CEERP: Documenting Performance and Leveraging Opportunities for Programmatic Reporting and Accountability

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Steamboat Slough at Julia Butler NWR, *Photo courtesy of Light Hawk Conservation Flying*

ACKNOWLEDGEMENTS

Multiple agencies support CEERP adaptive management, monitoring and research.

US Army Corps of Engineers®
Portland District

Est. 1802

Bonneville
POWER ADMINISTRATION

Est. 1937

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

Est. 1970

crest
COLUMBIA RIVER ESTUARY STUDY TASKFORCE

Lower Columbia Estuary Partnership

COWLITZ INDIAN TRIBE
The Forever People

Pacific Northwest
NATIONAL LABORATORY

YAKAMA NEZ PERCE WARM SPRINGS UMATILLA

Columbia Land Trust
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W2

USGS
science for a changing world

OVERVIEW

- CEERP adaptive management
- Progress towards meeting restoration goals
- Priority restoration project uncertainties
- New pilot studies and opportunities for learning
- Data sharing and reporting

CEERP ADAPTIVE MANAGEMENT

Ebberts et al. 2017, https://doi.org/10.1111/rec.12562
Littles et al. 2022, https://doi.org/10.1111/rec.13634

CEERP AM | Restoration | Uncertainties | Pilot Studies | Data Sharing

"ADAPTING THE PROGRAM"

Continue advancing tools and strategies to support robust restoration projects *Updates to Site Evaluation Cards, Renewed emphasis on landscape principles when assessing restoration opportunities*

Better leverage the expertise of CEERP practitioners and support strategic collaborations *Work at Steigerwald and other sites often involves numerous sponsors and partner organizations; Corps, BPA, LCEP, and USFWS actively working to restore habitat for multi-species benefits*

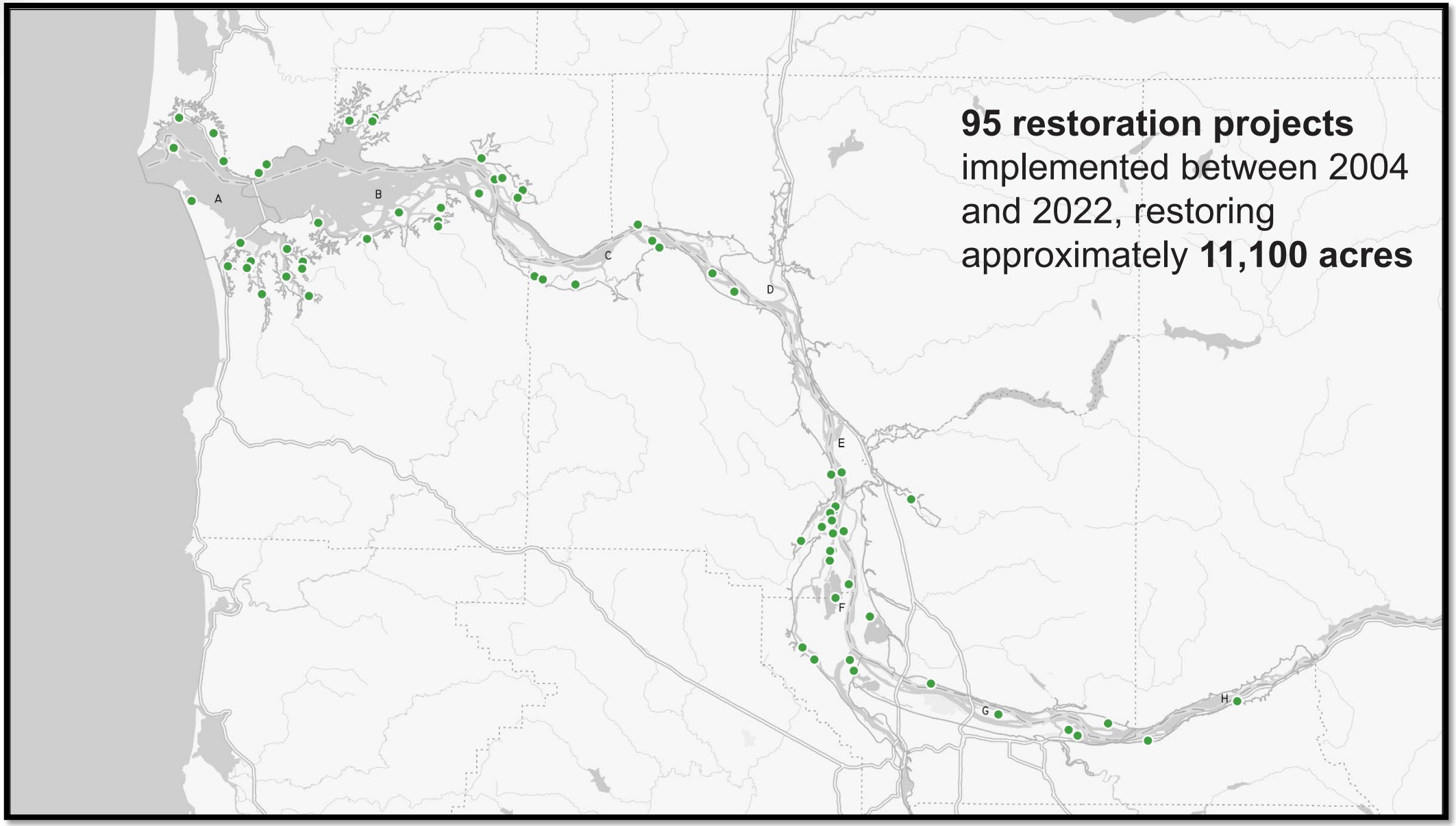
Increase emphasis on climate-smart restoration projects *May incorporate climate adaptation potential into project review*

