Endangered Species Act
Federal Columbia River Power System

2013
Comprehensive Evaluation
Appendices

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2013 Comprehensive Evaluation: Appendices

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Appendix A: Tributary Habitat Adaptive Management Plan

This appendix contains a general description of the tributary habitat adaptive management plan and individual adaptive management plans for populations addressed by each of the seven tributary habitat expert panels convened by the Action Agencies once every three years for the 2008/2010 FCRPS BiOp (Table 1). These adaptive management plans have been developed as one part of the strategy necessary to deliver on the 2018 RPA Action 35, Table 5 Habitat Quality Improvements (HQIs). The next section provides a general introduction to the individual adaptive management plans presented later in this appendix.

Table 1. Chinook Salmon and Steelhead Populations Associated with Expert Panel Evaluations and Adaptive Management Plans. RPA Action 35, Table 5 priority populations are denoted in bold typeface. Populations that include supplemental actions in their individual adaptive management plan are denoted with an asterisk.

Individual Adaptive Management Plan	Expert Panels	Chinook Salmon Populations	Steelhead populations
• Grande Ronde/Imnaha	• Upper Grande Ronde/Catherine Creek • Lower Grande Ronde-Wallowa-Imnaha	• **Catherine Creek *** • Lostine/Wallowa • **Upper Grande Ronde *** • Imnaha River	• Lower Grande Ronde • Upper Grande Ronde • Joseph Creek (OR) • Wallowa River • Imnaha River
• Upper Salmon	• Upper Salmon	• East Fork Salmon River • Lemhi River • Pahsimeroi River • Salmon River lower mainstem below Redfish Lake • Salmon River upper mainstem above Redfish Lake * • Valley Creek • **Yankee Fork ***	• East Fork Salmon River • Lemhi River • Pahsimeroi River • Salmon River upper mainstem
• Lower Salmon	• Lower Salmon	• Big Creek • Secesh River • South Fork Salmon River	• **Big Creek** • **Secesh River** • **South Fork Salmon River**
• Lower Snake	• Lower Snake	• **Tucannon River**	• Asotin Creek • Tucannon River
• Clearwater	• Clearwater	(extirpated)	• **Lochsa River *** • **Lolo Creek** • **Selway River** • **South Fork Clearwater River ***
• Upper Columbia	• Upper Columbia	• **Entiat River *** • **Methow River** • **Wenatchee River**	• **Entiat River** • **Methow River** • **Okanogan River** • **Wenatchee River**

General Tributary Habitat Adaptive Management Plans

The Action Agencies adaptive management plans are found in the tables of completed projects presented in CE Section 3, Attachment 2, Tables 1, 2, and 3 and the menu of 2012 to 2018 projects in Appendix A of the 2014-2018 Draft IP. All of the projects in these tables were evaluated by expert panels. After the 2012 panels were completed, the Action Agencies converted expert panel results to HQIs using the Habitat Collaboration Workgroup methodology (2007 Comprehensive Analysis, Appendix C, Attachment C1). Results indicated that 12 of 18 priority and 37 of 38 of the remaining Table 5 populations have either met or exceeded or are projected to meet or exceed the Table 5 HQIs by 2018 (CE Section 2, Table 35).

For reasons described below, the Action Agencies expect that all populations will be shown to meet or exceed the 2018 Table 5 HQIs when results from the 2015 expert panel evaluations are tallied. However, the Action Agencies enlisted assistance from tribal and watershed partners to compile a menu of supplemental actions (2014-2018 Draft IP, Appendix B) and demonstrate additional opportunities to meet or exceed RPA Action 35, Table 5 HQIs for those seven populations denoted in Table 1. Priority population supplemental actions were compiled by tribal partners and could be implemented through the Fish Accords. Supplemental actions were provided by the upper Salmon Watershed partners for the upper Salmon Chinook salmon population (2014-2018 Draft IP, Appendix B) and would be implemented through existing contracts. The Action Agencies applied an interim method (Appendix B) to estimate the HQIs for the supplemental actions (2014-2018 Draft IP, Appendix B). These projects will be included in the 2015 expert panel evaluations.

The 2008/2010 FCRPS BiOp requires the Action Agencies to report progress in the 2013 and 2016 CEs toward achieving population-specific tributary HQIs listed in RPA Action 35, Table 5. In this 2013 CE, the Action Agencies are reporting on HQIs for actions completed from 2007 and into 2012 and HQIs for prospective 2012 to 2018 actions. In 2016, the Action Agencies will update HQIs through 2015 based on completed 2012 to 2015 actions and HQIs through 2018 for the menu of 2015 to 2018 projects based on results of expert panel evaluations in 2015.

The HQIs reported in CE Section 2, Table 35 show that steady progress was made toward the RPA Action 35, Table 5 HQIs during the first five years of BiOp implementation. The Action Agencies are positioned to continue and improve on that progress through 2018 for reasons that are not obvious solely by reviewing the tables of limiting factors, actions, metrics, and HQIs reported in the 2013 CE and 2014-2018 Draft IP.

Achieved and projected results reported in CE Section 2, Table 35 and the projects and metrics depicted in CE Section 3, Attachment 2, Tables 1, 2, and 3 represent a gradual, methodical, and deliberate progression to planning and implementing tributary habitat improvement projects since this work became part of the FCRPS consultation in 2000. The objective of this progressive change in approach is to refine the way that habitat improvement projects are identified, developed, and implemented to address the most important factors limiting fish growth and survival in the areas that matter the most. Key changes that have been influenced by Action Agency involvement related to the FCRPS BiOp are introduced below.

Extensive regional collaboration conducted for the 2008 FCRPS BiOp, combined with other regional processes such as Subbasin Planning, Recovery Planning, and input from research and monitoring efforts, has changed how habitat actions are identified, prioritized, and selected for implementation.

The Action Agencies and watershed groups[1] (Table 2) developed and are using new tools and improving processes (discussed below) to better identify habitat improvement actions that address limiting factors related to egg-to-smolt life history stages; are designed to improve and provide benefits as a function of instream conditions and fluvial processes; and will contribute to reaching FCRPS BiOp RPA Action 35, Table 5 HQIs. As a result, habitat improvement strategies focus on identifying and implementing actions that address important limiting factors where they will benefit fish the most. Project sponsors are more likely to receive funding and technical assistance from the Action Agencies and other sources when the justification of project benefits in their project proposals are consistent with and feature results from these tools and processes. As local partners incorporate these features into their planning and implementation processes, the habitat improvement estimates for future projects are expected to translate to even greater benefits than those evaluated for completed projects by the 2007, 2009, and 2012 expert panels.

Table 2. Expert Panels and Web Links to More Information Associated with Watershed Groups in the Columbia River Basin.

Watershed Group	Expert Panel	Website for More Information
Grande Ronde Model Watershed	• Upper Grande Ronde/ Catherine Creek • Wallowa/Imnaha	*http://www.grmw.org/*
Upper Salmon Basin Watershed Project	• Upper Salmon	*http://modelwatershed.org/*
Clearwater Focus Group	• Lower Salmon	*https://pisces.bpa.gov/release/documents/documentviewer.aspx?pub=H00023412-1.pdf*
Southeast Washington Salmon Recovery Board	• Lower Snake	*http://snakeriverboard.org/wpi/*
Clearwater Focus Group	• Clearwater	*https://pisces.bpa.gov/release/documents/documentviewer.aspx?pub=H00023412-1.pdf*
Upper Columbia Salmon Recovery Board	• Upper Columbia	*http://www.ucsrb.com/*

Another reason that the Action Agencies are optimistic that by 2018 the RPA Action 35, Table 5 HQIs will be met or exceeded is that the latest 2012 expert panel estimates of future improvements are conservative and are likely to increase when evaluated by future expert panels. Although many of the

[1] *A watershed group is a formal or informal body that coordinates the planning, funding, implementation, monitoring, and reporting of habitat improvement projects in a particular geographic area. Watershed groups are often chartered by a State or tribe and work closely with professional staff from tribal, state, federal, and local government agencies; conservation organizations; private entities; and landowners.*

projects evaluated by the 2012 expert panels will proceed to implementation over the life of the BiOp, estimates of potential improvements are either not captured in CE Section 2, Table 35 or are extremely conservative[2]. As these projects become better defined, future expert panels can perform better-informed evaluations for reporting by the Action Agencies.

Improved Tools and Processes

To help watershed groups improve project identification and prioritization, the Action Agencies enhanced existing processes and developed planning tools and technical aids such as Tributary and Reach Assessments and Limiting Factor pie maps. Some of the Action Agencies main efforts to improve habitat project planning and implementation involve:

1. Tributary and Reach Assessments
2. Limiting Factor pie maps
3. RME Synthesis
4. Dedication of Action Agency technical specialists
5. Integrating expert panel and watershed planning processes

Tributary and Reach Assessments describe the dynamic geomorphic, hydraulic, and biological processes at watershed and reach scales, respectively, that influence the success of potential habitat improvement actions, present historical conditions and factors that limit biotic production, establish environmental baseline conditions for pre- and post-implementation physical and biological monitoring, and identify protection and treatment areas for prioritization of potential habitat improvement actions by local watershed planning groups, project sponsors, and other interested parties. Assessments are completed with the input and involvement of local scientists and various public participants. (See *http://www.usbr.gov/pn/fcrps/habitat/index.html* for examples of tributary and reach assessments completed by the Action Agencies in Washington, Oregon, and Idaho). The approach and methodology employed in tributary and reach assessments are consistent with findings and recommendations of the process-based habitat improvement strategy presented in Roni (2002), Roni (2005), Roni et al. (2008), Beechie et al. (2008) and Beechie et al. (2010). Assessments produced by the Action Agencies served as models for assessments prepared by private contractors for the YN and the Lower Snake River Salmon Recovery Board (Table 2).

Limiting Factor Pie Maps were developed by the Action Agencies in 2011 to visually represent data for expert panel workshops. All the data represented on the maps are developed or approved by expert panel members and recorded by the Action Agencies. The maps clearly and concisely illustrate the volumes of numeric data collected for fish population assessment units[3], limiting factors, and limiting factor habitat conditions. The source of the data depicted on the Limiting

[2] The Action Agency belief that 2012 Expert Panel estimates are conservative is based in the recognition that there remains a lot to learn about the affect of habitat improvement actions on the environment and on salmonids. As our understanding improves we will be better able to project and as well evaluate the benefits of our actions. Over time, our estimates may become less conservative. The current approach guards against overstatement of our accomplishments.

[3] Assessment units are geographic areas that share a common set of habitat limiting factors that affect the survival and conservation of steelhead and salmon populations.

Factor pie maps range from scientific reports and analyses, such as EDT (Ecosystem Diagnostic and Treatment) modeling, NOAA Fisheries' intrinsic potential analysis, research, and professional judgment of local biologist and other expert panel members. The maps were used in the 2012 expert panel workshops and helped the panels evaluate how habitat improvement projects would change habitat conditions to benefit salmon and steelhead.

The maps have been updated to reflect the outcomes of the 2012 expert panel workshops and are available to watershed groups as they plan, prioritize, and refine projects for future implementation. The maps can also be updated as new and relevant information becomes available. NPCC adopted the Limiting Factor pie maps among the tools they plan to introduce for all interior Columbia River watersheds (including those that currently have no FCRPS BiOp expert panels). The NPCC plans to incorporate these tools into future program reviews for sponsor consideration and use when preparing proposals. The NPCC will refer to the maps to support funding recommendations.

RME Synthesis. Several RME initiatives are supported by the Action Agencies through other FCRPS BiOp RPA Actions that can inform RPA Action 35. The Columbia Habitat Monitoring Program (CHaMP) began in 2011 and monitors status and trends of habitat conditions. The Integrated Status and Effectiveness Monitoring Program (ISEMP) monitors status and trends of fish characteristics. Intensively-Monitored Watersheds (IMWs) are designed to evaluate the effectiveness of habitat improvement treatments. A wide variety of models are in process that intend to link results from the various types and scales of RME to provide insight into the habitat treatments that will provide the greatest benefits to fish based on empirical data and statistically valid scientific relations. As results from these initiatives are produced, the Action Agencies and watershed partners will incorporate findings into the project planning, development, implementation and evaluation process. The Action Agencies are describing RME results through an evaluation of tributary habitat Benefits (BPA and Reclamation, 2013). The Tributary Habitat Benefits Report will support implementation planning, expert panel processes, and project development, prioritization, and implementation of tributary habitat improvement projects. RME results from 2007–2012 also are described in RPA Actions 56 and 57.

The Action Agencies Dedicated Technical Staff with the Educational and Professional Credentials and Experience[4] to participate in local interdisciplinary teams[5] and watershed planning processes. Action Agency staff is contributing to the project planning, prioritization, and selection discourse that precedes project implementation. These teams also evaluate whether projects continue to function as intended after projects are completed. These evaluations contribute to adaptive management employed by watershed planning groups, project sponsors, and the Action Agencies to correct deficiencies or make improvements intended to increase fish benefits for existing and future projects. Including key Action Agency staff in local watershed planning processes ensures that Action Agency resources are more focused on achieving FCRPS

[4] *Dedicated Action Agency staff disciplines include fish biology, geomorphology, geology, hydrology, environmental compliance and cultural resources, and hydraulic engineering and modeling.*

[5] *Interdisciplinary teams are groups of discipline specialists from the Action Agencies and watershed partners who evaluate scientific, social, budget, logistical, and other related information to develop habitat improvement projects that address the most important limiting factors where they will do the most good for fish to advise watershed groups and project sponsors.*

BiOp targets and that RME is being proactively focused to help planners and decision makers implement projects with the greatest biological benefits.

Integrating Watershed Planning, Prioritization, and Implementation with the FCRPS Biop Expert Panel Process. Tributary and Reach Assessments and Limiting Factor Pie Map tools are providing organized, objective, scientifically-based information to improve the ability to plan, prioritize, and implement habitat improvement actions that target significant life stages and limiting factors and are designed to provide sustained fish benefits while accounting for dynamic river processes. Assessments and pie maps produced by the Action Agencies fill knowledge gaps that existed prior to the 2008 FCRPS BiOp. Completed assessments and pie maps stage regional interests and the Action Agencies to implement habitat improvement actions that address the most important limiting factors. Including key Action Agency staff in local watershed planning processes ensures that Action Agency resources are more focused on achieving FCRPS BiOp targets and RME is being proactively focused to help planners and decisionmakers implement projects with the greatest biological benefits. These features continue to be incorporated into the continuous planning and implementation processes that existed in each watershed group prior to the FCRPS BiOp and facilitate the evaluation of completed and future projects when the expert panels convene once every three years.

The technical and personnel resources developed and directed to tributary habitat improvement projects by the Action Agencies for the FCRPS BiOp are unparalleled in the Pacific Northwest. These projects involve hundreds of people to coordinate planning, prioritization, implementation, monitoring, and evaluation of on-the-ground projects that benefit steelhead and salmon. Relationships developed among the Action Agencies and local, state, tribal, and other federal partners, and the resulting actions and progress, serve as a successful example of collaboration, cooperation, and accomplishment.

Progress, Achievements, Adaptive Management Strategies, and Supplemental Actions for Individual Adaptive Management Plans

The individual plans present additional detail including general progress related to 2009 and 2018 CE Section 2, Table 35 HQIs and noteworthy achievements in addition to the accomplishments presented in CE Section 3, Attachment 2, Tables 1, 2, and 3. A detailed description of each individual adaptive management plan follows the general progress and noteworthy achievements. Descriptions of supplemental actions for five Chinook salmon populations (including four priority populations) and two priority steelhead populations are included in the five respective individual adaptive management plans where they apply.

Individual Tributary Habitat Adaptive Management Plans

Snake River Steelhead and Spring/Summer Chinook Salmon

Grande Ronde and Imnaha River Populations

The Action Agencies will achieve 2018 HQIs for nine Grande Ronde and Imnaha river Chinook and steelhead populations (Table 1). The four Chinook populations are in the Grande Ronde/Imnaha MPG; the steelhead populations are classified into two MPGs; in the Grande Ronde River MPG and in the Imnaha River MPG (RPA Action 35, Table 5).

Progress

The 2009 Expert Panel

Results indicated that implementation of completed actions from 2007-2009 had achieved RPA Action 35, Table 5 2009 HQIs for three of the four populations that comprise the Grande Ronde/Imnaha Chinook MPG, and three of the four populations that comprise the Grande Ronde steelhead MPGs. HQIs for the Imnaha steelhead MPG were exceeded in 2009 (CE Section 2, Table 35).

The 2012 Expert Panel

Results indicate that implementation of completed actions from 2007 to 2011 achieved or exceeded at least 50 percent of the 2018 RPA Action 35, Table 5 HQIs for three of the four populations that comprise the Grande Ronde/Imnaha Chinook MPG, and all the steelhead populations that comprise the Grande Ronde and Imnaha steelhead MPGs (*ibid*). Progress achieved by 2011 represents less than half the duration of the 2008 FCRPS BiOp and demonstrates steady improvement since the BiOp started for all Grande Ronde/Imnaha populations.

Results also indicate that the menu of 2012 to 2018 projects evaluated by the 2012 expert panels is sufficient to meet or exceed RPA Action 35, Table 5 2018 HQIs for two of the four populations that comprise the Grande Ronde/Imnaha Chinook MPG, and for all the steelhead populations that comprise the Grande Ronde and Imnaha steelhead MPGs. The 2012 expert panel estimates demonstrate an increase in the level of improvement compared to the 2009 estimates for populations in all MPGs. With the Adaptive Management Strategy that includes supplemental actions for the upper Grande Ronde and Catherine Creek Chinook salmon populations described below, all Grande Ronde and Imnaha steelhead and Chinook populations will meet or exceed 2018 RPA Action 35, Table 5 HQIs.

Noteworthy Achievements

Since 1992, BPA has funded the GRMW Program to coordinate and plan habitat restoration projects in the Grande Ronde and Imnaha subbasins. Since 2007, Reclamation has funded a local liaison and provided technical assistance to local partners to plan and develop fish habitat improvement actions in the Grande Ronde and Imnaha subbasins.

In 2008, recognizing that the Grande Ronde Model Watershed played a key role in developing on-the ground habitat improvement projects in the Grande Ronde Basin, BPA doubled the amount of funding to the organization, specifically for implementation of priority BiOp projects. In the case of the Grande Ronde and elsewhere the Action Agencies guide funding toward entities capable of helping deliver on FCRPS BiOp objectives for tributary habitat[6]. In addition, the Lower River Tribe Fish Accord Agreement

[6] *Certainty of implementation does not rest on funding alone. However, the commitment of funds to entities with the administrative capacity to deliver on Action Agency objectives is a strategic approach to assuring some measure of "certainty." In this case, the Grande Ronde Model Watershed has the capacity to convene the social capital necessary to deliver on Action Agency commitments; deliver refined technical analyses to support project development; and improve the process by which projects are proposed and reviewed prior to being presented to Expert Panels for consideration. Entities like the Model Watershed are reviewed by the Action Agencies for the value-added products and services they deliver on an annual basis. Where the entities fall short of Action Agency expectations, the Action Agencies have adjusted administration of their contracts to ensure that funding continues to be directed to priority outcomes. Certainty of implementation relies in part on the local lead entity and their capacity to convene stakeholders and the fiscal and social capital necessary to deliver. In the absence of direct oversight and perfect knowledge, the Action Agencies strategic engagement in the review and administration of the lead entities work provides a valuation of "certainty."*

includes Action Agency funding and CTUIR commitments to improve habitat for Catherine Creek and upper Grande Ronde Chinook and steelhead.

The Catherine Creek tributary and reach assessments, in addition to other previous assessments, have established that water quality and water quantity are primary limiting factors for salmonids in the Grande Ronde Basin (Huntington 1994, Grande Ronde Model Watershed 1995, Duncan 1997, Gildemeister 1998, Reclamation 2012b, Reclamation 2012c). Where retaining specialized skills results in more effective action in efforts to improve conditions for salmonids, the Action Agencies have taken steps to ensure successful outcomes will result from the investment of time, money, or resources. Through the Columbia Basin Water Transaction Program, BPA funds the Freshwater Trust to broker deals that result in more water instream for fish. Results to date are shown in CE Section 3, Attachment 2, Table 1.

Action Agency staffs have been dedicated to working with partners in the Grande Ronde to increase capacity and quality of projects available for implementation. Reclamation assigned a team of professionals to organize and complete the Catherine Creek tributary and reach assessments and prepare the associated reports. Reclamation also assigned a team to develop a tributary assessment for the upper Grande Ronde that started in late 2012.

The Catherine Creek tributary and reach assessments produced information and data that will be used to better inform how to increase the habitat improvements associated with implemented projects. These assessments build on data collected through other processes, such as recovery or subbasin plans. These assessments characterize physical, geomorphic, hydrologic, and biological baseline conditions that are used by watershed partners to plan, prioritize, implement, and monitor habitat improvement actions that work in harmony with natural river processes to provide sustainable benefits to listed fish. Assessments incorporate the latest available scientific information and are consistent with the process-based habitat improvement strategy presented by Roni (2002), Roni (2005), Roni et al. (2008), Beechie et al. (2008), and Beechie et al. (2010). The Catherine Creek Tributary (*http://www.usbr.gov/pn/fcrps/habitat/index.html)* and Reach (*http://www.usbr.gov/pn/fcrps/habitat/projects/granderonde/reports/catherinecreek-ta/catherinera.pdf)* assessments are being used to engage and inform key landowners and public constituents, and they have been used to identify viable habitat actions that will be relied upon to increase the pace of project implementation and the quality of treatments.

In 2010, BPA staff worked with the GRMW to initiate a “Stepwise Process” with the objective of providing greater transparency to the project proposal and selection processes and to ensure that projects received adequate technical review and input early in the planning phase. The Stepwise Process includes technical team site visits of proposed actions prior to funding expensive design work. The site visits provide the opportunity for knowledgeable biologists and specialists to comment on issues that may affect the cost effectiveness, biological benefits, and/or sustainability of a proposed project. The Stepwise Process improved project review and alleviated delays associated with projects that are not ready for implementation. The Stepwise Process was intended to improve the process for ensuring biological benefits of implemented projects. The Stepwise Process is described in a web accessible document on the Grande Ronde Model Watershed Project web site at *http://www.grmw.org/funding/stepwise/.*

In 2010, the Action Agencies funded the Oregon Department of Fish and Wildlife (ODFW) to conduct fish tracking studies in Catherine Creek. Results from these studies clearly identified the reaches of Catherine Creek that are important for Chinook spawning and rearing. Identification of these reaches helped focus implementation of habitat improvement actions that were initiated in 2011. Two of those projects were completed in 2012 (CE Section 3, Attachment 2, Table 1).

As a corollary to the tributary and reach assessments and Stepwise Process, the Action Agencies have initiated an additional planning effort referred to as the Atlas Process. This process is described in more detail below in the Grande Ronde/Imnaha Adaptive Management Strategy.

The Action Agencies also support the CTUIR efforts to pursue habitat improvement and protection and flow augmentation projects under the Accord Agreement with the Tribe. Increased focus on the Catherine Creek and upper Grande Ronde watershed will be relied upon to approach 2018 Table 5 HQIs for these populations.

Grande Ronde/Imnaha Adaptive Management Plan for 2013-2018

The Action Agencies will continue to provide support and resources to improve and enhance the planning, prioritization, and implementation of habitat improvement projects in the Grande Ronde. Reclamation will continue to dedicate staff and financial resources to tributary and reach assessments and development of comprehensive reports for use by the Action Agencies and other local watershed groups. Building on the success of the Catherine Creek tributary and reach assessments begun in 2009, Reclamation has assigned a team to develop and prepare a tributary assessment for the upper Grande Ronde. The Catherine Creek and upper Grande Ronde assessments will continue to be used to engage and inform key landowners and public constituents, to identify a supply of viable habitat actions, and increase the pace and quality of project implementation.

Reclamation's tributary and reach assessments are contributing data to BPA's Atlas Process. The Atlas Process is being tested in the Grande Ronde Basin and will be used to develop a matrix of opportunities with specific project types identified at a much finer scale than those from the assessments. The Atlas Process will identify project opportunities to address high-priority limiting factors. BPA, in coordination with basin partners began working with the GRMW in 2012 to spearhead the Atlas Process and will continue to dedicate staff resources to ensure its application and use.

Accomplishments through 2011 and estimated improvements through 2018 reflect the latest step in efforts to enhance planning and implementation of habitat improvement projects among the Action Agencies and local, state, federal, and tribal partners in the Grande Ronde and Imnaha subbasins. In addition to the tributary and reach assessments described above (*http://www.usbr.gov/pn/fcrps/habitat/projects/index.html)*, the Action Agencies prepared limiting factor pie maps for the 2012 expert panel workshops to clearly and concisely summarize limiting factor importance, status, and potential. Updated maps that incorporate the latest values from the 2012 expert panel workshop will help the Action Agencies and Grande Ronde/Imnaha watershed partners focus financial and other resources on habitat improvement actions where they are needed the most and will most benefit fish.

Future progress will be further enhanced by coordination with Intensively Monitored Watershed (IMW) activities (*http://www.nwfsc.noaa.gov/research/divisions/cbd/mathbio/isemp/projects_watersheds.cfm*) and the Columbia Habitat Monitoring Program (*http://www.champmonitoring.org/*) actions that are occurring in the Columbia Basin watersheds. The CHaMP program was initiated in the upper Grande Ronde and other basins in 2011. The CHaMP project conducts monitoring in the upper Grande Ronde and Catherine Creek and has established a reference reach in the Minam drainage. Although the Grande Ronde and Catherine Creek are not included among the IMWs, intensive fish-in/fish-out monitoring for Chinook is being conducted. The monitoring effort includes sampling suites of habitat improvement actions to determine effectiveness and response of treatments relative to climate change and changes in temperature and sediment related to those actions. Over time, expansion of CHaMP monitoring

beyond the pilot phase could include the Imnaha among the monitoring sites. IMW and CHaMP results will, over time, also influence project identification, prioritization, and implementation.

IMW and CHAMP monitoring results are intended for incorporation into decision making, administrative processes, project prioritization, and project implementation. To "ensure" that happens, actions will vary based on the level of report or data development necessary to share result and "preliminary" conclusions. For example, in January 2013 during Reclamation's annual report on the program of work of the Columbia/Snake Salmon Recovery Office, monitoring results from the IMWs and elsewhere were presented. Representatives from the Action Agencies and the NOAA ScienceCenter were there to take advantage of those presentations.

Likewise, in March 2013, the Pacific Northwest Aquatic Monitoring Partnership convened a meeting to present the most recent results from IMWs. As data and results from IMWs, CHAMP, and ISEMP become available it is shared through professional channels. Whether and how working groups choose to incorporate information into project identification, prioritization, and implementation is up to individual discretion. The Action Agencies make every effort to deliver updated science findings to partners and stakeholders in order that updated science findings can be brought to bear on these processes.

Adoption and use of assessments and limiting factor pie maps, and coordination with results from IMWs and the CHaMP program in the upper Grande Ronde and other basins, demonstrate an adaptive management strategy to a reach-based approach to project planning, prioritization, and implementation. This approach builds on past experience by including recent science findings in the planning process. This approach is anticipated to enhance the competence of the planning process that aims to produce successful projects that work with the natural river processes, function properly when built, are sustainable, and help fish the most. This approach resulted in suites of projects that are focused on making fish habitat improvements where they are needed the most and is expected to continue to provide a steady stream of additional habitat improvement actions even beyond the life of the current FCRPS BiOp.

By employing the adaptive management plan described above, the Action Agencies and their state and tribal partners expect to reach 2018 HQIs for Catherine Creek and upper Grande Ronde Chinook, the only Grande Ronde/Imnaha populations that expert panel estimates indicate need adjustment to reach the 2018 Table 5 HQIs.

BPA will consider alternatives to develop habitat improvement actions with other entities or sponsors in the Grande Ronde Basin if the current implementation strategy is determined to be inadequate to achieve the 2018 HQIs.

NOAA Fisheries and the Interior Columbia Technical Recovery Team identified population size categories that relate to the capacity of the tributary habitat environment to support different numbers of spawning adults (*http://www.nwfsc.noaa.gov/trt/trt_documents/appendix_b_viability_3_15_2007.pdf*). There are one intermediate and three large populations in the Grande Ronde/Imnaha Chinook MPG; one basic, two intermediate, and one large population in the Grande Ronde steelhead MPG; and one intermediate population in the Imnaha steelhead MPG. These characteristics are elements of the project replacement strategy included in RPA Action 35 and developed between the Action Agencies and NOAA (2014-2018 Draft IP, Appendix D). When considering population size categories and the 2012 expert panel results, completed implementation from 2007 to 2011 and the menu of 2012 to 2018 projects evaluated by the 2012 expert panels are sufficient to achieve 2018 HQIs at the MPG level for all Grande Ronde/Imnaha MPGs.

Supplemental Actions for the Upper Grande Ronde Chinook Priority Population

Supplemental actions for upper Grande Ronde Chinook salmon are presented in the 2014-2018 Draft IP Appendix B. One of these supplemental actions contains the majority of the available upper Grande Ronde Chinook spawning and rearing habitat. Work started on this project several years ago, and there is still more to be completed. Because of the high inherent relative value of this project among all the other projects in the upper Grande Ronde, the expert panel declared in 2007 that completion of this project will meet or exceed the 2018 RPA Action 35, Table 5 HQI. For this reason, a HQI of 18 percent was attributed to the upper Grande Ronde Chinook supplemental actions (2014-2018 Draft IP Appendix B). The Action Agencies continue to support all upper Grande Ronde projects. The remainder of this section describes background that contributed to the identification of the upper Grande Ronde supplemental actions.

Action Agency habitat improvement projects in the upper Grande Ronde have addressed riparian condition and floodplain connectivity; instream habitat complexity; sediment loading and recruitment; water quality; and flow acquisition. A tributary assessment evaluating 33 miles of the upper Grande Ronde River is in progress (2013). This tributary assessment is focused on five priority areas:

- Hilgard Reach from RM 137.0 to 139.7
- Hampton, Longley Meadow, and Bird Track Springs reaches from RM 140.8 to 146.2
- Starkey Reach from RM 151.8 to 156.2

McCoy and Meadow creeks were initially identified as priority areas for assessment but ultimately were not included in the analysis because those tributaries have had a considerable amount of habitat improvement already completed and might shed more light on the benefit of those types of actions if existing sites were monitored with adaptive management in mind.

The mainstem of the Grande Ronde River is channelized between the city of La Grande and the confluence with Catherine Creek. Primary spawning and rearing habitat in the upper Grande Ronde River occurs upstream from La Grande.

Based on initial site visits for the tributary assessment, the potential to address various limiting factors through multiple habitat actions within most of the priority areas is high. Most of the priority areas exhibit one or more of the following conditions:

- Over widened wetted width
- Plane- bed channel form
- Lack of in-stream complexity
- Altered or removed riparian vegetation
- Disconnected off channel habitat

Among other benefits, the tributary assessment process is effective at convening the interest of local landowners and building that interest into an expanded knowledge base. With this, regional partners among the agencies and Tribes are able to galvanize interests toward project development. Whether this translates to acquisition of instream flows or site specific habitat improvement, the potential for any action is improved as a function of community engagement. Communication “early and often” that is facilitated by the tributary assessment process seems to contribute to significant ends insofar as habitat improvement actions are considered.

Habitat improvement projects evaluated by the expert panels and the menu of 2012 to 2018 projects evaluated by the 2012 expert panels are presented in 2014-2018 Draft IP Appendix A Tributary Habitat Projects table. Understanding that achieving the HQIs for the upper Grande Ronde will

demand effort beyond the projects evaluated by the 2012 expert panel, the Action Agencies worked with the CTUIR, a Fish Accord partner, to review projects the projects that the CTUIR submitted to the 2012 Expert Panel for evaluation to determine the potential for expanding the projects in areal extent (e.g., acres or miles), size or configuration, or modifying the projects to incorporate new features (e.g., logs vs. engineered log jams). Together the Action Agencies and the CTUIR developed a menu of supplemental actions that expanded project scope for projects reviewed by the expert panels and included land acquisition to facilitate implementation of long-term habitat improvement and changes in land management.[7] These supplemental efforts are presented in the 2014-2018 Draft IP Appendix B Tributary Habitat Projects table and complement the major upper Grande Ronde spawning and rearing habitat improvement project.

The CTUIR assembled a portfolio that prioritizes acquisition and/or the establishment of conservation easements to facilitate riparian improvement; floodplain reconnection and re-activation; improved instream channel complexity; flow acquisition; and changes in grazing management. Some of these actions will build from projects evaluated by the expert panels previously or will secure "anchor areas"[8] upon which future habitat improvement actions can be implemented. In addition to the acquisition portfolio, the CTUIR identified elements of projects evaluated by the expert panels that are expected to deliver habitat improvements beyond what was determined by the expert panels during the 2012 workshops. Specific actions that were expanded after the 2012 workshop include culvert replacement; revetment removal; floodplain and side channel re-activation; flow enhancement; and placement of structures to encourage sediment recruitment. Additionally, some of the proposed habitat improvement actions developed in conjunction with changes in grazing management, development of riparian exclosures, and development of off-channel watering structures are anticipated to deliver benefits beyond which were accounted during the 2012 expert panel workshops. These supplemental actions focus on increasing and improving juvenile rearing conditions throughout the upper Grande Ronde River (see 2014-2018 Draft IP Appendix B Tributary Habitat Supplemental Actions).

