Habitat Retrospective Report:

Review and Synthesis of Progress and Challenges in Columbia River Basin Fish and Wildlife Program Habitat Protection and Restoration Projects

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Presentation at the Upper Columbia Science Summit Meeting

January 22, 2026

ISRP INDEPENDENT SCIENTIFIC REVIEW PANEL

ISRP 2025-2 | June 30, 2025

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Habitat Retrospective Report - Why Now?

- 40+ years of F&W Program habitat protection and restoration work with increased scope and emphasis on natural processes, floodplains, riparian conditions, and complexity
- In the 28 years of ISRP reviews, habitat restoration approaches and RM&E are highlighted in programmatic issues and project conditions in every review. 2022 marked the end of the 6th major review of Fish and Wildlife Program projects
- A similar review of habitat restoration has not been completed for many years
- Columbia Basin Tributary Habitat RM&E Strategy developed to guide future efforts

Racetrack Creek, Clark Fork River subbasin, Montana

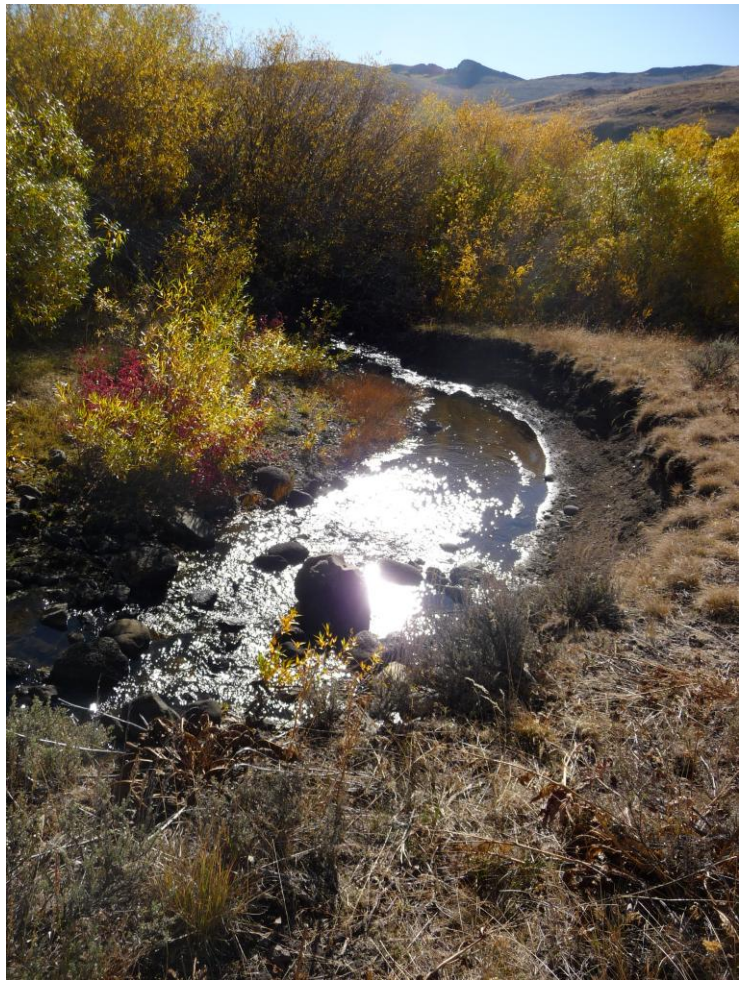
Major Objectives

Identify:

- Advancements and achievements in habitat protection and restoration planning, prioritization, implementation, and RM&E
- Evidence for success, including exemplary projects
- Current and emerging challenges
- Recommendations for improvements in Program actions

