Building a Foundation for Measuring Progress

OWEB's Focused Investment Partnerships

Washington Salmon Recovery Conference

Different monitoring approaches for adaptive management and salmon recovery

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UPPER DESCHUTES WATERSHED COUNCIL

Acknowledgements

Oregon Watershed Enhancement Board

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Project Team

- ***Lauren Mork and Ryan Houston, Upper Deschutes Watershed Council***
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Outline

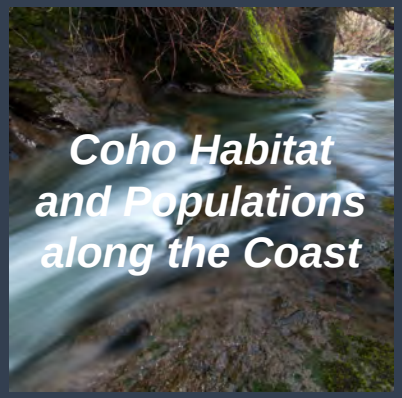
- Introduction to the Oregon Watershed Enhancement Board's ***Focused Investment Partnership*** Program
- Approach for Measuring Progress
- The Deschutes Partnership
- What's Next

OREGON WATERSHED ENHANCEMENT BOARD

OWEB's Focused Investment Partnership (FIP) Grant Program

- Investment in ***high performing*** partnerships
  - Addresses one or more Board identified priorities of significance to the state
  - Strategic action plan
  - Governance structure
- 6-year funding timeframe
- Invest at higher levels – up to $12 million

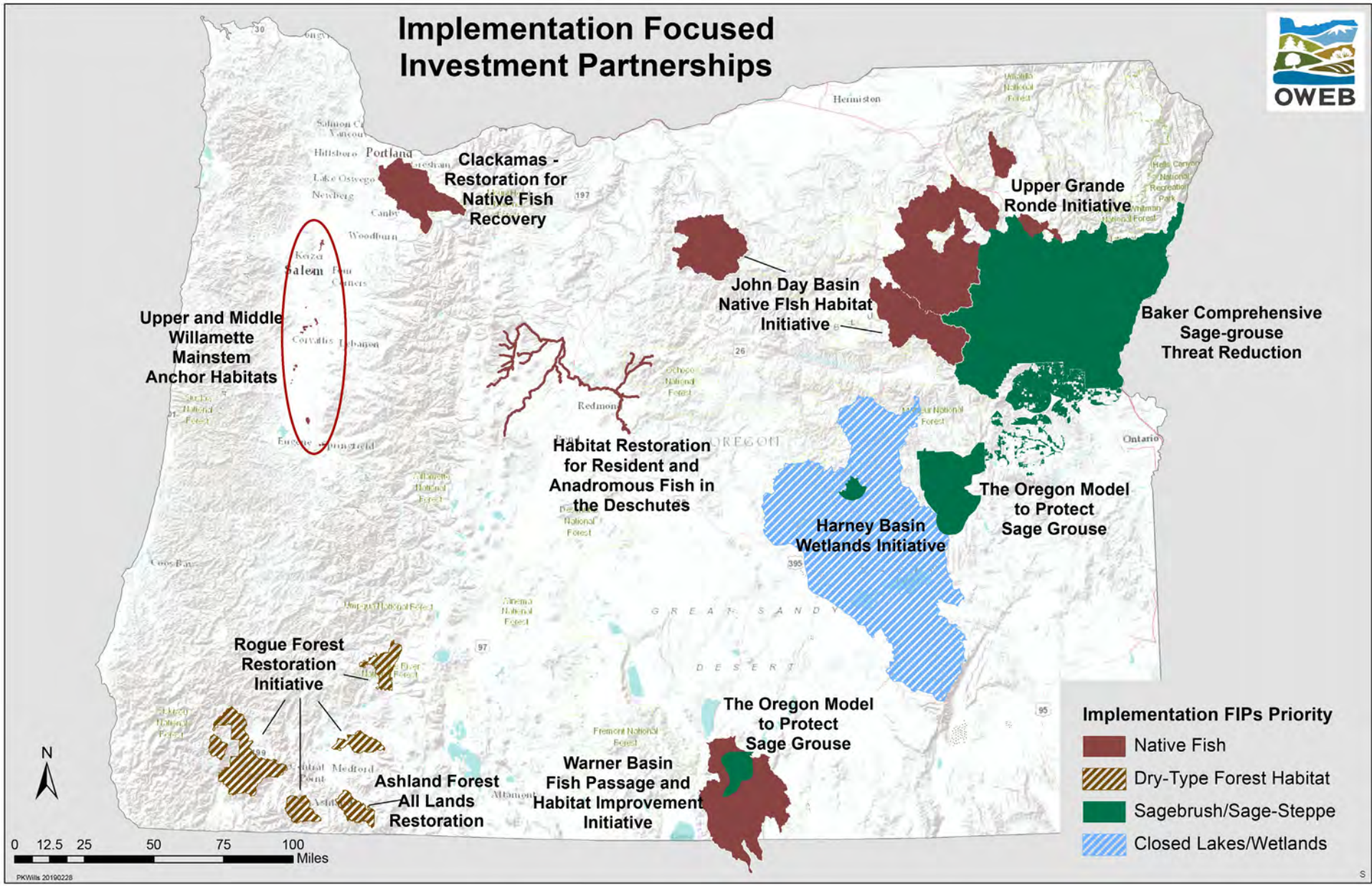
Board-Identified Ecological Priorities for Oregon