Projects evaluated by the 2012 expert panel and supplemental actions identified for implementation from 2012 to 2018 will be developed and implemented following the Grande Ronde/Imnaha adaptive management plan employed by the Action Agencies and regional partners. The Action Agencies will continue to work closely with Grande Ronde Model Watershed, CTUIR, Union Soil and Water Conservation District, and other responsible individuals and agencies to adjust the scale and scope of the projects already evaluated by the 2012 expert panel and the supplemental actions identified in the 2014-2018 Draft IP Appendix B Tributary Habitat Supplemental Actions table to ensure that the 2018 Table 5 HQIs are met.

In addition to implementation of habitat improvement actions, the Action Agencies will incorporte effectiveness monitoring results into the adaptive management approach. For example, results from the upper Grande Ronde IWM analysis will continue to be used to inform expert panel evaluations, and project development and implementation. Results might also guide changes in estimates of project benefits when the 2015 and 2018 expert panels revisit the projects evaluated by the 2012 expert panel.

[7] The Action Agencies understand that land acquisition sets the stage for habitat improvement actions that address limiting factors and are evaluated by the expert panels.

[8] Anchor areas" refer to parcels, which once acquired, serve as a point from which efforts can be expanded to adjacent parcels or as a point for site specific habitat improvement actions.

Supplemental Actions for the Catherine Creek Chinook Priority Population

Supplemental actions and associated HQIs for Catherine Creek Chinook salmon are presented in the 2014-2018 Draft IP (Appendix B). HQIs for these supplemental actions were estimated using the methodology described in Appendix B and Appendix B, Table B1. The remainder of this section describes background that contributed to the identification of the Catherine Creek Chinook salmon supplemental actions.

Habitat improvement projects in Catherine Creek have addressed riparian condition and floodplain connectivity; instream habitat complexity; sediment loading and recruitment; water quality; and flow acquisition. The extent to which these actions have and will contribute to the 2018 Table 5 HQIs for Catherine Creek Chinook necessitated consideration of supplemental actions to ensure this outcome.

The following technical analyses support the planning, development, and implementation of supplemental habitat improvement efforts in Catherine Creek. These studies provide the technical basis for developing habitat improvement projects in the future. The Catherine Creek Tributary Assessment (Reclamation 2012b) evaluated 55 miles of river and identified general geomorphic, geologic, hydraulic, and hydrologic conditions for three channel segments and seven geomorphic reaches. Additional detail was evaluated in a reach assessment of reaches 3 and 4 (December 2012), to identify habitat improvement potential and facilitate project identification and development (Reclamation 2012c). The reach assessments and rapid site assessments[9] and field visits listed below were completed to identify specific habitat improvement projects:

- CC 31 Rapid Site Assessment: completed March 2012
- CC 37 Rapid Site Assessment and site visits: project completed
- CC 44 Site Visits: multiple site visits, project development currently in progress
- LCH1 RSA: tributary to Catherine Creek in reach 2, currently in peer review.

The following description summarizes findings from the tributary and reach assessments, rapid site assessments, and site visits.

The Valley Floor Group segment exhibits these characteristics:

- Reach 1; River Mile (RM) 0.0 – 22.5 includes the Catherine Creek channel segment from the present-day confluence with Catherine Creek and the Grande Ronde downstream of State Ditch upstream to the historic confluence of Catherine Creek and the Grande Ronde River. The reach is very low gradient and serves as a migratory corridor for both adult steelhead and Chinook, as well as a overwintering for juvenile Chinook.
- Reach 2; RM 22.5 – 37.2 includes the Catherine Creek channel segment from the historic confluence of Catherine Creek to upstream of Pyles Creek. The reach is very low gradient and serves as a migratory corridor for both adult steelhead and Chinook, as well as overwintering for juvenile Chinook.

Human-caused habitat degradation in both Reaches 1 and 2 is the result of conversion of a multiple channel wetland complex to a single-thread channel with local channel straightening and conversion of

[9] *"Rapid site assessments" provide consistent, scientific information about a site based on visual field indicators that are used to determine the condition of a site. Rapid site estimates are developed to allow for cost-effective and efficient evaluation of a site. Rapid site assessments are usually conducted in conjunction with other more detailed assessments such as tributary or reach assessments.*

disconnected oxbows to irrigation storage. The construction of an extensive levee system artificially deepened the river channel where they occur and potentially widened the channel immediately downstream from the terminus of the levee. Riparian and bank vegetation has been altered throughout both reaches. These actions, combined with the rerouting of the Grande Ronde River (out of Reach 1) and regional changes to the hydraulic regime have resulted in an underfit stream, that acts like an incised stream in both reaches. There is little to no off-channel habitat for fish (Reclamation 2012b and 2012c). Interconnected ponds and wetland complexes have been drained and converted to agricultural use. High levels of nitrates and other nutrients from surface run off also contribute to degraded water quality.

Potential habitat improvement actions in these segments would improve off-channel habitat and floodplain complexity through levee setbacks and riparian planting. At least one levee set back project has been completed in Reach 1. Fish ladder and screening projects might also be considered to improve fish passage at irrigation diversions. Four in-stream passage improvement projects have been completed on the mainstem Catherine Creek within the valley floor group of Catherine Creek and tributaries. Low base flows and seasonal low flows could be improved in the upstream section of Reach 2 by actions implemented upstream.

The Reach 3 segment from RM 37.2 – 40.78 includes the channel segment of Catherine Creek that flows over the historic Catherine Creek alluvial fan. Gradients range from relatively low in the downstream end to moderate on the upstream end. The reach is a migration corridor for adult steel head and Chinook, with limited Chinook spawning downstream. The downstream end of the reach is also used by juvenile Chinook for overwinter rearing.

This reach has been straightened and channelized, and banks have been hardened with concrete walls and riprap. Levees have been constructed throughout much of the downstream end of the reach. These actions, combined with the regional changes to the hydraulic regime have resulted in an underfit stream that acts like an incised stream. There is little to no off-channel habitat (2012b and 2012c).

In the downstream end of the reach, potential habitat improvement actions would target improving floodplain function and off-channel habitat complexity through channel reactivation, wetland creation, and side-channels and alcove enhancement. Habitat improvements to the main channel could include increased complexity through the placement of in-stream structures. Both efforts would necessitate riparian vegetation enhancement and livestock exclusion. One project increased stream length and in-stream habitat complexity with the objective of maintaining or improving bedform diversity.

The upper end of the reach is limited in potential due to the natural channel configuration and the fact that the segment flows through the town of Union.

Low base flow and seasonal low flow may be improved throughout the reach by actions implemented upstream

The upper Valley Group Segment includes:

- Reach 4; RM 40.78 – 45.58, and includes the Catherine Creek channel segment upstream from the town of Union to where a natural constriction occurs. The reach has a moderate gradient with low to moderate sinuosity. In the bottom section of the reach, the channel location and planform is controlled in part by the structural geology (faulting) of the Catherine Creek Valley. The reach is used as a migratory corridor for both adult steelhead and Chinook. Some Chinook spawning takes place throughout the reach and overwintering by juvenile Chinook is assumed to occur.

Human-caused habitat degradation is the result of local channelization and systematic debris removal eliminating most large woody material from the channel. A few sections of levees and a section of highway that acts as a levee limit local floodplain interaction. There are some sections of riprap that slow natural lateral migration, but natural migration rates are believed to be low, particularly in the mid and downstream sections of the reach.

Reach 4 contains a high degree of potential for improvement of in-stream habitat complexity and bedform diversity, riparian function, and floodplain function and complexity.

Potential habitat improvement actions have been focused on removing levees and riprap and the installation of in-stream structure including large wood and engineered log jams (ELJs) to improve connection to side channels and the floodplain. Installing in-stream structure including large wood and ELJs will also improve in-stream diversity and complexity

Although low base flows and seasonal low flow was not observed to be an issue in this reach, water conservation efforts in this reach will have positive effects in the reaches downstream. Actions to improve water efficiencies in this reach could include the consolidation and piping of multiple diversion points and delivery systems. By eliminating the need for 'annual in-stream maintenance practices' required for the current 'push-up' diversions, destruction/disturbance of existing habitat may be reduced.

- Reach 5; RM 45.8 – 50.11, and includes the Catherine Creek channel segment that is confined by a historic landslide up to the confluence with little Catherine Creek. Within the reach, the channel reach is predominantly confined with a moderate gradient and low sinuosity. Fish use is presumed to be migratory corridor for both adult steelhead and Chinook. Localized areas with limited floodplain and existing or potential side channel exist. Chinook spawning was observed to occur near the Catherine Creek State park. Overwinter rearing use is unknown.

  The potential to implement large- scale habitat improvement projects in this reach is low due to the overall confined and bedrock-controlled nature of the reach. No large-scale improvement projects to address in-stream complexity and bedform diversity or riparian function are identified at this time. There is some potential to improve or create localized floodplain and side channel habitat.

  Although low base flow and seasonal low flow was not observed to be an issue in this reach, water conservation would have positive effects in the reaches downstream.

- Reach 6; RM 50.11 – 52.0, and includes the 'Hall Ranch Research Station'. The channel segment within the reach is unconfined with a low to moderate gradient and moderate sinuosity. Channel processes and riparian vegetation Reach 6 are in relatively good condition. The reach is used as a migration corridor for steelhead and Chinook and for Chinook spawning. Overwinter rearing has not been confirmed.

  The potential to implement large- scale habitat improvement projects is low due to the already existing habitat and functioning processes and vegetation as well as the land being owned by Oregon State University (OSU) and operated as a research station. No large-scale habitat improvement projects to address in-stream complexity and bedform diversity or riparian function are identified at this time. One extensive in-stream complexity project installing large wood, riparian vegetation, and stream meandering has been completed on a tributary through the OSU property.

Low base flow and seasonal low flow was not observed to be an issue in this reach, and no surface water diversions were observed. Water conservation in this reach will have positive effects in the reaches downstream.

- Reach 7; 52.0 – 54.9 and includes the channel segment from the top of Hall Ranch Research Station upstream to the confluence with the North and South Forks of Catherine Creek. The channel segment within the reach has a relatively steep gradient and low sinuosity. The reach is presumed to be a migration corridor for steelhead and Chinook with Chinook spawning observed. Overwinter rearing has not been confirmed.

  The potential to implement large- scale habitat improvement projects in this reach is low due to the confined nature and steep gradient. No large-scale habitat improvement projects to address in-stream complexity and bedform diversity or riparian function are identified at this time.

Chinook spawning generally occurs upstream from the town of Union, in Reaches 4, 5, 6, and 7. Limited spawning has been reported downstream from the town of Union. Juvenile overwinter rearing is the primary limiting factor listed for Chinook. Rearing is important in the lower section of Reach 3 and throughout the upper portions of Reach 2.

The technical background in the assessments provides the basis for identifying supplemental habitat improvement projects in addition to those evaluated by the 2012 expert panel. The science informing the tributary and reach assessments provides an objective point of reference to guide project identification and development. In Catherine Creek these additional projects will focus on increasing and improving juvenile rearing conditions throughout Catherine Creek (2014-2018 Draft IP Appendix B Tributary Habitat Supplemental Actions).

In addition to providing an objective basis for identifying projects, the tributary and reach assessment process is effective at convening the interest of landowners in these areas. Building from that interest and an expanded knowledge base, regional partners among the agencies and Tribes are able to galvanize interests toward project development. Whether this translates to acquisition of instream flows or site specific habitat improvement, the potential for any action is expanded as a function of community engagement. Communication “early and often” seems to contribute to significant ends insofar as habitat improvement actions are considered.

Habitat improvement projects evaluated by the expert panels and the menu of 2012 to 2018 projects evaluated by the 2012 expert panels are presented in the 2014-2018 Draft IP Appendix A Tributary Habitat Projects table. Understanding that achieving the HQIs for Catherine Creek will demand effort beyond the projects evaluated by the 2012 expert panel, the Action Agencies worked with the CTUIR, a Fish Accord partner, to review projects the projects that the CTUIR submitted to the 2012 Expert Panel for evaluation to determine the potential for expanding the projects in aerial extent (e.g., acres or miles), size or configuration, or modifying the projects to incorporate new features (e.g., logs vs. engineered log jams). Together the Action Agencies and the CTUIR developed a list of supplemental actions that will achieve a significant portion of Table 5 HQIs for Catherine Creek Chinook by 1) expanding project scope for projects reviewed by the expert panels; 2) relating metric benefits for the expanded projects to those for projects evaluated by the 2012 expert panel; and 3) including land acquisition to facilitate implementation of long-term habitat improvement and changes in land management. These supplemental efforts are presented in the 2014-2018 Draft IP Appendix B Tributary Habitat Supplemental Actions table and are intended to “shore up” expectations for delivery of HQIs by 2018 and beyond. In addition, the Action Agencies have adopted a strategy for achieving the complete HQI for Catherine Creek by 2018.

The CTUIR assembled a portfolio that prioritizes acquisition and/or the establishment of conservation easements to facilitate riparian improvement; floodplain reconnection and re-activation; improved instream channel complexity; flow acquisition; and changes in grazing management. Some of these actions will build from projects evaluated by the expert panels previously or will secure "anchor areas" upon which future habitat improvement actions can be implemented.

In addition to the acquisition portfolio, the CTUIR identified elements of projects evaluated by the expert panels that are expected to deliver habitat improvements beyond what was determined by the expert panels during the 2012 workshops. Specific actions that were expanded after the 2012 workshop include culvert replacement; revetment removal; floodplain and side channel re-activation; flow enhancement; and placement of structures to encourage sediment recruitment. Additionally, some of the proposed habitat improvement actions developed in conjunction with changes in grazing management, development of riparian exclosures, and development of off-channel watering structures are anticipated to deliver benefits beyond which were accounted during the 2012 expert panel workshops.

Projects evaluated by the 2012 expert panel and supplemental actions identified for implementation from 2012 to 2018 will be developed and implemented following the Grande Ronde/Imnaha adaptive management plan employed by the Action Agencies and regional partners. The Action Agencies will continue to work closely with GRMW, CTUIR, Union Soil and Water Conservation District, and other responsible individuals and agencies to adjust the scale and scope of the projects already evaluated by the 2012 expert panel and the supplemental actions identified in the 2014-2018 Draft IP Appendix B Tributary Habitat Supplemental Actions table to ensure that the 2018 Table 5 HQIs are met.

In addition to implementation of habitat improvement actions, the Action Agencies will incorporate, effectiveness monitoring results into the adaptive management approach. For example, results from the upper Grande Ronde IMW analysis will continue to be used to inform expert panel evaluations, and project development and implementation. Results might also guide changes in estimates of project benefits when the 2015 and 2018 expert panels revisit the projects evaluated by the 2012 expert panel.

Habitat Quality Improvement

The Action Agencies and their partners fully expect to meet the 2018 Table 5 HQIs for Catherine Creek Chinook by 2018 through a combination of projects evaluated by the expert panels from 2007 to 2018, a menu of supplemental actions, and expansions of projects described below. HQIs for the supplemental actions (Draft 2014-2018 Draft IP, Appendix B) were estimated by the Action Agencies. The Action Agencies tallied the metrics associated with the menu of supplemental actions and compared them to the cumulative 2007 to 2018 metrics that were evaluated by the expert panels.[10] The comparison indicated that the estimated HQI for metrics associated with the supplemental actions, when included with the HQI for 2007 to 2018 projects evaluated by the expert panels, are not enough to meet the 2018 Table 5 HQIs. This conclusion is expected to change for the better when the Catherine Creek expert panel evaluates projects in 2015 and takes into account expansions of projects that are occurring. For example, some of the projects being developed from those evaluated by the 2012 expert panel have already increased significantly in scope. This expansion is a good example of how on-the-ground relationships lead to expanded project opportunities. As a result of satisfaction of landowners with completion of the CC-37 project in Catherine Creek, more landowners have stepped

[10] *(CE Section 3, Attachment 2, Table 1 and 2014-2018 Draft IP, Appendix A)*

forward to expand the scope of the project to cover a number of additional miles of habitat. In cases like these, benefits associated with projects that expanded in scope after evaluation by the 2012 expert panel will increase with evaluation by the 2015 expert panel.

Another source of supplemental actions is expected to come into play by 2014 from the Catherine Creek Atlas process. The Catherine Creek Atlas process follows a similar process implemented in the Entiat subbasin. Tributary and reach assessments completed in the Entiat River Subbasin served as the basis for Project Map Books that were produced for the Stormy and Gray reaches of the Entiat (Reclamation 2013b, 2013c). The Project Map Books identify geomorphically appropriate opportunities that maximize benefits of habitat actions. The Project Map Books identify treatment types and locations as well as expected outcomes and benefits of implementation. The Project MapBooks become the basis for identifying, prioritizing, and developing actions for implementation and will be used by locally-led organizations and regional technical teams to accomplish this objective.

The Catherine Creek Atlas process is following a parallel course. In 2012, Reclamation finalized tributary (Reclamation 2012b) and reach (Reclamation 2012c) assessments for Catherine Creek as described earlier. The tributary and reach assessments were used to assemble the menu of supplemental actions (2014-18 Draft IP, Appendix B) and will guide habitat improvement actions throughout Catherine Creek based on site specific assessment of current conditions. The Action Agencies are working with local partners through the Catherine Creek Atlas process to deliver a product at the same level of detail as the Entiat Project Map Books that will include a menu of additional habitat improvement opportunities to the ones in Appendix B of the 2014-2018 Draft IP.

The Gray and Stormy Reach Project Map Books and the Catherine Creek Atlas serve as concrete examples of how the adaptive management processes continue to move forward and build improved understanding of system attributes into products that can be used for project planning, development, and implementation.

HQIs for projects evaluated by the expert panels, supplemental actions identified in Appendix B of the 2014-2018 Draft IP, expansions of existing projects, and supplemental actions that develop from the Catherine Creek Atlas process will be evaluated by the 2015 expert panel.[11] Results from 2015 expert panel evaluations of these projects are expected to exceed the 2018 RPA Action 35, Table 5 HQIs.

The Action Agencies will continue to use the latest information available to develop habitat improvement projects to meet or exceed the 2018 RPA Action 35 Table 5 HQI for Catherine Creek Chinook, but as a backstop the Action Agencies acknowledge survival improvements from the Lookingglass Creek Hatchery. Reforms at the Lookingglass Hatchery represent a 12 percent life-cycle survival improvement and demonstrate a completed Action Agency project which provides benefits in the tributary habitat life-history stage comparable to those obtained from tributary habitat improvement projects (CE, Appendix C).

Snake River Steelhead and Spring/Summer Chinook Salmon

Upper Salmon River Populations

The Action Agencies consider the upper Salmon River to include the East Fork Salmon River, Lemhi River, Pahsimeroi River, Salmon River lower mainstem, and Salmon River upper mainstem Chinook

[11] The Action Agencies have not estimated HQIs for the additional supplemental actions that will arise from the Catherine Creek Atlas process.

and steelhead populations. The Action Agencies are to achieve 2018 HQIs for seven Chinook and four steelhead upper Salmon River populations (Table 1). The Chinook populations are included in the upper Salmon River MPG. Steelhead populations are included as part of the larger Salmon River MPG, which also includes three lower Salmon River steelhead populations (RPA Action 35, Table 5).

Progress

The 2009 Expert Panel

Results indicate that implementation of actions from 2007 to 2009 was sufficient to achieve or exceed RPA Action 34, Table 5 2009 HQIs for five of the seven populations that comprise the upper Salmon River Chinook MPG, and two of the four steelhead populations in the same geographic area as the upper Salmon River Chinook MPG that comprise the Salmon River steelhead MPG (CE Section 2, Table 35). Achievements for these seven populations by 2009 also met or exceeded the RPA Action 35, Table 5 HQIs for 2018.

The 2012 Expert Panel

Results indicate that implementation of completed actions from 2007 to 2011 achieved or exceeded 50 percent of the 2018 Table 5 HQIs for five of the seven populations that comprise the upper Salmon River Chinook MPG, and all four steelhead populations that comprise the Salmon River steelhead MPG in the upper Salmon River area (*ibid*). Results from the 2012 expert panel demonstrate steady improvement from results for 2009 for populations in both MPGs. Progress achieved by 2011 represents less than half the duration of the 2008 FCRPS BiOp and demonstrates improvement since the BiOp started for all upper Salmon River populations, except for the Yankee Fork Chinook population which is described below.

Results also indicate that the menu of 2012 to 2018 projects evaluated by the 2012 expert panels is sufficient to meet or exceed RPA Action 35, Table 5 2018 HQIs for five of the seven populations that comprise the upper Salmon River Chinook MPG, and all steelhead populations in the upper Salmon River Chinook MPG that comprise the Salmon River steelhead MPG in the upper Salmon River area (*ibid*). Results from the 2012 expert panel demonstrate further improvement from results for 2009 for populations in both MPGs. With the Adaptive Management Plan that includes supplemental actions for the upper Salmon River mainstem above Redfish Lake and Yankee Fork Chinook salmon populations described below, all upper Salmon River steelhead and Chinook populations will meet or exceed 2018 RPA Action 35, Table 5 HQIs.

Noteworthy Achievements

BPA has funded the upper Salmon Basin Watershed Project (USBWP) since 1992. The USBWP included the Custer Soil and Water Conservation District (SWCD) until 2006 when BPA began to fund them under a separate project to coordinate and plan habitat improvement projects in the upper Salmon River. Since 2001, Reclamation has funded two local liaisons and provided technical assistance to local partners to plan and develop fish habitat improvement actions in upper Salmon River subbasins.

Beginning in 2008, BPA more than doubled the USBWP and Custer SWCD annual planning budget to expand implementation of habitat improvement actions needed to achieve the 2008 FCRPS BiOp upper Salmon River population habitat improvements. In addition, the Shoshone-Bannock Tribe and Idaho State Fish Accord Agreements include Action Agency funding and state and tribal commitments to improve habitat for upper Salmon River populations.

Water quantity and quality are primary limiting factors for fish in the upper Salmon River basin due to past and current land management practices. BPA is funding the Idaho Department of Water

Resources (IDWR) to identify and negotiate water transactions in the upper Salmon River. Results to date are shown in CE Section 3, Attachment 2, Table 1.

Accomplishments through 2011 and estimated progress through 2018 reflects current efforts to enhance the approach for planning and implementing habitat improvement projects among the Action Agencies and local, state, federal, and tribal partners in the upper Salmon River area. This change was significantly influenced with publication of the first in a series of tributary and reach assessments by the Action Agencies in 2012 (*http://www.usbr.gov/pn/fcrps/habitat/index.html*). The assessments characterize physical, geomorphic, hydrologic, and biological baseline conditions that are now used by watershed partners to plan, prioritize, implement, and monitor habitat improvement actions that work with natural river processes to provide sustainable benefits to listed fish.

Assessments incorporate the latest available scientific information and are consistent with the process-based habitat improvement strategy presented by Roni (2002), Roni (2005), Roni et al. (2008), Beechie et al. (2008), and Beechie et al. (2010). Additional assessments are being planned for completion before 2018.

Limiting factor pie maps prepared by the Action Agencies for the 2012 expert panel workshops summarize limiting factor importance, status, and potential. Updated maps that incorporate the latest values from the 2012 expert panel workshop will help the Action Agencies and upper Salmon River watershed partners focus financial and other resources on habitat improvement actions where they are needed and will most benefit fish.

This transition is further enhanced by coordination with IMW sampling and analysis efforts (*http://www.nwfsc.noaa.gov/research/divisions/cbd/mathbio/isemp/projects_watersheds.cfm*) and the CHaMP actions (*http://www.champmonitoring.org/*) that are occurring in the Lemhi River subbasin. IMWs are being implemented in accordance with FCRPS BiOp tributary habitat RPA Actions 56 and 57. IMWs aim to develop quantifiable relations between individual elements in the chain of events that include 1) implementation of habitat action(s); 2) change in habitat condition resulting from the habitat action; and 3) the change in biological response of fish to the change in habitat condition.

The CHaMP program was initiated in the Lemhi River in 2011 and involves systematic collection of habitat condition variables which are used to monitor changes in habitat condition over time. The data are also used to develop relations between habitat actions and habitat changes and between habitat changes and biological changes in fish abundance, productivity, distribution, and diversity. Better understanding of treatment affects and consequent effects on salmon based from IMW and CHaMP results is expected to influence project identification, prioritization, and implementation.

Adoption and use of assessments and limiting factor pie maps, and coordination with results from IMWs and the CHaMP program in the upper Salmon River demonstrate an adaptive management strategy to transition from implementation of opportunistic, site-specific habitat improvement projects to a reach-based approach to project planning, prioritization, and implementation. This approach builds on past experience by including recent science findings in the planning process. This approach is anticipated to enhance the competence of the planning process that aims to produce successful projects that work with the natural river processes, function properly when built, are sustainable, and help fish the most. This approach resulted in suites of projects that are focused on making fish habitat improvements where they are needed the most and is expected to continue to provide a steady stream of additional habitat improvement actions even beyond the life of the current FCRPS BiOp.

Upper Salmon River Adaptive Management Plan for 2013 to 2018

The Action Agencies will continue to support state and tribal watershed partners for implementing habitat improvement actions for all RPA Action 35, Table 5 upper Salmon River populations and

maintain the progress accomplished for these populations. The Action Agencies are meeting with members and staff of the Idaho Office of Species Conservation, USBWP, Shoshone-Bannock Tribes Fish Accord partners, Custer SWCD, IDFG, IDWR, and other state and federal agencies in the upper Salmon River to refine a mutual plan to reach remaining RPA Action 35, Table 5 commitments by 2018. Strategy meetings will begin in early 2013 to refine the list of habitat improvement projects evaluated at the 2012 expert panel workshops to focus financial and other resources on achieving the RPA Action 35, Table 5 commitments by 2018.

The Action Agencies and partners are using available tributary and reach assessments, current limiting factor pie maps, and lists of habitat improvement actions assembled and evaluated by the expert panels for implementation from 2013-18. The groups are pursuing an aggressive strategy to refine the location, scope, and timeframe for proposing and implementing the set of actions that will reach the RPA Action 35, Table 5 HQIs by 2018 for all upper Salmon River steelhead and salmon populations, but particularly for the Chinook populations in the Yankee Fork and Salmon River upper mainstem above Redfish Lake. The Action Agencies and partners fully expect to reach 2018 HQIs for the two remaining upper Salmon River populations that have not yet reached their 2018 Table 5 HQIs by implementing the Adaptive Management Plan described earlier in this section. NOAA Fisheries and the ICTRT identified population size categories that relate to the capacity of the tributary habitat environment to support different numbers of spawning adults (*http://www.nwfsc.noaa.gov/trt/trt_documents/appendix_b_viability_3_15_2007.pdf*). There are two Basic, three Large, and two Very Large populations in the upper Salmon River Chinook MPG and one Basic and three Intermediate populations in the upper Salmon River part of the Salmon River steelhead MPG. These characteristics are elements of the project replacement strategy included in RPA Action 35 and developed between the Action Agencies and NOAA (2014-2018 Draft IP, Appendix D). When considering population size categories and the 2012 expert panel results, completed implementation from 2007 to 2011 and the menu of 2012 to 2018 projects evaluated by the 2012 expert panels are sufficient to achieve 2018 HQIs at the MPG level for both MPGs.

Supplemental Actions for the Upper Salmon River above Redfish Lake Chinook Population

The upper Salmon River above Redfish Lake Chinook population is not a Table 5 priority population. However, a habitat improvement project in Pole Creek, a tributary to the upper Salmon River, doubled in scope since evaluation by the 2012 expert panel. The Action Agencies and regional partners expect that the benefits derived from this expanded project, along with the other projects identified, but evaluated with very conservative metrics at the time by the 2012 expert panel for this population, will contribute to meet or exceed the 2018 Table 5 HQI when more information is available for evaluation by the 2015 panel.

Supplemental Actions for the Yankee Fork Chinook Priority Population

Supplemental actions and associated HQI estimates for Yankee Fork Chinook salmon are presented in the 2014-2018 Draft IP Appendix B. HQIs for these supplemental actions were estimated using the methodology described in CE Appendix B and CE Appendix B, Table B2. The remainder of this section describes background that contributed to the identification of the Yankee Fork Chinook salmon supplemental actions.

Habitat improvement projects in the Yankee Fork are implemented by the Action Agencies and their partners with attention to channel geomorphology and the dynamics and potential of the river system to ensure that projects will deliver effective and sustainable benefits for anadromous fish. The following technical analyses summarize habitat characteristics that support the planning, development, and implementation of habitat improvement efforts in the Yankee Fork:

The Yankee Fork of the Salmon River Tributary Assessment (TA), Upper Salmon Subbasin, Custer County, Idaho (Reclamation 2012e) was completed for 16.5 river miles (RM) of the Yankee Fork of the Salmon River (Yankee Fork), and 4 RM of Jordan Creek (*http://www.usbr.gov/pn/fcrps/habitat/projects/uppersalmon/yankeeforkproject/index.html*). The TA delineated six valley segments along the Yankee Fork, and two valley segments along Jordan Creek.

The Middle Yankee Fork was not impacted by historic dredge-mining and exhibits these characteristics:

- Reach YF-6 from RM 16.5 (Eightmile Creek) to RM 13.3 (Fivemile Creek) is an unconfined, straight-to-meandering channel. Chinook salmon and steelhead use this reach for migration, spawning, and rearing.
- Reach YF-5 from RM 13.3 to RM 11.7 (aka "Canyon Section") is a confined, bedrock channel. Chinook salmon, steelhead and other fish species use this reach predominantly as migratory corridor.
- Reach YF-4 from RM 11.7 to RM 9.1 (Jordan Creek) is a moderately confined, straight channel. Chinook salmon and steelhead use this reach for migration, spawning, and rearing.

The lower Yankee Fork subwatershed was impacted by historic dredge-mining and exhibits these characteristics:

- Reach YF-3 (aka Bonanza Area Reach) from RM 9.1 to RM 6.8 (West Fork of the Yankee Fork) is an anthropogenically confined, straight channel. Chinook salmon use this reach for migration, spawning, and rearing, and steelhead use this reach for migration and rearing.
- Reach YF-2 (aka Pole Flat Area Reach) from RM 6.8 to RM 3 (Polecamp Creek) is an anthropogenically confined, straight channel. Chinook salmon and steelhead use this reach for migration, spawning, and rearing.
- Reach YF-1 from RM 3 to RM 0 (confluence with Salmon River) is a confined, bedrock channel. Chinook salmon and steelhead and other fish species use this reach predominantly as a migratory corridor.

The Jordan Creek Subwatershed was partially impacted by historic mining and exhibits these characteristics:

- Reach JC-2 from RM 4 to RM 1.4 is a moderately confined channel. Steelhead use this reach for spawning and rearing. There is very limited Chinook salmon rearing habitat in this reach.
- Reach JC-1 from RM 1.4 to RM 0 (Jordan Creek and Yankee Fork confluence) is a moderately confined to unconfined channel. Chinook salmon and steelhead use this reach for rearing.

The lower Yankee Fork subwatershed emerged as some of the best potential habitat to improve for anadromous fish. Historically, these reaches were utilized by anadromous fish and today are well below their potential to produce fish. Currently, they are characterized by (1) habitat fragmentation and loss of connectivity, and (2) loss of habitat quantity and quality. This limits the ability of habitats to fully sustain populations of salmonids. The remainder of the Yankee Fork has not been significantly impacted by anthropogenic disturbances and the habitats remain for the most part relatively intact.

Reach-scale assessments evaluated three reaches to identify habitat improvement potential and facilitate project identification and development.

- *Bonanza Area Reach Assessment, Yankee Fork of the Salmon River, Upper Salmon Subbasin, Custer County, Idaho* (Reclamation, 2012f): completed September 2012: covered 2.3 RM along the Yankee Fork and 0.8 RM along the lower West Fork.
- *Pole Flat Area Baseline Condition Assessment, Yankee Fork of the Salmon River, Upper Salmon Subbasin, Custer County, Idaho (*Reclamation, 2012g): completed October 2012: covered 3.8 RM along the Yankee Fork.

These already completed studies provide a technical base for a steady supply of habitat improvement

projects.

Habitat potential is especially high for Chinook salmon in the Bonanza Area Reach. Limiting and causal factors for this reach are (1) habitat fragmentation and connectivity due to dredge tailings artificially constraining the stream and disconnecting historic floodplains, and (2) habitat quantity and quality that have artificially confined the channel, removed the vegetation, and disconnected off-channel habitat. Historically (pre-European settlement), the Yankee Fork flowed through an alluvial valley with a valley gradient of about 1.1 percent. There were two channel reaches in this 2.3-mile section, (1) a moderately confined channel between Jordan Creek and Preachers Cove and (2) an unconfined channel between Preachers Cove and the West Fork. Under existing conditions, the Yankee Fork is anthropogenically confined along most its length by dredge tailings. Channel confinement, and loss of or isolation of floodplain patches have changed the geometry of the channel/floodplain cross-sectional area which has resulted in increases in flow depth, flow velocities, and shear stress during high water events.

The long-term rehabilitation objectives are to improve habitat-forming processes within the two historically distinctive channel reaches, RM 9.1 to 7.6 and RM 7.6 to 6.8 by implementing the following habitat actions:

- Reconnecting the dynamic channel-floodplain interactions that once occurred in Yankee Fork and West Fork confluence area will increase gravel retention, nutrient cycling, and availability of more diverse habitats.
- Increasing dynamic channel-floodplain interactions by increasing the average floodplain patch size and connecting isolated floodplain patches will reduce and add variability to flow velocities and reduce shear stress, and improve nutrient cycling and sediment retention.
- Improving riparian vegetation conditions will (1) increase channel boundary and floodplain roughness, (2) provide shading and cover and (3) improve nutrient cycling.

