The Deschutes Partnership

Habitat Restoration for Resident and Anadromous Fish in the Deschutes

VISION

The Deschutes Partnership envisions successful community-supported restoration that results in floodplain, riparian and aquatic conditions sufficient to support sustainable spawning and rearing of salmon and steelhead in the Metolius River, Whychus Creek, and the Crooked River.

PARTNERSHIP MEMBERS

The core partners of the Deschutes Partnership:

- Deschutes Land Trust
- Deschutes River Conservancy
- Crooked River Watershed Council
- Upper Deschutes Watershed Council

Other supporting partners (partners that provide needed help and support in the form of providing scientific data, feedback on the design of projects…)

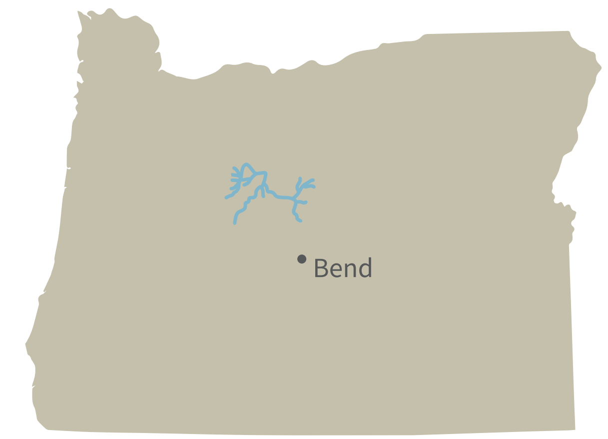
- Oregon Department of Fish and Wildlife
- Portland General Electric
- US Forest Service
- US Fish and Wildlife Service

ECOLOGICAL PRIORITY

Aquatic Habitat for Native Fish Species

FOCAL SPECIES

Summer steelhead
Chinook salmon
Sockeye salmon
Bull trout
Redband trout



GEOGRAPHIC SCOPE

The Deschutes Partnership is focusing its efforts on the 226 miles of historic habitat for salmon and steelhead in the Whychus Creek, Metolius River (primarily Lake Creek and the mainstem Metolius) and lower Crooked River systems.

Operational Context.

The regional context for the Deschutes FIP is the Upper Deschutes River Basin, which is included within the Mid-Columbia spring salmon Ecologically Significant Unit (ESU) and Mid-Columbia steelhead Distinct Population Segment (DPS). The FIP is implementing actions of the Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment (ODFW 2010). The restoration work is supporting the effort led by PGE, Confederated Tribes of Warm Springs, and ODFW to reintroduce salmon and steelhead to the upper Deschutes River. Monitoring under the FIP is focused primarily on habitat results (although partners are also monitoring macroinvertebrate communities); fish response monitoring will be carried out by the other contributors involved in the reintroduction effort.