Focused Investment Partnerships

2016	
Partnership	**Initiative**
Ashland Forest All-lands Restoration Partnership	Ashland Forest All-lands Restoration
The Deschutes Partnership	Habitat Restoration for Resident and Anadromous fish in the Deschutes
Grande Ronde Restoration Partnership	Upper Grande Ronde Initiative
Oregon All Counties CCAA Steering Committee	Oregon Model to Protect Sage Grouse, All Counties
Willamette Mainstem Anchor Habitat Working Group	Upper and Middle Willamette Mainstem Anchor Habitats
Harney Basin Wetlands Initiative Partners	Harney Basin Wetlands Initiative Focused Investment

2019	
Partnership	**Initiative**
Baker Sage-grouse Local Implementation Team	Baker Comprehensive Sage-grouse Threat Reduction
Clackamas Partnership	Restoration for Native Fish Recovery
John Day Basin Partnership	John Day Basin Native Fish Habitat Initiative
Rogue Forest Restoration Partnership	Rogue Forest Restoration Initiative
Warner Basin Aquatic Habitat Partnership	Warner Basin Fish Passage and Habitat Improvement Initiative


Implementation Focused Investment Partnerships
OWEB
Clackamas - Restoration for Native Fish Recovery
Upper and Middle Willamette Mainstem Anchor Habitats
John Day Basin Native FIsh Habitat Initiative
Upper Grande Ronde Initiative
Baker Comprehensive Sage-grouse Threat Reduction
Habitat Restoration for Resident and Anadromous Fish in the Deschutes
The Oregon Model to Protect Sage Grouse
Harney Basin Wetlands Initiative
Rogue Forest Restoration Initiative
Ashland Forest All Lands Restoration
Warner Basin Fish Passage and Habitat Improvement Initiative
The Oregon Model to Protect Sage Grouse
Implementation FIPs Priority
Native Fish
Dry-Type Forest Habitat
Sagebrush/Sage-Steppe
Closed Lakes/Wetlands
N
0 12.5 25 50 75 100 Miles
PKWills 20190228

