Desolation Creek Geomorphic Assessment and Action Plan

Project Goal, Objectives, and Metrics

Submitted to:

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1. Introduction

This document describes the goal and objectives, as well as quantifiable and repeatable metrics directly associated with the Desolation Creek Geomorphic Assessment and Action Plan (the Project). These have been developed by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Fisheries Program and Tetra Tech, Inc. (Tetra Tech), as subcontractor. The Project will involve extensive coordination between numerous agencies, organizations, and stakeholders with vested interests in the welfare of Desolation Creek, with work occurring through 2017.

The intent of the Project is to assess watershed- and reach-scale existing conditions, including hydrology, sediment, fish habitat, and fish passage in the Desolation Creek watershed. The Project area includes the mainstem Desolation Creek and tributaries, from its confluence with the North Fork of the John Day River to the Creek's headwaters, with emphasis on the primary assessment area (PAA) that includes approximately 10.5 miles of private land from river miles 1.8 to 12.3. The Project's study area also includes the balance of the remaining lands within the watershed that are under ownership of the U.S. Department of Agriculture Forest Service (USFS), and identified as the secondary assessment area (SAA). Information provided in the watershed- and reach-scale assessments will be used to develop an action plan for improving fish habitat conditions, along with restoration designs at various stages, eventually leading to the implementation of the highest ranked project within the PAA.

The Desolation Creek watershed has been impacted by forest practices, agriculture, fires, roads, and other activities that have decreased water quality, along with valuable fish habitat, resulting in inhibited fish passage, altered sediment supply and sorting, reduced frequency of large wood and habitat features such as high-quality pools, and poor connectivity of adjacent floodplains, springs, and wetlands. The CTUIR seeks to perform an assessment and develop an action plan that can be used as a common tool for future restoration planning and implementation within Desolation Creek for the benefit of focal fish species including steelhead (*Oncorhynchus mykiss*), bull trout (*Salvelinus confluentus*), spring Chinook salmon (*O. tshawytscha*), and Pacific lamprey (*Entosphenus tridentatus*). Through this Project, the CTUIR intends to identify opportunities to increase spawning, rearing, and migration habitat for these species by increasing habitat quantity and quality, improving habitat connectivity, and restoring processes that sustainably maintain high-quality habitat.

2. Purpose and Need

In its efforts to understand and address habitat issues and concerns in the Desolation Creek watershed, the CTUIR determined that a strategic approach in the form of a geomorphic

assessment and action plan was necessary. To address this need, the CTUIR intends to implement the Project for the following purposes:

1. Obtain new empirical data for use in evaluating degraded conditions and identifying and prioritizing restoration and enhancement projects;
2. Use existing and new information to develop scientifically based designs for prioritized restoration projects that address factors limiting focal species population performance;
3. Implement one of the designs for the highest priority project within the PAA; and
4. Identify and utilize metrics that will aid in tracking restoration actions that are most effective at improving degraded conditions and provide benefits to focal species in the Desolation Creek watershed.

As contract administrator and technical lead for the Project, the CTUIR recognizes that the Desolation Creek watershed contains mixed ownerships as well as land management authority and responsibilities. In recognition of this, the CTUIR aims to develop the Project as a cooperative effort with the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) and the Oregon Department of Fish and Wildlife (ODFW), who are designated watershed co-managers (Three Treaty Tribes-Action Agencies 2008); the Umatilla National Forest (UNF), who owns all federal land within the watershed; Desolation Creek LLC, who is the primary private landowner; and the North Fork John Day Watershed Council (NFJDWC). Therefore, an approach involving active participation by these key stakeholders that are likely to be involved at vital phases of Project development is needed to attain long-term consensus and support through future regulatory and funding pathways.

3. Goals and Objectives

This section describes goals and objectives at both the programmatic and the Project level. The missions, goals, and objectives of the co-managers, landowners, and stakeholders are first described, followed by the Project specific goal and objectives.

3.1 NORTH FORK JOHN DAY CO-MANAGER PROGRAMMATIC MISSION, GOALS, AND OBJECTIVES

The mission, goals and objectives of recognized North Fork John Day Subbasin co-managers as related to the Project and restoring watersheds for Endangered Species Act (ESA)-listed and culturally significant species are described in the following subsections.