Improve the system for tracking the flow (and retention) of institutional knowledge *Concerted effort to ensure significant overlap between new ERTG + SC members and those retiring from their roles*

Enhance opportunities for pilot studies that may address emerging uncertainties *Ongoing work to monitor and learn from Woodland Islands and other BUDM, along with potential new pilots*

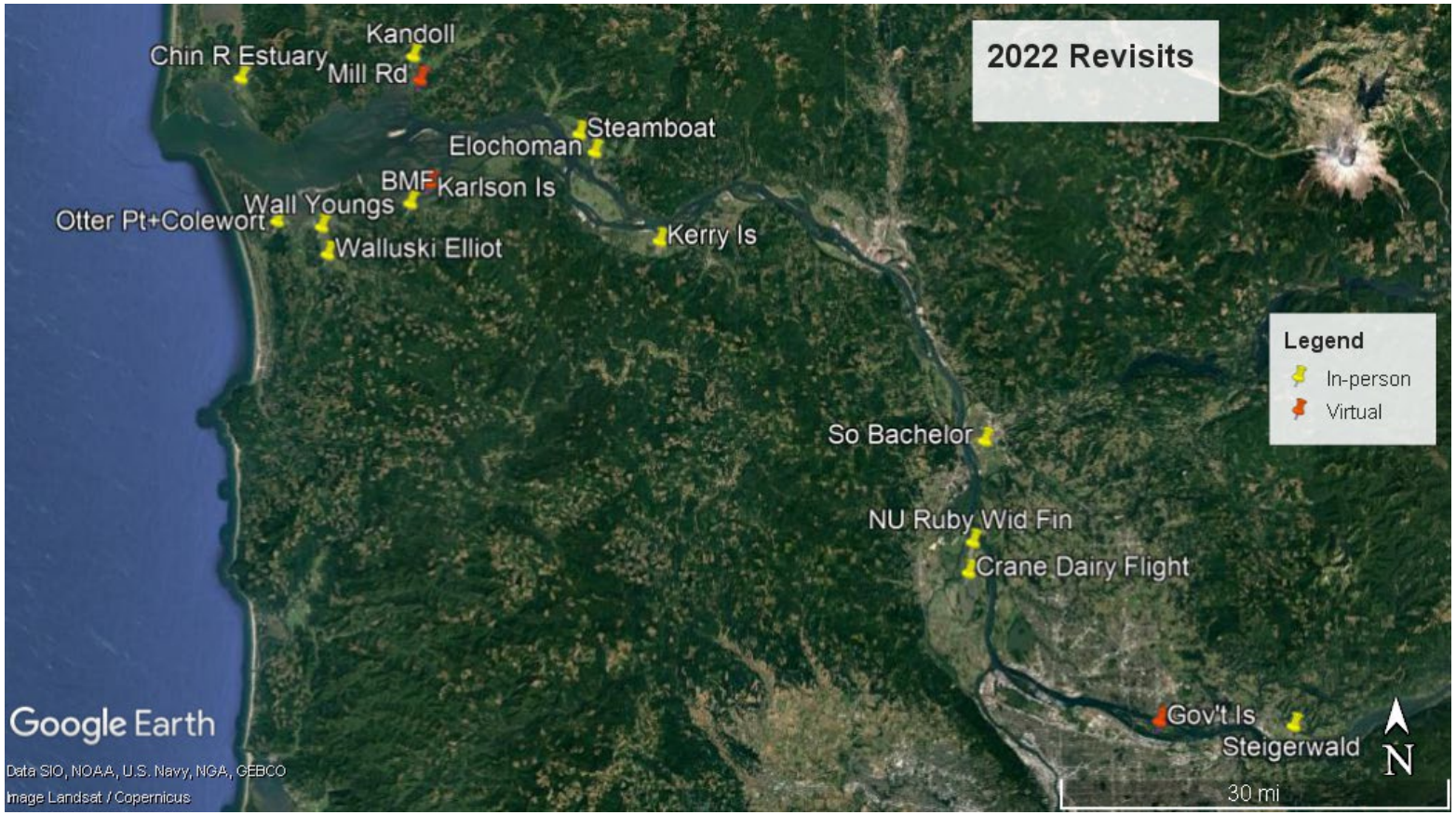
Steigerwald floodplain reconnection, Photo credit LCEP