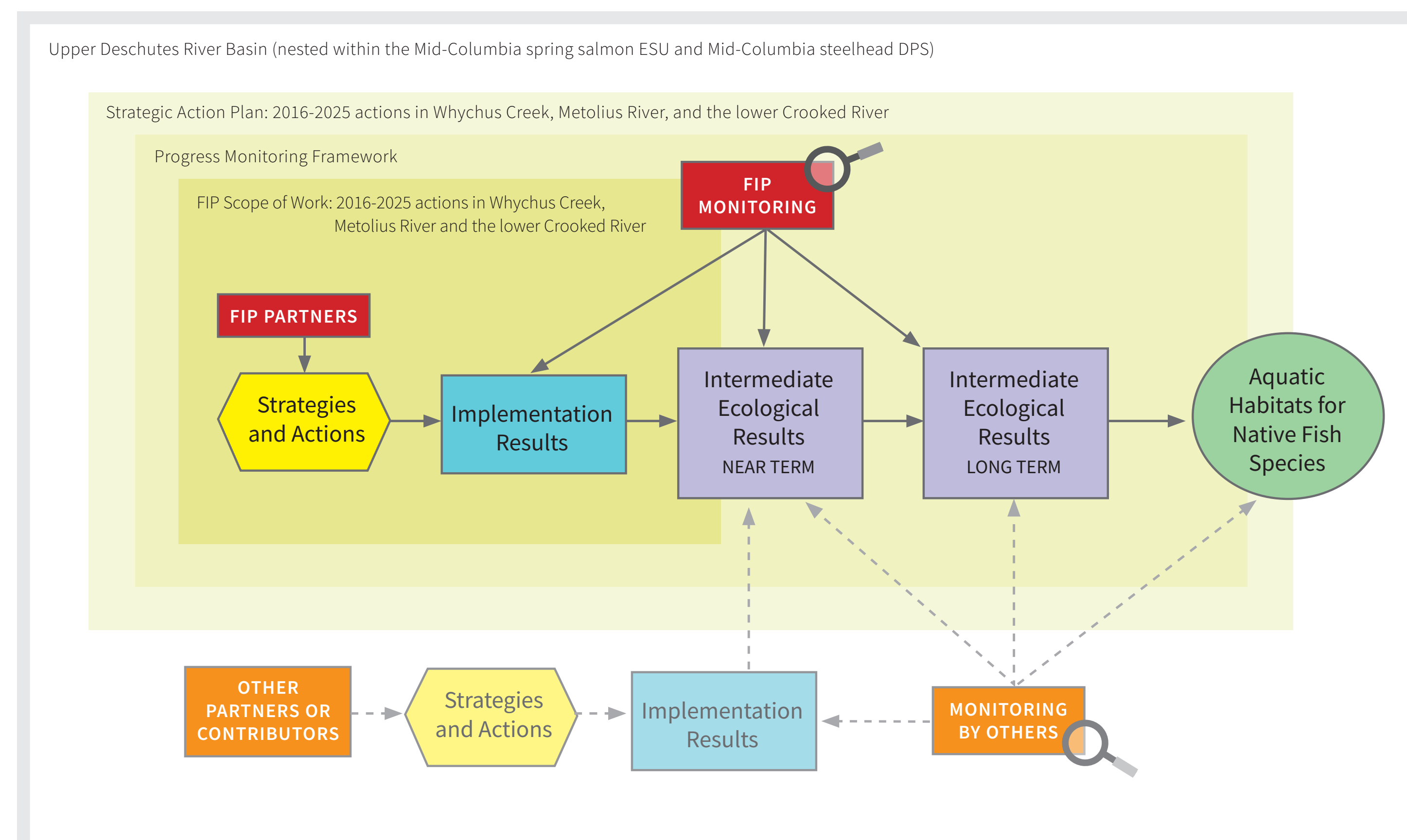


Figure 1: Operational context of the OWEB-funded Focused Investment Partnership Initiative

Theory of Change.

SITUATION

By the late 1990s, over a century of stream modifications including diversion of stream flow, construction and maintenance of diversion dams and other irrigation infrastructure to divert flow away from stream channels, and alterations to floodplain areas created conditions that impacted critical fish habitat.

These conditions include:

- Altered and simplified stream habitat
- Reduced flows and stream dewatering
- Floodplains disconnected from stream channels
- Altered riparian areas
- Elevated stream temperatures
- Barriers to fish passage
- Entrainment of fish through unscreened irrigation diversions

APPROACH

The results chain *(Figure 2)* articulates the partnership's theory of change by displaying the relationships between strategies, implementation results, and the intermediate ecological results partners predict will occur in response to strategy implementation. Intermediate ecological outcomes resulting from strategy implementation are, in the long term, expected to culminate in restoration of the FIP's ecological priorities.

Numbered results are those the partnership determined would be important to highlight as part of a monitoring approach. They will allow the partnership to measure progress in both the near (e.g., six-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 *(Figure 2)*.