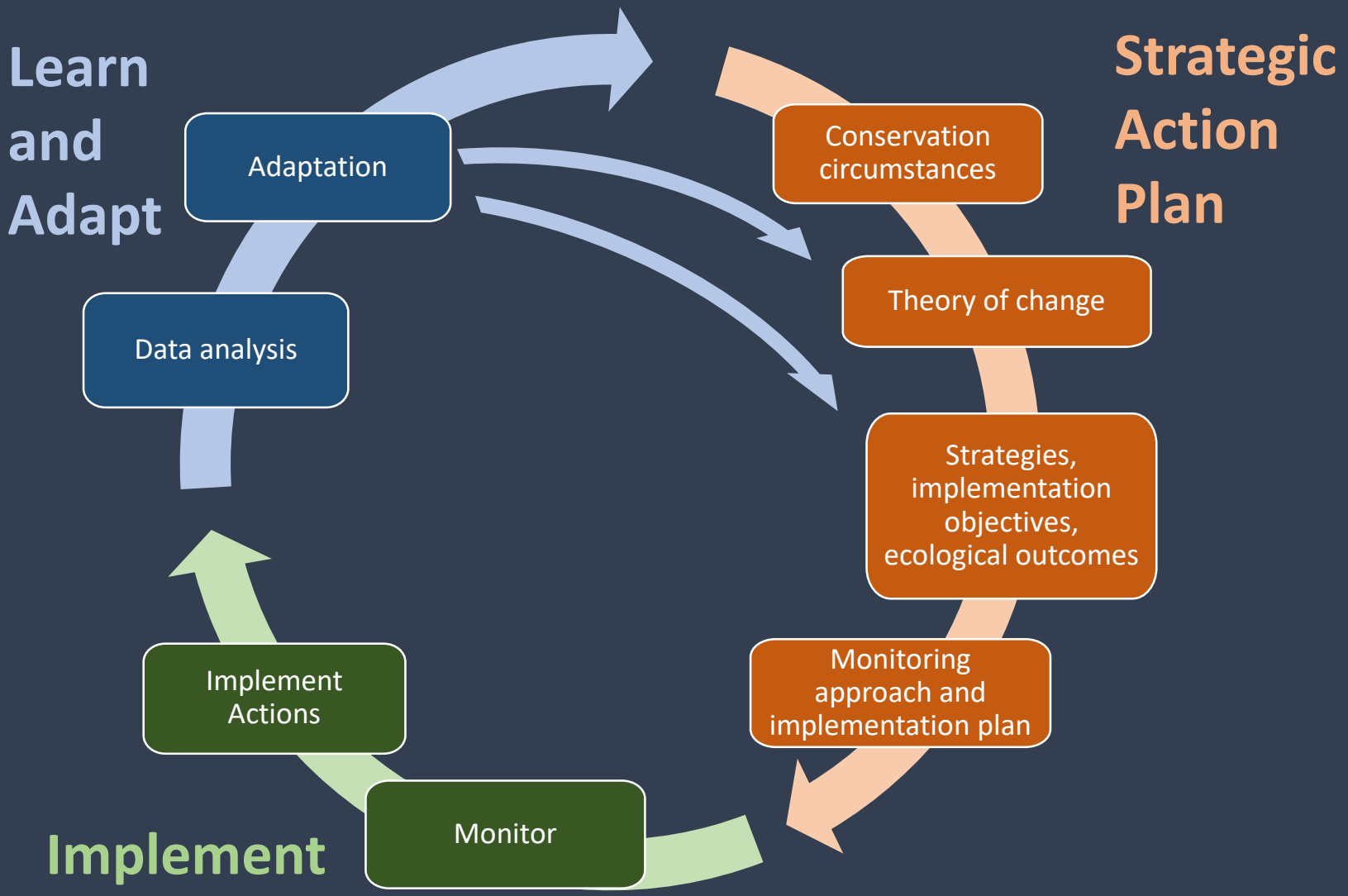
Progress Monitoring Framework

- An approach that could be applied consistently across varied ecological priorities
- Flexible to meet unique needs and circumstances
- Balance of practicality and rigor
- Provides an opportunity to measure progress at the state scale

Theory of Change

Articulation of the hypothesized relationships between strategy implementation (outputs) and predicted near- and long-term ecological results (outcomes)