U.S. ARMY



95 restoration projects implemented between 2004 and 2022, restoring approximately **11,100 acres**

RESTORATION PROJECT REVISITS



RELATED CREC TALK: *Development of Site Evaluation Cards: Preliminary Findings Based on Restoration Project Revisits in Fall 2022;* Bottom et al.; **Thursday, 5/18, 9:40 AM**

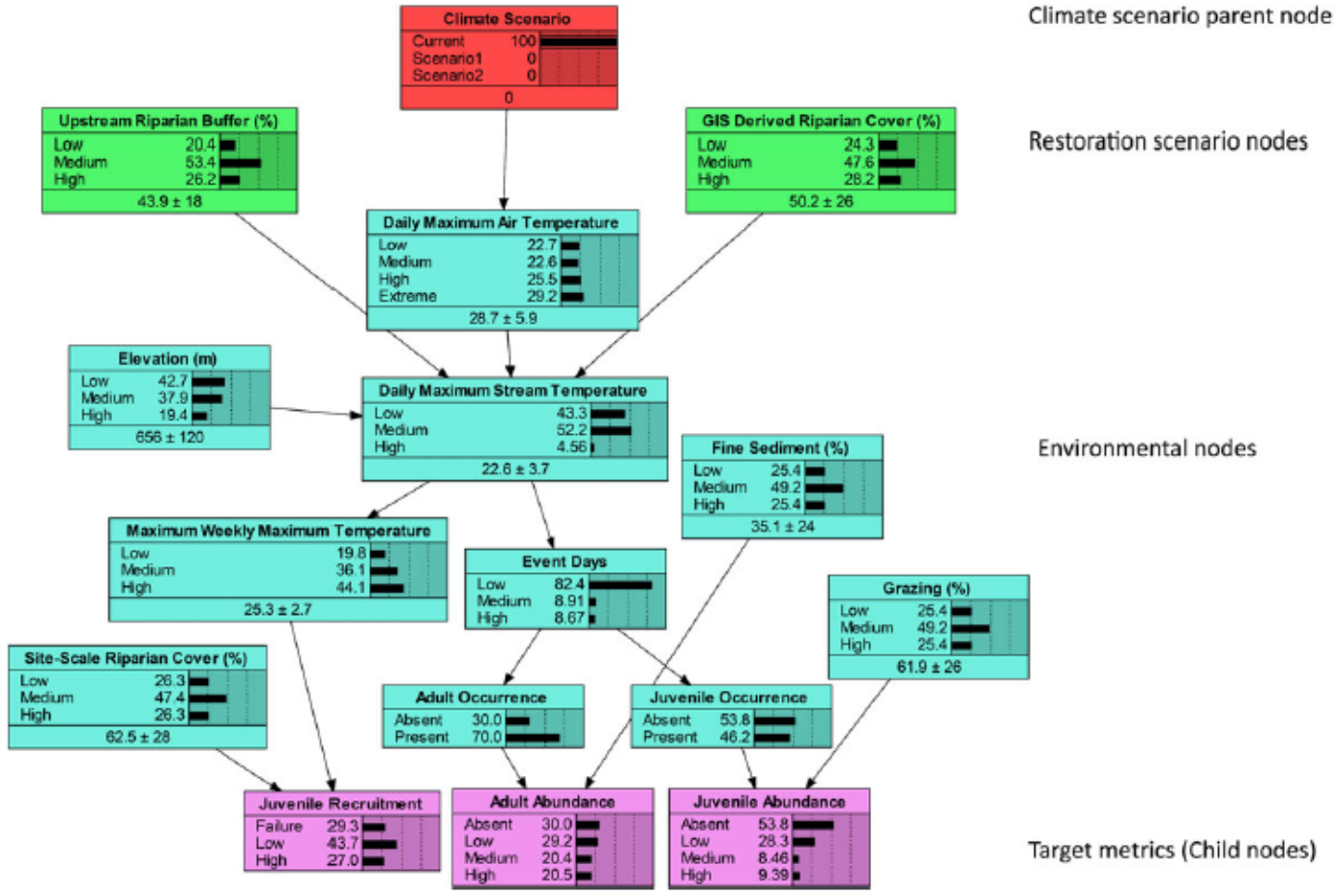
PRIORITY CEERP UNCERTAINTIES

- How will climate change affect the LCRE ecosystem and restoration strategy and what actions could be taken to mitigate for adverse effects? *[System]*
- How does reconnecting fragmented estuarine landscapes improve life history variation and adult survival in naturally produced populations? *[Estuary]*
- How do transitional habitats in the designated priority areas (e.g., priority reaches, tributary junctions) compare in importance to other salmonid rearing habitats in the estuary? *[Estuary]*
- How does patch size and travel distance between habitats influence salmon use, access, and performance? *[Landscape]*
