Clackamas Partnership

Restoration for Native Fish Recovery

VISION & MISSION

Vision: *The Clackamas Partnership envisions healthy watersheds that sustain native fish and wildlife populations, diverse habitats, and thriving human communities.*

Mission: *The Clackamas Partnership collaborates on coordinated aquatic, riparian and floodplain restoration, conservation, and habitat protection actions to enhance watershed health, support the recovery and sustainability of native fish populations, and contribute to the region's economic and social vitality.*

PARTNERSHIP MEMBERS

Core Partners:

- Clackamas River Basin Council
- Greater Oregon City Watershed Council
- North Clackamas Watersheds Council
- Johnson Creek Watershed Council
- Clackamas Soil and Water Conservation District
- Metro
- US Forest Service
(Mt Hood National Forest, Clackamas Ranger District)
- Confederated Tribes of Warm Springs
- North Clackamas Parks & Recreation District
- Oregon Department of Fish and Wildlife

Supporting Partners:

- Clackamas County Water Environment Services
- Clackamas River Water Providers
- Oregon Dept of Environmental Quality
- Oregon Parks and Recreation Dept.
- Portland General Electric

ECOLOGICAL PRIORITY

Aquatic Habitat for Native Fish Species

FOCAL SPECIES

Chum salmon

Coho salmon

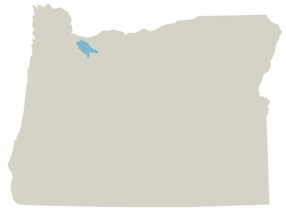
Fall Chinook salmon

Spring Chinook salmon

Steelhead

Bull trout

Pacific lamprey



GEOGRAPHIC SCOPE

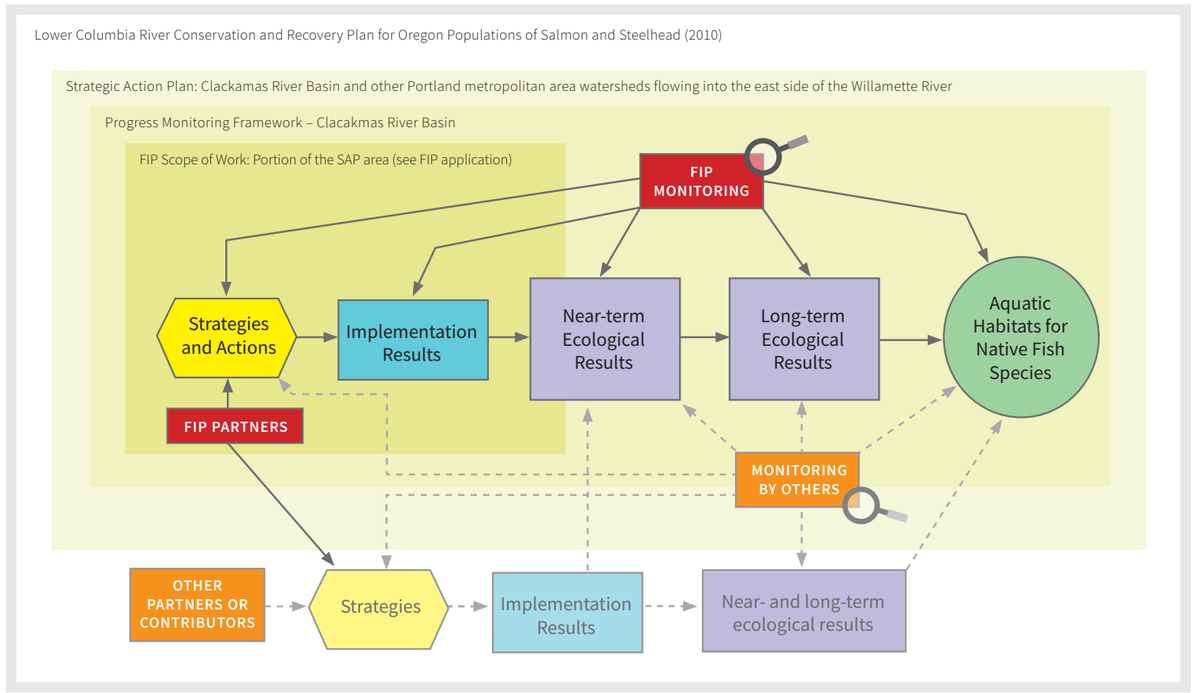
The Clackamas Partnership's FIP Initiative's geography, or Geographic Area, covers a portion the Partnership's Strategic Plan Area. The Geographic Area encompasses the Willamette and Clackamas River reaches; lower Clackamas River tributaries (e.g., Clear, Deep, and Eagle Creek Watersheds); and Willamette River tributaries (Abernethy, Kellogg-Mt. Scott, Johnson Creek and other urban tributaries). The Geographic Area includes three Clackamas River reaches and one Willamette River reach:

- **Upper Clackamas River and Floodplain Reach** – Clackamas River headwaters downstream to Oak Grove Fork *(31.7 miles)*
- **Middle Clackamas River and Floodplain Reach** – Confluence of Oak Grove Fork downstream to River Mill dam *(29.3 miles)*
- **Lower Clackamas River and Floodplain Reach** – River Mill Dam downstream to the confluence of the Willamette River *(23.3 miles)*
- **Lower Willamette River and Floodplain Reach** – Willamette Falls downstream to and including the confluence of Johnson Creek *(9.2 miles)*

Operational Context

The Clackamas Partnership's Restoration for Native Fish initiative is built on the content and actions outlined in the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (2010) and contributes to the goals and objectives associated with the Clackamas Population area. Work included in the FIP Scope of Work extends through 2025 and is limited to one specific set of actions (Strategy 1: Habitat Restoration) and to the area described above in the Geographic Scope. Members of the Partnership and others carry out actions in areas outside the scope of the FIP that also contribute to desired ecological outcomes within the larger Clackamas River basin. For example, limiting factors related to harvest, hatcheries, and hydropower are not directly tied to the Partnership's activities because they are addressed through PGE's FERC licensing obligations or State fish management objectives.

Figure 1: Operational context of the OWEB-funded Focused Investment Partnership Initiative



Theory of Change.

SITUATION

The Clackamas River basin's streams, floodplains, and riparian vegetation have been significantly degraded by a variety of land use activities, including timber harvest, urban and rural development, clearing for agriculture, construction of dams, channelization, and flood control levees, and removal of wood in stream and river channels. Historical and current land uses have impaired aquatic habitat diversity, complexity, and connectivity, and therefore the function of aquatic, floodplain, and riparian habitats within the Plan Area.

Factors limiting the productivity of native fish populations included in the Strategic Action Plan include:

- Habitat access (impaired upstream passage) imposed by small dams and diversions
- Hydrograph/water quantity (altered hydrology) due to upslope land uses, impervious surfaces, including stormwater, flashy flows, and altered groundwater recharge
- Physical habitat quality (impaired gravel recruitment) due to large dams impacting gravel movement and spawning habitat downstream
- Physical habitat quality (impaired habitat complexity and diversity, including access to off channel habitat) including:
    - Degraded riparian areas and large wood recruitment
    - Isolated side channels and off-channel habitats
    - Degraded channel structure and complexity, including lack of large wood
    - Degraded floodplain connectivity and function
    - Channelization and hardening of streambanks and channels
    - Invasive species (riparian / terrestrial)
- Water quality (elevated water temperature) from large reservoirs
- Water quality (toxins) from urban and industrial practices, including stormwater

APPROACH

The results chain ***(Figure 2)*** articulates the partnership's theory of change by displaying the relationships between strategies, implementation results (outputs), and near- and long-term ecological results (outcomes) partners predict will occur in response to strategy implementation that will ultimately lead to achieving goals associated with the partnership's ecological priorities.

Numbered results identified in *Figure 2* are those the partnership has selected to be part of a progress monitoring approach. Measuring these results over time will allow the partnership to evaluate progress in both the near (e.g. 6-year FIP timeframe) and long term, and to identify where key uncertainties might exist with regards to confidence of predicted outcomes or relationships between results, or where and to what extent externalities beyond the scope of this partnership (i.e., ocean conditions impact on target species, weather patterns, land-use decisions, etc.) impact the linkage between outputs and longer-term outcomes.

Each numbered implementation result is associated with the corresponding objective in the Strategic Action Plan *(Tables 1 and 2)*. For intermediate ecological outcomes, objectives are included if identified; however, for many ecological results, the degree to which they will be achieved is not yet well understood. Given this complexity, continued assessment and planning will be required to support development of specific, measurable objectives for the desired ecological outcomes.

The narrative below summarizes the resulting theory of change. Implementation outputs and ecological outcomes prioritized for monitoring during the six-year FIP timeline are indicated by superscript to correspond to the results chain *(Figure 2)* and measuring progress tables *(Tables 1 and 2)*.