Each numbered implementation result is associated with the corresponding objective in the Strategic Action Plan *(Tables 1 and 2)*. For intermediate ecological results, objectives are included if identified; however, for many ecological results, the degree (and timeframe) 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, measureable objectives for the desired ecological outcomes.

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

STRATEGIES

Deschutes Partnership strategies aim to ameliorate the limiting factors identified in the Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment (ODFW 2010). *The strategies are:*

- Strategy 1: Protect spawning and rearing habitat through **land conservation** easements and fee purchases
- Strategy 2: **Restore stream habitat** conditions necessary for successful spawning and rearing
- Strategy 3: **Restore stream flow** sufficient to support successful spawning and rearing
- Strategy 4: **Restore fish passage**
- Strategy 5: **Reduce or eliminate risk of entrainment** in irrigation infrastructure
- Strategy 6: **Engage the community** in the focal watersheds to promote increased awareness about reintroduction and to recruit support

STRATEGIES

1 Land Conservation

The partners will work cooperatively to purchase land or enter into conservation easements in critical areas of Whychus Creek and the Metolius and Crooked Rivers. Restoration actions will be planned and carried out on acquired or easement properties as needed.

Theory of Change.
Protection of spawning and rearing habitat through land purchases or conservation easements[1] will prevent development and further degradation of stream and floodplain habitat in areas of the watersheds that are critical for supporting fish. Protected lands will become available for stream channel, floodplain and riparian restoration where it is needed.

2 Stream Habitat Restoration

The partners will design and implement stream habitat restoration projects to restore stream, riparian and floodplain habitat including the suite of channel and floodplain conditions required for successful spawning and rearing in historic floodplain and wet meadow reaches.

Theory of Change.
Stream habitat restoration projects[2] set the stream channel and floodplain system on a trajectory toward self-sustaining function. These projects interrupt degradation of stream and floodplain habitat structure and function and create the necessary conditions for geomorphic processes to resume. *These include:*

- floodplain inundation[7], groundwater storage[7], and groundwater recharge and cooling of base flows;
- functioning sediment transport, deposition, and erosion (fine suspended sediment reduced[10]); and
- an abundant and diverse native riparian plant community[8] that slows floodwaters, stabilizes soil, shades the stream, and contributes plant material, from leaves and twigs that become food for aquatic insects to large wood that provides cover.

These processes in turn create and maintain stream channels with a diversity of habitats and flow velocities[9].

3 Stream Flow Restoration

Restoration partners will implement infrastructure projects and transfer or lease water rights instream to restore stream flow sufficient to support successful spawning and rearing in Whychus, McKay, and Ochoco Creeks and the Crooked River.

Theory of Change.
Stream flow restoration[3] increases the amount of water left in the stream (restored hydrograph[11]) rather than diverted for irrigation.

- More stream flow means more stream habitat: as flows rise, stream reaches formerly fragmented through drying up sections of the stream are reconnected and wetted width and depth increase.
- With more water, the stream stays cooler[12], bringing down the unnaturally high temperatures that result from diminished flows, and making the stream more livable for fish.[13, 14]

4 Restore Fish Passage

The partners will work with irrigators and landowners to remove or remediate dams in Whychus Creek and the Metolius and Crooked Rivers that are believed to impede the free upstream or downstream movement of trout and salmon. It is believed that important spawning and rearing habitat is currently left unused by trout and salmon because it is not accessible to them.

Theory of Change.
Removal of diversion dams[4] will increase the availability of critical spawning and rearing habitat (habitat connectivity[15]) which currently limit the overall productivity and spatial distribution of trout and salmon in Whychus Creek and the Metolius and Crooked Rivers.

- With dam removal, fish will access and use newly available spawning and rearing habitat.
- With increased access to spawning and rearing habitat, productivity and population size and resilience of trout and salmon will increase.