Habitat potential is also high for Chinook salmon in the Pole Flat Area Reach. Limiting and causal factors for this reach are (1) habitat fragmentation and connectivity due to dredge tailings artificially constraining the stream and disconnecting historic floodplains, and (2) habitat quantity and quality due to dredge mining activities that have confined the channel, removed the vegetation, and disconnected off-channel habitat. Historically, the Yankee Fork was a moderately confined, straight channel with a plane-bed and a low rate of lateral channel migration. Under existing conditions, the channel remains moderately confined with a similar plane-form and bed-form. The primary difference between the historic and existing conditions is related to disconnected tributaries and channel/floodplain interactions. In the fall 2012, Cearly Creek was reconnected to the Yankee Fork as part of Pond Series Three adaptive management actions. Silver Creek, and Jerry's Creek, as well as other small, unnamed tributaries are disconnected from the mainstem Yankee Fork by dredge tailings. Channel confinement has increased by about 25 percent resulting in a similar loss in available floodplain area, and associated increases in instream velocities and shear stresses during high-water events. Dredge tailing mounds encroach on the channel causing flow constrictions in multiple locations. Dredge tailing mounds block access to floodplain patches and form topographic highs that fragment the floodplain patches.

The long-term objectives along the mainstem Yankee Fork are to improve habitat-forming processes, and the potential modifications needed to achieve those conditions include, but are not limited to the following:

- Increasing dynamic channel-floodplain interactions by increasing the average floodplain patch size and connectivity to reduce and add variability to flow velocities, and improve nutrient cycling and sediment retention.
- Improving riparian vegetation conditions to (1) increase channel boundary and floodplain

roughness, (2) provide shading and fish cover, and (3) improve nutrient cycling.

- Reconnecting tributaries directly to the Yankee Fork, where possible, to increase sediment inputs and nutrients, and availability of additional habitats. Further analysis is necessary to evaluate potential alternatives, objectives, and their limitations.

Habitat improvement projects evaluated by the expert panels and the menu of 2012 to 2018 projects evaluated by the 2012 expert panels are presented in the 2014-2018 Draft IP Appendix A Tributary Habitat Projects table. The Action Agencies, the Shoshone-Bannock Tribe Fish Accord partner, and other State and local partners identified additional projects from available assessments to supplement the projects evaluated by the 2012 expert panel. The technical background provided in the assessments is the basis for identifying supplemental habitat improvement projects in addition to those evaluated by the 2012 expert panel. The science informing the tributary and reach assessments provides an objective point of reference to guide project identification and development. These additional projects focus on increasing and improving juvenile rearing conditions in the Yankee Fork and are also presented in the 2014-2018 Draft IP Appendix B Tributary Habitat Supplemental Actions table.

Projects evaluated by the 2012 expert panel and supplemental actions identified for implementation from 2012 to 2018 will be developed and implemented following the upper Salmon River adaptive management plan employed by the Action Agencies and regional partners and described earlier in this section. The Action Agencies will continue to work closely with the Idaho Office of Species Conservation, Custer County, Shoshone-Bannock Tribes, Upper Salmon Basin Watershed Project, Idaho Department of Fish and Game, U.S. Forest Service, Yankee Fork Interdisciplinary Team, and other responsible individuals and agencies to adjust the scale and scope of the projects already evaluated by the 2012 expert panel and the supplemental actions identified in the 2014-2018 Draft IP Appendix B Tributary Habitat Supplemental Actions table to ensure that the 2018 Table 5 HQIs are met or exceeded.

Snake River Steelhead and Spring/Summer Chinook Salmon

Lower (South and Middle Fork) Salmon River Populations

The Action Agencies consider the lower Salmon River populations to include Chinook and steelhead populations that inhabit the South and Middle Fork Salmon rivers. The Action Agencies are to achieve 2018 HQIs for three Chinook and three steelhead lower Salmon River populations (Table 1). The Chinook populations are part of two MPGs – the Middle Fork Salmon River MPG and the South Fork Salmon River MPG (RPA Action 35, Table 5). The steelhead populations are included as part of the larger Salmon River MPG, which also includes four upper Salmon River populations.

Progress

The 2009 Expert Panel

Results indicate that implementation of completed actions from 2007-2009 were sufficient to meet or exceed the RPA Action 35, Table 5 2009 HQIs for two of the three Chinook populations and one of the three steelhead populations in the lower Salmon River. The 2018 HQIs for those same three populations were also estimated to have been met.

The 2012 Expert Panel

Results indicate that implementation has already met or exceeded the 2018 HQIs for two Chinook and one steelhead population in the lower Salmon River (CE Section 2, Table 35). Expert panel results indicated that HQIs for all lower Salmon River populations will be met or exceeded by 2018 (*ibid*).

Noteworthy Achievements

In 2007, BPA began funding a project to improve habitat for Chinook and steelhead populations in the East Fork of the South Fork Salmon River. In late 2009, after review by the ISRP, the project's geographic scope was broadened and funding significantly expanded to allow contracts that would improve habitat for the entire South Fork Salmon River watershed (including the Middle Fork Salmon River), specifically for Big Creek, Secesh River, and South Fork Salmon River populations. Through this expanded project, BPA can now execute contracts to replace fish passage barrier culverts, reconnect floodplains, re-vegetate riparian areas, increase instream habitat complexity, and decommission roads to provide biological benefits for the lower Salmon River populations.

Lower Salmon River Adaptive Management Plan for 2013 to 2018

After the 2012 expert panel workshops, the Action Agencies determined that the resources in place to implement habitat actions in the lower Salmon River were adequate to ensure the 2018 HQIs, but that greater gains could be achieved through improved focus and prioritization of actions. The Action Agencies have initiated discussions with the project sponsors to ensure that the actions proposed for implementation are consistent with the prioritized limiting factors and assessment units identified through the 2012 expert panel process, and that funding commitments are commensurate with the associated improvements. The Action Agencies will review actions prior to executing implementation contracts to ensure they are aligned with FCRPS BiOp priorities. The Action Agencies may consider alternative implementation mechanisms with other entities or sponsors in the lower Salmon River if the current implementation plan is inadequate to achieve the 2018 HQIs.

Estimated progress through 2018 reflects recent steps to enhance the approach to plan and implement habitat improvement projects among the Action Agencies and local partners. This change was influenced by the limiting factor pie maps prepared by the Action Agencies for the 2012 expert panel workshops that clearly and concisely summarize limiting factor importance, status, and potential. Updated maps, which incorporate the latest values from the 2012 expert panel workshop, will help the Action Agencies and lower Salmon River watershed partners focus financial and other resources on habitat improvement actions where they are needed the most will do the most good for fish.

This transition will be further enhanced by coordination with IMW activities (*http://www.nwfsc.noaa.gov/research/divisions/cbd/mathbio/isemp/projects_watersheds.cfm*) and the CHaMP activities (*http://www.champmonitoring.org/*). IMWs are being implemented in accordance with FCRPS BiOp tributary habitat RPA Actions 56 and 57. IMWs aim to develop quantifiable relations between individual elements in the chain of events that include: 1) implementation of habitat action(s); 2) change in habitat condition resulting from the habitat action; and 3) the change in biological response of fish to the change in habitat condition.

The CHaMP program was initiated in 2011 and involves systematic collection of habitat condition variables which are used to monitor changes in habitat condition over time. The data are also used to develop relations between habitat actions and habitat changes and between habitat changes and biological changes in fish abundance, productivity, distribution, and diversity. Better understanding of treatment affects and consequent effects on salmon based from IMW and CHaMP results is expected to influence project identification, prioritization, and implementation.

Adoption and use of assessments and limiting factor pie maps, and coordination with results from IMWs and the CHaMP program, demonstrate an adaptive management strategy to transition from implementation of opportunistic, site-specific habitat improvement projects to a reach-based approach to project planning, prioritization, and implementation. This approach builds on past experience by including recent science findings in the planning process. This approach is anticipated to enhance the competence of the planning process that aims to produce successful projects that work with the

natural river processes, function properly when built, are sustainable, and help fish the most. This approach resulted in suites of projects that are focused on making fish habitat improvements where they are needed the most and is expected to continue to provide a steady stream of additional habitat improvement actions even beyond the life of the current FCRPS BiOp.

Of the three RPA Action 35 Table 5 lower Salmon River Chinook populations, one is classified as Intermediate and two are classified as Large Population Size category by NOAA Fisheries and the ICTRT. Population size categories of the lower Salmon River steelhead populations in RPA Action 35, Table 5 include one Basic and two Intermediate. These characteristics are elements of the project replacement strategy included in RPA Action 35 and developed between the Action Agencies and NOAA (2014-2018 Draft IP , Appendix D). Given the estimated 2018 improvements from populations within the Middle Fork and South Fork Salmon River MPGs for Chinook and upper Salmon River MPG for steelhead, as well as population size categories within those MPGs, the Action Agencies will reach the 2018 habitat improvements at the population and MPG level.

Snake River Steelhead and Spring/Summer Chinook Salmon

Lower Snake River Populations

The Asotin and Tucannon populations comprise the lower Snake River Chinook and steelhead MPGs. The Asotin Chinook population is extirpated and not included in RPA Action 35, Table 5. The Action Agencies are to achieve HQIs by 2018 for Tucannon River Chinook and Tucannon and Asotin steelhead populations in the lower Snake River MPGs (Table 1 and RPA Action 35, Table 5).

Progress

The 2009 Expert Panel

Results indicated that the 2009 HQIss for Tucannon and Asotin steelhead had been met or exceeded and were on track to exceed the 2018 improvements (CE Section 2, Table 35). The expert panel results also indicated that 2012 progress would achieve less than 50 percent of the improvements for Tucannon Chinook. These results prompted the Action Agencies to increase the level of support for projects in the Tucannon and served as the springboard to initiate the Tucannon Programmatic Habitat Project described below.

The 2012 Expert Panel

Results indicate that progress for projects completed through 2011 was greater than 50 percent of the 2018 HQIs and projected implementation will meet or exceed the 2018 HQIs for all lower Snake River Chinook and steelhead populations (*ibid*).

Noteworthy Achievements

The Tucannon River suffers from historic or legacy land uses and river management. Historic tillage, logging, and grazing, combined with channel straightening and diking, have degraded the spawning and rearing habitat of Chinook and steelhead. Although substantial improvements have been made over the past two decades, damaged riverine ecosystem function and processes due to historic channel and floodplain manipulations have not been reversed. This is largely due to the magnitude of work needed to reverse these damaged systems and a lack of organized and committed resources to do so.

Since the mid-1990s, BPA has funded local county conservation districts to implement habitat improvement projects in the Asotin and Tucannon basins. Reclamation does not work in the lower Snake River geographic area.

Beginning in 1994, BPA funded habitat improvement projects through the Tucannon Model Watershed. In 1998, the Washington State Governor's Salmon Recovery Office funded restoration projects in the Tucannon Watershed with Pacific Coastal Salmon Recovery Funds (PCSRF) based on guidance from the local watershed groups. This program transitioned into the Salmon Recovery Funding Board program in 1999 and has funded dozens of salmon recovery projects in the Tucannon Watershed since that time. In 1999, the U.S. Department of Agriculture (USDA) initiated the Conservation Reserve and Enhancement Program that has resulted in approximately 33 miles (1,785 acres) of riparian buffers along the Tucannon River and tributaries. The WDOE has funded six irrigation efficiency projects resulting in 10 cfs protected in the Washington Water Trust. Through a combination of funding and voluntary efforts, tillage practices have changed from conventional tillage to direct seed, reducing significant amounts of fine sediment that were historically delivered to the Tucannon River.

Since 2007, the Action Agencies more than doubled annual planning budgets to implement habitat improvements in the Tucannon Basin. The Lower River Tribe Accord Agreement secured funding and CTUIR commitments to improve habitat for Tucannon Chinook and steelhead. BPA has generally maintained the level of funding available to support habitat improvement projects in the Asotin subbasin.

In 2011, after receiving scientific review through the ISRP, BPA began funding the new Tucannon River Programmatic Habitat Project with the Snake River Salmon Recovery Board (SRSRB) as project sponsor. The project goal is to improve habitat function and channel processes in the priority reaches of the Tucannon River. This programmatic project is designed to resolve the legacy institutional constraints and substantively improve the Tucannon River ecosystem by applying a combination of process-based principals for improving river ecosystems (Beechie et. al., 2010) with actions such as adding significant quantities of large wood. The project includes several specific reach-scale actions that will significantly improve habitat, as well as a process for identifying and selecting future habitat actions for implementation. The individual reach-scale projects have been identified by the Regional Technical Team and approved by the SRSRB. Future habitat work under this project will go through a proposal process similar to the SRSRB process for Salmon Recovery Funding Board funding, with selection criteria that prioritize projects which address limiting factors outlined for the Tucannon River in the 2008 FCRPS BiOp. This programmatic project and the CTUIR habitat project under the Accord Agreement are the Action Agencies' primary mechanisms for expanding the pace, scale, and quality of habitat improvement projects in the Tucannon.

Lower Snake River Adaptive Management Plan for 2013 to 2018

After the 2012 expert panel workshops, the Action Agencies determined that the resources in place to implement habitat actions in the lower Snake River are adequate to ensure that the 2018 HQIs are achieved. The Action Agencies will continue the current strategy of implementing projects through the programmatic approach described above. The SRSRB, Accord partner CTUIR, USFS, Washington Department of Fish and Wildlife (WDFW) and the local SWCDs are using tributary and reach assessments and other updated scientific information to identify limiting factors, develop and prioritize habitat improvement actions, and select projects for implementation. The technical review of projects and input from the Regional Technical Team prior to implementation provides an additional level of scrutiny to ensure a high likelihood of project success. The Action Agencies will continue to work closely with the SRSRB to ensure that FCRPS BiOp priorities are achieved by 2018.

Estimated progress through 2018 reflects an adaptive management plan that builds on and enhances the ability of local partners to identify and implement high-quality habitat improvement projects. The limiting factor pie maps prepared by the Action Agencies for the 2012 expert panel workshops have clearly and concisely summarized limiting factor importance, status, and potential and helped the

Action Agencies better articulate the FCRPS BiOp priorities. Updated maps that incorporate the latest values from the 2012 expert panel workshop will continue to help the Action Agencies and lower Snake River watershed partners focus financial and human resources on habitat improvement actions where they are needed the most and will do the most good for fish.

The Adaptive Management Plan is further enhanced by coordination with IMW activities (*http://www.nwfsc.noaa.gov/research/divisions/cbd/mathbio/isemp/projects_watersheds.cfm*) and the CHaMP activities (*http://www.champmonitoring.org/*). IMWs are being implemented in accordance with FCRPS BiOp tributary habitat RPA Actions 56 and 57. IMWs aim to develop quantifiable relations between individual elements in the chain of events that include: 1) implementation of habitat action(s); 2) change in habitat condition resulting from the habitat action; and 3) the change in biological response of fish to the change in habitat condition.

The CHaMP program was initiated in 2011 and involves systematic collection of habitat condition variables which are used to monitor changes in habitat condition over time. The data are also used to develop relations between habitat actions and habitat changes and between habitat changes and biological changes in fish abundance, productivity, distribution, and diversity. Better understanding of treatment affects and consequent effects on salmon based from IMW and CHaMP results is expected to influence project identification, prioritization, and implementation.

Adoption and use of assessments and limiting factor pie maps, and coordination with results from IMWs and the CHaMP program demonstrate an adaptive management strategy to transition from implementation of opportunistic, site-specific habitat improvement projects to a reach-based approach to project planning, prioritization, and implementation. This approach builds on past experience by including recent science findings in the planning process. This approach is anticipated to enhance the competence of the planning process that aims to produce successful projects that work with the natural river processes, function properly when built, are sustainable, and help fish the most. This approach resulted in suites of projects that are focused on making fish habitat improvements where they are needed the most and is expected to continue to provide a steady stream of additional habitat improvement actions even beyond the life of the current FCRPS BiOp.

The Tucannon River Chinook and steelhead populations are classified as an intermediate size by NOAA Fisheries and the ICTRT. The extirpated Asotin River Chinook is classified as a Basic size population. These characteristics are elements of the project replacement strategy included in RPA Action 35 and developed between the Action Agencies and NOAA (2014-2018 Draft IP, Appendix D). Based on the 2012 expert panel estimates, the Action Agencies will achieve or exceed the 2018 improvements for Tucannon River Chinook and steelhead and Asotin River steelhead at the population and MPG scales.

Snake River Steelhead and Spring/Summer Chinook Salmon

Clearwater River Populations

The Action Agencies are to achieve 2018 HQIs for the four Clearwater River MPG steelhead populations that are identified as B-run: the Lochsa River, Lolo Creek, Selway River, and South Fork Clearwater populations (Table 1). The FCRPS BiOp does not require HQIs for the lower Clearwater steelhead population, which is identified as A-run. The North Fork Clearwater population is extirpated and is not a subject of RPA Action 35. Chinook are extirpated from the Clearwater River.

Progress

The 2009 Expert Panel

Results indicated that 2009 HQIs had not been achieved for any of the Clearwater River populations identified in RPA Action 35, Table 5 (CE Section 2, Table 35). The results also indicated that by 2012, half of those populations would achieve at least 50 percent of the 2018 habitat improvements. Based on these results, BPA increased funding for habitat improvement projects in Lolo Creek and initiated new projects to implement habitat improvement projects in the Selway River and the American and Crooked river watersheds of the South Fork Clearwater River. The new and expanded projects are being implemented as part of a partnership that includes cost-sharing agreements between the Nez Perce Tribe and Nez Perce National Forest.

The 2012 Expert Panel

Results indicated that one Clearwater River steelhead populations achieved 50 percent of the 2018 HQIs by 2011 (*ibid*). The results also indicate that 2018 HQIs would be achieved or exceeded for the Selway and Lolo river populations and almost achieved for the South Fork Clearwater River population. With the Adaptive Management Plan that includes supplemental actions for the Lochsa and South Fork Clearwater River steelhead populations described below, all Clearwater River steelhead populations will meet or exceed 2018 RPA 35, Table 5 HQIs.

Noteworthy Achievements

Since the 1990s, BPA has supported projects to improve habitat quality in the Clearwater River subbasin. Reclamation does not work in the Clearwater River geographic area. The Nez Perce Tribe is a project sponsor for a majority of the Action Agency funded projects in this basin, with many of those projects occurring on federally managed USFS lands. Since the release of the 2008/2010 FCRPS BiOp, the Action Agencies significantly increased funding and expanded the local infrastructure and capacity to support projects that would ensure the 2018 HQIs for all four B-run populations of the Clearwater River MPG would be achieved. These projects have been fully ramped up and the Action Agencies continue to work with the Nez Perce Tribe and USFS to focus implementation and ensure that the 2018 HQIs are achieved.

Clearwater River Adaptive Management Plan for 2013-2018

After the 2012 expert panel workshops, the Action Agencies determined that the resources in place to implement habitat actions for the Clearwater River populations were adequate to ensure that the 2018 HQIs were achieved, but that greater gains could be achieved through improved focus and prioritization of actions. The Action Agencies have initiated discussions with the project sponsors to ensure that the actions proposed for implementation will address the prioritized limiting factors and assessment units identified through the 2012 expert panel process and that funding commitments are commensurate with the associated improvements. The Action Agencies will review actions prior to executing implementation contracts to ensure they are aligned with FCRPS BiOp priorities. The Action Agencies are contemplating conducting focused monitoring activities for Clearwater River B-run steelhead populations to improve the biological information available for future funding decisions. The Action Agencies may also consider alternative implementation mechanisms with other entities or sponsors in the Clearwater River basin if the current implementation plan is determined to be inadequate to achieve the 2018 HQIs.

The estimated progress through 2018 reflects the need for an evolving adaptive management plan that improves the current knowledge of fish use and habitat status for the Clearwater River B-run steelhead populations. The limiting factor pie maps prepared by the Action Agencies for the 2012 expert panel workshops reflect the current understanding of limiting factor importance, status, and potential, and they helped the Action Agencies better articulate the FCRPS BiOp priorities. Updated maps that incorporate the latest values from the 2012 expert panel workshop will continue to help the

Action Agencies and partners in the Clearwater River basin focus financial and human resources on habitat improvement actions where they are needed the most and will do the most good for fish.

The Adaptive Management Plan is further enhanced by coordination with IMW activities (*http://www.nwfsc.noaa.gov/research/divisions/cbd/mathbio/isemp/projects_watersheds.cfm*) and the CHaMP activities (*http://www.champmonitoring.org/*). IMWs are being implemented in accordance with FCRPS BiOp tributary habitat RPA Actions 56 and 57. IMWs aim to develop quantifiable relations between individual elements in the chain of events that include: 1) implementation of habitat action(s); 2) change in habitat condition resulting from the habitat action; and 3) the change in biological response of fish to the change in habitat condition.

The CHaMP program was initiated in 2011 and involves systematic collection of habitat condition variables which are used to monitor changes in habitat condition over time. The data are also used to develop relations between habitat actions and habitat changes and between habitat changes and biological changes in fish abundance, productivity, distribution, and diversity. Better understanding of treatment affects and consequent effects on salmon based from IMW and CHaMP results is expected to influence project identification, prioritization, and implementation.

Adoption and use of assessments and limiting factor pie maps, and coordination with results from IMWs and the CHaMP program demonstrate an adaptive management strategy to transition from implementation of opportunistic, site-specific habitat improvement projects to a reach-based approach to project planning, prioritization, and implementation. This approach builds on past experience by including recent science findings in the planning process. This approach is anticipated to enhance the competence of the planning process that aims to produce successful projects that work with the natural river processes, function properly when built, are sustainable, and help fish the most. This approach resulted in suites of projects that are focused on making fish habitat improvements where they are needed the most and is expected to continue to provide a steady stream of additional habitat improvement actions even beyond the life of the current FCRPS BiOp.

NOAA Fisheries and the ICTRT identified “population size categories” that relate to the capacity of the tributary habitat environment to support different numbers of spawning adults (*http://www.nwfsc.noaa.gov/trt/trt_documents/appendix_b_viability_3_15_2007.pdf*). One B-run Clearwater River steelhead population is classified as Basic size and the other three B-run populations are classified as Intermediate size. The two other Clearwater River populations are classified as Large, but one is extirpated and the other is A-run, and neither of them are identified in RPA Action 35, Table 5. These characteristics are elements of the project replacement strategy included in RPA Action 35 and developed between the Action Agencies and NOAA (2014-2018 Draft IP, Appendix D). Given these population size categories, and the Clearwater Adaptive Management Plan described in this section, the Action Agencies fully expect to achieve or exceed the 2018 improvements for two populations of Clearwater River B-run steelhead and for all populations at the DPS scale.

Supplemental Actions for the Lochsa Steelhead Priority Population

Supplemental actions and associated HQI estimates for Lochsa River steelhead are presented in the 2014-2018 Draft IP Appendix B). HQIs for these supplemental actions were estimated using the methodology described in Appendix B and Appendix B, Table B3. The remainder of this section describes background that contributed to the identification of the Lochsa River steelhead supplemental actions.

Among the factors limiting steelhead in the Lochsa are reduced stream complexity, impaired water quality, and restricted access to quality spawning and rearing habitat (Roper et al., 2013). These systems were altered by past management actions which, if reversed, or corrected could improve riparian condition, reduce sediment loading, and increase habitat access for fish. The 2012 expert

panels evaluated habitat actions for their potential to address these, among other, priority limiting factors necessary to meet HQIs for Snake River Basin steelhead.

Habitat improvement actions are currently being implemented in the highest priority areas of the Lochsa watershed to address the critical limiting factors to steelhead productivity, abundance, distribution, and migration. The habitat improvement actions that were reviewed by the expert panels were prioritized for implementation based on the limiting factors with the highest weights in the corresponding assessment units of these watersheds. It is expected that as a function of these actions, habitat quality will improve and ultimately meet or exceed the HQIs in Table 5 of the 2008 FCRPS BiOp.

In addition to the actions reviewed by the expert panels during the 2012 workshops (2014-2018 Draft IP Appendix A Tributary Habitat Projects table), the Nez Perce Tribe identified additional projects that are being proposed through the Northwest Power and Conservation Council's (NPCC) categorical review process to address critical limiting factors (2014-2018 Draft IP Appendix B Tributary Habitat Supplemental Actions table). Based on existing habitat assessments developed by the Nez Perce Tribe and the U.S. Forest Service (USFS), the Tribe assembled additional actions for implementation. Funding decisions made pursuant to NPCC recommendations for the categorical review provide some measure of certainty insofar as project funding and implementation prior to 2018 is concerned. It is anticipated that these supplemental actions in addition to the projects reviewed by the 2012 expert panels will deliver HQIs that meet or exceed the Table 5 estimates for Snake River steelhead.

Supplemental Actions for the South Fork Clearwater Steelhead Priority Population

Supplemental actions and associated HQI estimates for South Fork Clearwater River steelhead are presented in the 2014-2018 Draft IP Appendix B). HQIs for these supplemental actions were estimated using the methodology described in Appendix B and Appendix B, Table B4. The remainder of this section describes background that contributed to the identification of the South Fork Clearwater River steelhead supplemental actions.

Among the factors limiting steelhead in the Clearwater and South Fork Clearwater are reduced stream complexity, degraded riparian condition, impaired floodplain function, access to quality spawning and rearing habitat, and impaired water quality. These systems were altered by past management actions which, if reversed, or corrected could improve riparian condition, reduce sediment loading, and increase habitat access for fish. The 2012 expert panels evaluated habitat actions for their potential to address these, among other, priority limiting factors necessary to meet HQIs for Snake River basin steelhead.

Habitat improvement actions are currently being implemented in the highest priority areas of the Clearwater and South Fork Clearwater watersheds to address the critical limiting factors to steelhead productivity, abundance, distribution, and migration. The habitat improvement actions that were reviewed by the expert panels were prioritized for implementation based on the limiting factors with the highest weights in the corresponding assessment units of these watersheds. It is expected that as a function of these actions, habitat quality will improve and ultimately meet or exceed the HQIs in Table 5 of the 2008 FCRPS BiOp.

In addition to the actions reviewed by the expert panels during the 2012 workshops (2014-2018 Draft IP Appendix A Tributary Habitat Projects table), the Nez Perce Tribe identified additional projects that are being proposed through the Northwest Power and Conservation Council's (NPCC) categorical review process to address critical limiting factors (2014-2018 Draft IP Appendix B Tributary Habitat Supplemental Actions table). Based on existing habitat assessments developed by the Nez Perce Tribe and the U.S. Forest Service (USFS), the Tribe assembled additional actions for implementation.

Funding decisions made pursuant to NPCC recommendations for the categorical review provide some measure of certainty insofar as project funding and implementation prior to 2018 is concerned. It is anticipated that these supplemental actions in addition to the projects reviewed by the 2012 expert panels will deliver HQIs that meet or exceed the Table 5 estimates for Snake River steelhead. Specific projects have been proposed for the lower South Fork Clearwater, Crooked and American River, and Newsome Creek watersheds.

Upper Columbia River Steelhead and Spring Chinook Salmon

Upper Columbia River Populations

The Action Agencies are to achieve 2018 HQIs for three upper Columbia River spring Chinook populations within one MPG and four upper Columbia River steelhead populations within one MPG (Table 1 and RPA Action 35, Table 5).

Progress

The 2009 Expert Panel

Results indicate that actions completed from 2007 to 2009 were sufficient to achieve RPA Action 35, Table 5 2009 HQIs for one of the three populations that comprise the upper Columbia River (Below Chief Joseph Dam) Chinook MPG, and two of the four steelhead populations that comprise the upper Columbia River (Below Chief Joseph Dam) steelhead MPG (CE Section 2, Table 35).

The 2012 Expert Panel

Results indicate that implementation of completed actions from 2007 to 2011 achieved or exceeded 50 percent of the 2018 Table 5 HQIs for none of the three populations that comprise the upper Columbia River (Below Chief Joseph Dam) Chinook MPG, and three of four steelhead populations that comprise the upper Columbia River (Below Chief Joseph Dam) steelhead MPG (*ibid*). Results from the 2012 expert panel demonstrate continued improvement from results for 2009 for populations in both MPGs. Progress achieved by 2011 represents less than half the duration of the 2008 FCRPS BiOp and demonstrates increased improvements since the BiOp started for all upper Columbia River populations.

Results also indicate that the menu of 2012 to 2018 projects evaluated by the 2012 expert panel is sufficient to meet or exceed RPA Action 35, Table 5 2018 HQIs for two of the three populations that comprise the upper Columbia River (Below Chief Joseph Dam) Chinook MPG, and all steelhead populations that comprise the upper Columbia River (Below Chief Joseph Dam) steelhead MPG. With the Adaptive Management Plan that includes supplemental actions for the Entiat Chinook salmon population described below, all upper Columbia River steelhead and Chinook populations are expected to meet or exceed 2018 RPA Action 35, Table 5 HQIs.

Noteworthy Achievements

BPA has funded the upper Columbia River basin counties, watershed action teams, planning units, and tribes since the 1990s to coordinate and plan habitat restoration projects in the Wenatchee, Entiat, Methow, and Okanogan subbasins. These funding arrangements were merged into a programmatic contract arrangement with the Upper Columbia Salmon Recovery Board (UCSRB) in 2011 and Fish Accord Agreements with the YN and Confederated Tribes of the Colville Reservation (CTCR) in 2008. Since 2001, Reclamation has funded two local liaisons and provided technical assistance to local partners to plan and develop fish habitat improvement actions in the Wenatchee, Entiat, and Methow subbasins.

Beginning in 2008, BPA more than doubled the funding available to expand implementation of habitat improvement actions needed to achieve the 2008 FCRPS BiOp upper Columbia River population habitat improvements.

Water quantity and quality are primary limiting factors for fish in the upper Columbia River basin due to past and current management practices (Arterburn et al., 2013). BPA is funding Qualified Local Entities (QLE) to identify and negotiate water transactions in the upper Columbia River. The QLEs have current discussions with water right holders that could put water instream as soon as 2011. Other pilot partnerships are also being pursued. Results to date are shown in CE Section 3, Attachment 2, Table 1.

Accomplishment through 2011 and estimated progress through 2018 also reflects the latest step in a progressive change to enhance the approach to plan and implement habitat improvement projects among the Action Agencies and their local, state, federal, and tribal partners in the upper Columbia River area. This change was significantly influenced with publication of the first in a series of several Tributary and Reach Assessments by the Action Agencies in 2008 (*http://www.usbr.gov/pn/fcrps/habitat/index.html*). Assessments characterize physical, geomorphic, hydrologic, and biological baseline conditions that are used by watershed partners to plan, prioritize, implement, and monitor habitat improvement actions that work in harmony with natural river processes to provide sustainable benefits to listed fish.

Assessments incorporate the latest available scientific information and are consistent with the process-based habitat improvement strategy presented by Roni (2002), Roni (2005), Roni et al. (2008), Beechie et al. (2008), and Beechie et al. (2010). Assessments produced by the YN through their Fish Accord agreement for other parts of the upper Columbia River area supplement the assessments prepared by the Action Agencies and serve as a means for project identification, prioritization, and implementation in these other parts of the upper Columbia River area. Additional assessments are planned for completion before 2018.

Limiting factor pie maps prepared by the Action Agencies for the 2012 expert panel workshops clearly and concisely summarizes limiting factor importance, status, and potential. Updated maps that incorporate the latest values from the 2012 expert panel workshop will help the Action Agencies and upper Columbia River watershed partners focus financial and other resources on habitat improvement actions where they are needed the most and will do the most good for fish.

These efforts are further enhanced by coordination with IMW activities (*http://www.nwfsc.noaa.gov/research/divisions/cbd/mathbio/isemp/projects_watersheds.cfm*) and the CHaMP activities (*http://www.champmonitoring.org/*) efforts that are occurring in selected reaches. IMWs are being implemented in accordance with FCRPS BiOp tributary habitat RPA Actions 56 and 57. IMWs aim to develop quantifiable relations between individual elements in the chain of events that include: 1) implementation of habitat action(s); 2) change in habitat condition resulting from the habitat action; and 3) the change in biological response of fish to the change in habitat condition.

The IMW in the Methow River has shown that non-target fish species (i.e., mountain whitefish and sculpin) dominate prey consumption in the main channel, resulting in potentially high competition for available food. In contrast, side channels had a larger portion of energy flowing toward Chinook salmon and steelhead. Carrying capacity estimates for both the main channel and side channels indicate that greater anadromous salmonid populations could be sustained in these habitats. A USGS study in Beaver Creek determined that the adult steelhead colonization leveled off during the first five years of the study, suggesting that some other factor(s) may be limiting reestablishment of the population.

The CHaMP program was initiated in 2011 and involves systematic collection of habitat condition variables which are used to monitor changes in habitat condition over time. The data are also used to develop relations between habitat actions and habitat changes and between habitat changes and biological changes in fish abundance, productivity, distribution, and diversity. Better understanding of treatment affects and consequent effects on salmon based from IMW and CHaMP results is expected to influence project identification, prioritization, and implementation.

Adoption and use of assessments and limiting factor pie maps, and coordination with results from IMWs and the CHaMP program in the upper Columbia River demonstrate an adaptive management strategy to transition from implementation of opportunistic, site-specific habitat improvement projects to a reach-based approach to project planning, prioritization, and implementation. This approach builds on past experience by including recent science findings in the planning process. This approach is anticipated to enhance the competence of the planning process that aims to produce successful projects that work with the natural river processes, function properly when built, are sustainable, and help fish the most. This approach resulted in suites of projects that are focused on making fish habitat improvements where they are needed the most and is expected to continue to provide a steady stream of additional habitat improvement actions even beyond the life of the current FCRPS BiOp.