3.1.1 The Confederated Tribes of the Umatilla Indian Reservation

As contract administrator, technical lead, and designated co-manager, the CTUIR intends to accomplish this Project in accordance with their First Foods Policy Program with a mission to

provide proactive planning and policy analysis and development to protect, restore, and enhance the First Foods and the exercise of associated rights reserved in the Treaty of 1855. This mission is based on the significant foods ritualistically served in a tribal meal and include, in the order they are served, Water, Salmon, Deer, Cous, and Huckleberry. The First Foods and associated Policy Program is utilized by the CTUIR Department of Natural Resources (DNR) as a management approach to ensure the minimum ecological products necessary to sustain CTUIR culture are protected and sustained to meet treaty-reserved resources (Quaempts et al. 2014). Further, through the Umatilla River Vision (Jones et al. 2008), the CTUIR has identified ecological characteristics for meeting the mission of implementing the First Foods Policy Program. The characteristics are founded on five fundamental "touchstones" that include: (1) hydrology, (2) geomorphology, (3) connectivity, (4) native riparian vegetation, and (5) native aquatic biota.

3.1.2 The Confederated Tribes of the Warm Springs Reservation of Oregon

As one of three co-managers, the CTWSRO Fisheries Habitat Program mission is to protect, manage, and enhance habitat that supports culturally significant fish populations for the CTWSRO. Objectives supporting the habitat program mission include:

- Maintain and restore high-quality aquatic habitat to support harvestable fish populations;
- Ensure access to these populations for the tribal membership;
- Foster partnerships to achieve holistic watershed scale benefits; and
- Demonstrate a conservation ethic that supports multiple use and harmony in rural communities with natural resource based economy.

3.1.3 Oregon Department of Fish and Wildlife

As one of three co-managers, ODFW's mission is to: "Protect and enhance Oregon's fish and wildlife and their habitats for use and enjoyment by present and future generations." With regard to watershed and fisheries restoration, ODFW follows State of Oregon policy based on the Oregon Plan for Salmon and Watersheds, whose mission is: "Restoring our native fish populations and the aquatic systems that support them to productive and sustainable levels that will provide substantial environmental, cultural, and economic benefits." Additionally, the ODFW John Day Fish Habitat Program, like the CTUIR and CTWSRO fisheries programs, is funded by the Bonneville Power Administration (BPA). Therefore, all three entities use BPA funding that is directed toward mitigation of ESA-listed fish species, and to that end have many objectives and work elements in common.

3.2 LANDOWNER PROGRAMMATIC MISSION, GOALS, AND OBJECTIVES

The mission, goals, and objectives of landowners as related to property management, the Project, and restoring watersheds for ESA-listed species are described in the following subsections. Each respective landowner retains final authority regarding decisions to implement any restoration actions advocated by co-managers or stakeholders.

3.2.1 Umatilla National Forest

As the largest landowner in the watershed, the mission of the USFS, which manages the Umatilla National Forest, is: "To sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations."

3.2.2 Desolation Creek LLC

Desolation Creek LLC purchased 13,440 acres of the lower Desolation Creek watershed in 2014. The property is managed by Ecotrust Forest Management (EFM), a for-profit subsidiary of Ecotrust formed to manage forestlands for financial, ecological, and social returns. The Desolation Creek Land Management Plan (EFM 2015) describes the purpose and need of the plan as follows: "Forests throughout the Blue Mountains face challenges resulting from past timber harvests, fire suppression, and overgrazing. Well-planned stewardship of these lands is critical to the long term sustainability of these resources and improvement of property values. Climate change adds an additional impetus for sound decision making in this ecologically complex landscape. This management plan provides a coordinated strategy towards these outcomes while meeting requirements for Forest Stewardship Council (FSC) certification."

3.3 STAKEHOLDER MISSION, GOALS, AND OBJECTIVES

The mission, goals, and objectives of other collaborators as related to the Project and restoring watersheds for ESA-listed and culturally significant species are described in the following section.

3.3.1 North Fork John Day Watershed Council

As a key stakeholder in the watershed, the mission of the NFJDWC is: "To actively participate in the planning, funding, and implementation of actions and projects that advance and sustain the health of the North/Middle Fork John Day Watershed, honor tribal treaty rights, and strengthen the long-term economic stability of individuals and communities that rely on the watershed's natural resources."