5 Reduce or Eliminate Risk of Entrainment

The partners will work with irrigators and landowners to screen active diversions or decommission defunct diversions suspected of entraining juvenile trout and salmon into irrigation canals or other water diversion structures.

Theory of Change.
Installation of fish screens on active diversion structures[5] will reduce entrainment of juvenile trout and salmon and decrease mortality rates.

- Reduction in mortality rates of juvenile trout and salmon from entrainment will increase fry/parr/smolt to adult survival.
- Increased adult survival will increase productivity of trout and salmon populations associated with Whychus Creek and the Metolius and Crooked Rivers.

6 Engage the Community

The partners will conduct a series of outreach and engagement activities including community presentations, stewardship projects for students, watershed education activities for elementary schools, stewardship hikes, and restoration tours.

Theory of Change.
Delivery of information[6] via a diverse array of approaches will improve the level of understanding and competence of the community regarding the need and approach for stream and river restoration. In turn, an increased level of understanding of the need and approach for stream restoration will increase engagement and participation in restoration activities on private lands.

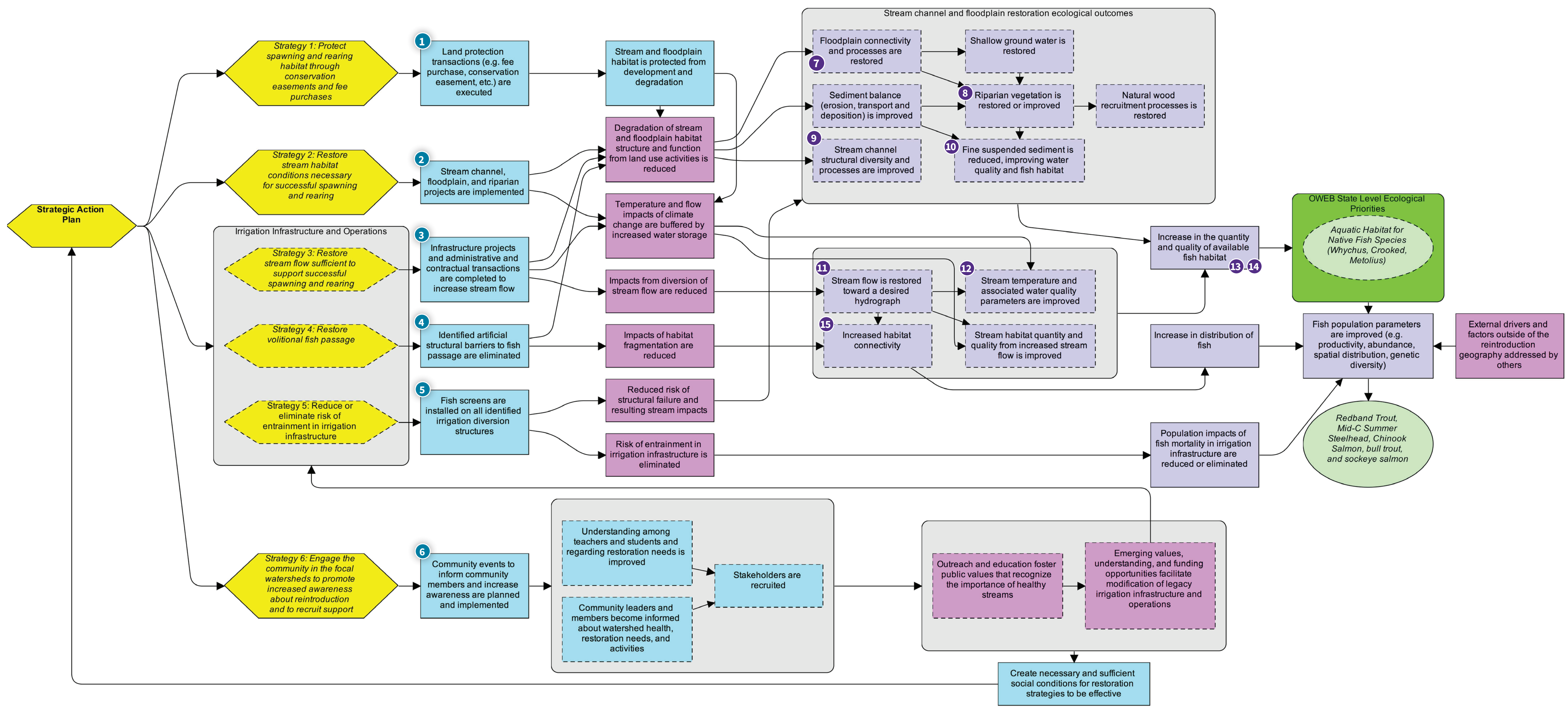
Superscript numbers 1-15 can be cross referenced on the Results Chain diagram and the Implementation Progress/Ecological Progress tables on the following pages.