The level of planning and coordination necessary to transition to a process-oriented, reach-based approach involves a high degree of preparation and interaction with landowners, the community, and state and federal environmental compliance and permitting agencies. The years of preparation that went into efforts in the Methow and Entiat river basins have resulted in several multi-component, reach-scale habitat improvement projects for implementation between 2013 and 2018. These projects will make significant improvements to habitat conditions for steelhead and salmon populations in these areas as reflected in the habitat improvement value accorded by the expert panels at the 2012 workshops.

Upper Columbia River Adaptive Management Plan for 2013 to 2018

The Action Agencies plan to continue support to watershed partners for implementing habitat improvement actions for all Table 5 upper Columbia River populations to maintain the progress that has been accomplished for these populations. The Action Agencies also plan to meet with members and staff of the UCSRB, YN, and CTCR Fish Accord partners, local watershed Action Teams and Planning Units, and state and other federal agencies in the upper Columbia River to refine a mutual strategy to reach RPA Action 35, Table 5 commitments by 2018. The objective of these meetings is to refine the list of habitat improvement projects evaluated at the 2012 expert panel workshops to focus financial and other resources to meet or exceed RPA Action 35, Table 5 HQIs by 2018. Strategy meetings will begin in early 2013. The Action Agencies and partners will draw on available tributary and reach assessments, current limiting factor pie maps, and lists of habitat improvement actions assembled and evaluated by the expert panels for implementation from 2013 to 2018. The groups will develop a strategy to refine the location, scope, and timeframe for proposing and implementing the set of actions that will reach the RPA Action 35, Table 5 commitments by 2018 for all upper Columbia River steelhead and salmon populations, but particularly for the Entiat River steelhead and Chinook populations. The strategy also will identify project work plans and time lines, as well as identify administrative, technical, and financial roles, and it will assign leads to those roles to ensure that actions are implemented in the most efficient and effective manner. This strategy will involve adjusting project implementation plans among all upper Columbia River steelhead and Chinook populations within the existing level of available financial and other resources.

The Action Agencies and their state and tribal partners fully expect to reach 2018 HQIs for all upper Columbia River populations by employing the Adaptive Management Plan described earlier in this

section. NOAA Fisheries and the ICTRT identified "population size categories" that relate to the capacity of the tributary habitat environment to support different numbers of spawning adults (*http://www.nwfsc.noaa.gov/trt/trt_documents/appendix_b_viability_3_15_2007.pdf*). There are one Basic and two Very Large populations in the upper Columbia River (Below Chief Joseph Dam Chinook MPG), and one Basic and three Intermediate populations in the upper Columbia River (Below Chief Joseph Dam steelhead MPG). These characteristics are elements of the project replacement strategy included in RPA Action 35 and developed between the Action Agencies and NOAA (2014-2018 Draft IP Appendix D). When considering population size categories and the 2012 expert panel results, completed implementation from 2007-2011 and the menu of 2012 to 2018 projects evaluated by the 2012 expert panels are sufficient to achieve 2018 HQIs at the MPG level for both MPGs.

Supplemental Actions for the Entiat Chinook Priority Population

Supplemental actions and associated HQI estimates for Entiat Chinook salmon are presented in the 2014-2018 Draft IP, Appendix B). HQIs for these supplemental actions were estimated using the methodology described in Appendix B and Appendix B, Table B5. The remainder of this section describes background that contributed to the identification of the Entiat Chinook salmon supplemental actions.

The type and sequencing of habitat improvement projects in the Entiat are influenced by geomorphic conditions that govern development and implementation of stream complexity habitat improvement projects. Results of technical analyses have and will continue to guide the planning, development, and implementation of these actions.

The Action Agencies with assistance from Fish Accord partners developed and reviewed technical analyses used to guide habitat improvement efforts in the Entiat. These include Reclamation's Tributary Assessment (2009) that evaluated the lower 26 miles of the Entiat River and several reach assessments for the same area. The RAs (listed below) provide specific detail on geomorphic characteristics and habitat potential that can be used to guide project identification and implementation.

- Preston (Middle Entiat): (July 2009)
- Stormy (Middle Entiat): (November 2009)
- Lower Entiat (RM 0-7): (January 2012)
- Gray (Middle Entiat): (Planned May 2013)

The YN, a Fish Accord Partner, also conducted an assessment of the middle and upper Entiat. These already completed studies provide a technical base for a steady supply of habitat improvement projects.

Assessments distinguished the lower 26 miles by valley type and described three general segments. Segment 1 includes the downstream valley segments of the lower Entiat from River Mile (RM) 0 to 16. This includes the reach downstream from the terminus of the glacial moraine located near Potato Creek. The lower valley segment that has been the focus of habitat improvement actions is characterized as naturally incised and armored with little to no off-channel habitat (Reclamation 2009 and 2012d). This segment has been formed by down-cutting over the last 10,000 years through boulder laden glacial outwash. Past logging in this segment has altered habitat structure in the channel and created a relatively homogeneous, plane-bed system. Habitat improvement in the Entiat has targeted the lower river up to this point and has included diversion removals, side-channel reconnection, placement of in-stream structures, and levee removal to re-establish channel complexity features. A total of 12 projects have been completed in the lower seven miles of this segment (d).

These actions were developed and implemented to benefit steelhead. Actions to improve conditions for Chinook have not been a focus up to this point.

Segment 2, referred to as the "Stillwater Area" extends from RM 16 to 21. This segment is a low-gradient, sinuous valley segment that supports Chinook spawning. Actions to benefit Chinook would target the middle Entiat generally between RM 16 and 26 where juvenile rearing habitat is a primary limiting factor. Habitat improvement actions to improve in-stream complexity (e.g., boulder clusters and large woody material), reduce water velocity, reconnect floodplains, and create or enhance off-channel habitat are expected to improve conditions for juvenile rearing in this reach.

Segment 3 is a high gradient reach located downstream of Entiat Falls (a natural barrier to fish passage) extending from RM 21 to 26. All three river segments support Chinook and steelhead rearing. The technical background provided above is the basis for identifying supplemental habitat improvement projects in addition to those evaluated by the 2012 expert panel. The science informing the TAs and RAs provides an objective point of reference to guide project identification and development. The Action Agencies, Accord Partners, U.S. Forest Service, and other partners expect to deliver on 2018 Table 5 HQIs by implementing habitat improvement projects between 2013 and 2018 that were evaluated by the 2012 expert panels and supplemental actions in the middle and upper Entiat derived from the YN and Reclamation assessments. Projects evaluated by the expert panels and supplemental actions are presented in Appendices A and B of the 2014-2018 Draft IP.

The Entiat IMW influences the location and timing for implementing habitat improvement projects through 2018. Action Agencies and partners coordinate closely to implement projects evaluated by the expert panels and supplemental actions within the Entiat River IMW framework.

Appendix B: Supplemental Actions Benefit Estimate Methodology

General Description

The Action Agencies and Fish Accord partners assembled menus of supplemental actions to demonstrate that additional habitat improvement projects are available for the six priority populations where additional work may be needed to meet or exceed 2018 RPA Action 35, Table 5 HQIs. Supplemental actions for these six populations are presented in the 2014-2018 Draft IP, Appendix B.

These supplemental actions were assembled after the 2012 expert panels completed their evaluation of 2012 to 2018 actions, but will be included in the expert panel evaluations when they reconvene in 2015. In the mean time, the Action Agencies applied a simple proportional relation to estimate the change in HQI related to the supplemental actions for five of the six populations where additional work may be needed. (The Action Agencies relied upon the original Fish Accord estimates for the upper Grande Ronde. See the upper Grande Ronde adaptive management plan in CE Appendix A for more information). The proportional relation is represented by this equation:

$$\frac{\text{HQI for the supplemental actions}}{\text{Metrics for the supplemental actions}} = \frac{\text{HQI for projects evaluated by the expert panels}}{\text{Metrics for projects evaluated by the expert panels}}$$

HQIs for projects evaluated by the expert panels were obtained from CE Table 35. Metrics for projects evaluated by the expert panels were obtained from Section 3, Attachment 2, table 1 of the 2013 CE for projects completed through 2012 and from the 2014-2018 Draft IP (Appendix A) for 2012 to 2018 projects evaluated by the expert panels.

This relation is a very simplified estimate of HQI associated with supplemental actions at the population level. It treats all projects and metrics equally and does not account for site-specific habitat and fish conditions which could affect an expert panel evaluation for addressing key limiting factors at the assessment unit level. While some supplemental actions are expected to have less and others more benefit when evaluated by the next expert panel, the Action Agencies contend that the benefits for the collective group of supplemental actions will be greater than estimated by this simple equation for the following reasons.

With the majority of the access and entrainment issues already addressed, and the fact that riparian improvement actions produce the majority of their benefit several years after the vegetation grows and matures, habitat complexity treatments are expected to provide the greatest benefits for salmon and steelhead growth and survival in the future. The majority of the identified supplemental actions affect habitat complexity including stream channel and side channel conditions and floodplain connection treatments. Complexity projects are more complicated to implement than screen, barrier, or riparian treatments for a variety of technical, biological, social, and logistical reasons. These are some of the reasons why complexity projects are gaining more attention now than in the past. Although benefits from screen and access projects are direct and rather obvious, benefits of habitat complexity projects require monitoring and assessment that sometimes can take long to monitor, analyze, and report. However, studies describing results of effectiveness monitoring of complexity projects are beginning to be completed and released. For example, Polivka (summarized in Reclamation, 2013) observed more and larger Chinook salmon in pools treated with large wood than

in untreated pools. Crandall (summarized in Reclamation, 2013) observed extensive use of a reconnected side channel to the Twisp River by juvenile Chinook salmon and steelhead. With the implementation of relatively more complexity projects and related monitoring and evaluation, the Action Agencies expect that complexity actions will do much to reduce density dependence and improve salmon and steelhead growth and survival in these and many other ways.

Detailed Description

Tables B1 through B5 present the data and analyses for estimating HQI for supplemental actions from metrics and HQI for projects evaluated by expert panels. The following steps were followed for each table:

- Metrics for projects completed from 2007 to 2011 (from the 2013 CE) and evaluated by the panels for 2012-18 (from the 2014-2018 Draft IP, Appendix A) and for supplemental actions from tribal partners (2014-2018 Draft IP, Appendix B) were assembled by categories of flow, entrainment, access, complexity, and riparian metrics held in common between projects evaluated by expert panels and supplemental actions in the (a) part of each table.
- The 2018 RPA 35, Table 5 HQI and (A) 2018 HQI resulting from results of expert panel evaluations (obtained from table 35 in CE section 2) were entered at the top row of the "Result" column in the (b) part of each table.
- The "Base" for each metric type was established by normalizing metrics to a base increment of "one" for projects evaluated by the expert panels that were also present as metrics for supplemental actions.
- The (B) "Base total" was calculated by adding up the "Base" values.
- The incremental change (C) between 1) metrics for supplemental actions and 2) metrics evaluated by the expert panels was calculated by dividing "1)" by "2)".
- The incremental change was added to the "Base" and summed to obtain (D) total base plus incremental change.

Total HQI for projects evaluated by the expert panels and supplemental actions (D) was produced using this equation:

$$HQI_{\text{Expert Panel+Supplemental}} = A*D/B.$$

Table B1. Metrics (A) and Steps (B) Used to Estimate HQI for Supplemental Actions from Metrics for Supplemental Actions and Metrics and HQI for Projects Evaluated by the Expert Panel for Catherine Creek Chinook Salmon.

(a) Metrics by Source	Flow (Cfs)	Passage (Barriers Addressed)	Complexity (Habitat Miles Improved)
2013-18 METRICS EVALUATED BY EPs (2014-18 IP)	3	14	19.2
2007-12 METRICS EVALUATED BY EPs (2013 CE)	1.7	12	20.8
TOTAL 2007-18 METRICS EVALUATED BY EPs	4.7	26	40
TOTAL METRICS FOR 2013-18 SUPPLEMENTAL ACTIONS (2014-18 IP)	3	1	12.45

(b) Steps for Estimating HQI for Supplemental Actions From Metrics And HQIs for Projects Evaluated by the Expert Panels	Flow (Cfs)	Passage (Barriers Addressed)	Complexity (Habitat Miles Improved)	Result
2018 Table 5 HQI				23
(A) 2007-18 HQI from metrics evaluated by EPs				11
Base increment of 2007-18 EP metrics that produced 2007-18 HQI from metrics evaluated by EPs (BASE)	1	1	1	
(B) BASE TOTAL				3
(C) Additional increment of BASE obtained from supplemental action metrics (TOTAL METRICS FOR 2013-18 SUPPLEMENTAL ACTIONS / TOTAL 2007-18 METRICS EVALUATED BY EPs	0.64	0.04	0.31	
(B) + (C)	1.64	1.04	1.31	
(D) Total of (B) + (C)				4
2007-18 HQI from metrics evaluated by EPs and supplemental actions (A*D/B)				15
2018 Table 5 HQI				23

Table B2. Metrics (A) and Steps (B) Used to Estimate HQI for Supplemental Actions from Metrics for Supplemental Actions and Metrics and HQI for Projects Evaluated by the Expert Panel for Yankee Fork Chinook Salmon.

(a) Metrics by Source	Complexity (Habitat Miles Improved)
2013-18 METRICS EVALUATED BY EPs (2014-18 IP)	6.14
2007-12 METRICS EVALUATED BY EPs (2013 CE)	0.5
TOTAL 2007-18 METRICS EVALUATED BY EPs	6.64
TOTAL METRICS FOR 2013-18 SUPPLEMENTAL ACTIONS (2014-18 IP)	7

(b) Steps for Estimating HQI for Supplemental Actions from Metrics and HQIs for Projects Evaluated by the Expert Panels	Complexity (Habitat Miles Improved)	Result
2018 Table 5 HQI		30
(A) 2007-18 HQI from metrics evaluated by EPs		21
Base increment of 2007-18 EP metrics that produced 2007-18 HQI from metrics evaluated by EPs (BASE)	1	
(B) BASE TOTAL		1
(C) Additional increment of BASE obtained from supplemental action metrics (TOTAL METRICS FOR 2013-18 SUPPLEMENTAL ACTIONS / TOTAL 2007-18 METRICS EVALUATED BY EPs	1.05	
(B) + (C)	2.05	
(D) Total of (B) + (C)		2
2007-18 HQI from metrics evaluated by EPs and supplemental actions (A*D/B)		43
2018 Table 5 HQI		30

Table B3. Metrics (A) and Steps (B) Used to Estimate HQI for Supplemental Actions from Metrics for Supplemental Actions and Metrics and HQI for Projects Evaluated by the Expert Panel for Lochsa Steelhead.

(a) Metrics by Source	Passage		Complexity (Habitat Miles Improved)	Water Quality / Riparian	
	Barriers	Access Miles		Riparian Acres Improved	Road Miles
2013-18 METRICS EVALUATED BY EPs (2014-18 IP)	13	56.5	35	1549	268.25
2007-12 METRICS EVALUATED BY EPs (2013 CE)	7	14.3			14.5
TOTAL 2007-18 METRICS EVALUATED BY EPs	20	70.8	35	1549	282.75
TOTAL METRICS FOR 2013-18 SUPPLEMENTAL ACTIONS (2014-18 IP)	31	12	0.25	4000	385

(b) Steps for Estimating HQI for Supplemental Actions from Metrics and HQIs for Projects Evaluated by the Expert Panels	Passage		Complexity (Habitat Miles Improved)	Water Quality / Riparian		Result
	Barriers	Access Miles		Riparian Acres Improved	Road Miles	
2018 Table 5 HQI						16
(A) 2007-18 HQI from metrics evaluated by EPs						8
Base increment of 2007-18 EP metrics that produced 2007-18 HQI from metrics evaluated by EPs (BASE)	1	1	1	1	1	
(B) BASE TOTAL						5
(C) Additional increment of BASE obtained from supplemental action metrics (TOTAL METRICS FOR 2013-18 SUPPLEMENTAL ACTIONS / TOTAL 2007-18 METRICS EVALUATED BY EPs	1.55	0.17	0.01	2.58	1.36	
(B) + (C)	2.55	1.17	1.01	3.58	2.36	
(D) Total of (B) + (C)						11
2007-18 HQI from metrics evaluated by EPs and supplemental actions (A*D/B)						17
2018 Table 5 HQI						16

Table B4. Metrics (A) and Steps (B) Used to Estimate HQI for Supplemental Actions from Metrics for Supplemental Actions and Metrics and HQI for Projects Evaluated by the Expert Panel for South Fork Clearwater Steelhead.

(a) Metrics by Source	Access		Complexity		Water Quality / Riparian		
	Barriers Addressed	Access Miles	Habitat Miles Improved	Structures	Riparian Miles Improved	Riparian Acres improved	Road Miles
2013-18 METRICS EVALUATED BY EPs (2014-18 IP)	23	71.7	8.1	345	15	276.5	179.6
2007-12 METRICS EVALUATED BY EPs (2013 CE)	11	30.5	3.8		19		
TOTAL 2007-18 METRICS EVALUATED BY EPs	34	102.2	11.9	345	34	276.5	179.6
TOTAL METRICS FROM 2013-18 SUPPLEMENTAL ACTION LIST	3	150	0.25	35	0.34	10.6	63

(b) Steps for Estimating HQI for Supplemental Actions from Metrics and HQIs for Projects Evaluated by the Expert Panels	Access		Complexity		Water Quality / Riparian			Result
	Barriers Addressed	Access Miles	Habitat Miles Improved	Structures	Riparian Miles Improved	Riparian Acres Improved	Road Miles	
2018 Table 5 HQI								14
(A) 2007-18 HQI from metrics evaluated by EPs								13
Base increment of 2007-18 EP metrics that produced 2007-18 HQI from metrics evaluated by EPs (BASE)	1	1	1	1	1	1	1	
(B) BASE TOTAL								7
(C) Additional increment of BASE obtained from supplemental action metrics (TOTAL METRICS FOR 2013-18 SUPPLEMENTAL ACTIONS / TOTAL 2007-18 METRICS EVALUATED BY EPs	0.09	1.47	0.02	0.10	0.01	0.038336	0.35	
(B) + (C)	1.09	2.47	1.02	1.10	1.01	1.038336	1.35	
(D) Total of (B) + (C)								9
2007-18 HQI from metrics evaluated by EPs and supplemental actions (A*D/B)								17
2018 Table 5 HQI								14

Table B5. Metrics (A) and Steps (B) Used to Estimate HQI For Supplemental Actions from Metrics for Supplemental Actions and Metrics and HQI for Projects Evaluated by the Expert Panel for Entiat River Chinook Salmon.

(a) Metrics by Source	Complexity	
	Habitat Miles Improved	Structures
2013-18 METRICS EVALUATED BY EPs (2014-18 IP)	6.24	49
2007-12 METRICS EVALUATED BY EPs (2013 CE)	3.7	
TOTAL 2007-18 METRICS EVALUATED BY EPs	9.94	49
METRICS FROM 2013-18 AA SUPPLEMENTAL ACTION LIST	3.75	19
METRICS FROM 2013-18 YN SUPPLEMENTAL ACTION LIST	8.75	81
TOTAL METRICS FROM 2013-18 SUPPLEMENTAL A LISTS	12.5	100

(b) Steps for Estimating HQI for Supplemental Actions from Metrics and HQIs for Projects Evaluated by the Expert Panels	Complexity		Result
	Habitat Miles Improved	Structures	
2018 Table 5 HQI			22
(A) 2007-18 HQI from metrics evaluated by EPs			9
Base increment of 2007-18 EP metrics that produced 2007-18 HQI from metrics evaluated by EPs (BASE)	1	1	
(B) BASE TOTAL			2
(C) Additional increment of BASE obtained from supplemental action metrics (TOTAL METRICS FOR 2013-18 SUPPLEMENTAL ACTIONS / TOTAL 2007-18 METRICS EVALUATED BY EPs	1.26	2.04	
(B) + (C)	2.26	3.04	
(D) Total of (B) + (C)			5
2007-18 HQI from metrics evaluated by EPs and supplemental actions (A*D/B)			24
2018 Table 5 HQI			22

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Appendix C: Estimating Benefits from Hatchery Reform

NOAA Fisheries 2008 FCRPS BiOp adopted the Action Agencies' method for quantifying the relative productivity improvements associated with certain hatchery reforms. The modeling method was described in Stier and Hinrichsen (2008) and was included as an appendix to NOAA's 2008 Supplemental CA. New information on the estimated effects of already and soon-to-be implemented hatchery reforms is included here. The method is taken from Stier and Hinrichsen (2008). The updated estimates of model parameters[1] are taken based on a communication with NOAA Fisheries staff. The tables below display estimates of the effects of both current and anticipated hatchery management actions. The changes are shown relative to the management in effect across the FCRPS BiOp's base period (roughly brood years 1980-1999). All estimates are given in terms of the change in the integrated productivity of a spawning population, e.g. the combined productivity of both natural-origin and hatchery-origin spawners in that spawning population. The FCRPS BiOp included estimates for the benefits of hatchery reforms for many of these populations. Therefore, the incremental improvement relative to the BiOp estimate is also given.

Table C1. Populations for which Hatchery Reforms are Currently Being Implemented. The method for calculating improvements is taken from Stier and Hinrichsen (2008); updated estimates of model parameters[12] are taken from a communication from staff at NOAA Fisheries.

Population	Total Hatchery Reform Productivity Improvement	Hatchery Reform Productivity Improvement Relative to FCRPS BiOp	Nature of Reform Action
Catherine Creek Chinook	34%	12%	Improved hatchery broodstock (non-local to local)
Upper Grande Ronde Chinook	35%	12%	Improved hatchery broodstock (non-local to local)
Lostine R. Chinook	15%	11%	Reduction in straying (new weir for pHOSmanagement)
Minam R. Chinook	23%	1%	Termination of hatchery outplants
Wenaha R. Chinook	41%	2%	Termination of hatchery outplants
Entiat R. Chinook	11%	11%	Termination of spring Chinook hatchery program and reduction in straying from Chelan PUD hatchery program

[12] The parameters of interest are the past and future relative reproductive effectiveness of the hatchery-origin spawners in a given spawning population, and the past and future proportions of hatchery-origin fish in that spawning population.

Table C2. Populations for which Hatchery Reforms are Indicated in Hatchery Genetic Management Plans Submitted to NOAA Fisheries for ESA Consultation. Hatchery reforms expected to be implemented by 2014-2016. The method for calculating improvements is the same as described for the table above.

Population	Total Hatchery Reform Productivity Improvement	Hatchery Reform Productivity Improvement Relative to FCRPS BiOp[13]	Nature of Reform Action
Imnaha R. Chinook	29%	29%	Reduction in straying (new weir for pHOS management)
Methow R. Chinook	6%	6%	Reduction in straying (improved imprinting/homing practices)
Wenatchee R. Steelhead	81%	13%	Improved broodstock and reduction in straying at Winthrop NFH
Entiat R. Steelhead	29%	58%	Cessation of hatchery outplanting practices
Methow R. Steelhead	162%	124%	Improved broodstock and reduction in straying
Okanogan R. Steelhead	34%	0%	Improved broodstock and reduction in straying

Catherine Creek Chinook

The Lower Snake River Fish and Wildlife Compensation Plan (LSRCP) program completed Lookingglass Hatchery in 1982, however the first releases of Rapid River stock spring Chinook salmon occurred in 1980 (1978 brood) in Lookingglass Creek. Rapid River and Carson origin fish were released in the early 1980s. Co-managers formed the Grande Ronde Endemic Spring Chinook Supplementation Program (GRESCSP) in the mid-1990s. The GRESCSP was implemented in three Grande Ronde River basin tributaries; the Lostine River, the upper Grande Ronde River, and Catherine Creek. The intent of this program was to change the mitigation aspect of the LSRCP program (harvest mitigation) to an integrated supplementation program. More history is available in the Catherine Creek Spring Chinook Hatchery Program Review (Carmichael et al., 2008), which can be found at *http://www.fws.gov/lsnakecomplan/Reports/ODFW/Eval/CatherineCreekSpringChinookSalmonHatcheryReviewFINAL.pdf*.

Lookingglass Hatchery objectives (ibid, p. 1) are to: 1) Prevent extinction of the Catherine Creek Chinook salmon population; 2) Establish adequate broodstock to meet annual production needs; 3) Establish an annual return of hatchery fish to the compensation area; 4) Provide a demographic foundation to rebuild from after the key limiting factors and threats are addressed; 5) Maintain and enhance natural production while maintaining long term fitness; 6) Maintain genetic and life history

[13] For the "low hatchery" estimate.

characteristics of the natural population; 7) Operate the hatchery program so that the genetic and life history characteristics of hatchery fish mimic wild fish; 8) Re-establish historical tribal and recreational fisheries; 9) Minimize straying to maintain endemic wild populations of spring Chinook salmon in the Minam and Wenaha rivers.

While all of these objectives contribute to the goal of increasing the productivity of Catherine Creek Chinook, the fourth objective is tied closely to habitat improvements. For example, density dependence influences productivity in Catherine Creek (ibid, p. 20). Hatchery operations provide a mechanism to artificially maintain relatively higher smolt production while the habitat improvement projects, that aim to increase available spawning and rearing habitat to reduce density dependence, have time to be implemented and function. Also, conditions in the lower reaches of Catherine Creek are an impediment to outmigration (*ibid*). The State Ditch (which shortened the length of the mainstem Grande Ronde River considerably to reduce flooding and moved the mouth of Catherine Creek several miles downstream from its original position) has been shown to adversely affect stream velocity significantly during spring migration periods (by actually causing Catherine Creek to flow upstream). Improving flow through this reach will take considerable study and likely will involve development of a complicated solution to correct, along with changes in current sensitivities to become feasible. In the meantime, the Lookingglass Creek Hatchery operation effectively provides a mechanism to overcome the loss of smolts in this reach that would occur from natural production only and would otherwise result in even greater productivity declines.

In order to better understand the reproductive success in hatchery- and natural-origin fish, BPA has provided funding to NOAA since 1989 (BPA Project 1989-096-00) to estimate adult returns, age class, and genetic pedigree analysis. Findings from these studies were used to estimate the relative productivity improvements associated with hatchery reforms identified in Table C.1. of “Monitor and Evaluate the Genetic Characteristics of Supplemented Salmon and Steelhead” (Berntson et al. 2013) which can be found at *http://pisces.bpa.gov/release/documents/documentviewer.aspx?doc=P131008*. Survival improvement from Lookingglass Hatchery reform represents a completed Action Agency project that benefits Catherine Creek Chinook.

The Lookingglass Hatchery reforms represent a life-cycle survival improvement of 12 percent.

Additionally, the Action Agencies view accomplishments for hatchery objective four as a short-term strategy to use a local broodstock-based hatchery supplementation program to reduce demographic risks of extinction. This view is consistent with the draft NE Oregon Recovery Plan (NOAA Fisheries, 2012).

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Appendix D: FCRPS Biological Opinion Tributary Habitat Projects: From Inception to Implementation

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This narrative describes the inception, evaluation and implementation of tributary habitat improvement projects for salmon and steelhead under the Biological Opinion (BiOp) for the Federal Columbia River Power System. It explains how projects emerge, how expert panels with local knowledge assess the benefits of projects before and after implementation and how the Action Agencies ensure that the projects are implemented effectively to meet the expectations of the expert panels.

The expert panel process is employed to evaluate changes in habitat quality improvement associated with completion of habitat improvement field projects that address key limiting factors for most of the Snake River and upper Columbia River Chinook and steelhead populations identified in the 2008/2010 FCRPS BiOp RPA Action 35, Table 5. Results from the Expert Panel process measure the accomplishment obtained by the Action Agencies and regional partners in reaching the Table 5 habitat quality improvements (HQIs). This description elaborates on the process described in Appendix C of the Comprehensive Analysis for the 2008 BiOp and describes how the process has been implemented during the initial years of the BiOp.

Background: A scientific foundation

The Expert Panel concept of local biologists assessing conditions for fish within individual watersheds and identifying the factors limiting fish populations, as called for by the BiOp, is not new. It has its roots in the 1990s, when Congress and the Northwest Power and Conservation Council (then called the Northwest Power Planning Council and referred to hereafter as the Council) took steps to strengthen the scientific basis and objectivity of the Council's Fish and Wildlife Program, designed to guide funding by the Bonneville Power Administration of mitigation for the effects of federal dams. This is important because the steps have carried through to today. Most habitat improvement projects at the time took place under the auspices of the Fish and Wildlife Program. Projects were often opportunistic, taking advantage of available funds and willing landowners, but not necessarily systematic in terms of applying resources where science showed they would do the most good for fish. The steps by Congress and the Council responded to a series of recommendations and directives from science organizations. As early as 1996, for instance, the National Research Council, an arm of the National Academy of Sciences, published a report on Northwest salmon (National Research Council 1996) calling for:

- Protecting the genetic diversity within salmon species.
- Recognizing and working with local breeding populations and their habitats.
- Working to protect salmonids at the watershed scale.
- Recognizing that different approaches are necessary in different watersheds, even if the goals are the same.
- Assessments of each major watershed or basin to identify causes of mortality (in other words, limiting factors) and the best means of addressing them.

That same year Congress followed with an amendment to the Northwest Power Act that for the first time required independent science review of BPA fish and wildlife projects before they are considered for funding. Shortly thereafter, the Council's Independent Science Group (ISG), created by the Council in 1992 to provide scientific advice, issued the first independent scientific review of the Fish and Wildlife Program. It reflected many of the same conclusions as the National Research Council and recommended an "integrated approach" to salmon protection and recovery and "rigorous program of evaluation, monitoring, research and adaptive management" (ISG 2000). The review was published in 2000 as "Return to the River: Restoration of Salmonid Fishes in the Columbia River System."

The Council responded with an overhaul of the Fish and Wildlife Program that adopted an ecosystem management focus and directed that implementation be guided by locally developed subbasin plans that address the unique conditions and challenges in each of about 60 subbasins within the Columbia River system. The plans identified limiting factors in each subbasin and included management plans with steps to address them. The Independent Scientific Review Panel (ISRP), a group of experienced scientists recommended by the National Research Council and appointed by the Council, reviewed each subbasin plan to assure that it was scientifically sound. Following ISAB approval the plans were adopted by the Council as amendments to the Fish and Wildlife Program, which, now accompanied by the BiOp, continues to guide BPA funding for mitigation projects. The purpose of the subbasin plans was to identify limiting factors affecting fish in each subbasin for the purpose of developing projects to implement the Fish and Wildlife Program. The ISRP also continues to review the science behind each mitigation project proposed for BPA funding, including habitat projects proposed under the BiOp.

Subbasin plans were followed in many parts of the Columbia River Basin by the development of recovery plans, science based blueprints for the recovery of salmon and steelhead listed under the Endangered Species Act. The first listings began in the 1990s and required the development of recovery plans. The recovery plans developed with NOAA guidance built upon the subbasin plans and went further by identifying specific actions, costs, and time frames and then using models to examine and refine the actions based on how effectively they would contribute to salmon recovery. Both the subbasin plans and, where they exist, recovery plans, proved to be important sources of information and knowledge for the expert panels regarding local conditions and potential projects.

How habitat projects emerge

The significance of subbasin and recovery planning is that habitat improvement projects proposed under the BiOp are based on a foundation of local knowledge developed over more than a decade. Although subbasin and recovery plans are not directly connected to the BiOp, they are complementary. While developed primarily as local blueprints for the Fish and Wildlife Program, the subbasin plans were also expected to help fulfill requirements of the BiOp (an earlier version in place at the time) and recovery plans. Many of the principles behind the subbasin and recovery plans, the types of habitat projects they outlined and the local knowledge gained through their application have carried over to habitat improvement plans under the BiOp. For instance, much of the work that went into identifying limiting factors and effective mitigation projects for the subbasin and recovery plans has continued to inform the development of projects and work of the expert panels under the current BiOp.

Such knowledge and expertise is typically maintained by local watershed groups that may include model watersheds, recovery boards and technical teams as well as other local biologists and experts affiliated with states, tribes and local agencies. These are the same organizations that assist with establishing and supporting the expert panels. In some cases the groups were established after development of the subbasin plans to provide local direction for subsequent salmon and steelhead recovery plans developed with the guidance of NOAA Fisheries. The overlapping purposes of the groups – for instance, supporting the BiOp, Fish and Wildlife Program and recovery plans – is intended and beneficial, so that work under the different initiatives can be coordinated to make the most of available resources.

Just as the subbasin and recovery plans are tailored to local conditions, many of the locally based groups have developed their own systematic approaches to identifying, evaluating and prioritizing projects to go forward under the BiOp and other habitat improvement programs. These individual strategies typically account for unique local conditions and concerns in ways that a single universal

approach to project selection would not. They also provide a science-based structure that helps guide potential project sponsors in developing and refining projects before they reach the expert panels.

For example, local biologists in the Upper Columbia region formed the Upper Columbia Regional Technical Team (RTT) to discuss and address habitat and other issues affecting salmon and steelhead in the region. The Upper Columbia Salmon Recovery Board (UCSRB), established to develop and coordinate the recovery plan for the Upper Columbia, then took advantage of the RTT to provide technical support for habitat restoration. The RTT includes nearly 15 scientists and other authorities on habitat conditions, who together drafted, "A Biological Strategy to Protect and Restore Salmonid Habitat in the Upper Columbia Region," a 200-plus-page document that is regularly reassessed and updated – most recently in 2013. (*See Appendix D, Attachment 1 for a synopsis of this document.*) It includes a scientific foundation for restoration activities in the Upper Columbia and outlines priority areas for habitat protection and restoration as well as individual biological objectives by subbasin and watershed. In addition, it includes scoring criteria to evaluate and prioritize projects for available funding, giving heavier weight to whether projects address primary ecological concerns and improve freshwater survival of the target species.