3.4 PROJECT GOAL

The overarching goal of the Project is to provide rigorous, data-driven, and science-based analyses leading to prioritized restoration and enhancement projects and designs that, when implemented over time, will rehabilitate Desolation Creek to the benefit of terrestrial and aquatic First Foods including but not limited to ESA-listed species such as steelhead and bull

trout, as well as other native species (e.g., spring Chinook salmon, lamprey, freshwater mussels [*Anodonta* sp.], and redband trout [*Oncorhynchus mykiss*]). Included in this goal is the need to understand the geomorphic and ecological processes and limiting factors affecting Desolation Creek to prioritize and implement restoration projects that will make quantifiable progress toward addressing the key limiting factors. Progress toward these goals should complement appropriate land management strategies of landowners and be in accordance with established planning documents that include:

- CTUIR's North Fork John Day Fisheries Enhancement Strategy, approved by the Independent Scientific Review Panel during the 2013 Geographic Review;
- John Day River Subbasin Plan (NPCC 2005);
- 2008 Columbia Basin Fish Accords (Three Treaty Tribes-Action Agencies 2008);
- Umatilla River Vision (Jones et al. 2008);
- John Day River Basin Watershed Restoration Strategy (CTWSRO 2014);
- Middle Columbia River Steelhead Distinct Population Segment ESA Recovery Plan (NMFS 2009);
- Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment (Carmichael and Taylor 2010);
- Revised Draft Recovery Plan for the Coterminous United States Population of Bull Trout (USFWS 2014); and
- Decision Notice/Decision Record, Finding of No Significant Impact, Environmental Assessment for Interim Management of Anadromous Fish-Producing Watersheds on Federal Lands in Eastern Oregon, Washington, Idaho, and Portions of California (USFS and BLM 1995).

3.5 PROJECT OBJECTIVES

The objectives established for this Project are connected to discrete actions that can be clearly defined and the results measured over time to evaluate progress toward meeting each objective. To address the goal of the Project, the following objectives and associated tasks were developed:

1. Determine the factors that are negatively influencing physical and biological processes resulting in degraded physical conditions (e.g., high eroding banks, limited floodplain and riparian areas, etc.) and limiting productivity (e.g., stream temperature, instream flows, etc.). This objective will be met by completion of the watershed- and reach-scale assessment tasks that include:
    - Descriptions of historical and current watershed processes, including land use, geology, geomorphology, water quality, hydrology, and hydraulics;
    - Identification of stream channel characteristics (primary and secondary channel lengths; channel width, depth, cross section area, gradient, incision

and entrenchment, classification; habitat units and features such as pools and large wood);

- Characterization of riparian, floodplain, wetland, and upland meadow areas (flood inundation, stream bank stability, channel migration rates, vegetative community complexity/health, and off-channel habitat);
- Determination of sediment distribution and mobility, and identifying any concerns related to sediment transport, erosion or deposition;
- Descriptions of current and historic fish abundance, species composition, distribution, timing, and passage-related concerns; and
- Refinements at the reach level for the geomorphic and habitat limiting factors affecting salmonid population performance.

2. Describe and develop desired future conditions that are realistic given the needs associated with private and public land uses, and the roles and responsibilities of the co-managers and stakeholders by completing tasks that include:
    - Define co-manager and stakeholder roles and responsibilities as related to terrestrial and aquatic ESA-listed and focal species.
    - Incorporate management plans and strategies of landowners and take into consideration the objectives developed through their management plans.
    - Ensure adequate opportunities for co-manager and stakeholder involvement.
    - Determine areas of common ground and cooperation.
3. Identify and prioritize restoration and enhancement projects and actions utilizing information from the assessments and by completing associated tasks that include:
    - Target significant stream reaches of concern (i.e., biologically significant reaches), and prepare a higher-level analysis of conditions at those locations.
    - Identify the most effective approach to address limiting factors and terrestrial/aquatic physical or biological processes.
    - Strategically identify and categorize and clearly display restoration actions or channel reaches to produce measurable benefits for aquatic species and terrestrial floodplain and riparian communities.
4. Develop conceptual levels of designs, based on developed lists of prioritized restoration and enhancement projects, that are practical to implement and able to be adapted and scaled to multiple sites.
    - Relate the design plan components to desired future conditions based on the ranking process developed from Objective 3.
    - Aid in articulating landowner and cooperator objectives and geomorphic assessment results.