Results Chain

Figure 2: *Results chain for the Deschutes Partnership Initiative*

Progression of the Results Chain.

Strategies & Actions	Implementation Results	Threat Reduced	NEAR TERM Intermediate Ecological Results LONG TERM	Desired Ecological Impacts



Measuring Progress

Deschutes Partnership core partners draw on multiple sources to collect or obtain implementation and effectiveness monitoring data. Core partners collect or contract with consultants to collect implementation and some effectiveness monitoring data specific to the projects they implement. Where other subbasin partners are already collecting data useful for evaluation of Deschutes Partnership projects, core Deschutes Partnership organizations obtain subbasin partner data and evaluate it within the context of Deschutes Partnership projects. While core partners have been using this approach to monitoring since 2009, the approach will be formalized in the Deschutes Partnership Integrated Monitoring Plan currently in development.

Implementation objectives are those identified in the 2015 Deschutes Partnership Strategic Action Plan. Ecological objectives have been developed to describe the specific desired ecological condition or trajectory. In some cases target values for ecological objectives will necessarily be project-specific (e.g. ecological result [9], Stream channel structural diversity and processes are improved), or potential metrics may not be cost-effective to measure (e.g. ecological result [15], Habitat connectivity is increased).

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	OBJECTIVES	METRICS
1 Stream and floodplain habitat is protected from development and degradation	**1.1 Whychus Creek:** Permanently protect 3.6 river miles and 173.95 floodplain acres between the City of Sisters (RM 21.3) and the Deschutes River (RM 0) by 2025 **1.2 Metolius River:** Permanently protect 3.9 miles and 198.1 floodplain acres of high priority spawning and rearing habitat on Lake Creek and the Metolius River mainstem by 2025 **1.3 Crooked River:** Work cooperatively with willing landowners to permanently protect 19.6 miles of stream habitat and 734.2 floodplain acres along McKay Creek, the lower Crooked River, and Ochoco Creek by 2025	Stream miles and floodplain, wetland, and upland acres protected
2 Stream channel, floodplain, and riparian projects are implemented	**2.1 Whychus Creek:** Restore stream, riparian and floodplain habitat along 8.5 miles and on 410 floodplain acres of Whychus Creek on the lands permanently protected by the Deschutes Land Trust. **2.2 Metolius River:** Restore stream habitat along Lake Creek and Metolius River by 2029. **2.3 Crooked River:** Restore stream habitat along 16 miles of McKay Creek, the lower Crooked River, and Ochoco Creek by 2040.	Post-project stream channel length Post-project acres planted
3 Infrastructure projects and administrative and contractual transactions are completed to increase stream flow	**3.1 Whychus Creek:** Protect a minimum of 27 cfs of instream flow (wet water) in Whychus Creek along its entire length from headwaters to the confluence with the Deschutes River by 2025. **3.2 Crooked River:** Protect spring and early summer stream flows of 11.2 cfs in McKay Creek, summer stream flows of 5 cfs in Ochoco Creek, and late spring through early fall stream flows of at least 26.1 cfs in the Crooked River through water transactions to meet target flow rates during critical times of year by 2035.	Streamflow (cfs) protected instream
4 Identified artificial structural barriers to fish passage are eliminated	**4.1 Whychus Creek:** Restore year-round fish passage along the entire length of Whychus Creek from RM 0 (confluence with the Deschutes River) to RM 39 (the upstream most natural barrier) by 2018. **4.2 Metolius River:** Restore year-round fish passage along the 5.5 miles of Lake Creek between Suttle Lake and the Metolius River by 2018. **4.3 Crooked River:** Restore year-round fish passage at all existing artificial barriers in the lower Crooked River by 2022.	Artificial structural barriers to fish passage retrofitted or removed
5 Fish screens are installed on all identified irri-gation diversion structures	**5.1 Whychus Creek:** Eliminate the risk of fish entrainment in irrigation canals or other diversions by fully screening all diversions along Whychus Creek to meet state and federal criteria by 2022. **5.2 Metolius River:** Eliminate the risk of fish entrainment at diversions by fully screening all diversions along the 5.5 miles of Lake Creek between Suttle Lake and the Metolius River by 2018. **5.3 Crooked River:** Eliminate the risk of fish entrainment at diversions by fully screening all diversions in McKay Creek, lower Crooked River and Ochoco Creek by 2030.	Proportion screened of total number of points of diversion
6 Community events to inform community members and increase awareness are planned and implemented	**6.1 Expand community awareness and engagement** in native fish reintroduction and restoration efforts in Whychus Creek, the Metolius River, and the Crooked River.	Number and type of outreach and en-gagement activities in Prineville, Sisters, Redmond, and Camp Sherman