- What are the functions of shoreline matrix habitats for juvenile salmon along channel margins of the mainstem river and tributaries and what is the restoration potential? *[Habitat]*

ERTG (Expert Regional Technical Group). 2022. Uncertainties. ERTG #2022-02, prepared for the Bonneville Power Administration, National Marine Fisheries Service, and the U.S. Army Corps of Engineers. Portland, Oregon. Available from https://www.cbfish.org/EstuaryAction.mvc/Documents

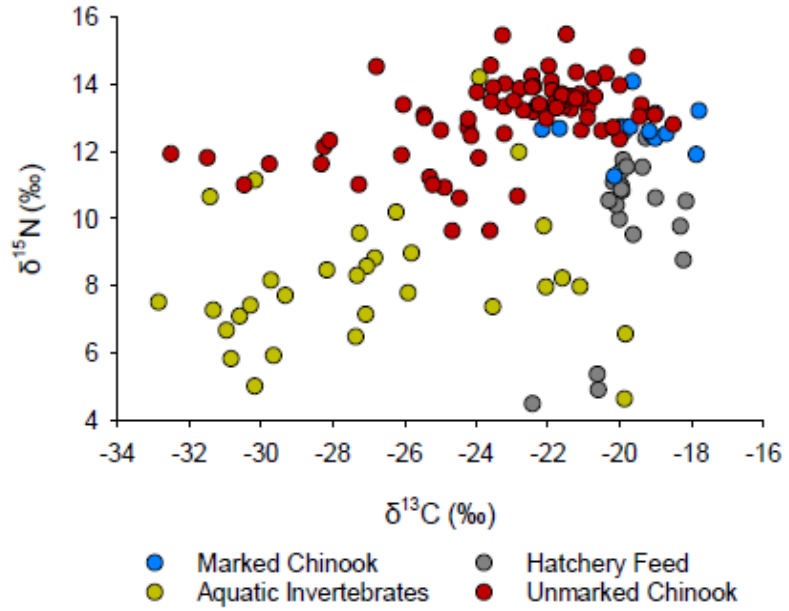
CLIMATE CHANGE

- Apply predictive models to examine ecosystem responses to various climate change scenarios
- Monitor long-term trends in water level, temperature, and sedimentation
- Incorporate climate resiliency into project designs and CEERP restoration strategy



Turschwell et al. 2017, Bayesian belief network (BBN) model to predict how riparian restoration could help mitigate effects from climate warming, https://doi.org/10.1002/aqc.2864

