area based on an ongoing restoration project in this area.

The table below characterizes changes to the AU layer based on reach breaks. High confidence indicates that AUs matched desired reach locations. Medium confidence means the exact AU was not necessarily used, but changes were minimal and based on relatively obvious geographical indicators. Low confidence indicates significant digitization of drainage basin perimeter was performed manually, guided by LIDAR, topography and hydrological data. Green highlights and labels of "Clean AU" indicates consistency of AU and reach. Numbers reflect numerical coding of AUs from raw Ecology data.

Creek	Reaches	Confidence	Notes
Perry	D/S of barrier falls	Low	AU 14012 split. Falls location not certain; used SWIFD extent
	U/S of barrier falls	Low	AU 14012 split and 14002
Schneider	D/S of Hwy 101	Medium	Grouped (D/S split portion of AU 10410 grouped with AU)
	U/S of Hwy 101	Medium	Using LIDAR and Hwy 101, split @ Hwy 101 (split AU 14010)
County Line		High	Clean AU
Kennedy	D/S of barrier falls	Low	Split 14009 into U/S and D/S using topo. Uncertain esp. west trib.
	U/S of barrier falls	Medium	Merge split part of 14009 with 14011, 14060, split part of 14001
	Summit Lake	Medium	Remainder of 14001
Snodgrass		High	Clean AU
Skookum	Mouth of Little Creek to RM ~0.7	Low	Split 14007, merged with split portion of 14022
	Little Creek RM 0.7 U/S	Low	Split portion of 14022
	D/S of RM 6 (valley bottom)	Low	Merged 14015 and 14017, split portion of 14016 and d/s

Creek	Reaches	Confidence	Notes
	Tributaries between RM 4.3 (McDonald Cr?) and RM 6.0	Low	Split from d/s using stream catalog between 0023 trib and RM 6 break
	U/S of RM 6 (valley narrows, one of bigger tribs enters, land use changes)	Low	Merged split portion of 14016 and 14013 and 14061
Elson		High	Clean AU, 14056
Lynch		High	Clean AU, 14055
Mill/Gosnell	Mill Creek	Low	Split 14024, 14025, 14027 plus one more u/s
	Isabella Lake	Low	Split 14023
	Rock Creek	High	Clean AU, 14020
	Gosnell from lake to confluence of Mystery Creek (0033)	Low	Split 14019 plus 14018
	Mystery Creek	Low	Split 14019
	Gosnell U/S of Mystery Creek confluence	Low	Split 14019 plus d/s AU(s)
Goldsborough	Lower Goldsb. - D/S of Coffee Creek	Low	Split 14026 / TO DO may need to change w/ new CC mouth, merged with part of CC (old mouth)
	Coffee Creek - new mouth to D/S of wetlands at RM 1.5	Low	Redone based on proposed new coffee creek route, merged w/ 14035
	Coffee Creek - wetlands at RM 1.5 U/S to headwaters	Low	Split 14026
	Middle Goldsb. - from Lower Goldsb. To ~RM 6.1	Low	Split 14035, 14036, 14037, may need to change w/ new CC mouth
	Upper Goldsb. - from ~RM 6.1 to confluence of NF & SF	Low	14034 plus split 14035
	Lower NF Goldsb., including Dayton Creek	Medium	14005, 14032, 14033 with adj. Winter Crk. Mouth
	Winter Creek	Medium	Clean AU; 14029, 14030, 14031 with adj. Winter Crk. mouth
	Upper Goldsb. - confluence of NF & SF to RM 10.3	Low	Split 14028
	RM 10.3 to 11.3	Low	Split 14028 plus modified mouth
	RM 11.3 to 14	Low	14027 plus modified mouth
Shelton	D/S of RM 1.3 (hospital)	Low	Split 14063
	Canyon Creek	Low	Split 14063
	U/S of RM 1.3	Low	Split 14063
Johns	D/S of E Johns Creek Dr (RM 2.6)	High	Clean AU, 14040

Creek	Reaches	Confidence	Notes
	U/S of E Johns Creek Dr (RM 2.6)	High	Merge 14038, 14039
Cranberry	D/S of Lake Limerick	High	Clean AU, 14044
	Lake Limerick	Medium	Clean AU, 14043
	Reach between Cranberry Creek and Lake Limerick	Low	Split 14042
	Cranberry Lake to headwaters	Low	Split 14041/14042
Deer		High	Clean AU, 14046 and 14045
Malaney		High	Clean AU, 14048
Campbell		High	Clean AU, 14049
Uncle Johns		High	Clean AU, 14046
Jones		High	Clean AU, 14095
Hiawata		High	Clean AU, 14091
Sherwood/ Schumocher	Mouth of Sherwood Creek to D/S of Mason Lake	Low	Split AU, 14054; 14053, 14059, 14054
	Anderson Creek	Low	Split AU, 14054
	Mason Lake	High	Clean AU, 14003 plus 14058
	Schumocher Creek U/S of Mason Lake	High	Clean AU, 14004, 14050, 14051, 14052
Independent Tribs			Uncategorized/labeled for now