Approach

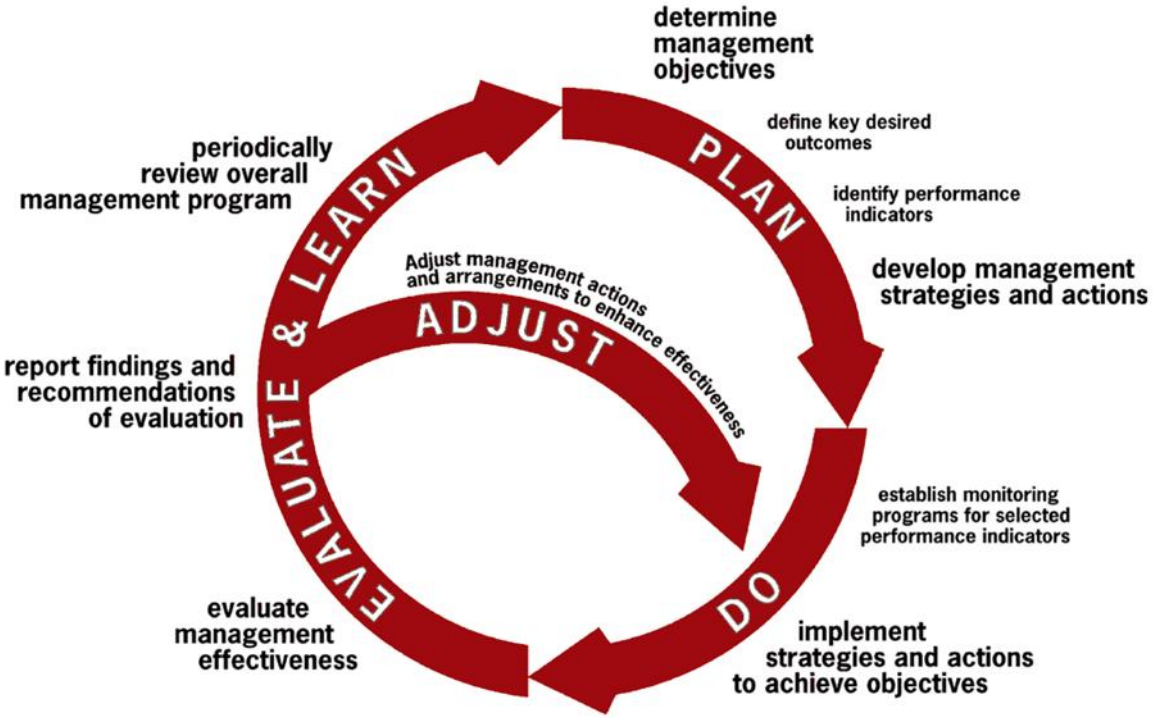
- We reviewed and synthesized:
  - program summaries and project proposals
  - reports and over 360 publications
  - the Habitat RM&E Strategy
  - ISRP and ISAB reports
- Focus on salmon, steelhead, and trout
- Focus on restoration types that targeted habitat processes
- Considered wildlife projects



Duck Valley, Southern Idaho

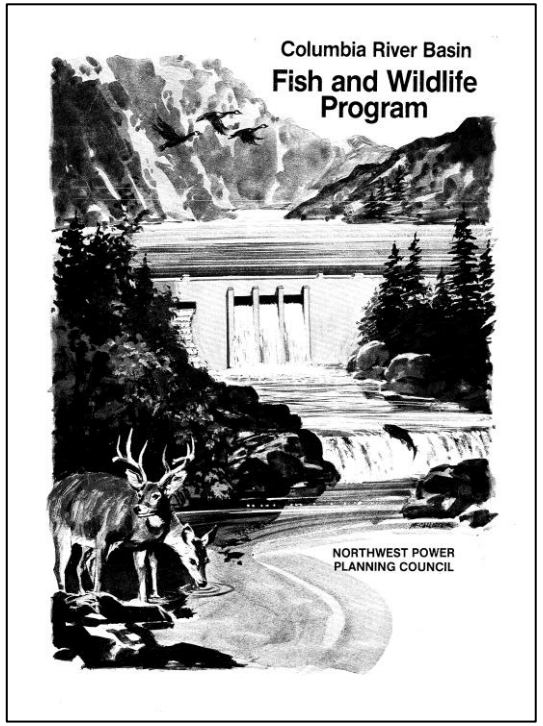
Report Organization

- Summary, plus the main body of the report, which is the technical material
- Chapters
  - Introduction
  - Planning and prioritization
  - Methods
  - RM&E
  - Intensively Monitored Watersheds (IMWs)
  - Confounding factors
  - Exemplary projects
  - Concluding remarks



Planning and Prioritization

- Significant improvement in habitat protection and restoration efforts over the 40+ year lifespan of the Program.



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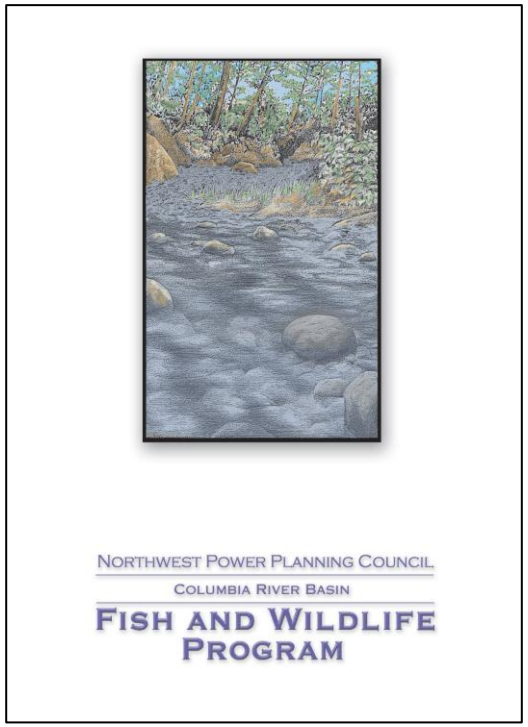
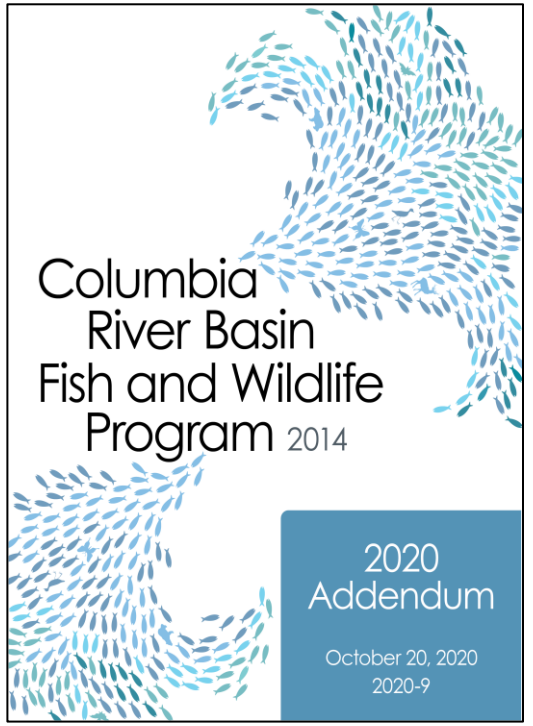