LINKING ESTUARY HABITAT TO SALMON LIFE HISTORY VARIATION AND ADULT SURVIVAL



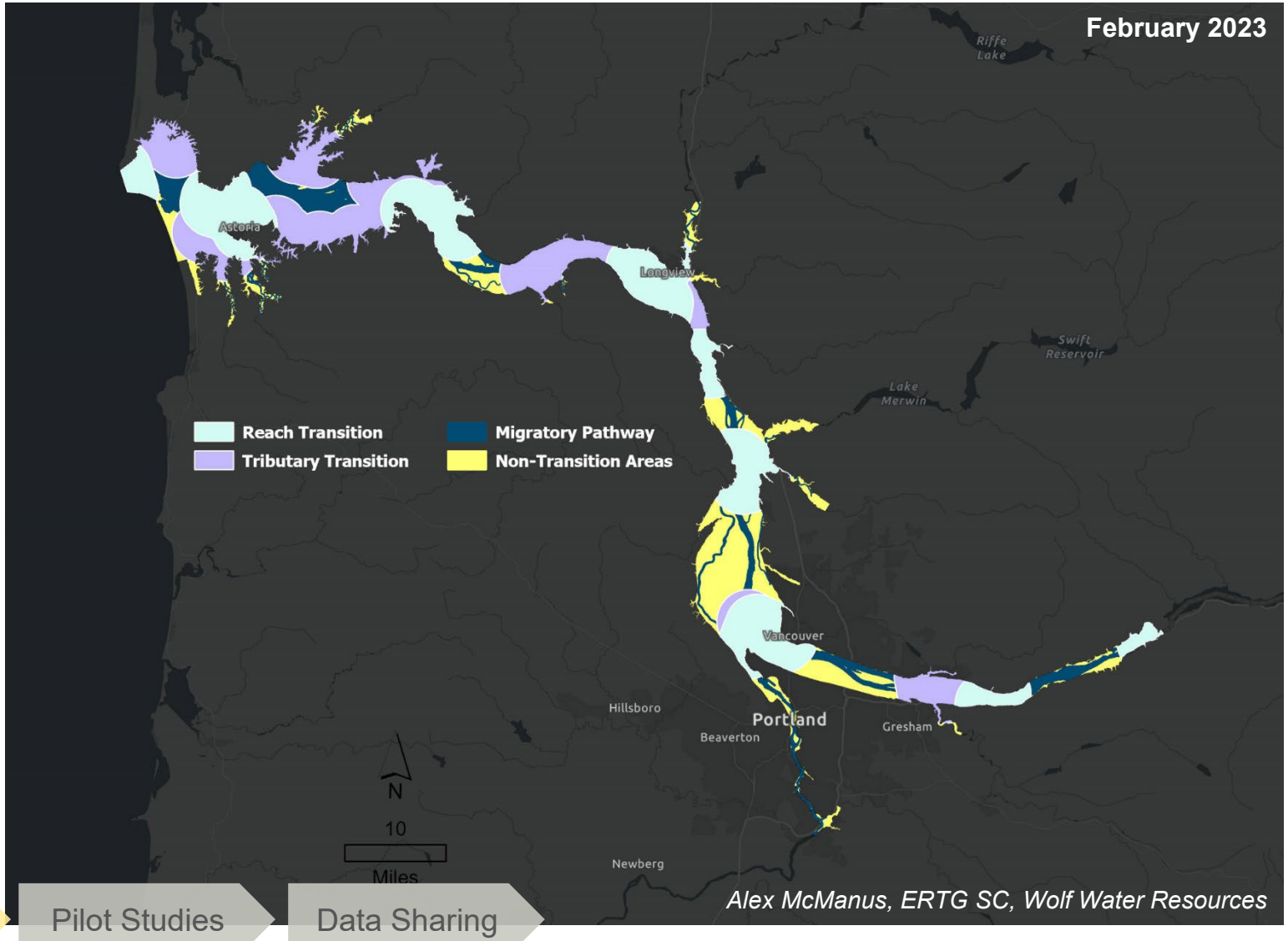
Nitrogen ($\delta^{15}N$) and carbon ($\delta^{13}C$) isotopic values of marked and unmarked chinook in the main and wetland channels from June 2017, wetland invertebrates from April - June 2017 and hatchery feed.

- Objective: use chemical signatures (isotopic markers) in adult otoliths to determine whether prey during juvenile rearing/migration originated in wetlands versus mainstem
- Begin with a workshop series to overview methods, limitations, and suitability for this purpose
- Identify potential chemical indicators and select target populations (e.g., by watershed or ESU) for a future pilot study
- Sampling program across multiple juvenile cohorts, ESUs, and years to identify markers and assess the significance of estuarine rearing habitat to adult returns

Sather er al. 2020. *Differential habitat use by subyearling chinook salmon in the lower Columbia River and estuary*. Chapter 7 in Restoration Action Effectiveness Monitoring and Research in the Lower Columbia River and Estuary, 2016-2017.
Barnett-Johnson et al. 2010, *Genetic and otolith isotopic markers identify salmon populations in the Columbia River at broad and fine geographic scales*, https://doi.org/10.1007/s10641-010-9662-5

RELATIVE IMPORTANCE OF TRANSITIONAL HABITATS FOR SALMONID REARING

Test the hypothesis that salmon habitat use and performance increase near reach transition boundaries and tributary junctions compared to other locations.