STRATEGIES

Strategies in the Clackamas Partnership's Restoration for Native Fish Recovery Strategic Action Plan seek to:

- **address the limiting factors and threats** for the Clackamas salmon, steelhead, Pacific lamprey, and bull trout populations;
- **prioritize habitat restoration and protection** using current science and information contained in regional and local plans; and
- **demonstrate project outcomes** by tracking habitat performance measures tied to the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (2010) and monitoring and evaluating habitat and fish response.

The Partnership's actions fall within three main integrated strategic programs including:

Strategy 1- Habitat Restoration,
Strategy 2 – Habitat Protection, and
Strategy 3 – Promoting Land Use and Landowner BMPs.

In addition, the Partnership has developed an approach and program for Landowner and Stakeholder Outreach and for Monitoring and Evaluation. The work included in the FIP Scope of Work and therefore the theory of change elements below is focused only on Strategy 1 – Habitat Restoration.

1 Habitat Restoration

Partners work collaboratively and with landowners to implement habitat restoration projects including: removal or remediation of barriers to fish passage[1]; placement of large wood[2]; enhancement and connection of confluence habitats; restoration and reconnection of side- and off-channel habitats[3] including alcoves, wetlands and floodplains[4]; and removal of invasive species[5]. Where appropriate, streambanks will be revegetated, regraded, or otherwise improved in conjunction with the actions listed above.

Theory of Change.
Generally, habitat restoration projects are designed to increase connectivity, quantity, and quality of stream, floodplain and riparian habitats[13]. In combination, the outcomes of these projects are expected to meet all freshwater life history requirements of viable and resilient populations of native fish species and other aquatic species and reduce the Clackamas Population limiting factors as described in the situation section above.

Barrier removal projects[1] will increase access to the full range of habitats[6] required by native fish including cold-water tributaries, floodplains, side channels, and off-channel wetlands. With access to previously disconnected habitats the spatial distribution of spawning adults and rearing juveniles will expand, individual survival and fitness will improve, and population scale life history diversity and productivity will improve.

Barrier removals[1] and actions to improve or restore side channel habitat and access[3] will also increase hydrologic connectivity[8] promoting floodwater inundation in some areas and hence floodplain function[11]. Enhanced connectivity of side channel and floodplain habitats to rivers and streams will expand available juvenile fish rearing opportunities. Restored floodwaters recharge groundwater and permit slower discharge of cooler water[10] during low flow periods.