2000



2020

Emphasis on Restoration of Ecological Processes

- The paradigm guiding restoration has shifted from restoring structure to restoring natural processes.
- Few of the Program's habitat restoration projects are strictly of process-based restoration as most also include structure restoration.
- The proportion designed to restore impaired processes has increased since 2000 to emphasize ecosystem function.

Wallooskee-Youngs Bay, Columbia Estuary, Oregon

Improvements in Planning and Prioritization

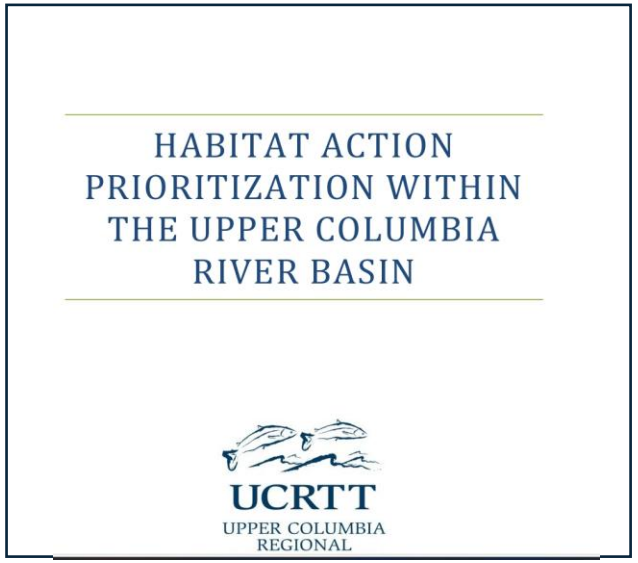
The Program's restoration efforts have evolved, expanded, and improved.

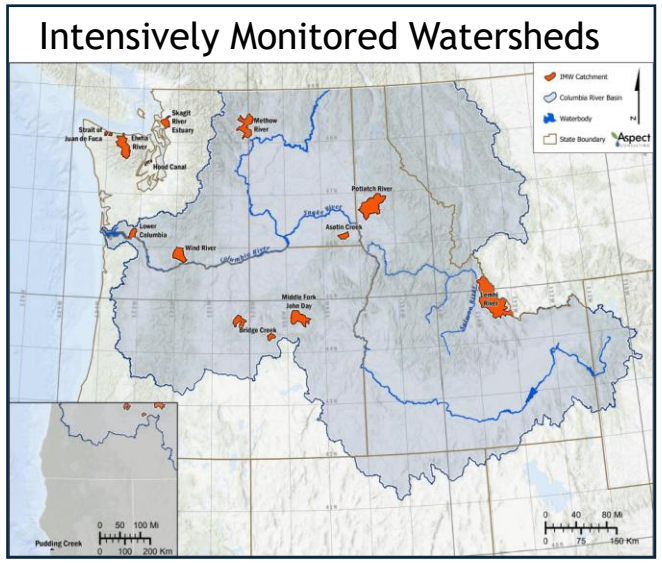
- Greater complexity and integration of restoration actions
- Include multiple coordinated projects across large spatial scales
- Greater use of landscape frameworks and strategic planning
- Expanded collaboration efforts and structured decision processes such as Atlas and the UC Habitat Prioritization Startegy

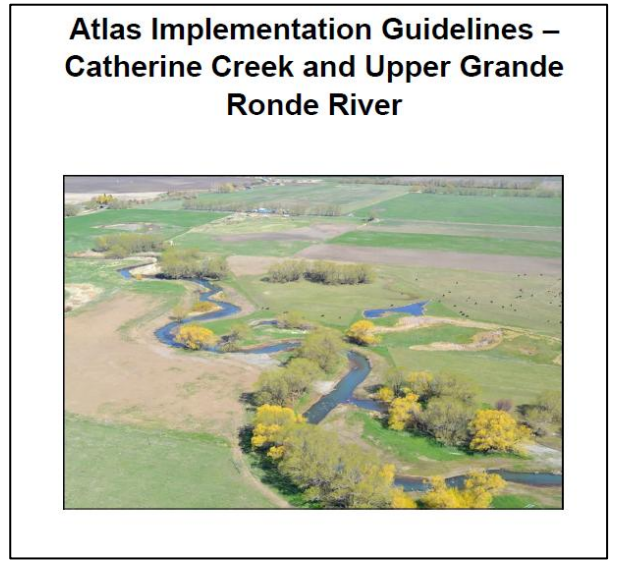
Clearwater subbasin, Idaho

Improvements in Planning and Prioritization

- Increasing and effective use of habitat assessments and habitat and life cycle models
- More rigorous analysis of limiting factors and density dependence
- Use of Indigenous Knowledge, such as First Foods Planning Framework (CTUIR)