5.0 Appendix B: Metadata and raw data

This appendix contains three sets of information:

a) Data dictionary. A table that describe the meaning/purpose of each data included in the master table for the Reach Prioritization layer.

b) Raw data. This data is also available for download as a table or geodatabase.

c) Sources. This is a list of source information for all datasets used in generation of this report and dataset.

a) Data Dictionary

ATTRIBUTE	EXPLANATION	ASSOCIATION	SOURCE DATA
Reach_ID			
Reach			
Watershed			
Downstream RM	Approximate river mileage to downstream end of reach from river mouth.		
Upstream RM	Approximate river mileage to downstream end of reach from river mouth.		
Watershed_Salmon_Pop	H,M,L bin for watershed based on salmon population numbers		
Reach_Salmon_Pop	H,M,L bin for reach based on watershed bin and reach context note		
Anad_Length_mi	Length of anad stream miles in reach, not counting CCT, in miles		SWIFD
Anad_Length_index	Length of anad stream miles, not counting CCT, indexed to longest reach, 0 to 1		SWIFD
Reach_area_sqmi_final	Area of reach in square miles		Reaches layer
Reach_area_index	Area of reach indexed to largest reach, 0 to 1		Reaches layer
Watershed_Anad_mi	Length of anad stream miles in watershed, not counting CCT, in miles		SWIFD
Watershed_Area_sqmi	Area of watershed in square miles		Reaches layer
Coho_pres	Presence (1) or absence (0) of coho in stream reach based on SWIFD		SWIFD
FallChinook_pres	Presence (1) or absence (0) of fall chinook in stream reach based on SWIFD		SWIFD
FallChum_pres	Presence (1) or absence (0) of fall chum in stream reach based on SWIFD		SWIFD
SummerChum_pres	Presence (1) or absence (0) of summer chum in stream reach based on SWIFD		SWIFD
WinterSteelhead_pres	Presence (1) or absence (0) of winter steelhead in stream reach based on SWIFD		SWIFD
CoastalCutthroat_pres	Presence (1) or absence (0) of coastal cutthroat in stream reach based on SWIFD		SWIFD
Coho_Spawn_ID	Presence (1) or absence (0) of coho spawning in stream reach based on SWIFD		SWIFD
FallChinook_Spawn_ID	Presence (1) or absence (0) of fall chinook spawning in stream reach based on SWIFD		SWIFD
FallChum_Spawn_ID	Presence (1) or absence (0) of fall chum spawning in stream reach based on SWIFD		SWIFD
SummerChum_Spawn_ID	Presence (1) or absence (0) of summer chum spawning in stream reach based on SWIFD		SWIFD
WinterSteelhead_Spawn_ID	Presence (1) or absence (0) of winter steelhead spawning in stream reach based on SWIFD		SWIFD
Temp_Ind	Summary Indicator from Phase 1 downscaled to reach scale	Existing Conditions > Stream Temp	revised from Existing conditions report
Temp_Ind_Sc	Scoring assigned to indicator		
303d_listed	Whether listed as Cat. 5 for temp or not		WA Dept. Ecology
303d_Sc	Scoring assigned to 303d listings		
Rip_Lporp	MCD riparian analysis		MCD
Rip_MIporp			
Rip_Mporp			
Rip_Tporp			
Rip_T_MT	sum of M and T proportions		
Rip_Sc	Scoring assigned based on sum of M and T proportions		
WCI_surface	Surface water withdrawals		Ecology Unmapped Water Device Point database
WCI_per_sqmi	Number of surface water withdrawals per reach area (sq. mile)		
Surface_div_sc	Scoring assigned to surface withdrawals		
Temp_Sum	Sum of contributing temperature scores		