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.

OUTCOMES

Ecological Progress

LIMITING FACTOR REDUCTION OR INTERMEDIATE ECOLOGICAL RESULTS	POTENTIAL OBJECTIVES	POTENTIAL METRICS
7 Floodplain connectivity and processes and shallow groundwater are restored	*Raise water table to ~2-3 ft below the surface to support riparian vegetation*	Depth to groundwater
8 Riparian vegetation is restored or improved	*To be determined through preliminary post-proj-ect monitoring*	% increase in acres of riparian vegetation from GIS polygons
9 Stream channel function is improved	*Reduce stream velocity*	Stream velocity at channel cross-sections
10 Fine suspended sediment is reduced, improving water quality and fish habitat	*Number of DEQ high sediment indicator taxa decreases and number of low sediment indicator taxa increases (range)*	Macroinvertebrate sediment optima and other macroinver-tebrate sediment metrics
11 Stream flow is restored toward a desired hydrograph	*Instantaneous flow averaged over 60-minute intervals meets or exceeds target flow numbers (see Implmentation Progress Objectives above)*	60-minute average instantaneous stream flow
12 Stream temperature and associated water quality parameters are improved	*Seven-day moving average maximum (7DADM) stream tem-perature does not exceed 18°C; Number of DEQ high tempera-ture optima taxa decreases and number of low temperature indicator taxa increases*	Percent of days meeting 18°C state temperature standard at WC 006.00; Macroinvertebrate temperature optima
13 Fish habitat quality is increased	*Depth, cover and velocity values are within ranges suitable or optimal for all life stages of resident and anadromous fish*	Depth, cover, and velocity criteria; habitat attribute criteria
14 Fish habitat quantity is increased (rearing)	*Stream channel area (wetted extent) is increased*	Wetted extent at x flow
15 Habitat connectivity is increasing	*Fish move between formerly fragmented reaches*	Fish movement between formerly fragmented reaches

Status & Trends

ECOLOGICAL PRIORITY

Aquatic Habitat for Native Fish Species

Monitoring the status and trends of ecological priority habitats and focal species will include coordina-tion 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 commu-nicate change in the status and trajectory of ecological priority habitats and focal species populations.