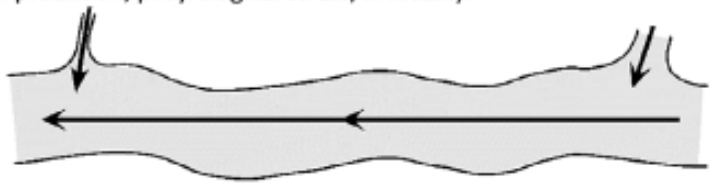


Hood et al. 2021. *Using landscape ecology principles to prioritize habitat restoration projects across the Columbia River Estuary*. Restoration Ecology 30(3): e13519. https://doi.org/10.1111/rec.13519

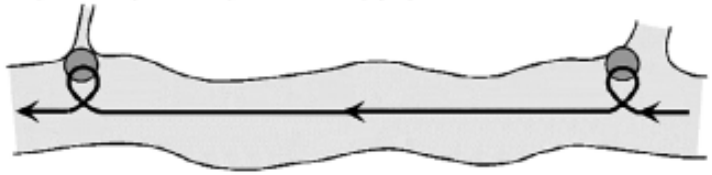
PATCH SIZE AND TRAVEL DISTANCE EFFECTS ON SALMON USE, ACCESS, AND PERFORMANCE

Test the underlying assumption that more patches and shorter distances between available habitat will ultimately improve juvenile salmon use as they move through the estuary, and possibly survival

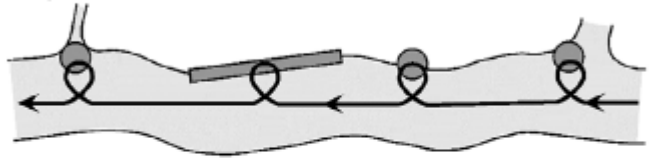
1. Initial condition--no habitat: short residence; low feeding opportunity; high predation, phsyiological stress, mortality.



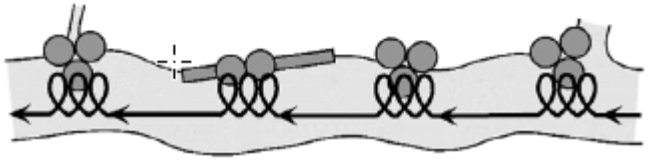
2. Initial priority--restoration at tributary junctions: some habitat; some residence, feeding, refuge; use by multiple stocks; high fish density due to proximity to tributary population sources.



3. Stepping stone corridor: some residence, feeding, refuge in each stepping stone; long residence in system of stepping stones; reduced travel time and mortality risk between stepping stone refuges. Riparian shoreline matrix habitat restoration with comparable overall residence time to a patch can substitute for wetland floodplain stepping-stone habitat patch restoration.



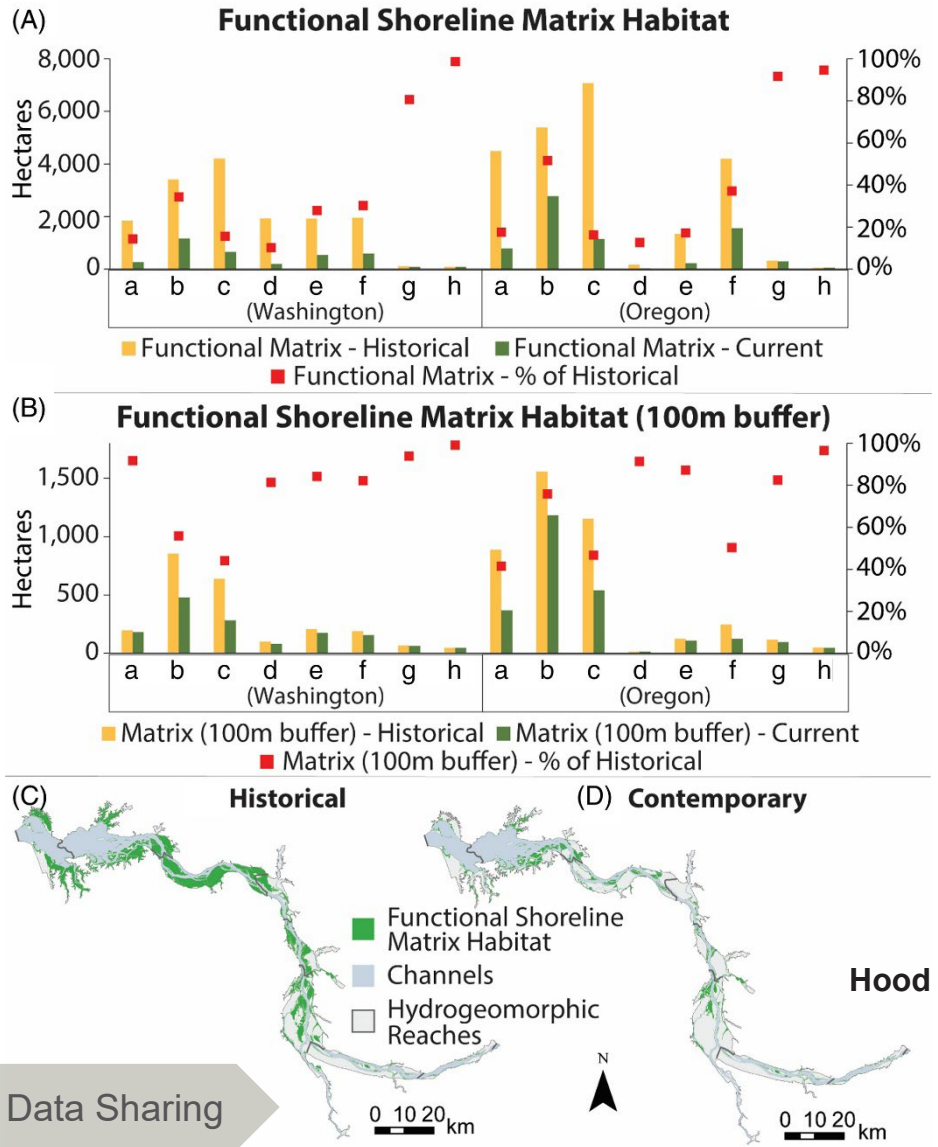
4. Mature system restoration--large, well-connected habitat patches: long residence in large habitat patches, long residence in stepping stone corridor; low stress and mortality within and between large, well-connected habitat patches.