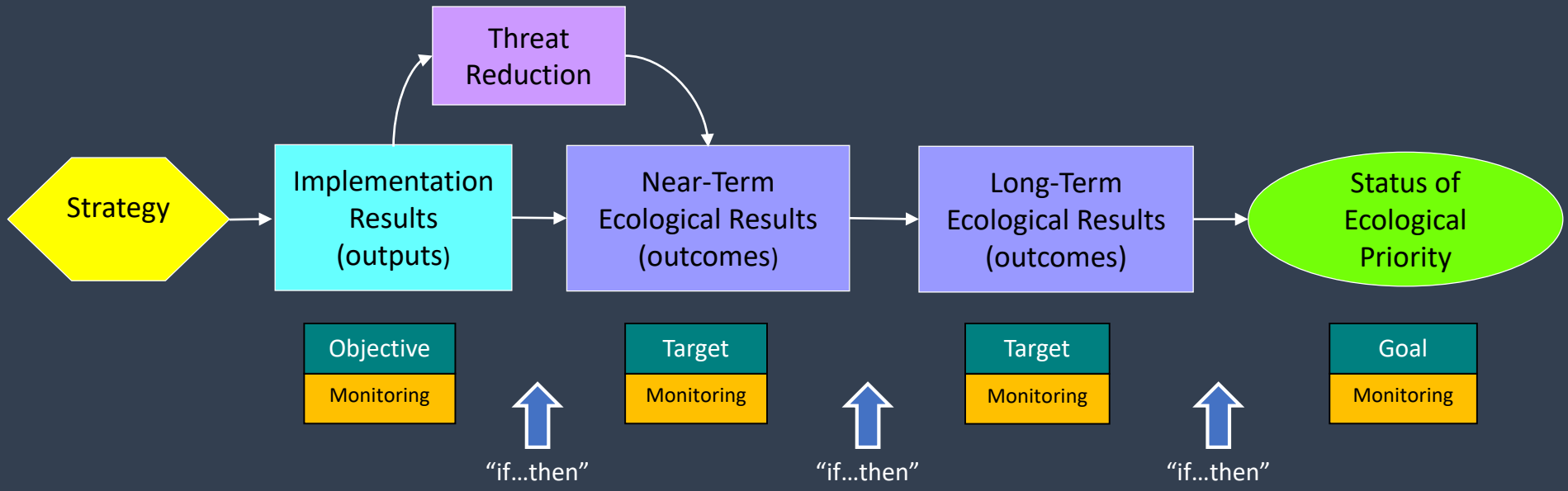
Adaptive Management Cycle



MIRADI

Adaptive Management Software for Conservation Projects

Results Chain



Based on Conservation Measures Partnership (2013)

Results Chains – Values *(and Cautions)*

Values

- Promotes understanding and agreement on context and theory – with line of sight to goals
- Helps identify knowledge gaps and uncertainties
- Helps identify strategic points of intervention
- Supports a framework for monitoring and adaptive management

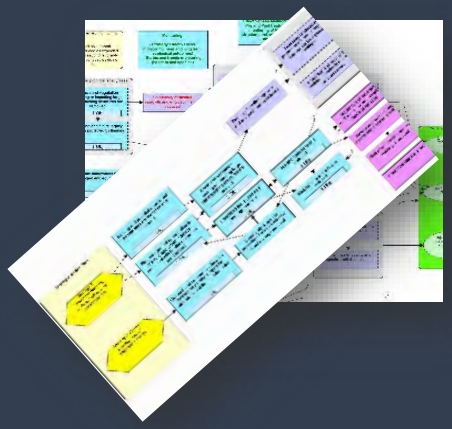
Cautions

- Balance detail with utility – law of diminishing returns
- Suggests simple, unidirectional, and equal relationships

Process

Review FIP ***Strategic Action Plans***

Develop draft ***results chains***



Collaboratively ground ***truth and refine*** results chains

Present ***final Progress Monitoring Framework*** to FIPs

Progress Monitoring Framework

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.