Strategic Guidance

The use of strategic guidance has expanded and improved – Examples:

- Grande Ronde Atlas
- Upper Columbia River Biological Strategy to Protect and Restore Salmonid Habitat
- The First Foods Framework - CTUIR
- Oregon Conservation and Recovery Plan for Middle Columbia River Steelhead
- Lower Columbia River Estuary Partnership

Strategic Guidance

Common elements of strategic guidance

- Protect the highest quality habitat that supports core production, primary life history types, important migratory habitats, and populations with unique life history and genetic characteristics.
- Base planning and prioritization on sound understanding of ecological processes, natural system properties, limiting factors, and life history.
- Protect and retore critical natural ecological and evolutionary processes.
- Target key limiting factors that most affect population productivity, abundance, spatial structure, and diversity.
- Manage in an adaptive manner that is minimally intrusive and based on sound RM&E results.

Middle Fork Salmon River

Planning and Prioritization Recommendations

- Continue to expand the use of strategic guidance, borrow from other basins if needed.
- Continue to support analyses and use of limiting factors, density dependence, and life history knowledge, including life-cycle modeling.
- Explore the potential application of established habitat and life-cycle models for restoration planning for projects that lack necessary information or support for detailed project-scale modeling.

Entiat River, Washington

Planning and Prioritization Recommendations

- Emphasize and incorporate process-based restoration and the pre-project assessments necessary to support it in the planning and prioritization process.

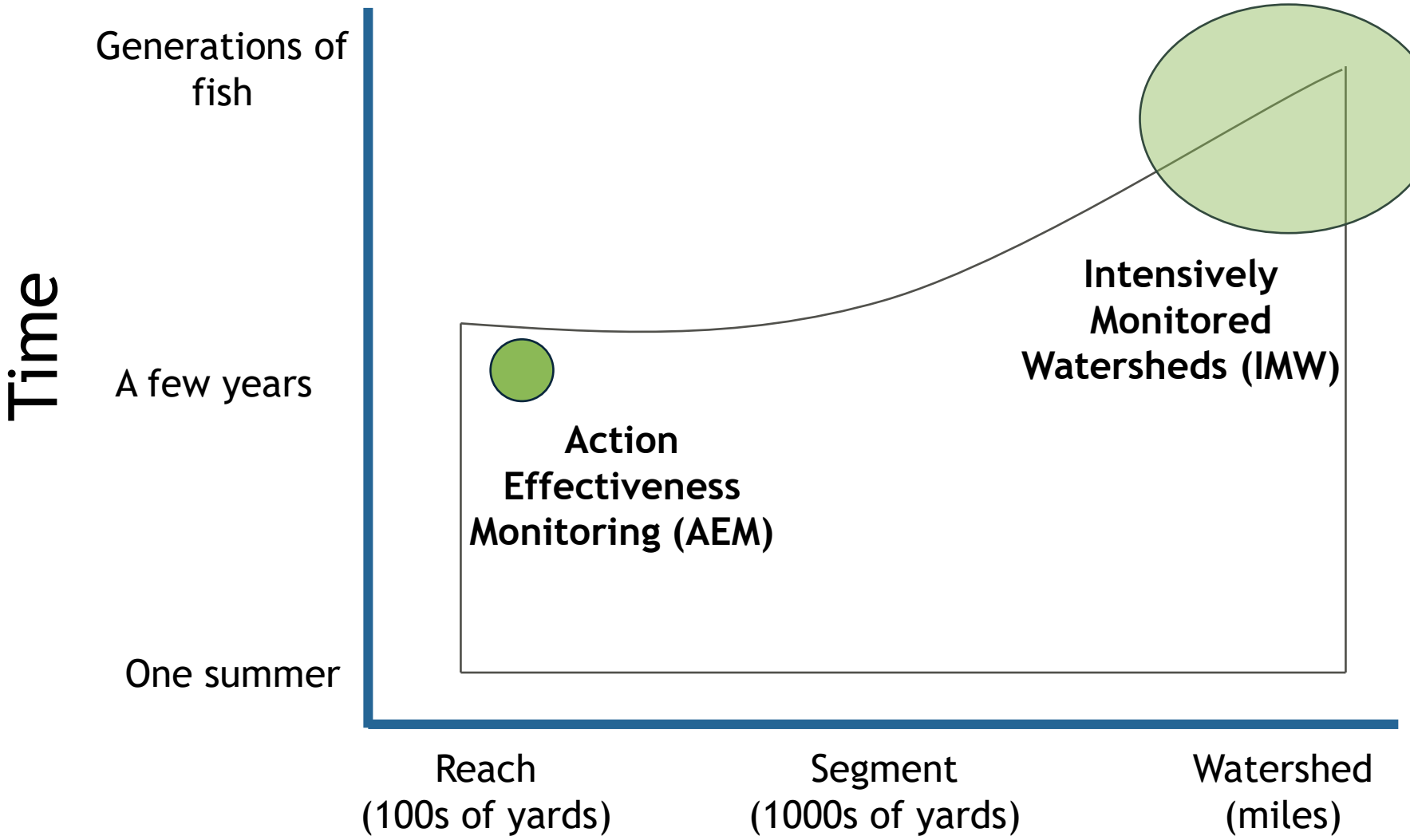
- Address subbasins that lack adequate approaches tombetter represent the diversity of landscape types and ecoregions in the Basin.