Conceptual model of stepping-stone habitat adapted from Hood et al. 2021.

FUNCTIONS AND RESTORATION POTENTIAL OF SHORELINE MATRIX HABITATS FOR JUVENILE SALMON

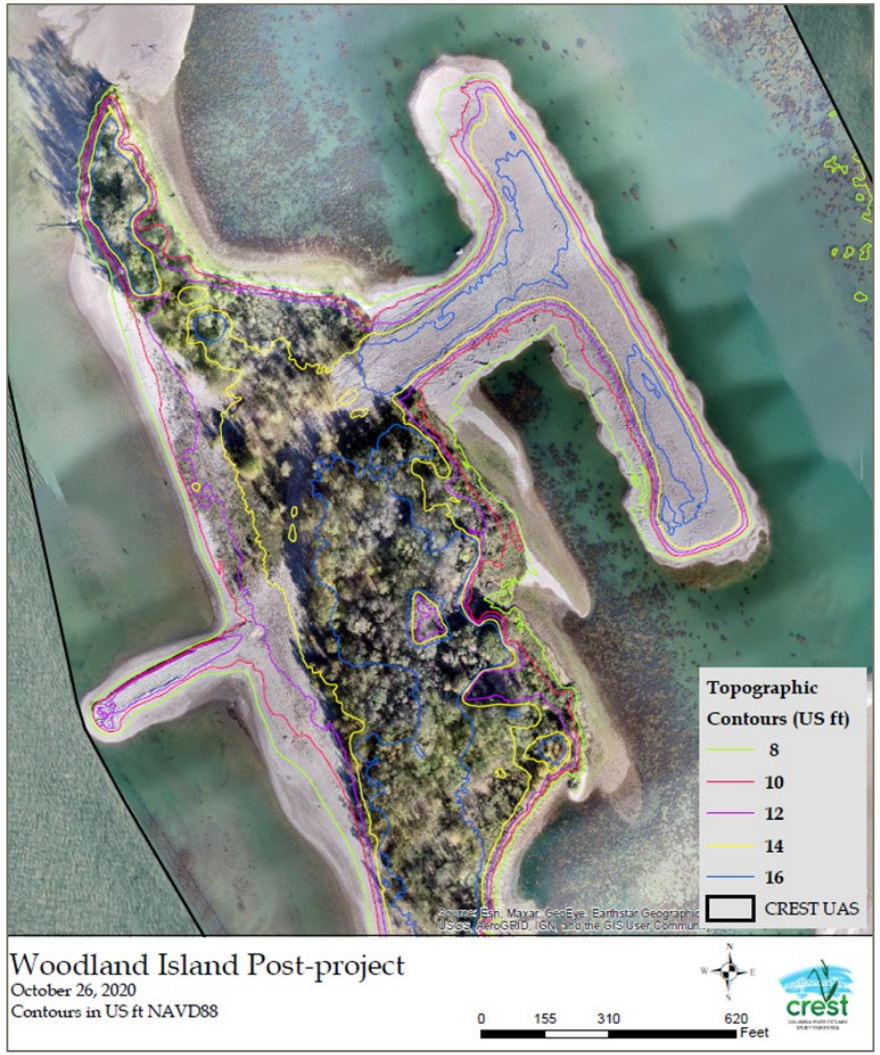
- Perform a global literature review of matrix (i.e., narrow fringing wetlands and riparian forests, armored or riprapped banks) restoration projects in estuaries
- Restore select matrix sites in the estuary, and design protocols to monitor use by juvenile salmon
- Investigate whether matrix habitat may have a role in providing thermal refugia for out-migrating salmon.