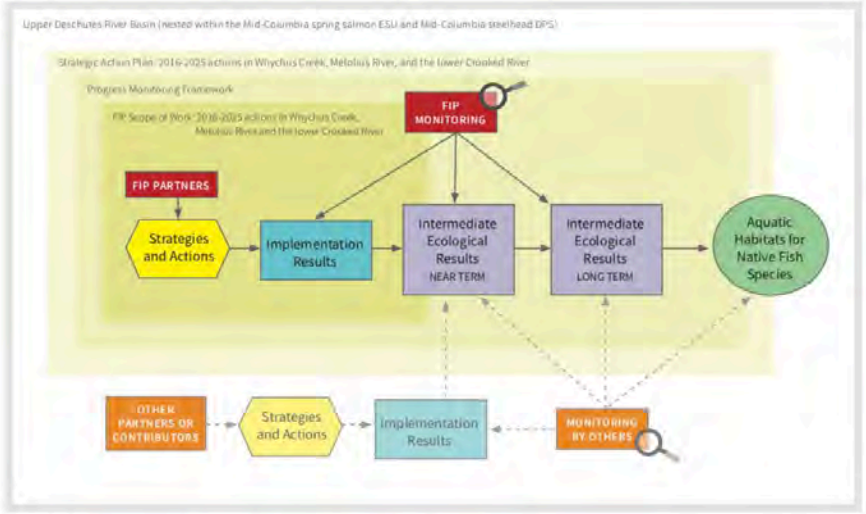
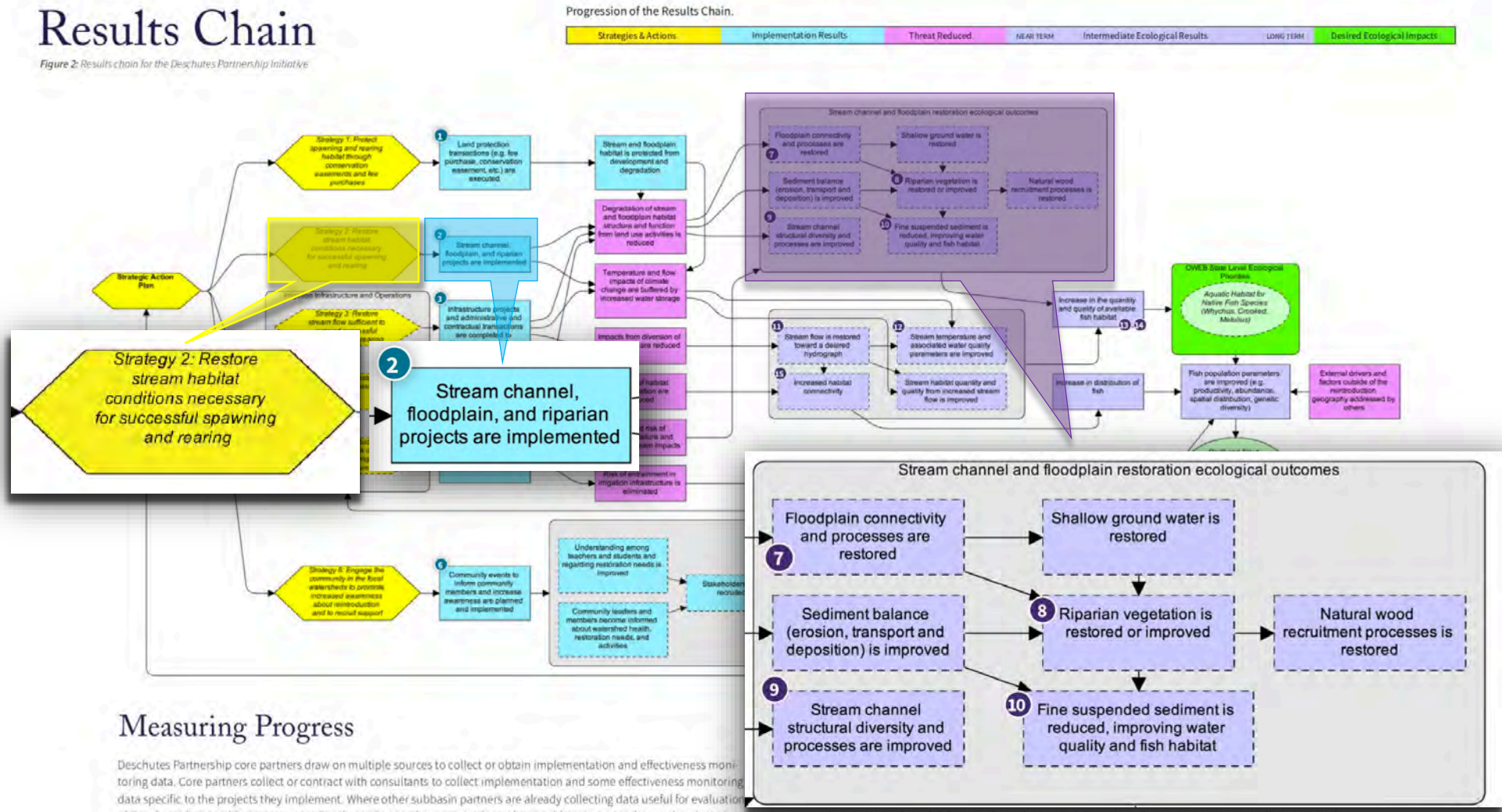


Figure 1: Operational context of the OWEB-funded Focused Investment Partnership Initiative.

Results Chain

Figure 2: Results chain for the Deschutes Partnership Initiative



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.

(e.g. ecological result [7], 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).

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 local 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[8], 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[9] 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[6].

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Theory of Change.