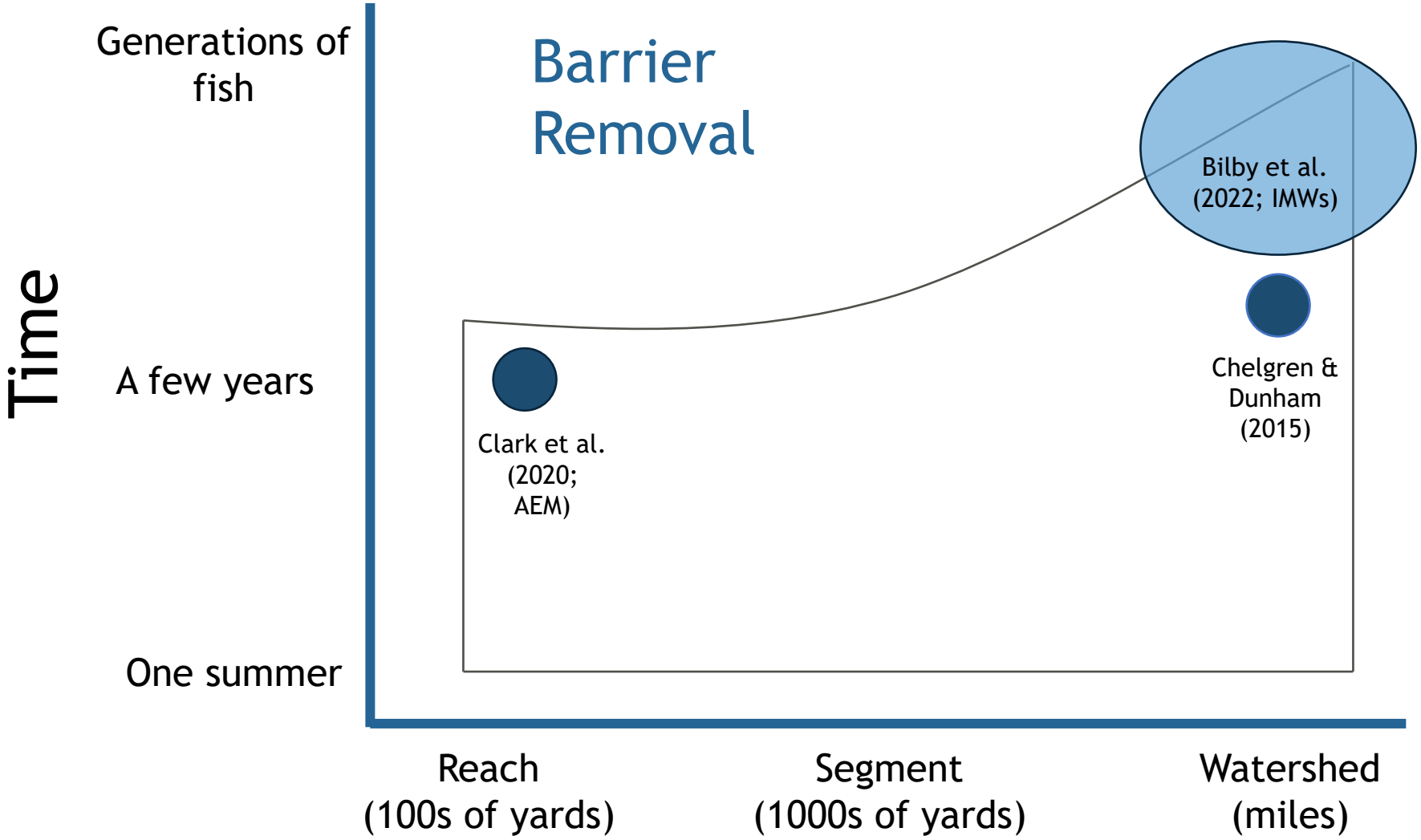
Meacham Creek, Umatilla River subbasin, Oregon