- Compile implementable restoration and enhancement actions based on their potential to affect limiting factors and processes in a concise and commonly understandable way.

5. Develop designs that will promote desired future conditions for the highest ranked project within the PAA to the 100 percent, construction-ready level.
    - Use data from the assessments and analyses to develop creative and effective treatments addressing watershed and reach specific processes and limiting factors within the PAA.
    - Develop permittable and fundable project opportunities based upon the project's ability to measurably influence limiting factors and processes and meet restoration goals and objectives within floodplain, riparian, and stream channel habitats.
6. Determine and measure the quantifiable and repeatable metrics to establish baseline conditions, and that can be utilized to evaluate progress toward addressing processes and limiting factors following the implementation of restoration actions (e.g., projects, land-use alterations, regulatory changes, etc.) at various scales (individual sites, reaches, and the Desolation Creek watershed).

Evaluating the progress and success of Project objectives is to be measured by metrics that demonstrate progress toward addressing habitat limiting factors, and that ultimately lead to the overall goal of improved fish population performance. The metrics associated with the Project are described in the following section.

4. Project Metrics

As noted in Section 3.5, Project objectives include the identification and application of quantifiable and repeatable metrics that can be utilized to establish baseline conditions, and that evaluate progress toward addressing processes and limiting factors following implementation of actions at various scales. Based on this objective, quantifiable and repeatable metrics were identified for Desolation Creek (Table 4-1). The metrics were developed by building on the monitoring metrics included in the CTUIR Physical Habitat Monitoring Strategy (PHAMS) that were developed in association with the CTUIR Umatilla River Vision (Jones et al. 2008). Table 4-1 presents metrics for the Project, including evaluation methods, and directly links the metrics to CTUIR North Fork John Day Habitat Program objectives, limiting factors, River Vision Touchstones (Jones et al. 2008), and PHAMS (Jones et al. 2015).

Table 4-1. Summary of CTUIR Habitat Objectives, Limiting Factors, River Vision Touchstones, Metrics, and Evaluation Methods Identified for Desolation Creek