Removal of diversion dams[4] will increase the availability of critical spawning and rearing habitat (habitat connectivity[10]) 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 irriga-

tion canals or other water diversion structures.

on active diversion structures[5] will
enile trout and salmon and decrease

es of juvenile trout and salmon from
fry/parr/smolt to adult survival.
will increase productivity of trout
associated with Whychus Creek
ooked Rivers.

mmunity

a series of outreach and engage-
ommunity presentations, steward-
watershed education activities for
ardship hikes, and restoration tours.

a diverse array of approaches will
tanding and competence of the com-
and approach for stream and river
ased level of understanding of the
am restoration will increase engage-
estoration activities on private lands.

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

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

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-project 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 macroinvertebrate 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 Implementation Progress Objectives above)*	60-minute average instantaneous stream flow

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
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Percent of days meeting 18°C state temperature standard at WC 006.00; Macroinvertebrate temperature optima

Depth, cover, and velocity criteria; habitat attribute criteria

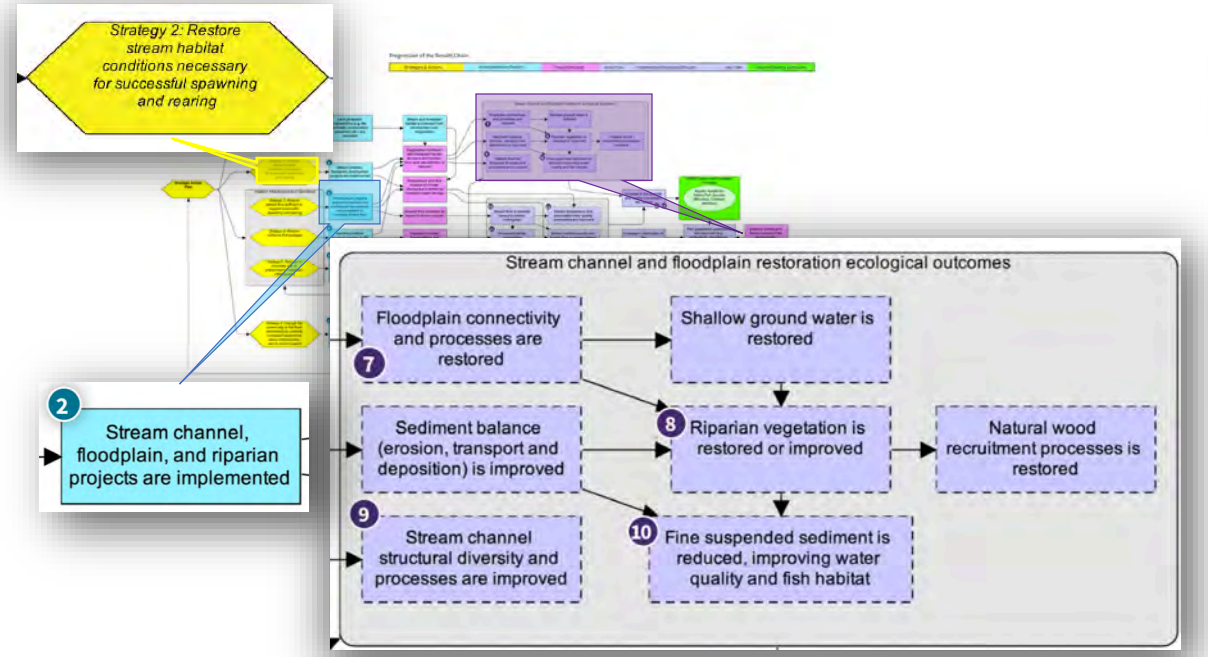
Wetted extent at x flow

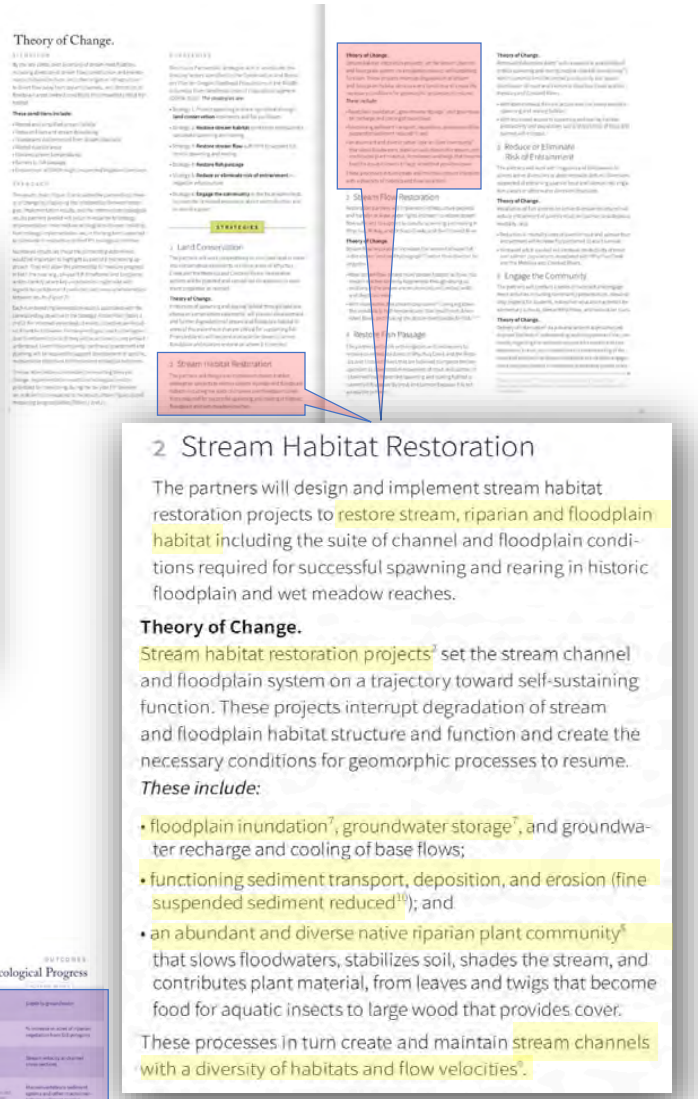
Fish movement between formerly fragmented reaches

Status & Trends

focal species will include coordina-
appropriate landscape or population
ocess for integrating their monitoring
(if they occur) or to establish an
measured to document and commu-
abitats and focal species populations.

8





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[7] 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:*

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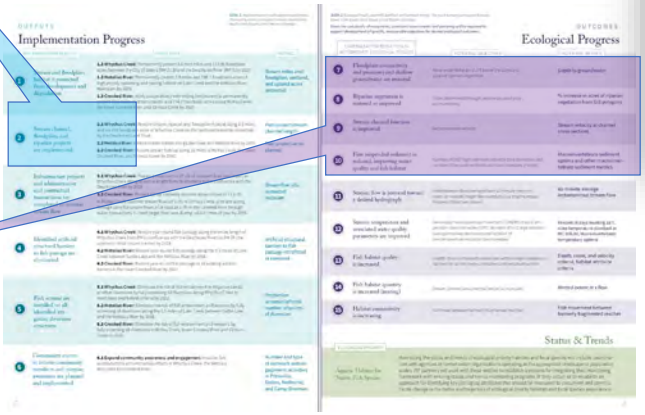