Methods of habitat restoration and protection

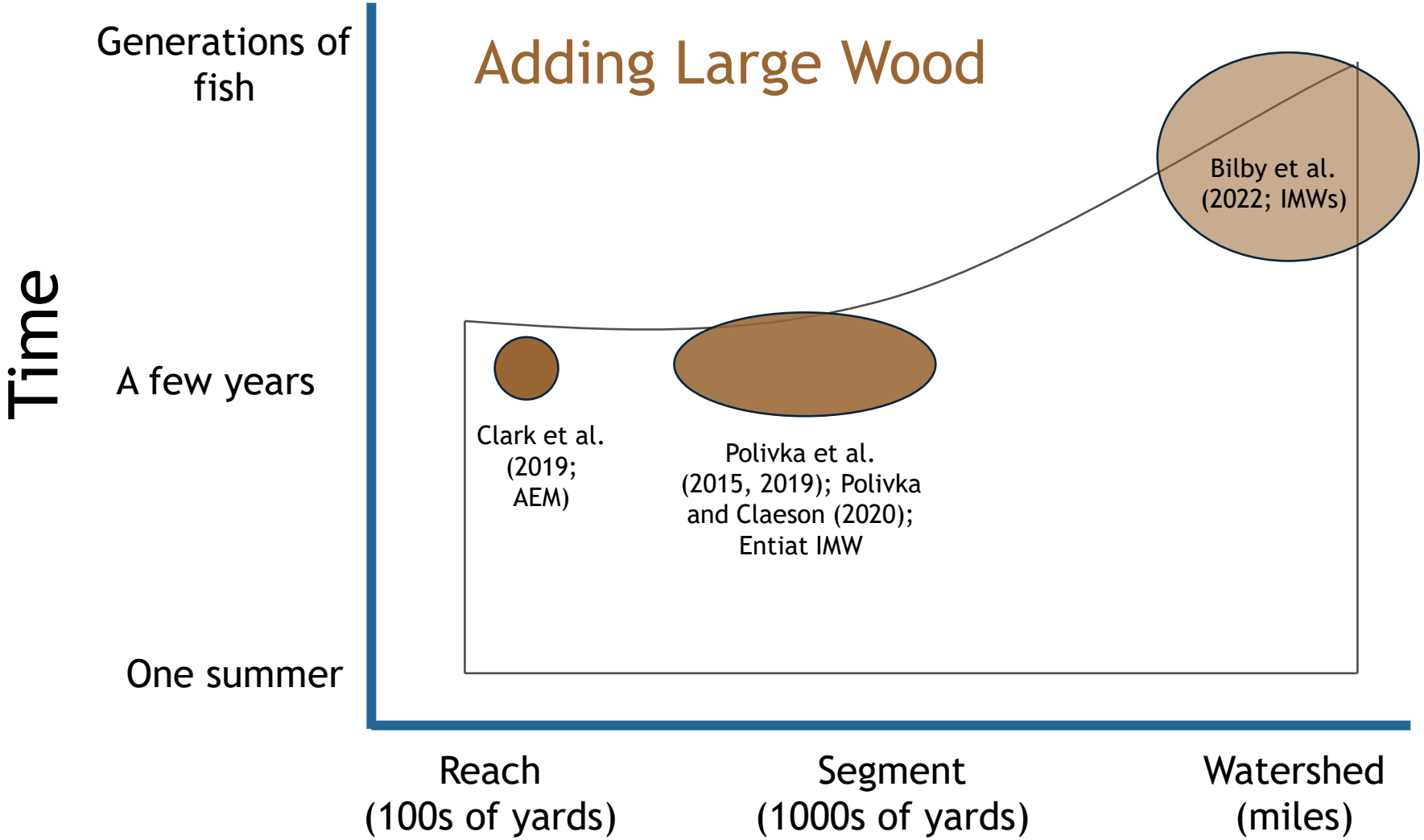
- Reviewed 8 common methods
- Reach vs. Watershed scales
- Resident fishes

Photo: Fifteenmile Creek, Oregon


Generations of fish
A few years
One summer
Time
Action Effectiveness Monitoring (AEM)
Intensively Monitored Watersheds (IMW)
Reach (100s of yards)
Segment (1000s of yards)
Watershed (miles)
Spatial Extent


Barrier Removal
Generations of fish
A few years
One summer
Time
Bilby et al. (2022; IMWs)
Chelgren & Dunham (2015)
Clark et al. (2020; AEM)
Reach (100s of yards)
Segment (1000s of yards)
Watershed (miles)
Spatial Extent

Adding Large Wood



Summary of Methods

Method	Effect	Response time (yrs)	Key limitations
Barriers	+	2-5	Lack of upstream habitat
Large wood	+	10 or more	Too little added
Reconnect floodplains	+	ca. 10	Lack suitable controls
Riparian restoration	(+)	30 to 50	Studies too short
Dikes/Tidegates	+	5 to 10	Few projects evaluated
Envt'l Flows	+	20 or more	Many complex effects
Coldwater refuges	(+)	10 or more	Small areas restored
Wildlife	(+)	Variable	Restoration not "in-kind"

Methods Recommendations

- Protection is critical and should always be considered in tandem with restoration.
- Process-based restoration should be emphasized over structural-based approaches.
- Of the 8 methods, removing barriers and reconnecting side channels and floodplains have strong likelihood of positive benefits.
- Barrier removal, flow enhancement, and wood additions are likely to achieve results in a short time period (5-10 years). Restoration of riparian forests and floodplain function have longer and uncertain time frames for effectiveness.
- Continue to support long-term projects like IMWs and Upper Columbia River collaborative efforts to answer key current and future restoration uncertainties.
- Develop a coordinated broad scale study to monitor and evaluate effectiveness of floodplain reconnection, riparian and meadow restoration, and creation-restoration of cold-water refuges.