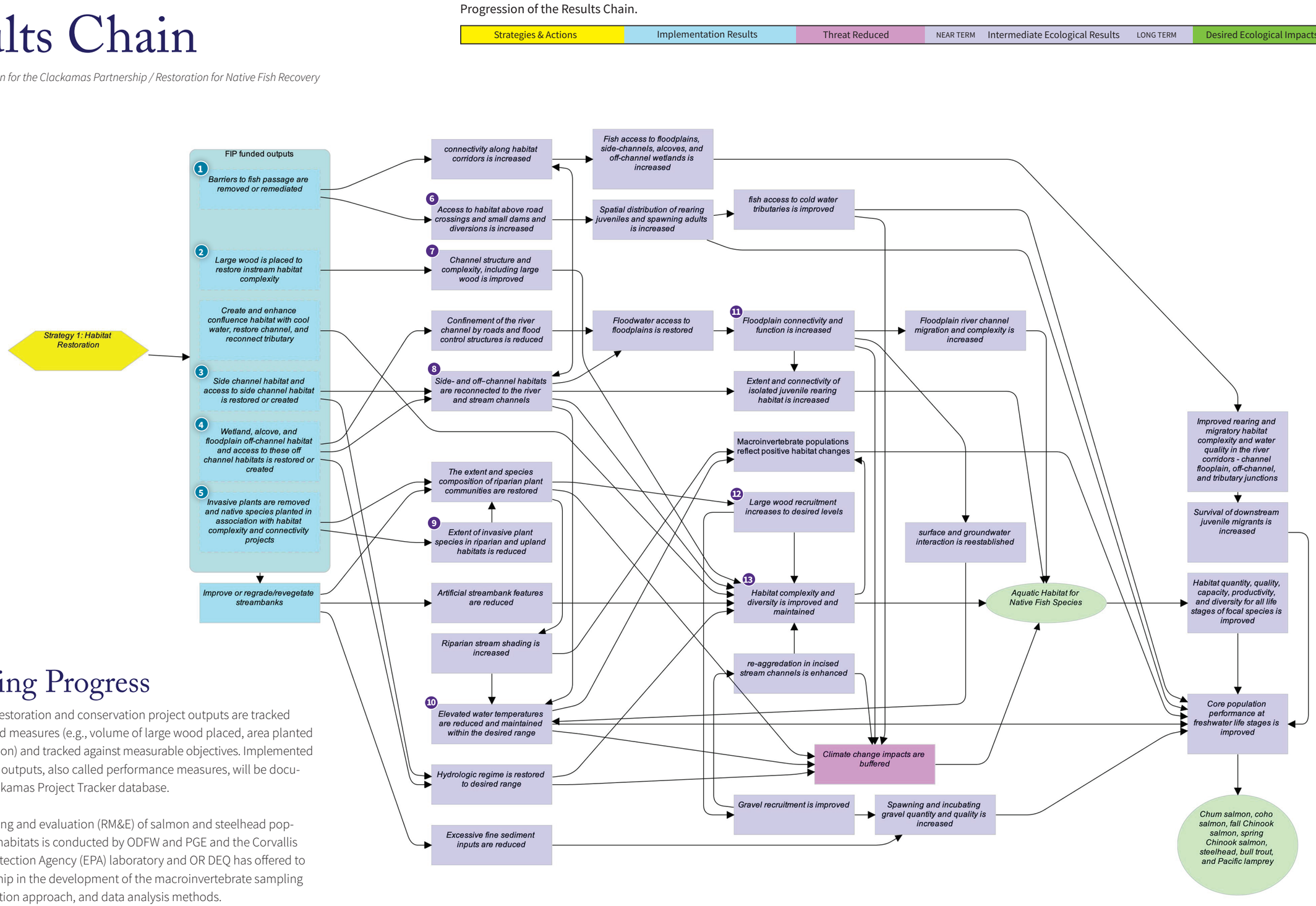
Removal of invasive plans and reestablishment of native riparian vegetation[5] increases stream shade, keeping water temperatures cool.

Large wood placed instream[2] promote sediment deposition and provides cover, building new, complex habitats for fish and aquatic organisms including macroinvertebrates. Over longer timeframes restored riparian areas become a natural source for large woody material[12].

Superscript numbers [1-21] can be cross referenced on the Results Chain diagram and the Implementation Progress/Ecological Progress tables on the following pages.

Results Chain

Figure 2: Results chain for the Clackamas Partnership / Restoration for Native Fish Recovery



Measuring Progress

The Partnership's restoration and conservation project outputs are tracked through established measures (e.g., volume of large wood placed, area planted with native vegetation) and tracked against measurable objectives. Implemented restoration project outputs, also called performance measures, will be documented in the Clackamas Project Tracker database.

Research, monitoring and evaluation (RM&E) of salmon and steelhead populations and their habitats is conducted by ODFW and PGE and the Corvallis Environmental Protection Agency (EPA) laboratory and OR DEQ has offered to assist the Partnership in the development of the macroinvertebrate sampling design, data collection approach, and data analysis methods.

OUTPUTS

Implementation Progress

Table 1. Implementation results objectives and metrics. The result numbers correspond to results shown in the results chain (Figure 2) and theories of change.