From 2018 Deschutes Partnership Progress Monitoring Plan

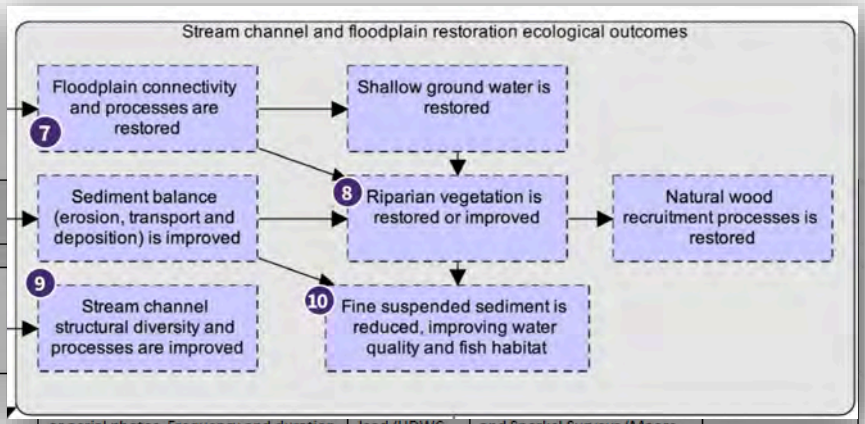

Table 1. Stream Habitat Restoration Monitoring

Results Chain Number	Ecological Outcome	Hypothesis	Indicator				
	Primary response: Runoff/Flow						
7	Increase floodplain connectivity and groundwater levels	Frequency, duration, and extent of floodplain inundation will increase, and stream bed elevations will be similar to floodplain elevations, resulting in an increase in groundwater levels	Average growing season depth to groundwater				
13, 14	Increase aquatic habitat quantity	Total channel length at base flow will increase Wetted area at base flow will increase Ratio of secondary to primary channels will increase	Total channel length Total wetted area Ratio of secondary to primary channels	or aerial photos. Frequency and duration dependent upon specific project.	lead (UDWC, DLT or CRWC)	and Snorkel Surveys (Moore et al. 2017)	
	Primary response: Wood/Detritus						
9	Increase amount of wood	Total amount of wood will increase	Pieces of large wood and wood complexes	Project as-built and/or ODFW AIP Stream Habitat Surveys. Frequency and duration dependent upon specific project.	PGE, ODFW or project lead (UDWC, DLT or CRWC)	Aquatic Inventories Project Methods for Stream Habitat and Snorkel Surveys (Moore et al. 2017)	Project monitoring report
	Secondary response: Physical Habitat						
9	Increase richness and abundance of habitat types	Richness (number) and abundance of habitat units will increase	Richness (number) and abundance of habitat units	ODFW AIP Stream Habitat Surveys. Frequency and duration dependent upon specific project.	PGE or ODFW	Aquatic Inventories Project Methods for Stream Habitat and Snorkel Surveys (Moore et al. 2017)	Project monitoring report
9	Reduce proportion of riffle habitat / increase proportion of pool habitat	The proportion of habitat units that are riffles will decrease and the proportion that are pools will increase	Proportion of habitat units that are riffles vs. pools	ODFW AIP Stream Habitat Surveys. Frequency and duration dependent upon specific project.	PGE or ODFW	Aquatic Inventories Project Methods for Stream Habitat and Snorkel Surveys (Moore et al. 2017)	Project monitoring report
	Tertiary response: Biological						
8	Increase native riparian vegetation	Extent of native riparian vegetation will increase	Extent of native riparian vegetation	Riparian vegetation mapping from aerial imagery; Invasive species extent from on-the-ground weed mapping (DLT properties). Frequency and duration dependent upon specific project.	Project lead (UDWC, DLT or CRWC)	Whychus Creek aerial imagery cover classification (in prep., EDC 2018)	Project monitoring report
12	Increase macroinvertebrate richness and abundance	Higher diversity of habitats will result in higher taxa richness More aquatic habitat and higher instream organic material will result in higher macroinvertebrate productivity (number of organisms) EPT ratios will increase	Number of macroinvertebrate taxa Total number of organisms EPT ratios	Multi-habitat sampling protocol adapted from USEPA 2009 and Ode 2016. Annually through 2021.	Project lead (UDWC, DLT or CRWC)	Multi-habitat sampling protocol adapted from USEPA 2009 and Ode 2016.	Annual watershed-specific monitoring reports
13, 14	Increase number of juvenile O. mykiss in project	Density of juvenile O. mykiss will increase	Juvenile O. mykiss density	Fish population estimates. Frequency and duration dependent upon specific project.	PGE, ODFW or USFS	ODFW/USFS fish survey protocols	Project monitoring report
16	Increase distribution of fish (adult steelhead trout and Chinook salmon)	Volitional passage will allow adult fish to migrate and use habitat upstream of historic fish passage barriers	Movement of radio-tagged adult steelhead and Chinook salmon	Radio tracking	PGE	Pelton Round Butte Project (FERC 2030) Test and Verification Study: Adult Migration, Survival and Spawning Study Plan (PGE and CTWS 2009)	Whychus Creek watershed report; project monitoring report
17	Increase fish growth, survival, and reproduction	O. mykiss growth rates will increase;	O. mykiss growth rate	Electrofishing (will require multiple visits throughout the season to track changes in lengths/weights)	ODFW and USFS	ODFW/USFS fish survey protocols	Project monitoring report

Going Forward

- Supplemental funding for data gaps
- Updated SAP guidance
- Adaptive management guidance
- OWEB FIP reporting dashboard

Thank You

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