The strategy also provides guidance for using habitat assessments such as tributary and reach assessments completed or in process by interdisciplinary teams of experts from the Bureau of Reclamation. The reach assessments evaluate the conditions of specific tributaries or reaches, identifying those where habitat improvements could be expected to provide the greatest benefits. About 20 of the assessments have been completed or are in process, with the intent of filling gaps in technical knowledge and providing insight and advice that might not be available locally.

Following completion of Reclamation's reach assessment for the Lower Entiat River, for instance, the RTT met with Reclamation's core team to translate the results into detailed guidance for potential project sponsors. The guidance focused on the development of projects that are suited for the geomorphology of the river and are biologically appropriate to meet the goals and objectives outlined for the Lower Entiat in the local biological strategy described above. The guidance included a spreadsheet outlining potential actions that could be developed to address certain limiting factors for salmon within the Lower Entiat assessment area and a recommended list of specific actions to address limiting factors at specific locations within the reach. For instance, recommended actions included placement of engineered log jams at the apex of islands at approximately river mile 6.3 and four other specific points down stream and removal of levees at several specific points to provide the river with renewed access to the floodplain. An accompanying map displayed sites of the recommended habitat improvement projects as well as related river conditions.

Another important advance in informing both the planning and evaluation of habitat projects was the development by the U.S. Bureau of Reclamation of so-called "limiting factor pie maps" that visually depict limiting factors and habitat conditions in individual assessment units. These provide the panels an immediate picture "at a glance" of the current state of limiting factors and, in turn, the condition of habitat in each assessment unit, along with indications of the how far the units are from "fully functioning condition." Assessment units are derived from the subbasin and recovery planning processes and represent smaller units of a watershed with common limiting factors that would be expected to respond to a certain habitat treatment in a similar way. The pie maps help project planners and expert panels quickly compare and assess conditions across watersheds to focus on those areas where habitat improvement projects would provide the greatest value.

The UCSRB and RTT also provide for adaptive management at the local scale. The RTT hosted a five-year analysis and synthesis workshop in January 2010, where biologists discussed fish and habitat

status and trends, action effectiveness of habitat actions and research needs. A report of the workshop was adopted by the RTT in October 2010 as Ward et al. (2010).

This provides one example of how habitat information is gathered, how prospective habitat improvement projects are identified and how they are evaluated through locally developed strategies that account for the conditions of individual watersheds. Other regions, such as the Lower Snake and Upper Salmon (*Appendix D, Attachment 2*), have developed similar processes to advance salmon recovery in ways that account for local conditions. Representatives of the Action Agencies also observe and track the evolution of habitat improvement projects through this process so that they have a picture of what upcoming opportunities are available. Where the Action Agencies have identified a need for additional habitat actions to benefit certain populations or ESUs, they may encourage sponsors to pursue projects in the appropriate areas. The project sponsors, often working with local landowners, develop the projects and then take the projects to the RTT for initial evaluation and scoring. This information, along with much additional information to be described below, then informs the expert panels convened under the BiOp. Since many expert panel members were involved in developing the earlier plans and information, many come to the panels with advance knowledge of habitat conditions and prospective improvement projects.

Forming the expert panels

Members of the expert panels are authorities on local habitat conditions and fish populations, although there are not specific selection criteria for panel members. The required expertise and knowledge of local habitat conditions can be developed in various ways and may not necessarily be reflected in certain academic degrees or years of experience. Typically, but not always, expert panel members are biologists or other scientists with local, state, tribal and federal natural resources or wildlife agencies. The number of local scientists with the background knowledge expected of expert panel members is typically limited. Most if not all are well known to each other, to local organizations involved in habitat rehabilitation and to the Action Agencies by virtue of their involvement in earlier habitat improvement initiatives including development of the subbasin plans and recovery plans. The result is that those most qualified to serve on the expert panels were usually widely recognized from the start and the Action Agencies engaged them in the process. The expert panels meet in three-year cycles to evaluate habitat improvement projects, convening most recently in 2012.

For example the 2012 Expert Panel for the Upper Columbia included a core regional team of experts from the Colville Tribes and Yakama Nation, Washington Department of Fish and Wildlife, public utility districts with their own habitat programs, U.S. Forest Service, U.S. Fish and Wildlife Service, NOAA Fisheries, Natural Resources Conservation Service and consulting biologists with experience in the area. Additional teams of experts on individual subbasins supplement the core panel when evaluating projects in those subbasins. For instance, the Entiat subbasin team includes experts from the Yakama Nation, Cascadia Conservation District, U.S. Forest Service and U.S. Bureau of Reclamation (the Reclamation expert participated in the Entiat reach assessment described above). Members of the expert panels submitted written descriptions of their qualifications as documentation of their expertise. Members representing organizations that also propose and sponsor projects are asked to recuse themselves from evaluating projects proposed by their organization.

The expert panels themselves do not design, develop or propose habitat improvement projects. Their one role is to examine projects and assess the degree to which the projects will address the limiting factors for salmon and steelhead. Since there is overlap between members of the RTT and expert panels, it is common for members of the panels to have encountered and examined the projects before and thus to be generally familiar with their design and objectives.

Expert panels are provided with numerous sources of information to supplement their professional knowledge and experience. Among the most important sources of background information on habitat conditions and limiting factors are recovery plans, where they are available, and the subbasin plans where they are not. Other information provided to the expert panels include details of the BiOp (both the original 2008 BiOp and 2010 Supplemental BiOp and AMIP) and the Habitat Collaboration Workgroup approach outlined by the BiOp. They are also provided with standardized definitions of limiting factors released by NOAA Fisheries in 2011, which the expert panels will use to evaluate actions completed from 2013 on. (The original set of limiting factors was used through 2012). They are also provided a wide array of background material on relevant issues including climate change and invasive species as well as the results of habitat monitoring programs and action effectiveness monitoring.

Background materials for the expert panels are provided in advance at a dedicated Bureau of Reclamation website, *http://www.usbr.gov/pn/fcrps/habitat/panels/index.html.*

How the expert panels work

Although expert panels represent an important core step in translating the effects of habitat improvement projects into benefits for fish, they meet only every three years. This allows for interim periods of planning, implementation, and research. During these regular workshops, the panels evaluate habitat improvement projects that have been completed during the previous three years. They compare the metrics of completed projects with those originally expected from the projects to determine whether the projects were implemented as expected. If not, the panels may adjust their findings as described below. The expert panels also "look forward" to examine planned and potential habitat improvement projects, along with the anticipated metrics of the projects.

The Action Agencies, with help from local watershed groups, assembled seven expert panels across the Columbia River Basin. The expert panels focus primarily on watersheds occupied by listed populations identified as priorities under the BiOp. Six of the panels address salmon and steelhead populations in the upper Columbia River, lower Snake River, Wallowa and Imnaha rivers, upper Grande Ronde River, lower Salmon River, and upper Salmon River. A seventh panel addresses Clearwater River steelhead. The panels all use the same process to evaluate projects, following guidance specified in the BiOp, based on how the projects address limiting factors. The primary steps include:

Identify key limiting factors. Expert panels use available information such as subbasin plans, monitoring and recovery plans, research results and the panel members' own knowledge of local conditions to identify environmental characteristics that constrain adult holding and passage, spawning, redds (nests of fish eggs), emergence, summer and winter growth and rearing, and smolting of salmon and steelhead populations in tributaries to the main stem of the Columbia and Snake rivers. Access to quality spawning and rearing habitat, mechanical injury, lack of sufficient streamflow, and lack of in-stream channel complexity are examples of key limiting factors. Different limiting factors may affect fish survival in different parts of each tributary. As noted above, parts of tributaries with a common set of limiting factors are called assessment units, many of which were first identified through subbasin and recovery plans. Assessment unit boundaries and associated key limiting factors can be different for each salmon and steelhead population, even when they occupy the same tributaries. The benefit of using assessment units is that they divide watersheds into sections that each have common characteristics, providing a more detailed picture of which limiting factors apply to which parts of the watershed. Expert panels began using a standardized set of limiting factors

and definitions developed by NOAA for projects completed from 2013 onward (Hamm 2012). The panels can also reconsider and update the limiting factors as conditions change.

Identify limiting factor status. When evaluating projects, expert panels assign three numeric values between zero and one to each limiting factor. The numeric values are related to Properly Functioning Condition (NMFS 1996), which reflects habitat quality and which NOAA has described as the habitat component of a species' biological requirements (NMFS 1999). A low value indicates that the status of the limiting factor is poor and is constraining fish populations. A higher value indicates that the status of the limiting factor is relatively better and is not limiting fish populations as severely. The Expert Panel first assigns a value to represent the current status of the limiting factor, prior to any habitat actions. This is called the "low bookend." Two other values represent the near and longer-term potential for improvement in each limiting factor through implementation of all reasonably feasible habitat improvement actions.

The first of these represent the relative improvement in the limiting factor expected from those habitat actions by 2018, the end of the 2008/2010 FCRPS BiOp. The second represents the improvement in the limiting factor expected by 2033, 25 years after the end of the 2008/2010 FCRPS BiOp. These are called the "2018 and 2033 high bookends," respectively. For example, the riparian condition may be assessed a low bookend of 40 percent, a 2018 high bookend of 50 percent and a 2033 high bookend of 80 percent. This recognizes a relatively small potential for riparian vegetation to grow and provide improvements by 2018. But as the vegetation matures, the full value of the action accrues between 2018 and 2033. In another example, the limiting factor of access by fish to rearing habitat may be assessed a low bookend of 40 percent, with 2018 and 2033 high bookends both assessed at 80 percent. This indicates that all the expected improvements from projects addressing this limiting factor will accrue by 2018, with no additional future improvement beyond 2018.

For projects completed during the previous three years, the expert panels assess whether they were completed as planned by comparing the actual metrics (such as miles of stream improved or barriers removed) to the expected metrics. If the projects were completed as planned, the Expert Panel accepts the change in limiting factor assigned previously unless newly documented scientific evidence warrants a different value. If the project changed to include more or fewer habitat improvements than originally planned, the panels debate and decide whether the changes in limiting factors they assigned earlier should be increased or decreased accordingly. For projects scored earlier by the expert panels but never completed, any associated change in limiting factor is discarded. The process is repeated for each limiting factor, assessment unit and steelhead and Chinook population.

Identify limiting factor weights. Certain limiting factors may have a greater relative effect on salmon and steelhead in some areas than others. Expert panels may assign weights between zero and one to different limiting factors to recognize the relative importance of each limiting factor in the appropriate area. For example, a given assessment unit or population may be limited by three primary factors: high levels of fine sediments, lack of woody debris, and a lack of off-channel habitat. In this case, biologists weight each habitat variable by its relative importance to fish survival. For instance, they may weight fine sediment highest, because it has a relatively larger effect on fish survival than the other two factors. The resulting weights may be 0.75 for fine sediment, 0.15 for off-channel habitat, and 0.10 for woody debris. The sums must equal 1.00. Expert panels are not required to weight limiting factors differently, but can if they feel it is warranted. The purpose of assigning weights is to make sure those factors or habitat variables with a relatively greater effect on fish survival or productivity are accurately reflected in representations of overall local habitat condition.

Identify assessment unit weights. The landscape and geomorphology in some assessment units provide greater spawning and rearing habitat potential than others. In the development of recovery plans, NOAA's Northwest Fish Science Center (NWFSC) developed a method for calculating this

potential based on local habitat characteristics. The result is a numerical indication of "intrinsic potential" that reflects the relative potential for the habitat to support salmon and steelhead. For instance, an assessment unit dominated by high gradient streams that are relatively inhospitable to fish may have low intrinsic potential regardless of habitat improvements, while one with lower gradient streams and numerous pools may have higher intrinsic potential that makes it a better candidate for improvement. The relative weights help discern those assessment units where habitat improvement projects could be expected to best capitalize on local conditions to produce benefits for fish. Improvement projects would ideally be concentrated in assessment units with poor habitat conditions (as represented by low limiting factor values) but high intrinsic potential. Such units would be expected to have significant potential to support fish, if habitat conditions can be improved. Expert panels may adjust intrinsic potential values based on new information or justifications that supplement the scientific data used in the NOAA NWFSC intrinsic potential analysis.

Finally, the Action Agencies compile the findings of the expert panels into an online database accessible to panel members, who then perform a final review. Once panel members have reviewed the results for accuracy, the Action Agencies use a mathematical procedure described in the BiOp to convert the changes in limiting factors as estimated by the expert panels into the expected percentage in habitat quality improvement that is the BiOp's yardstick for measuring improvements in habitat (Appendix C). HQIs represent survival improvements under the BiOp. The calculations by the Action Agencies take into account the weighting assigned by the expert panels to different limiting factors and different assessment units.

Ensuring project completion

In recent years BPA has invested in the development of Pisces and Taurus. Taurus facilitates tracking of funds and project completion, and ensures that funded projects address the specific limiting factors identified by the expert panels. This allows BPA to measure success not by the dollars spent but by the actual results delivered. The system provides additional accountability and transparency in the use of funds, which in turn yields increased confidence that the work funded by BPA is tied directly to actions that will improve the condition of those limiting factors. Most of the information described below is publicly accessible through the website *www.cbfish.org*, which is the public portal for the Taurus system. This includes roughly 80 percent of the information associated with habitat projects. The specific projections of the expert panels are in a secure section of the website to avoid alteration of the input outside of the expert panel process. A description of how Taurus relates to BPA business practices and links to expert panel products is presented in Attachment 4 .

Each habitat project may encompass one or more specific actions, which are represented in the Taurus system as individual work elements and associated metrics. Work elements may include, for example, installing fish passage structures. The metrics associated with each work element are categorized according to the specific limiting factor, as designated by the expert panels, that the work is designed to address. An anticipated value (miles of increased stream access or complexity, for example) is attached to each metric and BPA COTRs are responsible for ensuring the values are accurately represented in each contact. Each year BPA COTRs and sponsors review contracts to be sure the work elements and associated metrics still appropriately reflect the work that is being delivered under the contract. This provides BPA, project sponsors, expert panels and others with a clear picture of how each work element and associated metrics are expected to benefit fish, and how this relates to the work of the expert panels. It also serves as a systematic and structured way of assessing the results. The metrics can then be evaluated following completion of the project to

determine whether the project was completed as planned or if it underwent changes that warrant reassessment by the expert panels.

The system provides BPA and other stakeholders with more detail on the specific elements and progress of each habitat improvement project, which serves as an important tool to help BPA plan and track the millions of dollars dedicated annually to habitat projects. Direct annual fish and wildlife spending by BPA has increased by about $100 million since 2008, much of it to support habitat improvement projects under the BiOp. Spending over the life of the BiOp provides a measure of assurance that habitat improvement projects will continue to be implemented over time, avoiding any shortfalls at the very end of the BiOp. The Taurus system, which allows regular updates of project progress and spending, provides for tracking of projects in increased detail, which in turn provides more current and complete information on actual spending. This additional detail helps BPA monitor spending more closely so the agency can make the most of its available budget and use the full amount of funds available without overspending.

The Taurus system also provides for more effective "roll-up" of all habitat improvement metrics, improving BPA's ability to track total BiOp accomplishments.

In sum, the development, implementation, and evaluation of habitat improvement projects involves a lengthy and highly detailed process founded in scientific recommendations and direction identified in early reviews of the Fish and Wildlife Program. It provides for the local design and development of habitat projects according to local conditions as well as systematic evaluation of projects by expert panels under the framework outlined in the BiOp and according to established biological criteria. BPA then tracks progress to assess whether the Action Agencies are successfully addressing limiting factors, providing the anticipated biological benefits for fish.

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Attachment 1: Summary: A Biological Strategy to Protect and Restore Salmonid Habitat in the Upper Columbia Region

The biological strategy for the Upper Columbia Region (UCR) (2013) identifies the *key biological considerations in protecting and restoring habitat for salmonids*. The strategy is *intended* for use by project sponsors *to identify* the *locations and types of projects* with a high likelihood of improving abundance, productivity, spatial structure, and diversity for ESA-listed salmonids.

The 2013 strategy updates the strategy developed by the Regional Technical Team (RTT) of the Upper Columbia Salmon Recovery Board (UCSRB). The RTT was formed in 2000 to provide technical support to guide UCSRB restoration efforts. The strategy documents the technical foundation for setting priorities for developing habitat actions. Based on *available information* and *professional judgment* of natural resource professionals in the region the RTT expects:

1) To better define priority habitat actions.
2) To provide updated information regarding restoration strategies and priorities.
3) To provide technical scoring criteria for habitat restoration, protection, assessment, and design projects submitted for funding through various sources.
4) To continue to update information-needs.

The UCSRB is a partnership among Chelan, Douglas, and Okanogan counties, the Yakama Nation, and Colville Confederated Tribes and local, state, and federal partners. The mission of the UCSRB is to restore viable and sustainable populations of salmon, steelhead, and other species of concern (e.g., Westslope cutthroat trout and Pacific lamprey) through the collaborative, economically sensitive efforts, combined resources, and wise resource management of the UCR.

The RTT supports efforts of the UCSRB to: 1) recommend approaches to protect and restore salmonid habitat; 2) guide development and evaluation of salmonid recovery projects within the UCR; 3) review and coordinate monitoring and evaluation activities; and 4) develop and guide salmonid recovery monitoring plans. The RTT uses a scientific foundation to identify projects that will best contribute to the recovery of salmonids and other species. The RTT approach supports implementation of the Upper Columbia Spring Chinook and Steelhead Recovery Plan.

1.0 Development of Restoration Activities in the Upper Columbia Region

Development of habitat improvement actions in the UCR is informed by a number of factors or processes. Among these are Viable Salmonid Population (VSP) criteria, process-based restoration, and tributary and reach assessments. The adaption of these for use by the RTT is described below.

VSP Criteria--The RTT worked with stakeholders in the UCR and other regions to generate criteria and recommendations for developing habitat restoration projects and criteria for habitat protection. Originally, the RTT biological strategy (RTT 2000) adapted the work of MacDonald et al. (1996) who identified HUC-6 watersheds for spring and summer Chinook, sockeye, summer steelhead, bull trout, and Westslope cutthroat trout. That framework was generally consistent with VSP criteria for listed species (McElhany et al. 2000) with exception that it does not link criteria to attributes required for recovery. In 2007, the UCSRB adopted the VSP construct and the biological principles for developing

recommendations so criteria for recommending habitat projects could be linked to recovery[14] among other objectives.

Process-based restoration -- Process-based restoration refers to projects that will affect long-term changes to watershed and fluvial processes. Process-based restoration addresses causes not symptoms and includes projects like riparian plantings, flow restoration, and floodplain reconnection all that contribute to restoring natural processes. Process-based restoration is scalar insofar as it considers the geographic, watershed, and habitat/reach scales (Naiman et al. 1992; Montgomery and Buffington 1998). At the geographic scale, factors such as geology, soils, vegetation, and climate serve as ultimate "top down" spatial controls (Leopold et al. 1992; Montgomery and Bolton 2003). Factors at the watershed scale refer to landform, and biotic processes that operate over smaller spatial areas and shorter timeframes. Watershed factors include stream flow, temperature, sediment, and channel migration. Habitat/ reach-scale factors include pool-riffle ratios, channel size, riparian vegetation, substrate, large woody debris, and bank stability. This is the scale which fish species exploit resources and reproduce. This is also the scale which most restoration occurs (Fausch et al. 2002).

Assessments -- Assessments are used to characterize processes that affect habitat quality and actions that can be taken to reverse, improve, or enhance the processes that affect habitat quality. The Bureau of Reclamation develops tributary and reach assessments that depending on the scale can be used to identify project types and locations for achieving specific outcomes. Assessments can be used to develop a list of potential actions/opportunities, which then can be considered for prioritization based on funding or other feasibility criteria.

Each subbasin in the UCR is unique in the VSP parameters, process-based restoration opportunities, and assessments that will determine feasibility of project selection and development. The following narratives include objectives for habitat improvement of limiting factors in subbasins of the UCR.

2.0 UCR Subbasins and Priorities for Habitat Improvement

Each subbasin in the UCR is unique in the VSP parameters, process-based restoration opportunities, and assessments that will determine feasibility of project selection and development. The following narratives include objectives for habitat improvement of limiting factors in subbasins of the UCR.

2.1. The Wenatchee Subbasin

The Wenatchee River supports the greatest abundance and diversity of spring Chinook salmon and steelhead, summer Chinook, sockeye salmon, bull trout, Pacific lamprey, and Westslope cutthroat trout. These species persist although the system has been degraded by past land management activities. Primary among the factors affecting conditions for salmonid species is mining that affected riparian and stream conditions as early as the 1860s (Mullan et al. 1992). Like mining, intense

[14]VSPs are defined in terms of abundance, productivity, spatial structure, and diversity. The determination of viability references major spawning areas (MaSA) and independent populations, a number which can form major population groups (MPGs). When combined MPGs make up a DPS or ESU. A viable DPS or ESU is naturally self-sustaining, with a high probability of persistence of a 100-year time period.

livestock grazing from the late 1800s to the 1930s, water diversion for irrigation, and timber harvest reduced habitat diversity, connectivity, water quantity and quality, and riparian function in the Wenatchee (Mullan et al. 1992). Some headwater areas were spared the impacts of management and today serve as "strongholds" for listed species and species of concern. The primary habitat conditions in the Wenatchee Basin that currently limit abundance, productivity, spatial structure, and diversity of salmon and steelhead include a lack of habitat diversity and quantity, excessive sediment loading, blocked passage, channel instability, low flows, and high summer temperatures. The RTT prioritized assessment units in the Wenatchee Basin based on ecological concerns and actions to improve riparian conditions; these include:

Nason Creek
Icicle Creek
Lower Mainstem
Little Wenatchee
Middle Wenatchee
Chiwawa River
Upper Wenatchee
Peshastin Creek
Mission Creek
White River
Chumstick Creek

2.2. The Entiat Basin

Historical patterns of land use in the Entiat Basin are similar to those in the Wenatchee. Mining also affected riparian and stream conditions; and as in the Wenatchee flow diversion and timber harvest reduced habitat diversity, connectivity, water quantity and quality, and riparian function in many assessment units within the basin. The headwaters of the Entiat include several "strongholds" that provide habitat for listed species and species of concern. Conditions limiting abundance, productivity, spatial structure, and diversity for salmon and steelhead include stream channel configuration and complexity. Straightened channels, lack of pools, lack of large wood, and disconnected side channels, wetlands, and floodplains are primary among factors contributing to degraded conditions for salmonids. The RTT prioritized the following assessment units for restoration and protection:

Middle Entiat (Stillwaters)
Upper-Middle Entiat
Lower Entiat
Mad River

2.3. The Methow Basin

Like a number of drainages in the UCR, the Methow Basin has been impacted by mining, livestock grazing, water diversion for irrigation, and timber harvest. These activities reduced habitat diversity, connectivity, water quantity and quality, and riparian function (Mullan et al. 1992). Although intact portions of headwater tributaries provide more "pristine" habitat, the middle and lower mainstem and tributaries have been impacted by highways, roads, and housing and agricultural development that have diminished the function of stream channels and floodplains. Development has impaired stream complexity, wood and gravel recruitment, floodwater retention, and water quality. In addition to direct impacts from development or management, tributary streams are affected by low instream flows that affect migration, spawning, and rearing habitat. Based on these factors, the RTT prioritized the following assessment units for restoration and protection:

Upper, Middle, and Lower Methow River
Upper, Lower Chewuch River
Wolf Creek
Libby Creek
Lost River
Upper, Lower Twisp River
Beaver Creek
Gold Creek
Early Winters Creek

2.4. The Okanogan Basin

The Okanogan/ Similkameen is the largest and most complex subbasin in the region. Among the management activities, the affects which must be rectified, transboundary planning is critical to improvement of habitat for salmon because more than half of the Okanogan subbasin is in British Columbia. Transboundary planning is of relevance, particularly in light of some of the land management actions that affected conditions for salmon and steelhead in the Okanogan Basin. For example, mining that brought an influx of people to the valley in the mid-1800s extended into the Fraser River Basin in British Columbia. Getting there resulted in large cattle drives up the Okanogan River Valley that resulted in degraded riparian conditions. Current conditions that limit potential for salmonid productivity and use include barriers to migration, poor water quality, and reduced instream flows.

Elevated water temperatures in the Okanogan often exceed lethal tolerance levels for salmonids. High temperatures due in part to low gradient, aspect, high ambient air temperatures, and upstream lake effects are exacerbated by the impacts of dam operations, irrigation, and land management. Based on these factors, the RTT prioritized the following assessment units for restoration and protection:

Upper, Lower Salmon Creek
Okanogan River
Upper, Lower Antoine Creek
Johnson Creek
Loup Loup Creek
Upper, Lower Omak Creek
Nine Mile Creek
Lower, Middle Similkameen River

2.5. The Foster Creek and Moses Coulee Subbasins

Relative to other subbasins the Foster Creek and Moses Coulee subbasins have limited capability to support salmonids. This limitation is resultant of low levels of precipitation and resultant stream flows, and stream channel characteristics. Agricultural practices and conversion of upland, riparian, and wetland habitats to arable land reduced storage capacity of the floodplain, affected runoff, and contributed to sediment loading in valley streams. The immediate strategy for Foster Creek and Moses Coulee would be to monitor salmonid use and distribution, assess habitat condition, and evaluate barriers to upstream passage.

2.6. Squilchuck and Stemilt and Small Tributaries

A number of small tributaries drain directly into the Columbia River between the Wenatchee River and Crab Creek. Some have documented juvenile *O. mykiss* habitat that ranges from several hundred feet to several miles (WDFW unpublished data). Recent spring spawning ground surveys identified adult steelhead presence, redds, or carcasses in Squilchuck, Tarpiscan, Trinidad, Tekison, Quilomene, Brushy, Skookumchuck, and Johnson creeks (WDFW unpublished data). A combination of protection and restoration (depending on ownership) was considered by the RTT for these drainages.

3.0 Information Needs

The effects of altered fluvial processes on life stage specific survival in many UCR streams are not fully understood. Stream channels in many areas are constrained by railroads, highways, dikes, and development. These constraints result in reduced channel sinuosity, flood aggravation, reduced gravel recruitment, reduced large woody debris recruitment, and lost connection to side channels. Information needs include historical and current channel migration rates, factors affecting current channel migration rates, options to restore floodplain function, and appropriate types and locations of restoration.

More information is needed on the water balance and the relation of surface and groundwater in UCR streams. A hydrologic assessment should identify critical ground-water recharge areas and determine locations where groundwater contributes to surface water. The role of upslope forest and range management on water balance and hyporheic flows needs to be further understood as well.

Where they have not been completed, an inventory and assessment of fish passage barrier and screens, and prioritization of these passage issues should be pursued. A comprehensive inventory of artificial and natural barriers (culverts, diversions, diversion dams, gradients, etc.), diversions, and screens should be assembled for the Wenatchee, Entiat, Methow, and portions of the Okanogan subbasins.

A better understanding of habitat-productivity relationships in UCR streams is being addressed through the ISEMP program. This work will help guide land and water management decisions contributing to recovery of salmonids in the region. Increased effort and continuation of upstream/downstream salmonid migrant trapping, parr and spawning ground surveys in representative streams has greatly contributed to our knowledge base, and has resulted in appropriate resource allocation decisions.

The extent of salmonid spawning and rearing in small-order tributaries to the Columbia River is not well known. Many streams (such as Douglas, Sand, Rock Island, Colockum, Stemilt, Squilchuck, Tarpiscan, Trinidad, Quilomene, and Skookumchuck creeks) appear to offer rearing habitat and overwinter refuges that could be important to the population and spatial structure and dispersal patterns of salmonids in the ESU/DPS. The presence, extent, and distribution of *O. mykiss* in some of these streams has been evaluated and monitored; however, a more comprehensive evaluation would be needed to determine the current and potential future roll of these systems in the Upper Columbia steelhead DPS.

Appendix F identifies specific informational needs within the entire UCR. This information was initially gleaned from the Biological Strategy (RTT 2002) and the recovery plan (UCSRB 2007). However, the Monitoring and Data Management Committee (MaDMC) periodically updates and prioritizes the information needs (Appendix F).

4.0. Adaptive Management Process

In January, 2010, the RTT hosted the first five-year analysis and synthesis workshop. This workshop is a component of the UCSRB's adaptive management process for salmon and steelhead recovery in the UCR. Topics at the workshop were:

Status of VSP by population and ESU: fish status and trend

Implementation, limiting factors, and threats

Habitat status and trend

Habitat action effectiveness, and

Data gaps and research needs

A report of the workshop was adopted by the RTT in October 2010 (Ward et al. 2010). The information presented at the workshop was captured in Ward et al. (2010).

5.0 Project Evaluation Criteria

The RTT has defined criteria to assist in the development of project proposals. The adequacy of proposals affects the RTT's ability to assess and score potential benefits and is determined based on clearly defined objectives and methods, and inclusion of supporting materials (figures, maps, references). The RRT also evaluates a proposals cost effectiveness given the activities proposed. After proposals are scored for expected benefits, costs are used to develop a benefit:cost ratio.

Scoring Criteria

Scoring criteria are based on ecological concerns and overall effect of an action on freshwater productivity. These factors form the basis for evaluating restoration, protection, design, or assessment projects. Each category of projects is assigned separate criteria for scoring. Each criterion is weighted based on relative importance to other criteria in each category. For example, the criterion addressing a primary ecological concern will be weighted higher than the criterion of landowner acceptance. Both are important, but addressing primary ecological concerns has been determined to be more important from a technical perspective than landowner acceptance. The weight assigned to each question generates a total score that varies among projects.

Restoration Projects

1. Addresses Primary Ecological Concerns (25% of total score)

*a) Extent to which the proposed restoration project will reduce the effects of **primary** ecological concerns (as identified in the UCRTT Biological Strategy, Appendix E)?*

> **Rationale**: Proposed restoration actions must address **primary** ecological concerns limiting the freshwater survival and/or distribution of fish species within a priority sub-watershed or assessment unit. Projects that address more than one primary ecological concern, or fully rectify a single ecological concern, achieve the highest scores.

2. Methodology, Location, and Scale of the Restoration Project (15% of total score)

a) Extent to which the proposed restoration project is sited within a priority spawning/rearing area (as identified in Appendix E), or provides access to habitat that would function as priority spawning/rearing habitat?

> **Rationale**: Streams vary in intrinsic potential (i.e., potential quality and quantity of spawning/rearing habitat) because of differences in geology, geomorphology, valley width, elevation, stream size, gradient, and other factors. The RTT has incorporated intrinsic potential in the identification of priority restoration areas. Projects that improve habitat quantity and quality within streams of high intrinsic potential, or provide access to such habitat, will achieve the highest scores. For projects that are targeting only bull trout, known habitat use by life stage will be used since intrinsic potential has not been developed for bull trout.

b) Extent to which the restoration project is appropriately scaled and scoped.

> **Rationale**: Projects must be placed so that they function within the fluvial-geomorphic context of the stream reach or watershed. Projects sited without consideration of stream flow, sediment dynamics, and geomorphology are presumed to have a high likelihood of failure or to provide limited long-term physical and biological benefit, and thus are scored low. Similarly projects may be too small in scope to achieve purported benefits.

3. Longevity of Proposed Restoration Action (15% of total score)

a) Over what time period will the proposed restoration action and its benefits persist?

> **Rationale**: Restoration projects that promote long-term habitat improvement, and/or require little to no on-going maintenance are likely to have the greatest biological benefit and are scored high. Projects that treat only symptoms of degraded watershed processes, or require on-going maintenance are unlikely to persist for long periods and are assigned lower scores.

b) Extent to which the project promotes natural stream/watershed processes that are consistent with the fluvial geomorphology at the reach or assessment unit scale?

> **Rationale**: The RTT defines *natural stream/watershed processes* as those processes where habitat functions at large spatial and temporal scales. Connectivity to the floodplain, absence of barriers, and large, intact riparian zones are all features of natural stream/watershed processes. As discussed within the body of the biological strategy, “process based restoration” refers to projects that will result in long-term changes to natural watershed and fluvial processes. Projects like riparian plantings, increasing flows, removing structures that limit floodplain connection are all examples of projects that restore natural processes.

4. Benefits to Freshwater Survival (30% of total score)

a) Extent to which the project would improve freshwater survival of target species at the primary sub-watershed or assessment unit scale?

> **Rationale**: Habitat restoration projects are implemented to increase freshwater survival and/or distribution of target fish species. Therefore, it is important to assess the effects of restoration actions on pre-spawn survival, egg-smolt survival, and spawner distribution. These metrics are evaluated at the scale of the primary sub-watershed or assessment unit.

Protection Projects

1. Placement of Protection Project (30% of total score)

a) Extent to which the proposed protection project is sited within a priority spawning/rearing area (as identified in Appendix E)?

Rationale: Streams vary in intrinsic potential (i.e., potential quality and quantity of spawning/rearing habitat) because of differences in geology, geomorphology, valley width, elevation, stream size, gradient, and other factors. Projects that protect habitat within or along streams of high intrinsic potential will achieve the highest scores.

b) Extent to which the project protects high-quality habitat or habitat that can be restored to high quality with appropriate restoration actions?