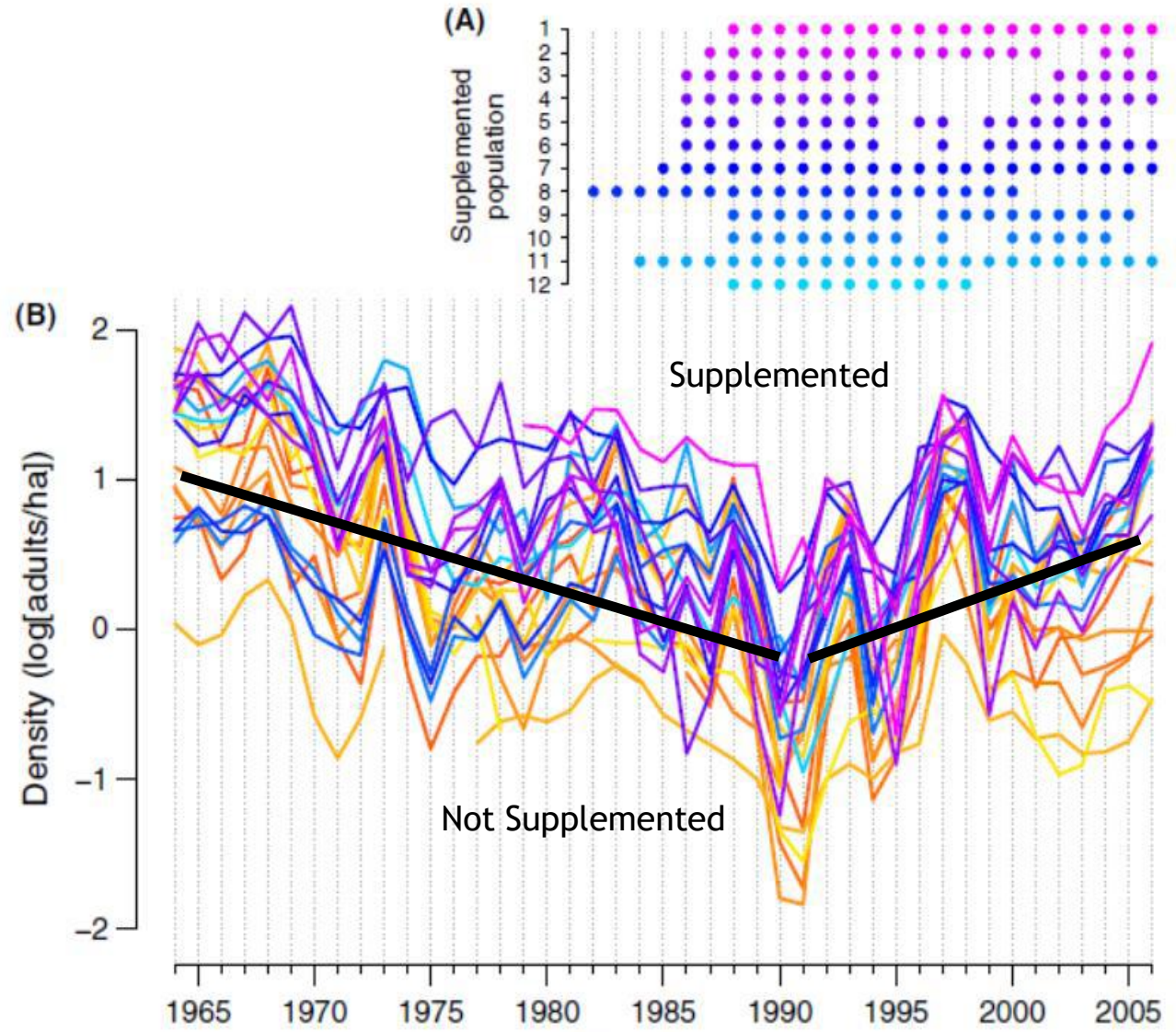
Research, Monitoring, and Evaluation (RM&E)

- Columbia Basin Tributary Habitat RM&E Strategy
  - Consistent and logical approach
  - Key Management Questions on implementation and effectiveness are valuable
  - Limited guidance on implementation, scaling up, data analysis, and evaluation of plan effectiveness
- Tradeoffs in study design
  - Confidence vs relevance
  - Testing designs in advance
- Pre-existing vs. new studies
  - BACI designs
  - Staircase – staggered start to account for unplanned events (fires, floods, etc.)