KEA_Temp_Sc	Adjusted Temperature KEA score on scale of 0 to 5		
Sediment_Ind	Summary Indicator from Phase 1 downscaled to reach scale	Existing Conditions > Sediment	revised from Existing conditions report
Sed_Ind_Sc	Scoring assigned to indicator		
WQDegSed_coH	Sediment degradation as characterized by the Puget Sound Watershed Characterization Project (PSWCP) related to overall sediment degradation in classes: High, Low, Medium-High, Medium		PSWCP
WQDegSed_coL			
WQDegSed_coMH			
WQDegSed_coM			
WQSed_Sc	Scoring assigned based on sediment degradation		
WQSed_Cat	Category assignment based on contributing assessment areas from data source (listed as inverse of degradation)		
KEA_Sediment_Sc	Sediment KEA score based on average of contributing sediment scores		
WHI_Cat0	Salmonid Habitat Index from the PSWCP. WHI attribute binned from 0 to 10 (rounded up)	Existing Conditions > Stream Complexity	PSWCP
WHI_Cat1			
WHI_Cat2			
WHI_Cat3			
WHI_Cat4			
WHI_Cat5			
WHI_Cat6			
WHI_Cat7			
WHI_Cat8			
WHI_Cat9			
WHI_Cat10			
WHI_Avg	Average Salmonid Habitat Index among assessment units in reach		
WHI_Sc	Scoring assigned based on average Salmonid Habitat Index		
WHI_Cat	Category assignment based on contributing assessment areas from data source. Score of 8-10 High, 5-7 Medium, and 0-4 Low.		
StreamComplexity_Ind	Summary Indicator from Phase 1 downscaled to reach scale		revised from Existing conditions report
Stream_Ind_Sc	Scoring assigned to indicator		
KEA_Complexity_Sc	Stream Complexity KEA score based on average of contributing sediment scores		
WCI_unclass	Unmapped water device points (unclassified, groundwater, surface, reservoir); Surface diversions used in Temperature KEA, otherwise not used in current draft of framework	Existing and Future Pressures > Hydrology	WA Dept. Ecology
WCI_groundwater			
WCI_reservoir			
WCI_surface			
Withdrawals/sq mi	Number of surface and groundwater withdrawals per reach area (sq. mile)		
WCI_sc	Scoring assigned based on withdrawal density. More than 10 per sq. mile equals -1.		
Total_Dvlpd_Chg	Land cover change from 2006 to 2011 based on HRLC change. Negative value signifies decline in land cover type, positive indicates increase.	Existing and Future Pressures > Land Conversion	Ken Pierce, WDFW
Total_Forest_Chg			
Total_Wetland_Chg			
Devlpd_%Chg	Percent changes in land cover from 2006 to 2011		
Forest_%Chg			
Wetland_%Chg			

Porp_UGARAC	Porportion of reach area within an urban growth boundary (UGA) or rural activity center (RAC)	Existing and Future Pressures > Development Potential	Mason Co. GIS
Temp_0_1	Proportion of total possible score for temperature KEA		
Temp_lim	Whether or not stream temperature is a limiting KEA (<0.5 or the minimum KEA value among stream temperature, sediment, and stream complexity)		
Sed_0_1	Proportion of total possible score for sediment KEA		
Sed_lim	Whether or not sediment is a limiting KEA (<0.5 or the minimum KEA value among stream temperature, sediment, and stream complexity)		
Complex_0_1	Proportion of total possible score for stream complexity KEA		
Complex_lim	Whether or not stream complexity is a limiting KEA (<0.5 or the minimum KEA value among stream temperature, sediment, and stream complexity)		
Form_Temp_sc	Intermediate score used to calculate overall Existing Conditions score	Existing Conditions > Stream Temperature	
Form_Sed_sc	Intermediate score used to calculate overall Existing Conditions score	Existing Conditions > Sediment	
Form_Complex_sc	Intermediate score used to calculate overall Existing Conditions score	Existing Conditions > Stream Complexity	
Exist_Hab_Sc	Overall Existing Conditions score	Existing Conditions	
Exist_Hab_Bin	H,M,L bin assigned based on Existing Conditions	Existing Conditions	
Restore_Rec	Restoration recommendation based on Existing Conditions and Salmon Bins, as modified by Pressures Bin	Recommendations	
Protect_Rec	Protection recommendation based on Existing Conditions and Salmon Bins	Recommendations	
Rest_actions_rec_temp	Recommended high priority restoration actions for improving temperature KEA	Recommendations	Based on Critical Actions table developed by Paul Schlenger, ESA
Rest_actions_rec_sed	Recommended high priority restoration actions for improving sediment KEA	Recommendations	
Rest_actions_rec_complex	Recommended high priority restoration actions for improving stream complexity KEA	Recommendations	
Consv_actions_rec_temp	Recommended high priority conservation actions for improving stream complexity	Recommendations	

b) Raw data

Data is available for download (the attribute table) via:

https://wacds.maps.arcgis.com/apps/webappviewer/index.html?id=d83a1ccd82cf4556bc1d1cf9150b3313

c) Sources

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