Rationale: Maintaining high-quality habitat within priority spawning and rearing areas is critical to the viability of target fish populations. Thus, protecting these areas, or areas with high restoration potential, is important to the conservation of the target species.

c) Extent to which the protection project is connected with other protected properties?

Rationale: Large parcels of high-quality riparian/floodplain habitat may have a greater effect on freshwater survival than smaller, discontinuous parcels of high-quality riparian/floodplain habitat. Therefore, projects protecting smaller, isolated "islands" of habitat will receive lower scores than large, connected parcels of high-quality habitat.

2. Potential Loss of Habitat Without Project (35% of total score)

a) What would be the anticipated loss in freshwater survival and/or distribution of target species if the proposed area was developed (i.e., what habitat values would be lost and to what degree would that loss reduce freshwater survival and/or distribution of target species at the assessment unit scale)?

Rationale: Freshwater survival is related to the quality of stream habitat. The loss of high quality habitat will result in reduced freshwater survival or distribution of target fish species.

3. Threat (15% of total score)

a) How imminent is the threat to the proposed land?

Rationale: Because salmon recovery funds are limited, the most pressing concerns need to be addressed first. When evaluating proposals, the RTT tries to predict the extent to which a project will change habitat conditions and to assess the significance of that change to fish populations. Therefore, to evaluate a habitat protection project, one must have a reasonable basis for comparing what would happen with and without the project. The ability to predict the fate of a proposed parcel of land for protection or easement is poor, but improved when informed by knowledge of the intentions of the present landowner, market conditions, and local critical areas and zoning laws among others. Scoring protection projects by default as if all extant habitat values will be lost but for the project, would substantially and artificially inflate the value of these projects as compared to restoration projects.

4. Cost Effectiveness of Protection Project (15% of total score)

a) How cost effective is the proposed project compared to other projects being proposed within the same funding cycle?

Rationale: As with restoration projects, the benefits associated with protecting a parcel of riparian/floodplain habitat should justify the cost of the acquisition or conservation easement.

Comments to be included in regard to this criterion (not part of the scoring):

1. Does the RTT believe there are cost efficiencies that could be gained?

2. Are there any costs that could be improved?

3. Was there a "value engineering review" (mostly design projects)?

5. Conditions Affecting the Project (5% of total score)

a) Are there any conditions regarding the protection of the property that could limit the existing high quality habitat?

Rationale: Purchase of a property with explicit provisions for activities or anthropogenic features that may affect the quality of habitat may reduce the

Assessment Projects

1. Address Primary Ecological Concerns (25% of total score)

*a) Extent to which the proposed assessment will inform the development of projects that will reduce the effects of **primary** ecological concerns (as identified in the UCRTT Biological Strategy, Appendix E)?*

Rationale: All assessments proposed should link directly to restoration or protection actions addressing **primary** ecological concerns that limit freshwater survival and/or distribution of fish species. Assessment projects that inform actions that address more than one primary ecological concern, or fully rectify a single ecological concern, will achieve the highest scores. Sequencing will also affect scores.

2. Area covered by Assessment (20% of total score)

a) Extent to which the proposed assessment is sited within a priority spawning/rearing area (as identified in Appendix E)?

Rationale: Streams vary in intrinsic potential (i.e., potential quality and quantity of spawning/rearing habitat) because of differences in geology, geomorphology, valley width, elevation, stream size, gradient, and other factors. Assessment projects that inform actions that improve habitat quantity and quality within priority areas, or provide access to such habitat, will achieve the highest scores.

b) Extent to which the assessment is appropriately scaled and scoped?

Rationale: Assessment projects must be sufficiently comprehensive to anticipate the physical and ecological issues that potentially influence the effectiveness of the restoration projects they will inform.

3. Use of Information (20% of total score)

a) Extent to which the assessment will fill data gaps identified in Appendix F of the Biological Strategy and will provide information that will lead directly to restoration and/or protection actions.

Rationale: An assessment must be designed to lead to specific projects, or inform critical data gaps, as identified by the RTT in Appendix F of the Biological Strategy.

4. Methods (20% of total score)

a) Are the methods outlined within the assessment proposal adequate to achieve the stated objectives?

Rationale: The assessment must clearly describe the methods that will be used to gather and analyze the information. The proposal should demonstrate that it is using an accepted approach. If it is innovative, the proposal should discuss how the methods will achieve the stated objectives of the assessment and demonstrate the benefits of the methods relative to a standard method.

5. Cost Effectiveness of Assessment Project (10% of total score)

a) How cost effective is the proposed project compared to other projects being proposed within the same funding cycle?

Rationale: For an assessment project, it is important that the cost reflects the appropriate amount of effort to obtain the information.

Comments to be included in regard to this criterion (not part of the scoring):

1. Does the RTT believe there are potential cost efficiencies that could be gained?

2. Are there any costs that could be improved?

3. Was there a “value engineering review” (mostly design projects)?

6. Dissemination of information (5% of total score)

a) Is there an avenue described for disseminating information to interested parties upon completion of the assessment?

Rationale: It is important that the proposal clearly identify how this information will be disseminated and accessed (e.g., on the web) once the project is complete.

Design Projects

1. Address Primary Ecological Concerns (25% of total score)

a) *Extent to which the proposed design will lead to the development of projects that will reduce the effects of **primary** ecological concerns (as identified in the UCRTT Biological Strategy, Appendix E)?*

Rationale: All designs should link directly to restoration or protection actions addressing **primary** ecological concerns that limit freshwater survival and/or distribution of fish species. Design projects with a direct linkage to development of actions addressing more than one important ecological concern, or fully rectifying a single ecological concern, achieve the highest scores. Sequencing also affects scores.

2. Area covered by Design (25% of total score)

a) Extent to which the proposed project (created from the design) is sited within a priority spawning/rearing area, or creates or provides access to habitat that could function as priority spawning/rearing habitat?

Rationale: Streams vary in intrinsic potential (i.e., potential quality and quantity of spawning/rearing habitat) because of differences in geology, geomorphology, valley width, elevation, stream size, gradient, and other factors. Design projects directly leading to actions that improve habitat quantity and quality within priority areas, or provide access to such habitat, will achieve the highest scores.

b) Extent to which the design is appropriately scaled and scoped?

Rationale: Projects must be designed so that they will function within the fluvial-geomorphic context of the stream reach or watershed. Projects that are sited without consideration of stream flows, sediment dynamics, and geomorphology are anticipated to fail or to provide limited long-term physical and biological benefit and will be scored low. Similarly a project may be too small in scope to achieve the purported benefits.

3. Methods (25% of total score)

a) Are the methods outlined within the design proposal adequate to achieve the stated objectives?

Rationale: The design must clearly illustrate what methods will lead to an action (project). The project proponent should demonstrate that the methods proposed are “accepted” as standard. Innovative designs must be discussed in terms of how approach will achieve the stated objectives and demonstrate the benefits of the method relative to a standard or alternative.

4. Cost Effectiveness of Design Project (15% of total score)

a) How cost effective is the proposed project compared to other projects being proposed within the same funding cycle?

Rationale: For a design, it is important that the cost reflects the appropriate amount of effort to develop appropriate actions.

Comments to be included in regard to this criterion (not part of the scoring):

1. Does the RTT believe that there are potential cost efficiencies that could be gained?

2. Are there any costs that could be improved?

3. Was there a “value engineering review” (mostly design projects)?

5. Level of completeness (10% of total score)

a) To what level of completion will the design be developed?

Rationale: It is important that the project proponent identify how complete the design will be (e.g., permit-ready, bid-ready, etc.); whether there is a preferred alternative; and whether permits will be applied for or in-hand once the design is complete. This will aid the RTT in determining the level of completeness of the proposed design.

b) Are there milestones for future check-ins with the RTT as the design progresses?

Rationale: Future check-in prior to full project development assists the project proponent and the RTT in ensuring that the best possible alternative for an action is designed.

Attachment 2: Summary: Snake River Salmon Recovery Plan for Southeast Washington

Original Text Prepared By **Snake River Salmon Recovery Board** *for the* Washington Governor's Salmon Recovery Office December 2006. *http://hwsconnect.ekosystem.us/File/320/2194.*

HABITAT STRATEGY

Protection and Restoration

The Snake River Salmon Recovery Plan habitat strategy is based on protection and/or restoration. Protection involves preserving high quality or productive habitat to maintain or not degrade current conditions. Restoration, which can be active or passive, is intended to improve degraded habitat. Within the context of the federal Recovery Plan for salmonids, habitat protection and restoration are balanced by considering the number of listed species and their abundance in a given portion of a subbasin; costs and benefits of protecting high quality habitat vs. restoring historic habitat; the cost and benefits of eliminating known fish passage obstructions, screening problems, or pollution sources; and the time frame in which benefits to salmon will accrue.

Based on these considerations, habitat protection and restoration are prioritized based on imminent threats to fish life in areas containing listed populations of salmon and steelhead. Actions in these areas receive the highest priority. Examples of "imminent threats" include adult fish passage barriers such as culverts or dams, unscreened or poorly screened irrigation diversions, stream crossings in spawning areas, dewatered reaches that strand or kill fish and act as passage barriers, and point sources of toxic pollutants. Removing imminent threats such as these are anticipated to deliver the greatest increase in fish survival over the shortest time.

While habitat actions are proposed only in the Washington portion of each subbasin, the analysis assumes that the State of Oregon will also improve habitat within its jurisdiction consistent with the level of improvement described in subbasin plans.

Active and Passive Restoration

Habitat restoration can be either active or passive. In the case of passive restoration legal tools may be used to secure land and achieve the ultimate goal of reducing disturbance. Conservation Reserve Enhancement Program (CREP) riparian buffers, conservation easements, and land acquisition are examples of passive restoration. Active restoration on the other hand involves direct intervention, often within the stream channel. Areas targeted for active restoration may include acquired parcels. Examples of active restoration include engineered restoration of stream channels; engineered log jams and addition of large woody debris; removal or relocation of dikes, levees, and embankments; creation of pools; and hydraulic reconnection of historical side channels.

For active restoration, stream reaches supporting listed populations take precedence over other reaches. Reaches supporting greater numbers of listed fish species or stocks take precedence over those supporting fewer listed populations. Protection of reaches with high productivity takes precedence over restoration of potentially productive reaches. The location of a reach within the

stream can affect priority. For example, salmon, passage projects in downstream areas would take precedence over those higher in the stream. However, for bull trout, which reside primarily in upstream areas, projects higher in the drainage would be assigned a higher priority than those downstream. Upstream projects for bull trout would be given equal priority to downstream passage projects to benefit salmon and steelhead. Actions target important reaches in each subbasin; with a reach considered "important" if improvements will result in increased fish abundance and productivity. Major Spawning Areas (MSA) are considered important reaches. Selection of habitat strategies and priority areas is subject to economic, legal, socio-cultural, and political constraints to recovery in the region. For example, the recovery region is highly dependent on agricultural production so restoration actions must be considered within the context of what economically drives and sustains the area. Likewise, legal, social, cultural and political constraints to project implementation must be given due consideration as projects are evaluated for their feasibility.

HABITAT ACTIONS

Habitat actions proposed by the Snake River Salmon Recovery Board are aimed at MSAs and are grouped under "Approach Categories" that define the approach to be taken (restoration or protection) to achieve the desired future conditions and recovery goals for habitat. Approaches are designed to improve upland habitat, riparian condition, floodplain function, instream habitat, water quantity, and water quality. Approaches are prioritized using the following criteria:

- **Effectiveness**: What is the probability that implementing this strategy will achieve the objective?
- **Technical Feasibility**: How feasible is the strategy from a technical perspective?
- **Cost/benefit**: Are the benefits to fish habitat large relative to the cost of the strategy?

Approach categories are assigned priority values from 1 (highest) to 5 (lowest). Habitat factors (attributes) are correlated with sets of approaches, each of which is prioritized. Actions proposed to achieve improvements are defined for each MSA and each habitat factor. The habitat factors are then arranged in order from the most important to least important for each MSA. In most cases, attributes were combined to obtain a single value for a habitat factor. For example, the value for the habitat factor "embeddedness" is the total of the related attributes turbidity, percent fines, and embeddedness.

IMPLEMENTATION STRUCTURE, ROLES, FUNCTIONS AND RESPONSIBILITIES

The Snake River Salmon Recovery Board agrees the federal plan to recover salmonids is scientifically sound and has local support. This section describes how administratively plan elements can be implemented. The Snake River Salmon Recovery Board is committed to implementation, monitoring and reporting to support the Plan and has adopted an adaptive management approach that involves the local community and natural resource agencies in the endeavor. Natural resource agencies, county planning departments, Tribes, conservation districts and the Regional Fisheries Groups assist in Plan maintenance and update. Plan implementation is coordinated with subbasin plans, watershed plans, Lead Entity processes, habitat conservation plans, and related local, state and federal efforts. The Snake River Salmon Recovery Board relies on staff and others to communicate, coordinate, and integrate processes and programs within the region and uses the Lead Entity program for public outreach, project identification and proposal development.

Public Support

Public involvement is essential for successful Plan implementation. It is vital that the public understand and support the priority areas and actions as well as the programs and potential policies necessary for salmon recovery. This involvement and support vests the public in the process and fosters a sense of ownership. The Snake River Salmon Recovery Board strives to reinforce understanding about the multiple planning efforts on-going in the region and assurance that these efforts are coordinated and to the extent possible.

For example, there is a Lead Entity program, watershed planning, habitat conservation planning, a regional fisheries enhancement group, Walla Walla watershed alliance, and dozens of state and federal programs like CREP, irrigation efficiencies, and the water trust. The Snake River Salmon Recovery Board coordinates information sharing among these entities to ensure actions are coordinated.

In addition to programs aimed at habitat, the region also supports efforts and priorities aimed at hatcheries, harvest and hydropower system management and improvement. The Snake River Salmon Recovery Board also promotes and supports greater accountability and understanding of these priorities and of other federal and state initiatives, and interfaces with the public on such matters.

Projects are implemented by citizens, state agencies, tribal organizations, regional fisheries groups, planning units, conservation districts and other organizations. These entities rely on a good understanding of priority areas and actions to guide project location and selection. The Snake River Salmon Recovery Board maintains a list of projects completed, scheduled for completion, and those project on the to-do list. This list guides the public, elected officials, and agencies in demonstrating the strategic approach to project implementation and address of limiting factors.

Technical Support

The Snake River Salmon Recovery Board acknowledges that the federal Recovery Plan is dynamic and that implementation of Plan elements will evolve over time. Changes to the Plan will require technical input and review; and the Snake River Salmon Recovery Board will rely on the RTT and the lead entity organization for technical support.

Regional Technical Team (RTT). The RTT is a science group with responsibility for RME coordination, adaptive management, and project review. This team operates at the regional level. In addition to local and state technical agencies and representatives, the RTT interfaces directly with federal agencies to identify issues and opportunities for enhancing Plan implementation and to elevate issues for consideration as the Plan is revised over time.

Implementation Work Group (IWG). The IWG in the Walla Walla Basin is responsible for reviewing and rating habitat and assessment projects for most funding sources. This group also ranks habitat and assessment projects for funding at the regional level. The IWG is composed of technical and citizen members from the three counties in the Walla Walla Basin.

Lead Entity Program. The Lead Entity program works with the Salmon Recovery Fund Board grant program and sponsors to develop applications for funding. Five CountyConservation Districts are co-leads contracted by the Board for county-specific tasks. In addition to the co-leads, the Lead Entity Program relies on a citizen-technical committee to review and rate projects for funding. Projects are presented to the Board for consideration and development of a final ranked list for Salmon Recovery Funding Board consideration. The Lead Entity program operates at the local and regional levels.

Regional Representation. The Snake River Salmon Recovery Board developed a strong relationship with federal fisheries agencies as the Recovery Plan was being developed. The board will continue to serve as the Southeast Washington liaison to federal agencies as issues related to the Plan

arise. Prior to the establishment of the Snake River Salmon Recovery Board, neither the local communities nor the federal government had a mechanism for engaging in policy and technical matters related to the Plan. Because the Snake River Salmon Recovery Board's geographic area includes the populations of mid-Columbia and Snake River listed stocks, the Board expects to be an active participant in Recovery Plan Implementation at the ESU scale.

LEAD ENTITY STRATEGY FOR IMPLEMENTING HABITAT PROTECTION AND RESTORATION PROJECTS

The Lead Entity process is used to identify and solicit habitat protection and restoration projects. As the Lead Entity, the Snake River Salmon Recovery Board reviews and ranks projects and submits these for funding requests to the Salmon Recovery Fund Board. The Lead Entity committee reviews, scores, and ranks proposals before sending them to them for review and concurrence. The scoring criteria were developed by the Lead Entity and have been used since 1999.

The Recovery Plan analysis provides the technical foundation for prioritizing the protection and restoration actions and the location of these. Stream reaches are rated for "preservation" based on current habitat condition. Reaches rated for "restoration" are based on a comparison between current and historic habitat condition. MSAs are overlaid on priority restoration and protection reaches to illustrate that actions in these areas will contribute to augmented spatial structure for salmonids within the recovery region.

Prioritized projects are organized into "tiers" ranging from 1 to 4. Tier 1 includes projects that address imminent threats. Tier 2 includes projects to restore habitat function within priority reaches of MSAs. Projects designed to protect priority areas are included in Tier 3. Tier 4 comprises projects in areas supporting salmon outside of identified MSAs.

Points are awarded to projects based on location and the proposed action. Evaluators rate each project according to its benefits to salmonids and their habitats. Benefits are ranked as **High, Medium,** or **Low** based on the project's proximity to priority areas, fish health and population status, fish productivity, life stage, number of fish species, habitat conditions, watershed-forming processes, and cost effectiveness.

Evaluators also assess the certainty that a project will deliver the expected benefits for fish. This determination is based on the project location, current habitat condition, habitat-forming processes, the degree to which historical functions will be protected or restored, the success of similar projects, the likelihood that benefits will be achieved, the appropriateness of the proposed methodology, and the potential for continued habitat degradation if the project does not take place.

Projects are awarded points for certainty, longevity, and size. Projects that have a high degree of certainty, will last in perpetuity, and affect a large area are scored high. Projects the certainty which is speculative, which benefits are anticipated to for less than 10 years, and that affect a relatively small area are scored low.

Agencies, citizens, tribal representatives, and conservation districts identify potential projects. Project sponsors apply to the Conservation District (co-lead entity) in the county which the project would be located. The co-lead entity reviews the project and determines community support and technical applicability. The Lead Entity then reviews projects forwarded from the co-leads. Any technical issues or concerns regarding implementation are addressed at this point before the assessment of benefit and certainty occurs.

SNAKE RIVER SALMON REGION – PROVISIONAL WORK PLAN 2013-2018

http://hwsconnect.ekosystem.us/File/320/3841

INTRODUCTION

The Snake River Salmon Region – Provisional Work Plan is produced by the Snake River Salmon Recovery Board as a guide for salmon and steelhead recovery actions within the Snake River Region. The Snake River Salmon Recovery Board RTT has developed and prioritized the actions and projects for habitat restoration, habitat assessments, research monitoring and evaluation, hatchery and information education and policy.

Recovery priorities are reviewed annually and new priority projects are identified, making the work plan a living document. The Snake River Salmon Recovery Board uses the work plan format to provide priority projects lists for habitat restoration, assessments, research/monitoring and evaluation, hatchery activities, information/education or regulations for those who are preparing projects and those who provide funding for salmon recovery actions.

This document is structured to list both general and specific actions for restoration by priority areas in each MSA as illustrated in the Snake River Reaches Priority Reaches Map. The projects listed as priorities are identified as needing attention over the next 1 to 3 years.

The 2013-2018 work plan has been partitioned into two sections; 1 - WRIA 32 33 & 35's Habitat Restoration & Protection, 2 – Habitat Assessments.

The RTT has worked to provide general project categories for conducting habitat restoration in priority restoration and protection reaches in the Snake River Recovery Region. The guidelines are designed to aid project sponsors in developing restoration projects into beneficial salmon projects. The following General Project Category outline lists actions designed and tested for addressing regional limiting factors.

General Project Categories for Priority Restoration Reaches Include:

- Restore and Protect Floodplain and Riparian Function o Easements (CREP, Permanent Conservation)
    - o Remove and modify river dikes that constrict floodplain function
    - o Control noxious weeds that reduce riparian function
    - o Riparian restoration projects (Fencing, planting, stock relocation)
    - o Land use and planning
- Restore Habitat Complexity
    - o Enhance stream channel complexity (wood placement, structures)
    - o Extend stream length (Meander projects, & side channel construction)
    - o Minimize confinement caused by channel training
- Reduce Fine Sediments
    - o Upland BMPs (Direct seed, grass waterways, sediment ponds, native grass, & reforestation)
    - o Fine sediment routing assessment and Implementation (Roadway maintenance, ephemeral stream, stream fords management, storm water)

- Remove Imminent Threats
    - o Assess and remove / modify fish passage barriers
    - o Screen and meter stream diversions
- Maintain or Restore In-stream Flow
    - o Conduct water efficiency
    - o Springhead inventory and protection
    - o Aquifer Recharge
    - o Assess and enhance stream flows

General Project Categories for Priority Protection Reaches:

- Protect Floodplain and Riparian Function
    - o Easements (CREP & Permanent Conservation)
    - o Control noxious weeds that reduce riparian function
    - o Riparian restoration projects (fencing, planting, stock relocation, & alternative water developments)
- Reduce Fine Sediments
    - o Upland BMPs (Direct seed, grass waterways, sediment ponds, native grass)
    - o Fine sediment routing assessment and Implementation (roadway maintenance, ephemeral stream, stream fords)
- Remove Imminent Threats
    - o Assess and remove fish passage barriers
    - o Screen and meter stream diversions
- Maintain or Restore In-stream Flow
    - o Conduct water efficiency
    - o Springhead inventory and protection
    - o Assess and enhance stream flows
- Water Quality
    - o Maintain or improve water quality consistent with TMDL plans

Attachment 3: Explanation of the Calculation of Tributary Habitat Benefits

This paper explains, in a step-by-step fashion, how the Action Agencies arrived at the numbers presented in the 2013 Comprehensive Evaluation Table 35, Section 2 (columns 6-8 labeled "From Expert Panel Results"). The Expert Panel process is employed for the 2008/2010 Federal Columbia River Power System Biological Opinion (FCRPS BiOp) to evaluate changes in habitat quality improvement associated with completion of habitat improvement field projects that address key limiting factors for most of the Snake River and upper Columbia River chinook and steelhead populations identified in RPA Action 35, Table 5. The habitat quality improvements, determined with expert panel input, represent the measure of RPA Action 35, Table 5 progress.

This evaluation of tributary habitat improvement project benefits by expert panels, by its nature, employs expert opinion and, in that sense, is qualitative. Expert opinions are judgments used as a form of scientific evidence, in contrast to evidence derived from direct empirical observation or to model-driven extrapolation based on empirical evidence. Expert knowledge is used widely in conservation science, particularly where data are scarce, problems are complex, and decisions are needed in a short time frame (Martin et al. 2011). NOAA and the Action Agencies employed collaboration with States and Tribes to develop the Proposed Action contained in the 2007 FCRPS Biological Assessment and the ensuing 2008 FCRPS Biological Opinion. The panels base their evaluations on the best available scientific information, including data on the status of fish runs; subbasin plans developed for the NPCC's subbasin planning process; NOAA Fisheries' ESA recovery plans and draft recovery plans; Reclamation's tributary and reach assessments; results of relevant research and monitoring; and other sources(including modeling such as Ecosystem Diagnostic and Treatment modeling, where it has been developed for the populations in question) (2013 Draft CE; BPA and Reclamation 2013b). Thus informed by scientific information, panels evaluate and debate effects of habitat improvement projects on changes in habitat condition limiting factors and apply their collective professional judgment to determine that change.

The numbers in the CE Table 35 should not be viewed as "precise measurements", like those obtained from a scientific measuring device such as mass spectrophotometer that can measure and report the concentration of a chemical constituent in parts per billion. Rather, these numbers represent results from a reasonable, systematic, widely applicable, biologically-based method of estimating benefits given the current state of the science. In addition, the Action Agencies, together with partners, continue to improve the science underpinnings that support the planning, development, prioritization, implementation and monitoring of tributary habitat improvement projects. For example, the Action Agencies work under RPA Actions 50, 56, and 57 continues to inform the expert panels and advance our knowledge of the benefits of tributary habitat projects. Although new science findings and modeling continue to develop and provide guidance and insight into stream habitat and fish-habitat relationships for the ESA listed Chinook salmon and steelhead populations, the state of the science cannot yet replace the Expert Panel process to evaluate tributary habitat improvements on the scale and scope of this process.

The expert panel process was developed through collaboration among NOAA Fisheries, the Action Agencies, and Pacific Northwest sovereign states and tribes for the 2008 FCRPS BiOp. The Habitat Collaboration Workgroup (HCW) that developed the process was convened by NOAA Fisheries in 2006 and first researched the availability of existing methods that could be used to correlate the construction of habitat improvement projects to changes in habitat quality improvement needed to satisfy the FCRPS BiOp. These included any direct methods such as monitoring or other measurement techniques, and indirect methods such as numerical modeling that relies on established relations between construction of habitat improvement projects and fish response. The group could not identify

any readily-available direct or indirect empirical methods that could be applied uniformly across the Columbia River basin. Consequently, the HCW developed the Expert Panel process.

The process represents a cause-and-effect chain of events that links the completion of habitat improvement actions to changes in habitat conditions; and changes in habitat conditions to changes in habitat quality improvement. Seven expert panels were assembled for the 20080/2010 FCRPS BiOp. Six address salmon and steelhead populations in the upper Columbia River, lower Snake River, Wallowa and Imnaha rivers, upper Grande Ronde River, lower Salmon River, and upper Salmon River. A seventh panel addresses Clearwater River steelhead. Expert panels in each of these areas comprise federal, tribal, state and local project sponsors who have specific knowledge about habitat improvement planning and implementation and federal, tribal, state and local fish biologists who have specific knowledge and experience on how habitat improvement projects affect salmon and steelhead spawning and rearing habitat requirements. For more information, see Science and the evaluation of habitat improvement projects in Columbia River tributaries (BPA and Reclamation 2013b).

Following the guidance prepared by the HCW (FCRPS CA, Appendix C, Attachment C-1), the expert panels:

Identify key limiting factors -- This includes environmental characteristics that negatively affect spawning, redds (nests of fish eggs), emergence, summer and winter growth and rearing, and smolting of salmon and steelhead populations in tributaries to the main stem of the Columbia and Snake rivers. Access to quality spawning and rearing habitat, mechanical injury, lack of sufficient streamflow, and lack of in-stream channel complexity are examples of key limiting factors. Different groups of key limiting factors affect fish survival in different parts of each tributary. Parts of tributaries with a common set of limiting factors are called assessment units. Assessment unit boundaries and associated key limiting factors can be different for each salmon and steelhead population, even when they occupy the same tributaries. Expert panels adopted a set of standardized limiting factors and definitions in 2012 (Hamm, 2012).

Identify limiting factor status and weights -- Each limiting factor is assessed three numeric values between zero and one. The numeric values are related to Proper Functioning Condition (BLM, 1998). A low value indicates that the status of the limiting factor is poor and there is a large need for improvement. A higher value indicates that the status of the limiting factor is relatively better. The first value assessed by the Expert Panel represents the *current* limiting factor condition and is called the “low bookend.” Two other values represent the *potential* to which each limiting factor could be increased by the construction of all reasonably feasible habitat improvement actions by 2018. The first of these represent the potential limiting factor status attainable by 2018 (the end of the 2008/2010 FCRPS BiOp). The second represents the potential limiting factor status attainable by 2033 (25 years after the end of the 2008/2010 FCRPS BiOp). These are called the “2018 and 2033 high bookends,” respectively. The purpose of the 2018 high bookend is to establish a ruler to gage the effects of constructing habitat improvement projects between the current status (low bookend) and 2018 (the term of the 2008/2010 FCRPS BiOp). The purpose of the 2033 high bookend is to establish a ruler to gage the effects of constructing habitat improvement projects that may accrue between 2018 and up to 25 years after the end of the 2008/2010 FCRPS BiOp. For example, the riparian condition limiting factor may be assessed a low bookend of 40 percent, a 2018 high bookend of 50 percent, and a 2033 high bookend of 80 percent. This assessment recognizes a relatively small potential for riparian vegetation to grow and provide improvements by 2018. But as the vegetation matures, the full value of the action accrues between 2018 and 2033. In another example, the access limiting factor may be assessed a low bookend of 40 percent and both 2018 and 2033 high bookends are assessed at 80 percent. This represents the fact that project completion provides an immediate improvement with no accrued future improvement.

Identify limiting factor weights -- Some limiting factors may be more important to improving habitat conditions for salmon and steelhead than others. Expert panels have the opportunity to assign a weight between zero and one to recognize the relative importance of each limiting factor in each assessment unit. For example, a panel may assign a weight of 60 percent for lack of sufficient streamflow and 20 percent each to riparian condition and lack of in-stream channel complexity if water availability currently influences improvements more than the other two limiting factors. Limiting factor weights must total to one among all limiting factors in each assessment unit.

Identify assessment unit weights -- Tributary habitat conditions in some assessment units provide greater spawning and rearing habitat potential than others. Assessment unit weights were initialized from the analysis of intrinsic potential conducted by the NOAA Northwest Fish Science Center (NWFSC). The expert panels have the opportunity to adjust these values based on justifications that supplement the scientific data used in the NOAA NWFSC intrinsic potential analysis.

Develop "look back" project lists -- This process compares habitat improvement projects planned for the last implementation cycle to those actually completed for each limiting factor in each assessment unit for each salmon and steelhead population that occupies each tributary. Expert panels are scheduled to meet once every three years at Expert Panel workshops convened by the Action Agencies. Before each Expert Panel workshop is convened, the panel determines whether the projects planned for completion at the last workshop were: a) completed as planned, b) completed with additions or subtractions, c) not completed, or d) completed but not planned at the earlier workshop. Panels also establish the metrics (cfs/acre-feet of flow, number of screens, miles of access, habitat complexity, riparian protection/enhancement, etc.) that are associated with each completed project to evaluate the a-b-c-d status outlined above. Table 1A shows part of the "look back" project list for the Tucannon steelhead[15] population.

Develop "look forward" project lists -- This process identifies planned projects and associated metrics for the next implementation cycle for each limiting factor in each assessment unit for each salmon and steelhead population that occupies each tributary. Table C2 shows part of the "look forward" project list for the Tucannon steelhead population.

Evaluate changes in limiting factors –This process is associated with completed and planned habitat improvement projects. At each Expert Panel workshop, panels evaluate the change in limiting factors associated with the group of habitat actions associated with each limiting factor in each assessment unit for each salmon and steelhead population that occupies the tributary. First, the panels evaluate the look back project list. If projects are (a) completed as planned, the change in limiting factor that was estimated for the planned projects at the last workshop is accepted (unless there is documented scientific evidence that would support an increase or decrease to the original estimate). If projects are (b) completed with additions or subtractions compared to what was planned, the panels debate and decide whether the change in the limiting factor should be increased or decreased accordingly. If planned projects were (c) not completed, the panel discounts the limiting factor change estimated at the last workshop for the planned projects. If the projects were (d) completed but not planned at the last workshop, the panel determines the improvement to the limiting factor associated with the new completed projects. This process is repeated for each limiting factor, for each assessment unit, and each steelhead and chinook population. A similar process is then followed to estimate changes in limiting factors for the look forward projects associated with each limiting factor.

The Action Agencies compile all the limiting factor changes associated with the assessment of look

[15] *Steelhead is used rather than Chinook to illustrate how values roll up over more than one assessment unit.*

back and look forward project lists made by the expert panels in a database system. Once the Action Agencies are satisfied that all the Expert Panel inputs have been accounted for in the database, tables that contain the look back and look forward limiting factors, limiting factor low and high bookends and weighting factors, assessment units and weights, actions that address the limiting factors, and the changes in limiting factors associated with the actions that address each limiting factor for each steelhead and chinook assessment unit are returned to the expert panels for final review before all comments are addressed and the records are finalized by the Action Agencies. The preceding description summarizes the role of the expert panels to evaluate limiting factors and changes in limiting factors associated with completed and planned habitat improvement projects. The Action Agencies prepared a website that provides background information about the expert panel process; contains materials presented and obtained from pre-workshop preparatory meetings, workshops, and post-workshop meetings; and includes final Expert Panel inputs in tabular and map form.

The Action Agencies finalize the Expert Panel input upon receipt of the final review comments from the expert panels and then use a mathematical procedure established by the HCW to convert the changes in limiting factors to changes in HQIs to address FCRPS BiOp RPA 35, Table 5 requirements. In summary, the procedure compares the current status of the limiting factors (low bookends) evaluated by the expert panels with the status of the limiting factors associated with completed (look back) or planned (look forward) projects evaluated by the panels. The procedure incorporates limiting factors and weights, assessment units and weights, and the chinook and steelhead factor that converts habitat condition change to habitat quality (survival) change. Final results of this procedure depict how Action Agency and regional partner progress on completing habitat improvement actions address FCRPS BiOp RPA Action 35, Table 5 habitat quality improvement requirements.

A large amount of detailed biological information (expert judgments on the degree to which salmon habitat limiting factors are improved by a suite of habitat projects in a particular place for a particular salmon population) is combined arithmetically by the Action Agencies. The following steps describe the mathematical procedure in more detail (the Tucannon steelhead Expert Panel results are used below as an example). This calculation is made separately for the look back and look forward set of habitat improvement actions. Look forward conditions (Appendix D, Attachment 3,Table C3) are presented for this example. This is also displayed in Figure 1 as a linear diagram.