Bridge Creek, John Day River subbasin, Oregon

Synthesizing information across multiple studies

- New statistical methods
  - Different years and duration
  - High year-to-year variation
- Example: Supplementation of Chinook
  - Long-term decline, then increase
  - 3% increase with supplementation
  - Environmental variation twice that of supplementation



Scheuerell et al. 2015

Confounding Factors

- Climate change
- Landscape change
- Ocean conditions
- Non-native species
- Predation
- Hatchery fish and supplementation
- Dams and Resevoirs
- Water quality
- Density Dependence
- Logistical factors
- Interactions among factors

Recommendation: Looking ahead, develop tools to try to forecast future conditions.

Bonneville Dam fish ladder

Exemplary Projects: Elements and Characteristics

The report:

Identifies exemplary projects for anadromous fish plus elements and characteristics:

- Guided by sound strategies, clear goals, SMART objectives, and quantitative desired outcomes
- Addresses key limiting factors and current and emerging threats
- Strong collaboration and partnerships with effective information sharing
- Effective integration of implementation and RM&E

Wind River, Photo: Wind River Watershed Project

Exemplary Projects – Anadromous Fish

- Columbia Land Trust Estuarine Restoration Project - Columbia Land Trust
- Wind River Watershed Project – U.S. Forest Service, Underwood Conservation District, WDFW, U.S. Geological Survey
- John Day Watershed Restoration Project - Confederated Tribes of the Warm Springs Reservation of Oregon
- Umatilla Anadromous Fish Habitat Project - Confederated Tribes of the Umatilla Indian Reservation
- Evaluating Salmonid and Stream Ecosystem Response to Conservation Measures and Environmental Stressors in the Columbia River Basin – Columbia River Inter-Tribal Fish Commission
- The John Day River Salmonid Monitoring to Inform Recovery – Oregon Department of Fish and Wildlife

Middle Fork John Day River, Photo: CTWS

Upper Columbia River Habitat Restoration Efforts
Highlighted in Numerous ISRP and ISAB Reports

Planning and Prioritization:

- Continued improvements since Subbasin Plans (2005)
- Strong Regional Technical Teams of experts (Tribes, WA, Feds, PUD, Consultants; UCSRB support)
- Biological Strategy to Protect and Restore Salmonid Habitat provides solid strategic guidance and emphasis on protection
- Highly collaborative and multi-disciplinary planning and prioritization approach integrates habitat, life history, limiting factors, and life cycle models (e.g., Wenatchee Spring Chinook LCM, Sorel IPM, EDT, HARP)
- Application of formal ranking system based on limiting factors, location and scale, survival benefits, and other factors.

Upper Columbia River Habitat Restoration Efforts
Highlighted in Numerous ISRP and ISAB Reports

Implementation Methods:

- Balanced emphasis on process based and structural restoration
- Strong record of barrier removal guided by strategic approaches
- Large scale projects with focus on floodplain restoration and wood additions
- Multi-species and population emphasis
- Applies current state of the science in all phases of restoration
- Efforts diversified on public and private lands

Entiat River, ISRP

Upper Columbia River Habitat Restoration Efforts

Highlighted in Numerous Places in ISRP and ISAB Reports

RM&E and Adaptive Management - a strong area that includes:

- Ongoing (OBMEP) and past (AEM, ISEMP/CHaMP, Entiat IMW)
- UCSRB conferences and state of the science syntheses - habitat, hatchery, hydrosystem, harvest
- Robust population monitoring of abundance, productivity, spatial structure, diversity, and pHOS
- Fish-habitat survival relationships
- Sound adaptive management decision processes with emphasis on improvement

Conclusions

- Significant improvement over 40+ years of F&W Program habitat protection and restoration work

- Planning, prioritization, and implementation methods have especially improved increasing effectiveness.

- Restoration methods have improved due to RM&E results and process-based approaches that emphasis natural processes.

- RM&E challenges remain despite significant Program efforts:
  - Columbia Basin Tributary Habitat RM&E Strategy is promising but RM&E needed at large physical and biological scales.
  - Scaling up the outcomes of habitat restoration to the Columbia River Basin and synthesis of information across studies, especially for IMWs, are needed.

- Prioritization of actions and evaluation of success must account for an array of confounding factors such as climate and landscape changes, human population growth, and associated water demands.

Acknowledgements

- **All the dedicated scientists, technicians, managers, and the cooperating private landowners that make habitat protection and restoration possible**
- **Northwest Power and Conservation Council staff:** Patty O'Toole, Kris Homel, Mark Fritsch, Rudy Salakory, Eric Schrepel, Kendra Coles, Kym Buzdygon, and intern Jasmine McIntosh
- **Bonneville Power Administration:** Jody Lando, Sean Welch, and Russell Scranton
- **Others provided information or photos:** Leslie Bach, Greg Sieglitz, Mike Young, Dan Isaak, Dan Bottom, Mark Scheuerell, Jude Love, Christian Gonzales-Pereda, Mike Lambert, and Jerimiah Bonifer

Questions?