IMPLEMENTATION RESULTS (OUTPUT)	OBJECTIVES	OUTPUTS/ PERFORMANCE METRICS
1 Barriers to fish passage are removed or remediated	***By 2021:*** **Obj. 6.1.** Remove a passage barrier and increase fish access in Kelly Creek, an important cold-water tributary, by 1.8 miles ***By 2023:*** **Obj. 6.2.** Remove a passage barrier and increase fish access in Mitchell Creek, an important cold-water tributary, by 1.4 miles ***By 2025:*** **Obj. 6.3.** Identify and address additional fish passage barriers	Miles of stream channel habitat made accessible to fish species by barrier removal or remediation
2 Large wood is placed to restore instream habitat complexity	***By 2021:*** **Obj 1.1.** Place large wood within 1.24 miles of off-channel habitat **Obj. 2.1.** Place large wood within 400 feet of off-channel or floodplain habitat **Obj. 3.1.** Place large wood in 600 feet of N.F. Deep Creek channel **Obj. 3.4.** Place large wood in 4,000 feet of Richardson Creek channel and floodplain **Obj. 4.1.** Place large wood in 1,500 feet of Middle Reach river channel **Obj. 5.1.** Place large wood in 5,574 feet of Newell and Abernethy Creek channels **Obj. 5.2.** Place large wood in 1,000 feet of lower Johnson Creek channel **Obj. 5.3.** Place large wood in 3,500 feet of upper Johnson Creek channel or floodplain? **Obj. 5.6.** Place large wood in 3,000 feet of Mt. Scott Creek channel or floodplain ***By 2023:*** **Obj. 1.4.** Place large wood within 3.2 miles of off-channel habitat **Obj. 1.5.** Place large wood within 0.9 miles of floodplain habitat **Obj. 3.7.** Place large wood in 17,500 feet of Clear Creek channel and floodplain **Obj. 3.9.** Place large wood in 5,000 feet of N.F. Deep Creek channel **Obj. 4.3.** Place large wood in 5,500 feet of the Middle Reach river channel habitat **Obj. 5.10.** Place large wood in 300 feet of upper Johnson Creek channel and floodplain ***By 2025:*** **Obj. 1.9.** Place large wood within 2 miles of off-channel habitat **Obj. 3.10.** Place large wood in 3,500 feet of tributary channels and floodplain **Obj. 3.12.** Place large wood in 3,000 feet of tributary channels **Obj. 4.6.** Place large wood in 5,500 feet of the Middle or Upper Reach river channel habitat **Obj. 5.12.** Place large wood in 500 feet of tributary channel and floodplain ***By TBD:*** **Obj. 2.3.** Place large wood within off-channel or floodplain habitats	Linear feet of stream with large wood placement, categorized by: 1) placement location: in channel (at or below OHW) or floodplain (above OHW); and 2) volume of wood (yd3) placed per length of stream.

IMPLEMENTATION RESULTS (OUTPUT)	OBJECTIVES	OUTPUTS/ PERFORMANCE METRICS
3 Side channel habitat and access to side channel habitat is restored or created	***By 2021:*** **Obj. 1.3.** Multiple projects: Increase side channel access in 2,000 feet of channel **Obj. 3.3.** Increase N.F. Deep Creek side channel access in 150 feet of channel ***By 2023:*** **Obj. 1.7.** Multiple projects: Increase side channel access in 2.0 miles of channel **Obj. 4.5.** Increase side channel access in 0.6 miles of Upper Reach channel ***By 2025:*** **Obj. 1.11.** Multiple projects: Increase side channel access in 2,000 feet of channel	Linear feet of side channel created or re-connected
4 Wetland, alcove, and flood-plain off-channel habitat and access to these off-channel habitats is restored or created	***By 2021:*** **Obj. 3.6.** Increase off-channel wetland area and access by 2.3 acres along Richardson Creek **Obj. 5.5.** Increase off-channel wetland area by 7.0 acres along upper Johnson Creek **Obj. 5.8**. Increase off-channel wetland area by 7.6 acres along Mt. Scott Creek ***By 2023:*** **Obj. 1.8.** Increase off-channel wetland area and access by 1.0 acres along the Clackamas River **Obj. 3.8.** Increase off-channel wetland area and access by 1.4 acres along Clear Creek ***By 2025:*** **Obj. 1.12.** Increase off-channel wetland area and access by 1.0 acres along the Clackamas River **Obj. 3.11.** Increase off-channel wetland area and access by 2 acres along tributary channels	Area in acres of off-channel wetland habitat
5 Invasive plants are removed and native species planted as an element of habitat complexity and connectivity projects	***By 2021:*** **Obj. 1.2.** Multiple projects: Control invasives and plant native floodplain vegetation on 25.5 acres **Obj. 3.2.** Control invasives and plant native riparian vegetation on 3 acres along N.F. Deep Creek **Obj. 3.5.** Control invasives and plant native riparian vegetation on 30 acres along Richardson Creek **Obj. 4.2.** Plant native riparian vegetation for 500 feet along the Middle Reach river channel **Obj. 5.4.** Plant 7 acres of native riparian vegetation along upper Johnson Creek **Obj. 5.7.** Plant 7.6 acres of native riparian vegetation along Mt. Scott Creek ***By 2023:*** **Obj. 1.6.** Multiple projects: Control invasives and plant native floodplain vegetation on 12.0 acres **Obj. 4.4.** Control invasives and plant native floodplain vegetation on 40 acres along the upper Clackamas River Reach **Obj. 5.9.** Control invasives and plant native riparian vegetation on 0.7 acres along upper Johnson Creek ***By 2025:*** **Obj. 1.10.** Multiple projects: Control invasives and plant native floodplain vegetation on 25.0 acres **Obj. 5.11.** Control invasives and plant native riparian vegetation on 3 acres of tributaries	Acres of streamside / floodplain invasive species removal Linear feet of streamside / floodplain invasive species removal Acres of riparian / flood-plain planted with natives Linear feet streamside / floodplain planted with natives