The Action Agencies:

Calculate “weighted current limiting factor condition”— by multiplying the limiting factor weight by the current limiting factor condition (low bookend) for each limiting factor in the assessment unit (Appendix D, Attachment 3, Table C3, col G = col E * col F [e.g., .05 x 75 = 3.8[16]]). These calculations represent the overall current status of all limiting factors in each assessment unit without any additional habitat improvement actions.

Calculate “weighted estimated 2018 limiting factor condition”— by multiplying the limiting factor weight by the estimated 2018 limiting factor condition associated with completed or planned habitat improvement actions for each limiting factor in the assessment unit (Appendix D, Attachment 3, Table C3, col L = col E * col K [e.g., 0.05 x 95 = 4.8]). These calculations represent the overall status of all limiting factors in each assessment unit accounting for all of the habitat improvement actions evaluated by the Expert Panel (Appendix D, Attachment 3, Table C2).

Calculate “current assessment unit habitat condition (Table C3, col H) — by summing the weighted

[16] Calculations are done in a spreadsheet or database and numbers shown here are rounded thus creating slight discrepancies compared to the actual computations.

current assessment unit limiting factor condition values within each assessment unit (Appendix D, Attachment 3,Table C3, col G) [e.g., 3.8+0+1.9+3.9+7.8+0+21+6.4+3.4+0+4.5=52.7 for the Upper Tucannon – Pataha up to Panjab assessment unit].

Calculate "estimated 2018 assessment unit habitat condition" (Table C3, col M) — by summing the weighted estimated 2018 assessment unit limiting factor condition values within each assessment unit (Appendix D, Attachment 3,Table C3, col L [e.g., [4.75+0+1.9+6.8+22.5+0+24+6.8+5+0+4.75=76.5 for the Upper Tucannon – Pataha up to Panjab assessment unit]).

Calculate "current population habitat condition (Appendix D, Attachment 3, Table C3, col I) — by multiplying assessment unit weight (Appendix D, Attachment 3, Table C3, col C) by current assessment unit habitat condition (Appendix D, Attachment 3, Table C3, col H) for each assessment unit and summing the results for the population [e.g., (0.85 x 52.7)+(0.05 x 44.9) = (0.01 x 7) = 47.7].

Calculate "estimated 2018 population habitat condition" (Appendix D, Attachment 3, Table C3, col N) — by multiplying assessment unit weight (Appendix D, Attachment 3,Table C3, col C) by estimated 2018 assessment unit habitat condition (Appendix D, Attachment 3,Table C3, col M) for each assessment unit and summing the results for the population [e.g., (0.85 x 76.5) + (0.05 x 72.5) = 68.7].

Calculate "current habitat quality" (Appendix D, Attachment 3,Table C3, col J) — by multiplying the current population habitat condition (Appendix D, Attachment 3,Table C3, col I) by the appropriate chinook (0.0018) or steelhead (0.0004) factor that converts habitat condition to habitat quality (survival) [e.g., (47.7 x 0.0004) = 0.0191].

Calculate "estimated 2018 habitat quality" (Appendix D, Attachment 3,Table C3, col O) — by multiplying the estimated 2018 population habitat condition (Appendix D, Attachment 3,Table C3, col N) by the appropriate chinook (0.0018) or steelhead (0.0004) factor that converts habitat condition to habitat quality (survival[e.g., (68.7 x 0.0004) = 0.0275)]) .

Calculate "percent change in habitat quality[17]" (Appendix D, Attachment 3,Table C3, col P) — by dividing estimated 2018 habitat quality (Appendix D, Attachment 3,Table C3, col O) by current habitat quality (Appendix D, Attachment 3,Table C3, col J), subtract 1, and multiply by 100 [e.g., ((0.0275/0.0191) -1) x 100 = 44%.

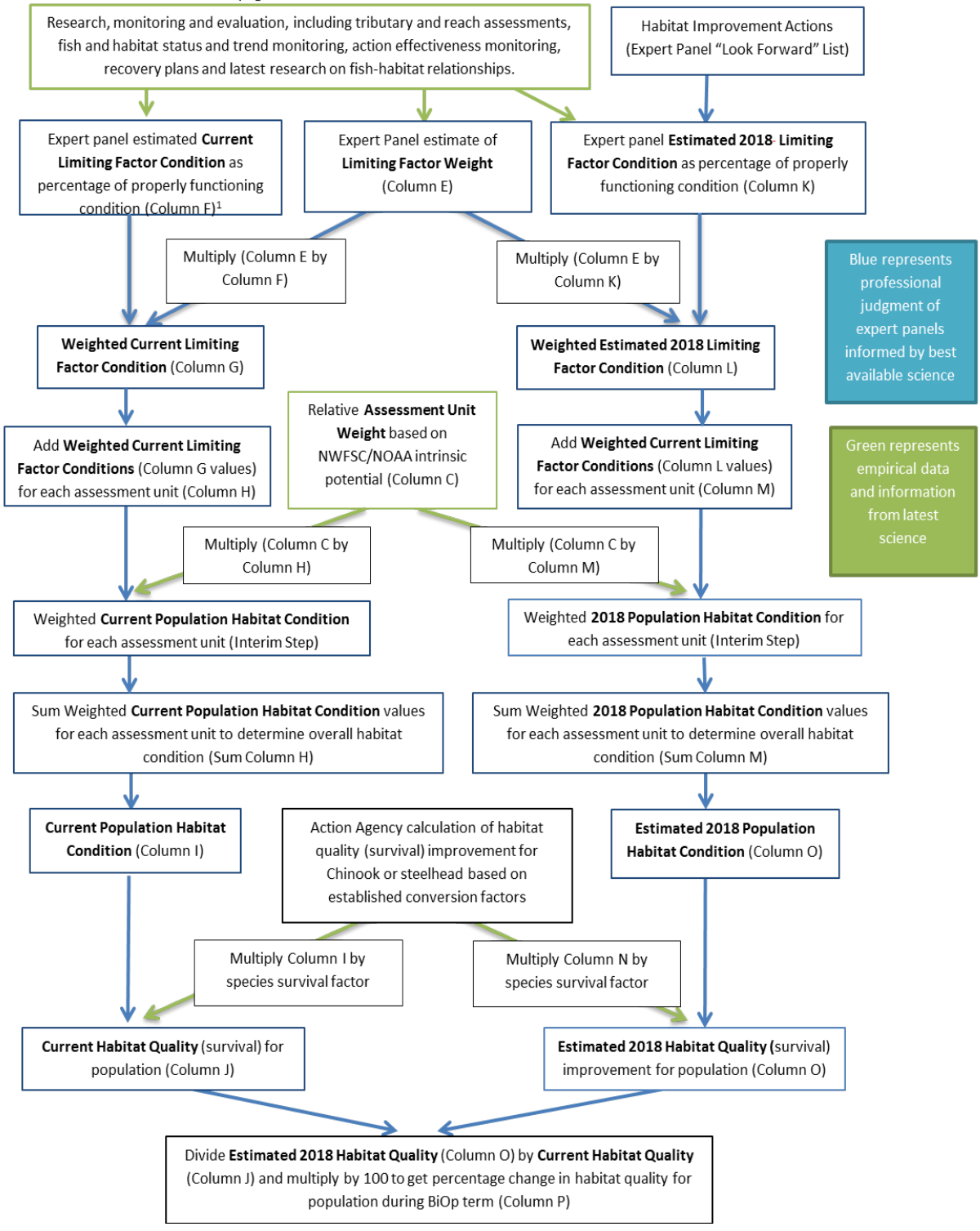
The 44 percent habitat quality improvement, shown as 1.44 in column P of Table C3 corresponds with the difference between the 2011 + 2012-18 and the 2011 HQIs achieved from expert panel results for Tucannon Steelhead presented in Table 35 in Section 2 of the 2013 Comprehensive Evaluation (3%). This result illustrates a nuance in the general procedure described above. HQI is calculated incrementally for each implementation cycle evaluated by the expert panels within the term of the BiOp. The incremental HQI for completed projects is accumulated with HQI for future projects evaluated by the expert panels to gage progress on RPA Action 35, Table 5 requirements. Thus, in Table 35 of the CE, the 47% habitat quality improvement for Tucannon steelhead represents a 44% improvement related to the look forward list of projects (2012-2018) plus 3% HQI from the look back (already completed as of the 2012 expert panel workshop) list of projects. The target for the Tucannon was a 5% improvement by 2018 for steelhead.

[17] *Because this is a ratio, the % improvement for habitat quality or population survival is represented by the same number*

Table descriptions

The following Tables C-1, 2 and 3 (Appendix D, Attachment 3) display information from the 2012 expert panel workshop for the Tucannon River Steelhead population. Table C-1 shows the Habitat Actions in the "Look Back" list for actions completed during 2009-2011. Table C-2 shows the Habitat Actions in the "Look Forward" list for actions planned for implementation for 2012-2018. Because the 2012 expert panel workshops took place early in the year, the actions implemented in 2012 which were mostly done after July are on the "Look Forward " list and will be evaluated in future expert panel workshops as part of the "Look Back" list. Table C-3 displays the Habitat Function values from the expert panel workshops and the subsequent HQI calculations.

Figure 1: Calculation of Tributary Habitat Benefits



[1] *Column references refter to Appendix D, Attachment 3, Table C3.*

Lower Snake Example - Table C1. 2009-2012 "Look Back" Actions for Tucannon River Steelhead												
DPS	**Population**	**Assess-ment Unit Code**	**Assess-ment Unit**	**2009 Limiting Factor**	**Action**	**Metric**	**Plan Value**	**Plan Comment**	**Actual Value**	**Actual Comment**	**Status**	**Work Element (In Progress / Planned)**
Snake River Steelhead	Tucannon River	TUS1	Tucannon	Barriers	No Action			No passage planned.	2011: CTUIR removed 2 passage barriers; Little Tucannon ADD IN BARRIER PROJECTS FROM CHINOOK PROJECTS	The barriers were on lower Pataha and opened up 23 miles; 3.3 miles from Little Tucannon; 0.5 miles from Russell & 0.25 Hartsock	New and Completed	85. Remove/Breach Fish Passage Barrier
Snake River Steelhead	Tucannon River	TUS1	Tucannon	Screens	No Action			No diversion screen projects planned.	No Action			
Snake River Steelhead	Tucannon River	TUS1	Tucannon	Riparian degradation	See comments.		2010, 2011, 2012: See comments.	Benefits from High Water Temperature projects.	2010: CTUIR planted 1 mile of Spring Cr.; 2011: CTUIR planted 0.5 miles/6 acres of Spring Cr. & 0.5/5 acres on Hartsock Cr. & 0.2/5 acres on the Tucannon		New and Completed	47. Plant Vegetation
Snake River Steelhead	Tucannon River	TUS1	Tucannon	Floodplain confinement	No Action		2012: CCD - 1-2 offsite dike projects are planned to restore floodplain connectivity and function.	No actions planned.	2011: CCD 1 river levee removal (5440 ft) and offsite dike (13,640 ft) 2012: WDFW remove 1300 river levee (move to look forward).	2011: CCD Minimize confinement over 3.7 RM 2012: WDFW remove confinement on 2 RM. The 2012 WDFW work will be evaluated as part of the "look forward" estimates because it is not yet completed.	In Progress / Planned	180. Enhance Floodplain/Remove, Modify, Breach Dike

Lower Snake Example - Table C1. 2009-2012 "Look Back" Actions for Tucannon River Steelhead												
DPS	**Population**	**Assess-ment Unit Code**	**Assess-ment Unit**	**2009 Limiting Factor**	**Action**	**Metric**	**Plan Value**	**Plan Comment**	**Actual Value**	**Actual Comment**	**Status**	**Work Element (In Progress / Planned)**
Snake River Steelhead	Tucannon River	TUS1	Tucannon	Habitat diversity (LWD)	See comments.		2010, 2011, 2012: See comments.	CCD - Total of 3 instream habitat projects; all include spawning and rearing habitat; locations to be determined.	2011: CCD instream restoration at Hovrud (750 ft 6 LWD structures placed). 2010: CTUIR 3.3 mile channel complexity 180 structures placed Cummings Cr, Spring Cr, & Hartsock Cr. 2012	These projects were completed in the tributaries with the exception of one structure placed at the mouth of Spring Cr in the main Tucannon River. Hovrud in mainstem. 750' instream complexity from Pataha Passage project.	Completed	29. Increase Instream Habitat Complexity and Stabilization
Snake River Steelhead	Tucannon River	TUS1	Tucannon	High water temperature	See comments.		2010, 2011, 2012: See comments.	CCD - For the 2010-2012 period, 5 additional CREP extensions will be purchased (10 year extensions).	8 contracts	73/303 acres in the lower Tucannon/Upper Tucannon	Completed	5. Land Purchase and/or Conservation Easement

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	2.3: Injury and Mortality: Mechanical Injury	No Action					

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	4.1: Riparian Condition: Riparian Vegetation	Project 1 relocate campground from floodplain to upland area	181. Create, Restore, and/or Enhance Wetland	1691. # of acres of riparian habitat restored/re-established	3 acres	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	move campground up slope out of floodplain Cost Range: $25,000 - $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	4.1: Riparian Condition: Riparian Vegetation	Riparian planting: Project Area 10 & 11 forty acres each, Project Area 12 eighteen acres, Project Area 17 seventeen acres	47. Plant Vegetation	1403. # of riparian acres treated	115 acres	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Areas Burn on WDFW and residential areas near Last Resort Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 28 Set back river levee and remove rip rap and hard points	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.125 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	removing structures will provide access to 22 acres of low lying floodplain Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 17 Excavate side channel habitat	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.3 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Cost Range: Over $200,003

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 3 remove small spoil berm to open low floodplain	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.07 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule, WDFW Floodplain Management Plan	remove 380 ft of riprap to reestablish approx. 0.59 acres of Low floodplain Cost Range: $25,000 - $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 4 & 5 Camp Wooten & Tucannon Camp Ground river levee removal and set back	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.43 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 8 Curl Lake Levee	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.13 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	This conceptual plan could be constructed without reconfiguring the lake and would reduce confinement and add I acre of floodplain Cost Range: Over $200,000

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 8 Curl Lake Levee	30. Realign, Connect, and/or Create Channel	1476. # of stream miles after treatment	0.29 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	This conceptual plan could be constructed without reconfiguring the lake and would reduce confinement and add I acre of floodplain Cost Range: $25,000 - $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project Area 10 LWD Project Big 4 to Beaver Lake Diversion	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.25 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	this will remove 1300 ft of levees and spoil piles limiting channel migration Cost Range: $25,000 - $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 11 Infrastructure removal, relocate access road to Beave Watson Lake	33. Decommission Road/Relocate Road	1394. # of miles of road improved or decommissioned in a riparian area	0.29 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule, WDFW Floodplain Management Plan	This would be tied to the Beave Watson proposed concept Cost Range: $25,000 - $200,000

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 14 remove channel confining structures and material	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.03 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	This metric is a bit odd is not good for representing reducing confinement. will open 18 acres of low-lying floodplain Cost Range: $25,000 - $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 23 Ramirez	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.41 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Approx 9.5 acres of low-lying floodplain possible, 890 ft of setback levee needed Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 4 & 5 Camp Wooten & Tucannon Camp Ground, create new side channel	30. Realign, Connect, and/or Create Channel	1476. # of stream miles after treatment	0.53 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Stream channel would be increased by 820 ft Cost Range: $25,000 - $200,000

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 7 USFS Ranger Station Road Set Back	33. Decommission Road/Relocate Road	1394. # of miles of road improved or decommissioned in a riparian area	0.5 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Remove 2700 ft of Tucannon Rd and about 340 linear ft of riprap. Rd would be relocated up slope. This entails removing 380 ft of rip rap along the road that is proposed to be removed Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Tucannon Lakes reconfiguration and infrastructure removal	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	1.59 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule, WDFW Floodplain Management Plan	This metric is for Big 4, Beaver Watson, Curl and Rainbow. Deer lake was not included but will be part of the floodplain management assessment. Complexity work associated with these projects is listed separately. Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 24, Golf Course	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.48 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	This is a measurement of the river reach which would have confinement minimized Cost Range: Over $200,000

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 27 River levee removal to encourage river meander width	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.05 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	this levee removal project will require 2800 ft of setback Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 15, Headquarters	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.16 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	This structure prevents lateral movement of the channel Cost Range: $25,000 - $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 17 Remove river levee to reconnect low-lying floodplain	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.13 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	would reconnect 2.25 acres of floodplain Cost Range: Over $200,001
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 18 remove infrastructure and access routes from floodplain	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	? Miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Cost Range: $25,000 - $200,000

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 19 Remove river levee to increase channel meander width	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.03 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	removing hard points restricting channel movement Cost Range: $25,000 - $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 21 Remove river levee and river confining structure	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.33 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Project 22 River levee removal to encourage lateral channel migration	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	0.56 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	would reconnect 2.45 acres of floodplain and require 190 ft of setback levee Cost Range: Over $200,002
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 11 Beaver Watson place LWD for channel complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	1.8 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	This project will be sequenced with the Tucannon Lakes Reconfiguration Plan Cost Range: Over $200,000

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 12 Deer Lake Side Channel	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.4 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	This work could be completed independently of the lake reconfiguration. Cost Range: $25,000 - $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 13 (Rainbow Lake) LWD placement for habitat complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.7 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	This project would be tied or sequenced with modifications of Rainbow Lake Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 14 place LWD for complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	1.95 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule, WDFW Floodplain Management Plan	this work is planned for 2013 work window Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 27 LWD placement to develop channel complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.23 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Cost Range: Over $200,000

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 28 Place LWD to improve channel complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.2 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Cost Range: $25,000 - $200,001
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 4 & 5 Camp Wooten & Tucannon Camp Ground LWD placement for channel complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.95 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	The proposed wood placement may be dependent on the levee and infrastructure work Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 4 & 5 Camp Wooten & Tucannon Camp Ground, decommission roadways	33. Decommission Road/Relocate Road	1394. # of miles of road improved or decommissioned in a riparian area	0.57 miles of road removed	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	this would open up 10.87 acres of floodplain Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 6&7 USFS Ranger Station LWD placement to create channel complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.7 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	The lower portion of project 6 is in protection. The upper section has a small LWD recommendation which I have combined with project 7 Cost Range: Over $200,000

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 8 Curl Lake LWD placement for channel complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.3 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	This conceptual plan could be constructed without reconfiguring the lake and would reduce confinement and add I acre of floodplain Cost Range: $25,000 - $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 25 LWD placement for complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.2 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	This project is small and also in close proximity to the CHAMP monitoring control Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 26 Marengo Levee Set Back	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	1.8 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	This work will be designed as the levee removal project has experienced some high flow Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 3 place LWD for complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	1.3 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Cost Range: Over $200,000

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 19 Add LWD for complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.3 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 9 (Big 4 Lake)	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.6 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	This project is tied to the Tucannon Lake Modification Plan and may be tied to the lake decommissioning Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project Area 10 LWD Project North South Camp to Beaver Diversion	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	1.6 miles improved complexity	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	220 trees placed in channel scheduled for 2012 Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 15, Headquarters	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.8 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	This project will be going to design in the summer of 2012 with implementation in 2013-2014 Cost Range: Over $200,000

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 17 Add LWD for increasing channel roughness	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.6 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Cost Range: Over $200,002
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 18 LWD supplementation to meet restoration objective of 1 key piece per channel width	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.7 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Cost Range: Over $200,004
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 21 LWD placement for the development of channel complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	1.1 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Cost Range: Over $200,001
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 22 LWD placement to increase channel complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	1 mile	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Cost Range: Over $200,003

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 24, Golf course	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.75 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 23 Ramirez	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.95 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 1 place LWD for complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	1.3 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	Project is being phase so the floodplain work will be completed prior to engaging in channel design and implementation Cost Range: $25,000 - $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project 2 reconnect side channel	30. Realign, Connect, and/or Create Channel	1476. # of stream miles after treatment	0.27 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	200 foot excavation would reconnect channel Cost Range: $5,000 - $25,000

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	6.2: Channel Structure and Form: Instream Structural Complexity	Project Area 2 (below Panjab Bridge) LWD placement for channel complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	0.2 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	This project is both on private and public lands Cost Range: $25,000 - $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	8.1: Water Quality: Temperature	Project 18, 20 and 25 Conservation Easements	5. Land Purchase and/or Conservation Easement	1379. # of riparian miles protected	1.3 miles	Conceptual Restoration Plan, Reaches 6-10 Tucannon River Phase II, SRSRB Implementation Schedule	These are protection reaches identified in the plan. Habitat is in excellent or recovered condition. Project 18 protection piece is below bridge 13 Cost Range: Over $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	8.4: Water Quality: Turbidity	Road Decommissioning Tucannon, Pataha	33. Decommission Road/Relocate Road	1394. # of miles of road improved or decommissioned in a riparian area	10 miles	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	Cost Range: $25,000 - $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	8.4: Water Quality: Turbidity	Road Decommissioning Tucannon, Pataha	33. Decommission Road/Relocate Road	1395. # of miles of road improved or decommissioned in an upland area	30 miles	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	Cost Range: $25,000 - $200,000

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	9.2: Water Quantity: Decreased Water Quantity	Road Decommission Tucannon, Pataha	33. Decommission Road/Relocate Road	1395. # of miles of road improved or decommissioned in an upland area	30 miles	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	Cost Range: $25,000 - $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	9.2: Water Quantity: Decreased Water Quantity	Tucannon Water efficiency	164. Acquire Water Instream	1452. Amount of water secured in acre-feet/year	23.4 ac-ft	CCD	Project should be completed in 2012 Cost Range: $25,000 - $200,000
Tucannon River	TUS1A	Upper Tucannon - Pataha up to Panjab	9.2: Water Quantity: Decreased Water Quantity	Road Decommission Tucannon, Pataha	33. Decommission Road/Relocate Road	1394. # of miles of road improved or decommissioned in a riparian area	10 miles	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	Cost Range: $25,000 - $200,000
Tucannon River	TUS1B	Lower Tucannon - Mouth to Pataha	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Tucannon Ranch Levee setback	180. Enhance Floodplain/Remove, Modify, Breach Dike	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	1 mile	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	Preliminary designs completed Cost Range: Over $200,000
Tucannon River	TUS1B	Lower Tucannon - Mouth to Pataha	6.2: Channel Structure and Form: Instream Structural Complexity	Tucannon Ranch Levee setback LWD placement for complexity	29. Increase Instream Habitat Complexity and Stabilization	1387. # of miles of stream with improved complexity	2 miles	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	Cost Range: Over $200,000
Tucannon River	TUS1B	Lower Tucannon - Mouth to Pataha	6.2: Channel Structure and Form: Instream Structural Complexity	Small Tucannon River Tributary LWD Placement	30. Realign, Connect, and/or Create Channel	1476. # of stream miles after treatment	2 miles	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	Cummins Creek Cost Range: $25,000 - $200,000

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1B	Lower Tucannon - Mouth to Pataha	8.1: Water Quality: Temperature	Tucannon Ranch Levee setback	47. Plant Vegetation	1403. # of riparian acres treated	5 acres	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	Cost Range: $25,000 - $200,000
Tucannon River	TUS1B	Lower Tucannon - Mouth to Pataha	9.2: Water Quantity: Decreased Water Quantity	Tucannon Water efficiency	164. Acquire Water Instream	1452. Amount of water secured in acre-feet/year	23.4 ac-ft	CCD	Project should be completed in 2012 Cost Range: $25,000 - $200,000
Tucannon River	TUS1C	Pataha	1.1: Habitat Quantity: Anthropogenic Barriers	Pataha Public Rd Culvert Fish Passage Project 35-00144	85. Remove/Breach Fish Passage Barrier	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	30 miles	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	The lower barriers are partial but have more than 30 miles of habitat up to them. The upper barriers have aproximatly4 miles of habitat above them Cost Range: Over $200,000
Tucannon River	TUS1C	Pataha	5.2: Peripheral and Transitional Habitats: Floodplain Condition	Small Tucannon River Tributary Connectivity	85. Remove/Breach Fish Passage Barrier	1441. # of miles of habitat accessed to the next upstream barrier(s) or likely limit of habitable range	2 miles	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	These tribs were identified in RTT discussion as a concern for steelhead only Cost Range: Over $200,000
Tucannon River	TUS1C	Pataha	8.1: Water Quality: Temperature	Pataha Riparian	47. Plant Vegetation	1403. # of riparian acres treated	20 acres	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	Cost Range: Over $200,000

Lower Snake Steelhead Example Table C2 - 2012-2018 "Look Forward" Actions for Tucannon River Steelhead									
Population	**Assessment Unit Code**	**Assessment Unit**	**2012 Standardized Limiting Factor**	**Action**	**Work Element**	**Metric**	**Metric Plan Value**	**Project source documentation**	**Plan Comment**
Tucannon River	TUS1C	Pataha	8.4: Water Quality: Turbidity	Relocate Stock Water Out of Sensitive Riparian Areas in Pataha Creek	40. Install Fence	1488. # of river miles treated	5 miles	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	Cost Range: Over $200,000
Tucannon River	TUS1C	Pataha	8.4: Water Quality: Turbidity	Pataha Creek Willow Whips	47. Plant Vegetation	1406. # of riparian miles treated	5 miles	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	These planting would take place in the inset floodplain Cost Range: Over $200,000
Tucannon River	TUS1C	Pataha	8.4: Water Quality: Turbidity	Road Decommissioning Tucannon, Pataha	33. Decommission Road/Relocate Road	1394. # of miles of road improved or decommissioned in a riparian area	10 miles	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	Cost Range: $25,000 - $200,000
Tucannon River	TUS1C	Pataha	8.4: Water Quality: Turbidity	Road Decommissioning Tucannon, Pataha	33. Decommission Road/Relocate Road	1395. # of miles of road improved or decommissioned in an upland area	30 miles	Salmon Recovery Plan for SE Washington 3 Yr Work Plan	Cost Range: $25,000 - $200,000

Lower Snake Steelhead Table C3. Example Habitat Quality Improvement estimation method for Tucannon River Steelhead

Assessment Unit Characteristics					Current Conditions- Before Actions Are Implemented					Estimated Conditions- After Actions Are Implemented					
Assess-ment Unit	Assess-ment Unit Code	Assess-ment Unit Weight	2012 Standard-ized Limiting Factor	Limit-ing Factor Weight	Current Limiting Factor Condi-tion (*Low Book-end*)	Weighte d Current Limiting Factor Condi-tion = (E)*(F)	Current Assess ment Unit Habitat Condi-tion = sum of (G)	Current Popula tion Habitat Condi-tion = sum of (H)*(C)	Current Habitat Quality (I*con-version factor[1])	Estima ted 2018 Limit-ing Factor Condi-tion	Weighted Estimated 2018 Limiting Factor Condition = (E)*(K)	Estimated 2018 Assess-ment Unit Habitat Condition = sum of (L)	Estimated 2018 Popula-tion Habitat Condition = sum of (M)*(C)	Estimated 2018 Habitat Quality (N*con-version factor[1])	Habitat Quality Im-prove-ment (O/J)
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)
Upper Tucan-non - Pataha up to Panjab	TUS1A	85%	1.1: Habitat Quantity: Anthropo-genic Barriers	5%	75	3.8	52.7	47.7	0.0191	95	4.75	76.5	68.7	0.0275	1.44
			10.4: Population Level Effects: Life History Changes	0%	25	0					0				
			2.3: Injury and Mortality: Mechanical Injury	2%	96	1.9				96	1.9				
			4.1: Riparian Condition: Riparian Vegetation	10%	39	3.9				68	6.8				

Lower Snake Steelhead Table C3. Example Habitat Quality Improvement estimation method for Tucannon River Steelhead															
Assessment Unit Characteristics					**Current Conditions- Before Actions Are Implemented**					**Estimated Conditions- After Actions Are Implemented**					
Assessment Unit	**Assessment Unit Code**	**Assessment Unit Weight**	**2012 Standardized Limiting Factor**	**Limiting Factor Weight**	**Current Limiting Factor Condition (*Low Book-end*)**	**Weighted Current Limiting Factor Condition = (E)*(F)**	**Current Assessment Unit Habitat Condition = sum of (G)**	**Current Population Habitat Condition = sum of (H)*(C)**	**Current Habitat Quality (I*conversion factor[1])**	**Estimated 2018 Limiting Factor Condition**	**Weighted Estimated 2018 Limiting Factor Condition = (E)*(K)**	**Estimated 2018 Assessment Unit Habitat Condition = sum of (L)**	**Estimated 2018 Population Habitat Condition = sum of (M)*(C)**	**Estimated 2018 Habitat Quality (N*conversion factor[1])**	**Habitat Quality Improvement (O/J)**
(A)	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**	**(G)**	**(H)**	**(I)**	**(J)**	**(K)**	**(L)**	**(M)**	**(N)**	**(O)**	**(P)**
			5.2: Peripheral and Transitional Habitats: Floodplain Condition	30%	26	7.8				75	22.5				
			6.1: Channel Structure and Form: Bed and Channel Form	0%	51	0					0				
			6.2: Channel Structure and Form: Instream Structural Complexity	30%	70	21.0				80	24.0				
			7.2: Sediment Conditions: Increased Sediment	8%	80	6.4				85	6.8				

Lower Snake Steelhead Table C3. Example Habitat Quality Improvement estimation method for Tucannon River Steelhead															
Assessment Unit Characteristics					**Current Conditions- Before Actions Are Implemented**					**Estimated Conditions- After Actions Are Implemented**					
Assess-ment Unit	**Assess-ment Unit Code**	**Assess-ment Unit Weight**	**2012 Standard-ized Limiting Factor**	**Limit-ing Factor Weight**	**Current Limiting Factor Condi-tion (*Low Book-end*)**	**Weighte d Current Limiting Factor Condi-tion = (E)*(F)**	**Current Assess ment Unit Habitat Condi-tion = sum of (G)**	**Current Populati on Habitat Condi-tion = sum of (H)*(C)**	**Current Habitat Quality (I*con-version factor[1])**	**Estima ted 2018 Limit-ing Factor Condi-tion**	**Weighted Estimated 2018 Limiting Factor Condition = (E)*(K)**	**Estimated 2018 Assess-ment Unit Habitat Condition = sum of (L)**	**Estimated 2018 Popula-tion Habitat Condition = sum of (M)*(C)**	**Estimated 2018 Habitat Quality (N*con-version factor[1])**	**Habitat Quality Im-prove-ment (O/J)**
(A)	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**	**(G)**	**(H)**	**(I)**	**(J)**	**(K)**	**(L)**	**(M)**	**(N)**	**(O)**	**(P)**
			Quantity												
			8.1: Water Quality: Tempera-ture	10%	34	3.4				50	5.0				
			8.4: Water Quality: Turbidity	0%	97	0					0				
			9.2: Water Quantity: Decreased Water Quantity	5%	90	4.5				95	4.75				
Lower Tucan-non - Mouth to Pataha	TUS1B	5%	1.1: Habitat Quantity: Anthropo-genic Barriers	5%	95	4.8	44.9			96	4.8	72.5			

Lower Snake Steelhead Table C3. Example Habitat Quality Improvement estimation method for Tucannon River Steelhead															
Assessment Unit Characteristics					**Current Conditions- Before Actions Are Implemented**					**Estimated Conditions- After Actions Are Implemented**					
Assessment Unit	**Assessment Unit Code**	**Assessment Unit Weight**	**2012 Standardized Limiting Factor**	**Limiting Factor Weight**	**Current Limiting Factor Condition (*Low Bookend*)**	**Weighted Current Limiting Factor Condition = (E)*(F)**	**Current Assessment Unit Habitat Condition = sum of (G)**	**Current Population Habitat Condition = sum of (H)*(C)**	**Current Habitat Quality (I*conversion factor[1])**	**Estimated 2018 Limiting Factor Condition**	**Weighted Estimated 2018 Limiting Factor Condition = (E)*(K)**	**Estimated 2018 Assessment Unit Habitat Condition = sum of (L)**	**Estimated 2018 Population Habitat Condition = sum of (M)*(C)**	**Estimated 2018 Habitat Quality (N*conversion factor[1])**	**Habitat Quality Improvement (O/J)**
(A)	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**	**(G)**	**(H)**	**(I)**	**(J)**	**(K)**	**(L)**	**(M)**	**(N)**	**(O)**	**(P)**
Lower Tucannon - Mouth to Pataha	TUS1B	5%	10.4: Population Level Effects: Life History Changes	0%	25	0					0				
Lower Tucannon - Mouth to Pataha	TUS1B	5%	2.3: Injury and Mortality: Mechanical Injury	2%	96	1.9				96	1.9				
Lower Tucannon - Mouth to Pataha	TUS1B	5%	4.1: Riparian Condition: Riparian Vegetation	10%	32	3.2				68	6.8				
Lower Tucannon - Mouth to Pataha	TUS1B	5%	5.2: Peripheral and Transitional Habitats: Floodplain Condition	30%	27	8.1				75	22.5				