CTUIR NFJD Habitat Program Objectives	River Vision Touchstones1/	Primary Limiting Factors2/	NOAA Ecological Concerns3/	Metrics	Evaluation Methods
Protect and conserve habitat and ecological processes supporting native fish population viability	Aquatic Biota; Connectivity; Geomorphology; Hydrology	In-Channel Characteristics	6.1 Channel Structure and Form: Bed and Channel Form	Primary Channel Length	Measure primary channel length from bathymetric survey or imagery
				Secondary Channel Lengths	Measure secondary channel lengths from bathymetric survey or imagery
				Bankfull and Wetted Width4/	Measure channel dimensions from field and bathymetric survey
				Bankfull Depth3/	Measure channel dimensions from field and bathymetric survey
				Bankfull Cross-Sectional Area	Calculate bankfull cross-sectional area from cross sections (Rosgen 1996)
				Width/Depth Ratio (W_{bkf}/D_{bkf})4/	Calculate width/depth ratio (bankfull width/bankfull depth) (Rosgen 1996)
				Gradient	Measure channel gradient from bathymetric survey
				Channel Incision	Calculate ratio of low bank height to bankfull height (Rosgen 1996)
				Entrenchment Ratio4/	Calculate entrenchment ratio (flood prone area width/bankfull width) (Rosgen 1996)
			6.2 Channel Structure and Form: Instream Structural Complexity	Channel Morphology	Classify channel morphology and process (Montgomery and Buffington 1997; Rosgen 1996)
				Braided-Channel Ratio4/	Ratio of the total channel length to the primary channel length (Friend and Sinha 1993)
				Pool Frequency or Spacing4/	Count of number of pools per channel length or spacing between pools (Montgomery et al. 1995; Beechie and Sibley 1997)
				Percent Pools and Pool Depths	Percent of primary channel length classified as pools (Beechie and Sibley 1997) and measure residual pool depths (Lisle 1987)
				Habitat Units	Measure pool, riffle, run and glide habitat and calculate as a percentage of primary channel length
				LWD Counts4/	Field survey counts and aerial photography determination of LWD
Improve passage to existing high quality habitats	Aquatic Biota; Hydrology; Connectivity	Passage / Entrainment	1.1 Habitat Quantity: Anthropogenic Barriers	Fish Passage Conditions	Review current and historical fish distribution
					Identify natural and artificial fish passage barrier locations
					Determine passage criteria (flow, timing, jump heights, etc.) based on state and federal criteria
Improve riparian and floodplain complexity; Improve floodplain connectivity	Riparian Vegetation; Aquatic Biota; Connectivity; Geomorphology; Hydrology	Riparian / Floodplain	4.1 Riparian Condition: Riparian Vegetation	Riparian Characteristics	Measure riparian characteristics using USGS Landfire data and RapidEye satellite data and GIS techniques
					Measure of wetlands, springs, and upland meadows from field surveys and aerial imagery and GIS techniques
			4.2 Riparian Condition: LWD Recruitment	Floodplain Inundation	Measure percentage of floodplain area disconnected from the main channel from aerial photography, field data, and flood inundation modeling
			5.1 Peripheral and Transitional Habitats: Side Channel and Wetland Conditions	River Complexity Index4/	Sinuosity times the number of nodes unitized by valley distance (Brown 2002)
				Sinuosity3/	Measure from bathymetric survey or imagery (channel length/valley length) (Rosgen 1996)
				Channel Migration Rate4/	Measure channel migration from multiple sequential aerial photographs (Latterell et al. 2006)
			5.2 Peripheral and Transitional Habitats: Floodplain Condition	Meander Belt Width	Measure meander belt width from multiple sequential aerial photographs (Williams 1986)
				Confinement Width	Measure width between confining features (natural or anthropogenic) from aerial photographs and/or bathymetric survey
				Off-Channel Habitat Length	Measure off-channel habitat from aerial photographs and/or bathymetric survey
Improve sediment routing and sorting	Aquatic Biota; Geomorphology	Sediment	7.1 Sediment Conditions: Decreased Sediment Quantity	Sediment Size Distribution: Channel	Pebble counts of surface grain sizes (Bunte and Abt 2001)
				Sediment Size Distribution: Bars	Pebble counts and bulk samples of surface and subsurface grain sizes (Bunte and Abt 2001)
				Percent Fine Sediment in Bed	Measurement of fine sediment proportion in bed material from surface or bar sediment samples
				Erosion/Deposition	Measure channel erosion and deposition with repeat LIDAR/topographic surveys (Li et al. 2006)
					Construct a watershed sediment budget (Reid and Dunne 1996)
				Bank Stability	Examine the effects of riparian vegetation on stream channel stability and form (Eaton 2004)
				Road Density	Measure of road density within the watershed (USFS 2011)
				Road Proximity to Streams	Measure of stream percent of stream length within 300 feet of roads (USFS 2011)
			7.2 Sediment Conditions: Increased Sediment Quantity	Bar Height	Bar height above thalweg measured from topographic survey surface data (Wallick et al. 2010)
				Bar Area	Bar area measured from topographic survey data and high resolution aerial imagery (O'Connor et al. 2009)
				Grain Size Threshold of Motion	Calculates the threshold of motion of minimum sediment particle size based on Shields equation (Shields 1936)
				Sediment Transport Rate	Calculate bed material transport rates (Wallick et al. 2010)

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CTUIR NFJD Habitat Program Objectives	River Vision Touchstones1/	Primary Limiting Factors2/	NOAA Ecological Concerns3/	Metrics	Evaluation Methods
Improve or preserve water quality	Aquatic Biota; Geomorphology	Water Quality - Temperature	8.1 Water Quality: Temperature	Water Temperature	Calculate the 7-Day Average Daily Maximum (7DAYMax) water temperature (ODEQ 1995). Evaluate potential impacts to temperatures in out years associated with climate change, and restoration actions that may buffer against climate change
			9.3 Water Quantity: Altered Flow Timing	Main Channel Low Flows or Off-channel Flows	Characterize low flows from stream gage data (Risley et al. 2008) and utilize hydraulic modeling to determine water elevations in off-channel areas using HEC RAS and GIS

1/ Primary limiting factors are based on the 2008 Fish Accords (Three Treaty Tribes-Action Agencies 2008).
2/ River Visions Touchstones are based on the Umatilla River Vision (Jones et al. 2008).
3/ National Oceanic and Atmospheric Administration standardized limiting factors or "Ecological Concerns"
4/ Metrics included in the CTUIR PHAMS (Jones et al. 2015).

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