OUTCOMES

Ecological Progress

Table 2. Ecological results, potential objectives, and potential metrics. The result numbers correspond to results shown in the results chain (Figure 1) and theories of change. Given the complexity of ecosystems, continued assessments and planning will be required to support development of specific, measurable objectives for desired ecological outcomes. Objectives in this table are italicized to reflect that they may be refined in the future. (Items in parentheses are monitoring activities that are not included in current monitoring grant application. Partners are applying for additional funds to cover these metrics.)

LIMITING FACTOR REDUCTION OR INTERMEDIATE ECOLOGICAL RESULTS	WORKING OBJECTIVE	POTENTIAL METRIC
6 Access to habitat above road crossings and small dams and diversions is increased	*Removing barriers and increasing access will increase spatial distribution of rearing juveniles and spawning adults.*	Fish use as indicated by environmental DNA
7 Channel structure and complexity, including large wood is improved	*Projects will improve habitat characteristics and processes, and fish habitat capacity. Restoration will Increase channel complexity to make progress toward LCR Plan delisting goal of 62.5 miles of large wood placement at 20m3 of large wood per 100m of stream in 7 miles of target areas; benthic conditions produce less sediment-tolerant and therefore more sediment-sensitive macroinvertebrate communities*	Fish use and density at installed habitat structures; Macroinvertebrate IBI or other metric as determined in consultation with ODEQ; ODFW benchmarks for channel structure and complexity (AQI)
8 Side- and off channel habitats are reconnected to the river and stream channels	*Improving and re-connecting off-channel habitat to river and stream channels will improve fish access and habitat capacity, increasing juvenile rearing and adult spawning.*	Fish presence and density; Length of side and off-channel habitats reconnected
9 Extent of invasive plant species in riparian and upland habitats is reduced	*Invasive plant species are replaced with natives on targeted riparian and upland habitat acres, increasing shade and improving habitat complexity.*	60% (or 1200 or more stems per acre) of native plant species established on 100 or more acres
10 Elevated water temperatures are reduced and maintained within the desired range	*Restoration projects will contribute to water temperatures reaching desired temperatures for aquatic species and human use and minimally maintain temperatures through 2030*	Macroinvertebrate temperature optima (Monitor stream thermal profile via UAS (drones))
11 Floodplain, wetland and alcove connectivity is increased	*Access to increased habitat and capacity will result from restoration projects. An increase in floodplain and wetland connectivity and function will improve fish productivity and restore natural processes.*	(Increase in floodplain / wetland connectivity, when & if funding is available to monitor) (Increased frequency of inundation when & if funding is available to monitor)
12 Large wood recruitment increases to desired levels	*Projects will improve instream habitat and habitat complexity for all life stages and increase productivity.*	Macroinvertebrate sampling results (TBD in consultation with ODEQ metric); ODFW AQI
13 Habitat complexity and diversity is improved and maintained	*Off-channel habitat complexity supports objectives of the Lower Columbia River Plan e.g., increase in miles of side channel and increased acreage of off-channel wetland for use by ESA-listed species and other native aquatic species.*	Macroinvertebrate sampling results (TBD in consultation with ODEQ metric); ODFW AQI Evidence of fish presence and use from ODFW AQI monitoring of juvenile fish presence

ECOLOGICAL PRIORITIES

Aquatic Habitat for Native Species

Native salmonid species:

Chum salmon
Coho salmon
Fall Chinook salmon
Spring Chinook salmon
Steelhead
Bull trout
Pacific lamprey

Status & Trends

Monitoring the status and trends of ecological priority habitats and focal species will include coordination with agencies or conservation organizations operating at the appropriate landscape or population scales. FIP partners will work with these entities to establish a process for integrating their monitoring framework with existing status and trends monitoring programs (if they occur) or to establish an approach for identifying key ecological attributes that should be measured to document and communicate change in the status and trajectory of ecological priority habitats and focal species populations.