Lower Snake Steelhead Table C3. Example Habitat Quality Improvement estimation method for Tucannon River Steelhead															
Assessment Unit Characteristics					**Current Conditions- Before Actions Are Implemented**					**Estimated Conditions- After Actions Are Implemented**					
Assess-ment Unit	**Assess-ment Unit Code**	**Assess-ment Unit Weight**	**2012 Standard-ized Limiting Factor**	**Limit-ing Factor Weight**	**Current Limiting Factor Condi-tion (*Low Book-end*)**	**Weighte d Current Limiting Factor Condi-tion = (E)*(F)**	**Current Assess ment Unit Habitat Condi-tion = sum of (G)**	**Current Populati on Habitat Condi-tion = sum of (H)*(C)**	**Current Habitat Quality (I*con-version factor[1])**	**Estima ted 2018 Limit-ing Factor Condi-tion**	**Weighted Estimated 2018 Limiting Factor Condition = (E)*(K)**	**Estimated 2018 Assess-ment Unit Habitat Condition = sum of (L)**	**Estimated 2018 Popula-tion Habitat Condition = sum of (M)*(C)**	**Estimated 2018 Habitat Quality (N*con-version factor[1])**	**Habitat Quality Im-prove-ment (O/J)**
(A)	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**	**(G)**	**(H)**	**(I)**	**(J)**	**(K)**	**(L)**	**(M)**	**(N)**	**(O)**	**(P)**
Lower Tucan-non - Mouth to Pataha	TUS1B	5%	6.1: Channel Structure and Form: Bed and Channel Form	10%	54	5.4				75	7.5				
Lower Tucan-non - Mouth to Pataha	TUS1B	5%	6.2: Channel Structure and Form: Instream Structural Complexit y	20%	36	7.2				62	12.4				
Lower Tucan-non - Mouth to Pataha	TUS1B	5%	7.2: Sediment Conditions : Increased Sediment Quantity	8%	80	6.4				85	6.8				
Lower Tucan-non - Mouth to Pataha	TUS1B	5%	8.1: Water Quality: Tempera-ture	10%	34	3.4				50	5.0				

Lower Snake Steelhead Table C3. Example Habitat Quality Improvement estimation method for Tucannon River Steelhead															
Assessment Unit Characteristics					**Current Conditions- Before Actions Are Implemented**					**Estimated Conditions- After Actions Are Implemented**					
Assessment Unit	**Assessment Unit Code**	**Assessment Unit Weight**	**2012 Standardized Limiting Factor**	**Limiting Factor Weight**	**Current Limiting Factor Condition (*Low Bookend*)**	**Weighted Current Limiting Factor Condition = (E)*(F)**	**Current Assessment Unit Habitat Condition = sum of (G)**	**Current Population Habitat Condition = sum of (H)*(C)**	**Current Habitat Quality (I*conversion factor[1])**	**Estimated 2018 Limiting Factor Condition**	**Weighted Estimated 2018 Limiting Factor Condition = (E)*(K)**	**Estimated 2018 Assessment Unit Habitat Condition = sum of (L)**	**Estimated 2018 Population Habitat Condition = sum of (M)*(C)**	**Estimated 2018 Habitat Quality (N*conversion factor[1])**	**Habitat Quality Improvement (O/J)**
(A)	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**	**(G)**	**(H)**	**(I)**	**(J)**	**(K)**	**(L)**	**(M)**	**(N)**	**(O)**	**(P)**
Lower Tucannon - Mouth to Pataha	TUS1B	5%	8.4: Water Quality: Turbidity	0%	80	0					0				
Lower Tucannon - Mouth to Pataha	TUS1B	5%	9.2: Water Quantity: Decreased Water Quantity	5%	90	4.5				95	4.75				
Pataha	TUS1C	10%	1.1: Habitat Quantity: Anthropogenic Barriers	5%		0	7.0				0	0			
Pataha	TUS1C	10%	10.4: Population Level Effects: Life History Changes	0%		0					0				

Lower Snake Steelhead Table C3. Example Habitat Quality Improvement estimation method for Tucannon River Steelhead															
Assessment Unit Characteristics					**Current Conditions- Before Actions Are Implemented**					**Estimated Conditions- After Actions Are Implemented**					
Assess-ment Unit	**Assess-ment Unit Code**	**Assess-ment Unit Weight**	**2012 Standard-ized Limiting Factor**	**Limit-ing Factor Weight**	**Current Limiting Factor Condi-tion (*Low Book-end*)**	**Weighte d Current Limiting Factor Condi-tion = (E)*(F)**	**Current Assess ment Unit Habitat Condi-tion = sum of (G)**	**Current Popula tion Habitat Condi-tion = sum of (H)*(C)**	**Current Habitat Quality (I*con-version factor[1])**	**Estima ted 2018 Limit-ing Factor Condi-tion**	**Weighted Estimated 2018 Limiting Factor Condition = (E)*(K)**	**Estimated 2018 Assess-ment Unit Habitat Condition = sum of (L)**	**Estimated 2018 Popula-tion Habitat Condition = sum of (M)*(C)**	**Estimated 2018 Habitat Quality (N*con-version factor[1])**	**Habitat Quality Im-prove-ment (O/J)**
(A)	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**	**(G)**	**(H)**	**(I)**	**(J)**	**(K)**	**(L)**	**(M)**	**(N)**	**(O)**	**(P)**
Pataha	TUS1C	10%	2.3: Injury and Mortality: Mechanical Injury	2%		0					0				
Pataha	TUS1C	10%	4.1: Riparian Condition: Riparian Vegetation	10%	40	4.0					0				
Pataha	TUS1C	10%	5.2: Peripheral and Transition-al Habitats: Floodplain Condition	30%		0					0				
Pataha	TUS1C	10%	6.1: Channel Structure and Form: Bed and Channel Form	10%		0					0				

Lower Snake Steelhead Table C3. Example Habitat Quality Improvement estimation method for Tucannon River Steelhead															
Assessment Unit Characteristics					**Current Conditions- Before Actions Are Implemented**					**Estimated Conditions- After Actions Are Implemented**					
Assess-ment Unit	**Assess-ment Unit Code**	**Assess-ment Unit Weight**	**2012 Standard-ized Limiting Factor**	**Limit-ing Factor Weight**	**Current Limiting Factor Condi-tion (*Low Book-end*)**	**Weighte d Current Limiting Factor Condi-tion = (E)*(F)**	**Current Assess ment Unit Habitat Condi-tion = sum of (G)**	**Current Populati on Habitat Condi-tion = sum of (H)*(C)**	**Current Habitat Quality (I*con-version factor[1])**	**Estima ted 2018 Limit-ing Factor Condi-tion**	**Weighted Estimated 2018 Limiting Factor Condition = (E)*(K)**	**Estimated 2018 Assess-ment Unit Habitat Condition = sum of (L)**	**Estimated 2018 Popula-tion Habitat Condition = sum of (M)*(C)**	**Estimated 2018 Habitat Quality (N*con-version factor[1])**	**Habitat Quality Im-prove-ment (O/J)**
(A)	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**	**(G)**	**(H)**	**(I)**	**(J)**	**(K)**	**(L)**	**(M)**	**(N)**	**(O)**	**(P)**
Pataha	TUS1C	10%	6.2: Channel Structure and Form: Instream Structural Complex-ity	20%		0					0				
Pataha	TUS1C	10%	7.2: Sediment Conditions : Increased Sediment Quantity	5%		0					0				
Pataha	TUS1C	10%	8.1: Water Quality: Tempera-ture	10%	30	3.0					0				
Pataha	TUS1C	10%	8.4: Water Quality: Turbidity	3%		0					0				

Lower Snake Steelhead Table C3. Example Habitat Quality Improvement estimation method for Tucannon River Steelhead

Assessment Unit Characteristics					**Current Conditions- Before Actions Are Implemented**					**Estimated Conditions- After Actions Are Implemented**					
Assessment Unit	**Assessment Unit Code**	**Assessment Unit Weight**	**2012 Standardized Limiting Factor**	**Limiting Factor Weight**	**Current Limiting Factor Condition (*Low Bookend*)**	**Weighted Current Limiting Factor Condition = (E)*(F)**	**Current Assessment Unit Habitat Condition = sum of (G)**	**Current Population Habitat Condition = sum of (H)*(C)**	**Current Habitat Quality (I*conversion factor[1])**	**Estimated 2018 Limiting Factor Condition**	**Weighted Estimated 2018 Limiting Factor Condition = (E)*(K)**	**Estimated 2018 Assessment Unit Habitat Condition = sum of (L)**	**Estimated 2018 Population Habitat Condition = sum of (M)*(C)**	**Estimated 2018 Habitat Quality (N*conversion factor[1])**	**Habitat Quality Improvement (O/J)**
(A)	**(B)**	**(C)**	**(D)**	**(E)**	**(F)**	**(G)**	**(H)**	**(I)**	**(J)**	**(K)**	**(L)**	**(M)**	**(N)**	**(O)**	**(P)**
Pataha	TUS1C	10%	9.2: Water Quantity: Decreased Water Quantity	5%		0					0				

[1] Conversion Factors:

Steelhead: 0.0004

Chinook: 0.0018

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Attachment 4: BPA Business Administration to Support the Implementation of FCRPS Tributary Habitat Actions

Background

Since 2003 the Bonneville Power Administration (BPA) Fish and Wildlife Division has developed, used, and adapted "PISCES" as the business system of record for the development, administration, and management of contracted actions to support the Fish and Wildlife Program. In 2008, the Fish and Wildlife Division developed the "TAURUS"[18] tool as a means to track the accomplishments of contracted work elements and related metrics that are required for reporting under the Federal Columbia River Power System (FCRPS) Biological Opinion (BiOp). Technological advancements in WEB SERVICES has facilitated "linking" PISCES to TAURUS, so today the systems can "communicate" in real time on planned/contracted work and actual completed work. As the agency has already demonstrated in recent years, BPA will continue to invest in the development and refinement of these systems to enhance capabilities that facilitate linking projects to metrics and standardized limiting factors. We expect this to improve the Action Agency's ability to report on BiOp and other Fish and Wildlife Program accomplishments. The data that populates PISCES and the TAURUS system can be accessed through CBFISH.ORG.

PISCES/TAURUS Interface and Tracking of Contracted Actions

The value of the PISCES and TAURUS systems to the Action Agencies is how the systems facilitate sorting contracted actions included in BPA projects and portfolios of work. Both systems use unique numerical identifiers. Even projects that pre-dated the 2008 or previous BiOps can be identified in the system based on the Contract ID and contract start date. Whether these projects have subsequently been modified over time to include actions that support BiOp implementation, the projects retain the unique numerical identifier.

As PISCES continue to be refined and TAURUS has come on line, some projects have been "labeled" with identifiers that distinguish "BiOp" actions from other BPA funded actions (e.g., Accord and non-BiOp actions). These identifiers allow users to sort on portfolios on projects. Likewise, other unique identifiers including work elements, metrics, and Reasonable and Prudent Alternative (RPA) associations allow users to sort on the types work and deliverables being accomplished. These two systems allow BPA to manage and administer upwards of 700 contracts in the Fish and Wildlife Program annually and as well to roll up and report on specific program accomplishments like those that support FCRPS BiOp implementation.

[18] *TAURUS represents a multi-million dollar investment in the Fish and Wildlife Divisions system of record for the business (i.e., budget management, expert panel, work element review, project proposals, and other business processes). The Division relies on the tool to document business decisions and enforce internal controls. Access is restricted to minimize to risk of data corruption, alteration, or deletion. Any corruption of the system contents would result in a significant cost to reconstruct.*

Tracking FCRPS Tributary Habitat Actions

BPA tributary habitat projects and the associated contracts that deliver on FCRPS BiOp obligations are the outcomes of Expert Panel deliberations, or are included among activities that have been supported by the Action Agencies because the projects are delivering important research, monitoring, and evaluation data and results. BPA projects and the associated contracts that originate from Expert Panel[19] deliberations are discussed in that forum as habitat "actions." These actions are distinguished based on their potential to improve conditions or limiting factors for salmonids.

During the Expert Panel workshops (that are convened every three years) a menu of actions "is delivered" to the expert panels from any number of potential project sponsors or proponents. These entities include Expert Panel members whose affiliations vary among Soil and Water Conservation Districts, Tribes, and Federal and state agencies, to name a few, who are members of a particular Expert Panel. At the completion of the Expert Panel review for a given period (e.g., 2009, 2012, 2015) a set of Expert Panel reviewed "look forward" actions is produced that describes potential actions and their effects on limiting factors for the next implementation cycle. Whether actions are implemented can be influenced by available funding, cost-share, landowner involvement, importance/priority, permitting requirements, and other factors that affect project feasibility. Actions that ultimately are implemented by BPA are entered into the PICES and TAURUS systems. The example which follows illustrates how an Expert Panel reviewed action can be traced through PISCES and TAURUS for management, administration, and accounting.

Example: Grande Ronde Model Watershed

In this example the Expert Panel reviewed action is traced back to BPA **Project 1992-026-01: Grande Ronde Model Watershed.** As mentioned earlier a number of BPA projects that deliver on BiOp obligations predated the 2008 or previous BiOps. The Grande Ronde project is one example. As indicated, the project number is reflective of the start date of work which BPA funded in that basin. New work to support the current or subsequent BiOps will be included under this or another Grande Ronde project as a contracted action and would be assigned a specific contract requisition (CR) number or Contract ID.

To find an Expert Panel reviewed action for the Grande Ronde Basin that currently addresses a tributary habitat RPA (RPAs 34 and 35) a user would log on to CBFISH.ORG and conduct a project search of BPAs portfolio of FCRPS BiOp projects (*http://www.cbfish.org/Portfolio.mvc/Projects/192*) . Once here, a user can conduct a search that discriminates based on:

- ☐ Stage — To see projects that are currently underway **Select** "Implementation"
- ☐ Area — To see tributary projects **Select** "Provincial"
- ☐ Purpose — To remove non-habitat projects (e.g., hatcheries) **Select** "Habitat"
- ☐ Emphasis — To remove RM&E projects **Select** "Restoration/Protection"
- ☐ BiOp Strategy — To see non-estuary tributary projects **Type** "Protect and Improve Tributary Habitat"

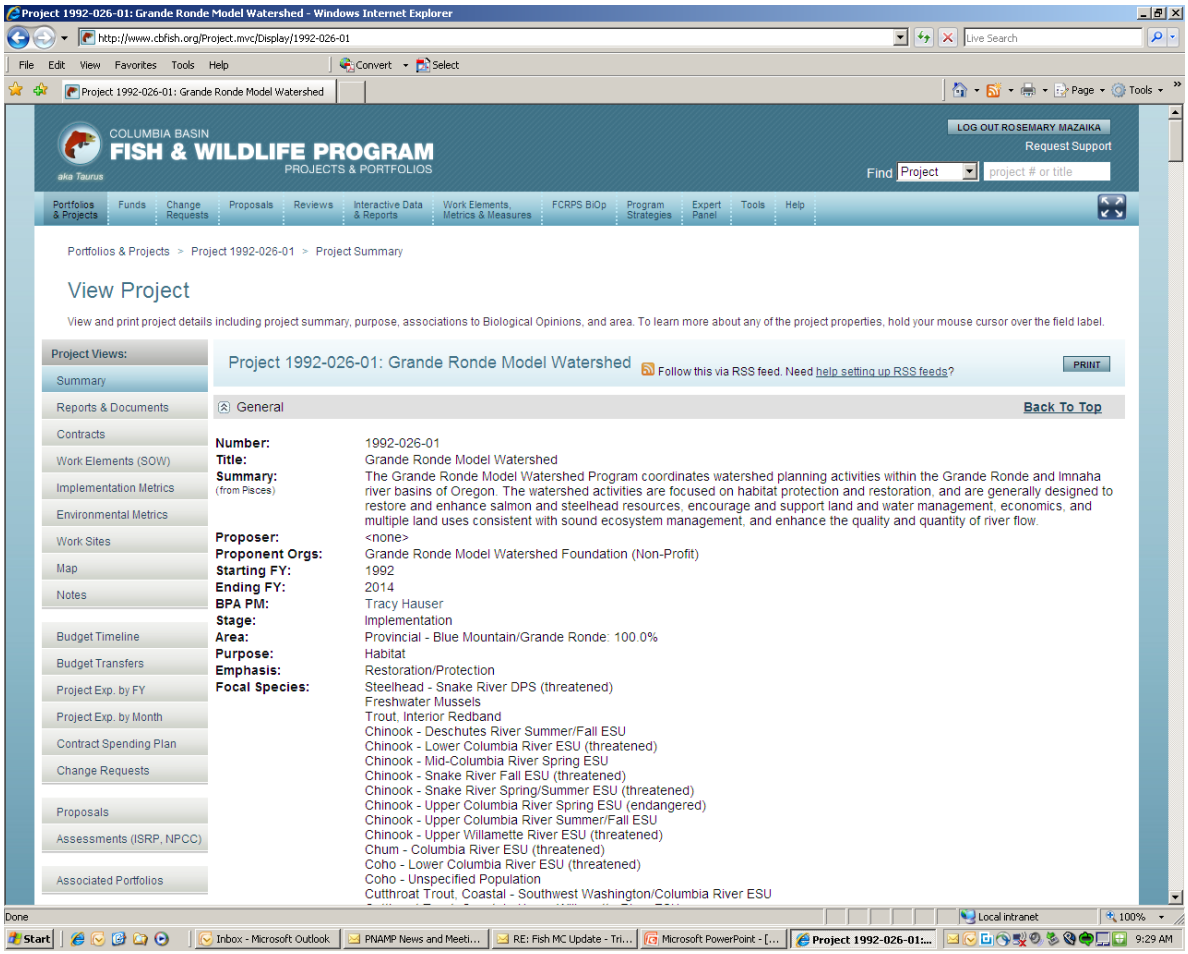
This search will produce a list of projects that support RPAs 34 and 35. From this list a user can scroll down and double click to select **Project 1992-026-01: Grande Ronde Model Watershed.** From

[19] For a discussion of Expert Panel process see "Science and the Evaluation of Habitat Improvement Projects in Columbia River Tributaries." BPA. March 2013.

the "View Project" screen, details like "Contracts" under the project can be reviewed. The screen includes the complete contracting history from the project start date forward to the present.

In this example, to illustrate where an Expert Panel reviewed action is managed as a BPA project/contract, under "Expense Contract Number" sub-heading if the user scrolls down to **CR 5298** and double clicks on the **"52985"** the system will produce the details for:

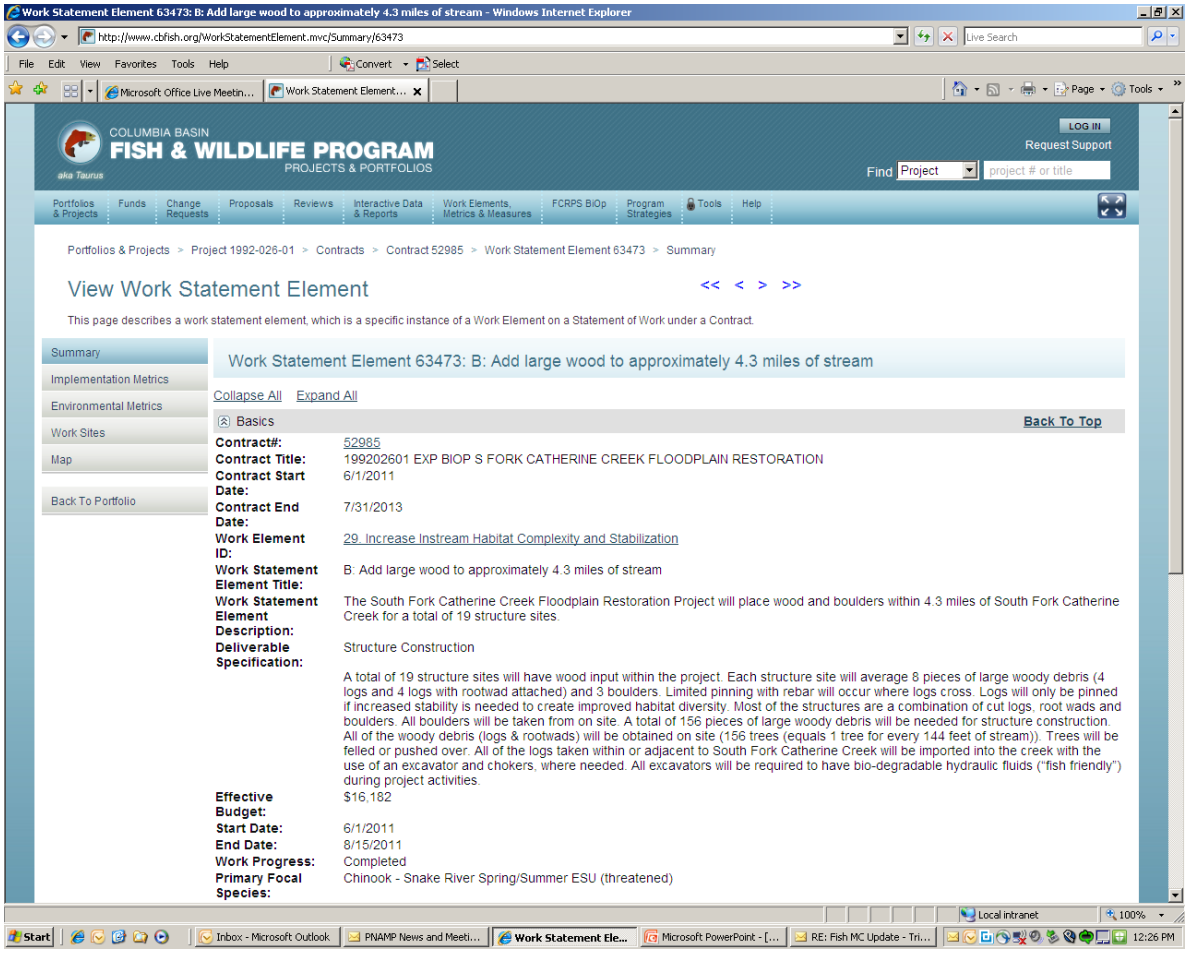
1992-026-01 EXP BIOP S. FORK CATHERINE CREEK FLOODPLAIN RESTORATION



Note: CR 52985 originated as an Expert Panel reviewed action that is traceable for the Upper Grande Ronde Catherine Creek as a Habitat Action in the Expert Panel's Look Back for 2009-2012. This information is also housed in TAURUS and is retrievable via another search that is described below.

Going back into **CR 52985** a user can view the project "SUMMARY" that includes among other details "Work Statement Elements". These Work Statement Elements are included in the statement of work for a contract and are developed with input from the project sponsors working with BPA Contracting Officers Technical Representatives (COTRs). Work Statement Elements include deliverables established in the BPA contract. The outputs of the Work Statement Elements insofar as the BiOp is concerned are metrics that are associated with the unique Work Statement Element.

For this example, if the user scrolls down to select "**Work Element ID"** "29 Increase Instream Habitat Complexity and Stabilization" and the "**Work Element Title" "**B: Add Large Wood to Approximately 4.3 Miles of Stream" and double clicks on the "B", a list of associated metrics for the contract will be produced.



Closer scrutiny of the detail illustrates:

- **Work Element ID:** 29. Increase Instream Habitat Complexity and Stabilization
- **Work Statement Element Title:** B: Add large wood to approximately 4.3 miles of stream
- **Work Statement Element Description:** The South Fork Catherine Creek Floodplain Restoration Project will place wood and boulders within 4.3 miles of South Fork Catherine Creek for a total of 19 structure sites.
- **Deliverable Specification:** Structure Construction A total of 19 structure sites will have wood input within the project. Each structure site will average 8 pieces of large woody debris (4 logs and 4 logs with root wad attached) and 3 boulders. Limited pinning with rebar will occur where logs cross. Logs will only be pinned if increased stability is needed to create improved habitat diversity. Most of the structures are a combination of cut logs, root wads and boulders. All boulders will be taken from on site. A total of 156 pieces of large woody debris will be needed for structure construction. All of the woody debris (logs & root wads) will be obtained on site (156 trees (equals 1 tree for every 144 feet of stream)). Trees will be felled or pushed over. All of the logs taken within or adjacent to South Fork Catherine Creek will be imported into the

creek with the use of an excavator and chokers, where needed. All excavators will be required to have bio-degradable hydraulic fluids ("fish friendly") during project activities.

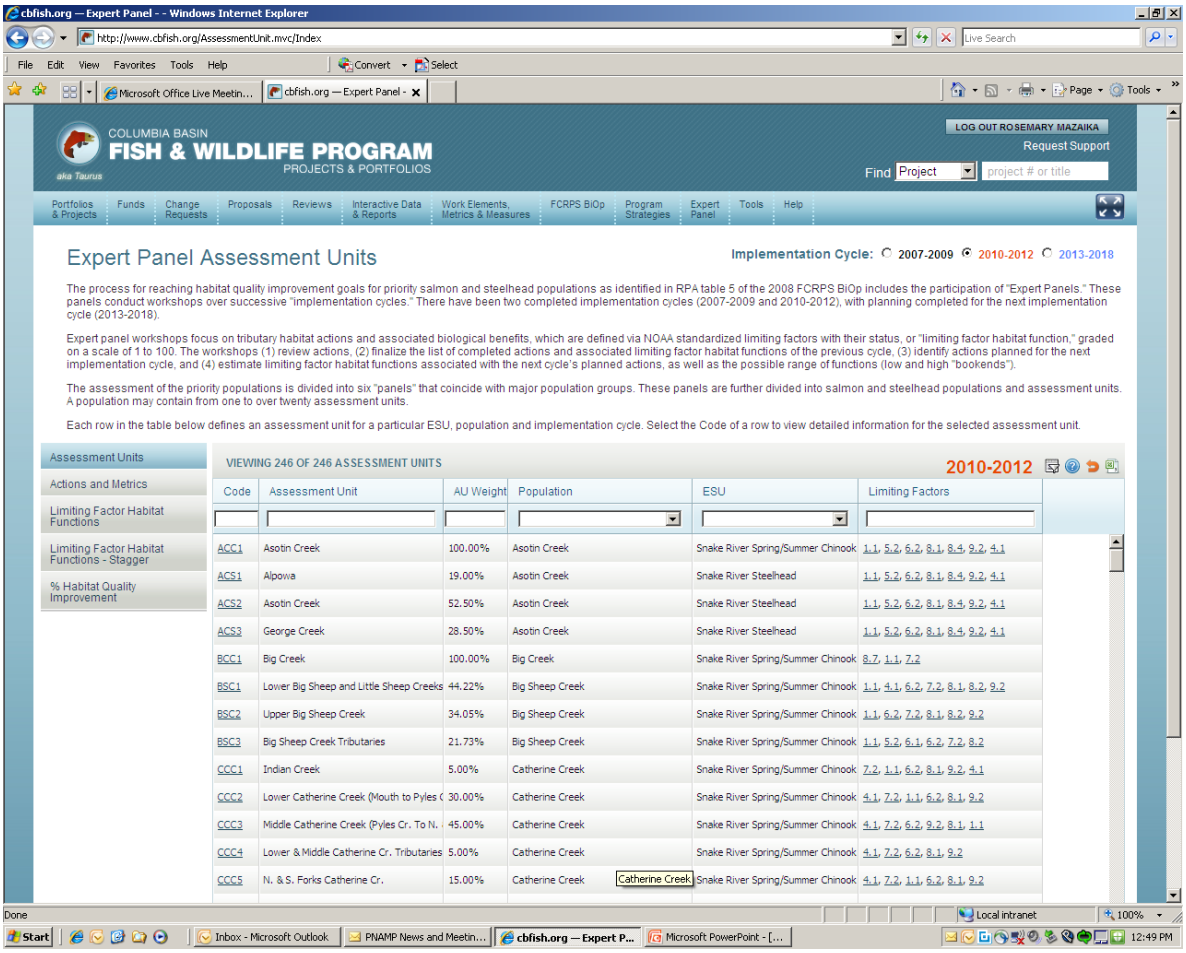
Scrolling down further to the **"Implementation Metrics"** illustrates the metric associations. The "Implementation Metrics" for 29.B Add Large Wood to Approximately 4.3 Miles of Stream"

Metric	Planned	Actual	Measures
1387. # miles of stream with improved complexity	4.30	4.30	miles of stream
1584. # of logjam structures installed for only complexity	19	19	structures installed
1748. # pools created for only complexity	30	30	pools created

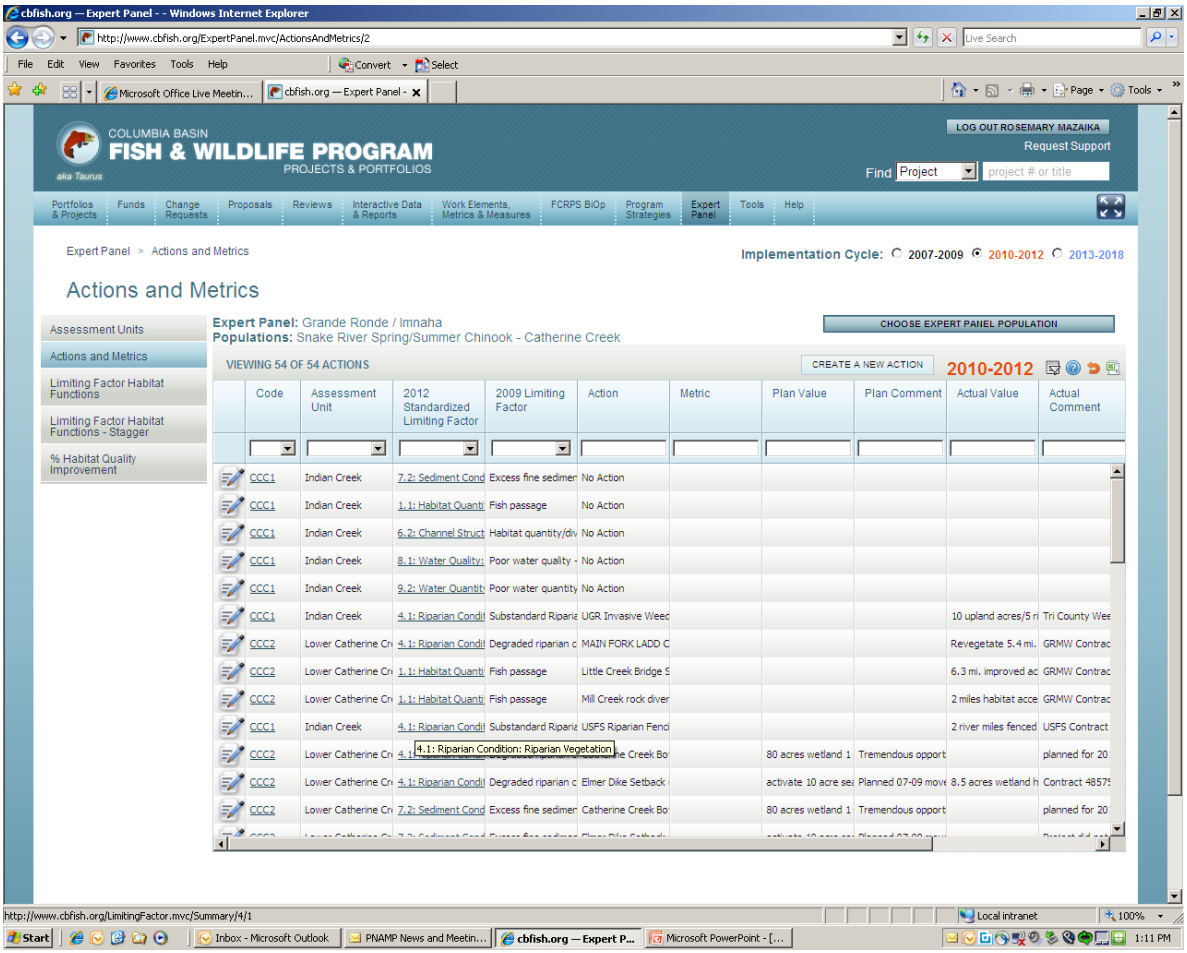
The "Actual" metrics are the delivered outputs that are rolled up for BiOp reporting and included in annual progress reports and comprehensive evaluations. "Planned" metrics are rolled up and reported in implementation plans for populations that are not evaluated by the Expert Panels.

Expert Panel Reviewed Actions/BPA Projects and Contracts

If a user is interested in the relationship of Expert Panel reviewed actions to BPA projects/contracts, CBFISH.ORG facilitates a search of Expert Panel data. To navigate to the Expert Panel actions and metrics a user would GoTo the **"Expert Panel"** and **"Manage Expert Panel Data." Note:** The "Manage Expert Panel Data Option" is a permission based option.



From the fillet on the left margin a user would select **"Actions and Metrics"** for Implementation Cycle **"2010-2012."** A button below the Implementation Cycle choices also prompts the user to **"Choose Expert Panel Population"**, which in this example is the **"Grande Ronde/Imnaha."** The population of interest in this example is the Snake River Spring/Summer Chinook for **"Catherine Creek."** To generate a complete list of actions and metrics by "**Assessment Units"** and "**Limiting Factors"** the user should choose **"All"** in both cases. Double clicking the **"Update Filter"** will yield a complete list of Actions and Metrics.



At the Actions and Metrics screen the user can sort on the **Assessment Unit and Standardized Limiting Factor** to identify the limiting factors addressed and metrics delivered.

- ☐ Assessment Unit — **Select** "N.& S. Fork Catherine Creeks"
- ☐ Standardized Limiting Factor — **Select** "6.2 Channel Structure and Form"

To draw attention to the relationship between the actions produced by the expert panels and BPA projects/contracts, look at the "Standardized Limiting Factor" metrics produced. The "4.3 miles of improved stream complexity (added LWD); 30 pools created; 19 logjam structures installed; .25 miles of side channel created; and 2.2 miles dike removed" cross walks directly from the Expert Panel data set for Catherine Creek to BPA Contract 52985. PISCES and TAURUS allow for the type of interrogation and corroboration of outputs illustrated by this example.