Hood et al. 2021

WOODLAND ISLANDS BUDM SITE

- Benthic monitoring (PNNL)
  - Sediments
  - Macroinvertebrates
  - Hydrographic data (CTD), surface/floor
- Avian monitoring
  - Aerial surveys conducted by Corps' Fish Field Unit
- Topography and bathymetry
  - Fall 2021-2026
- Vegetation
  - CREST planting, winter 2021-22 and winter 2022-23
  - Multispectral analysis 2024-2026
- Fish
  - USGS sampling in spring 2022, 2023, and 2025
  - Environmental parameters, juveniles, predators, prey, genetics

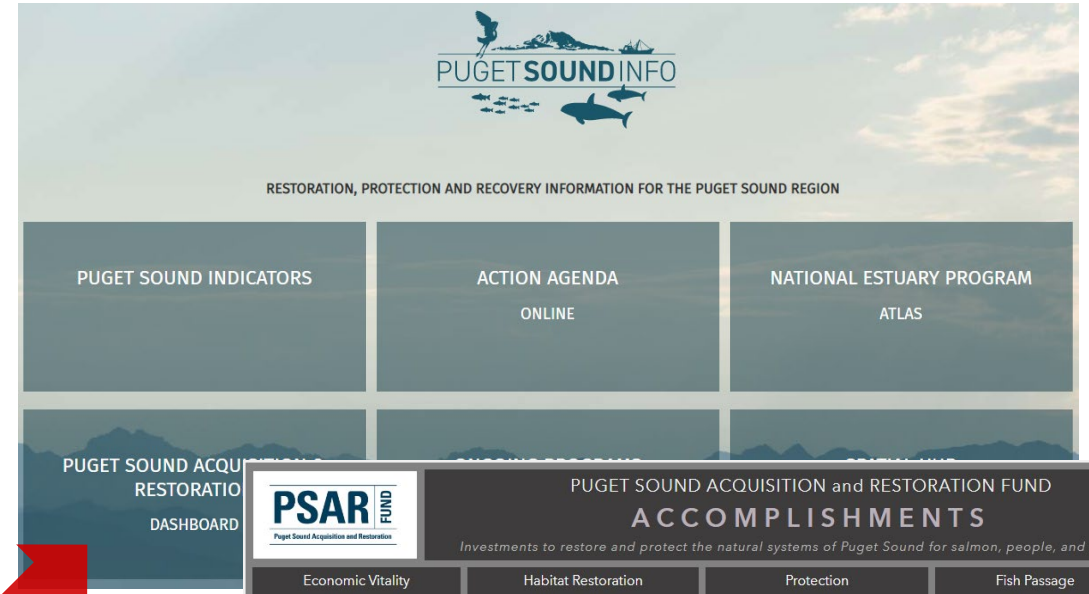


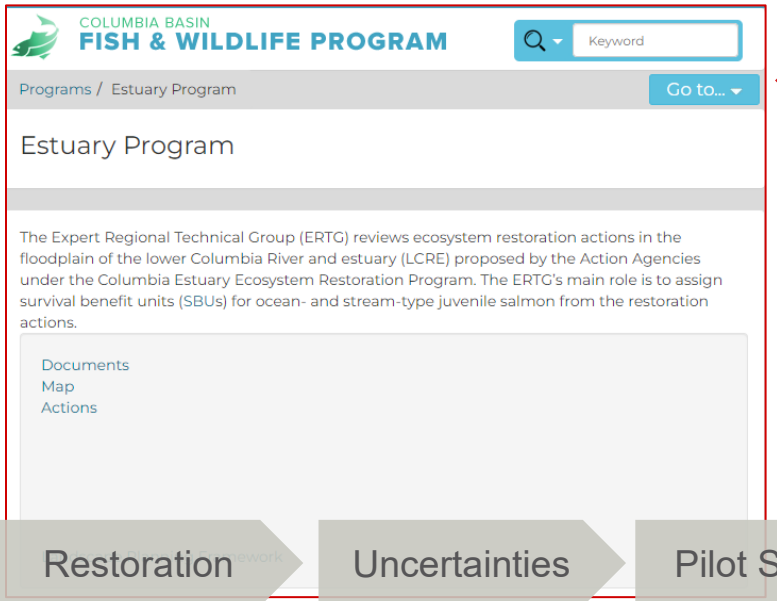
RELATED CREC TALKS:
Effects of Dredged Material Placement on Benthic Assemblages…, Sather et al.; **Tuesday, 5/16, 3:50 PM**
Wetland Reconnection and Habitat Restoration on South Bachelor…, Uber et al.; **Tuesday, 5/16, 4:10 PM**

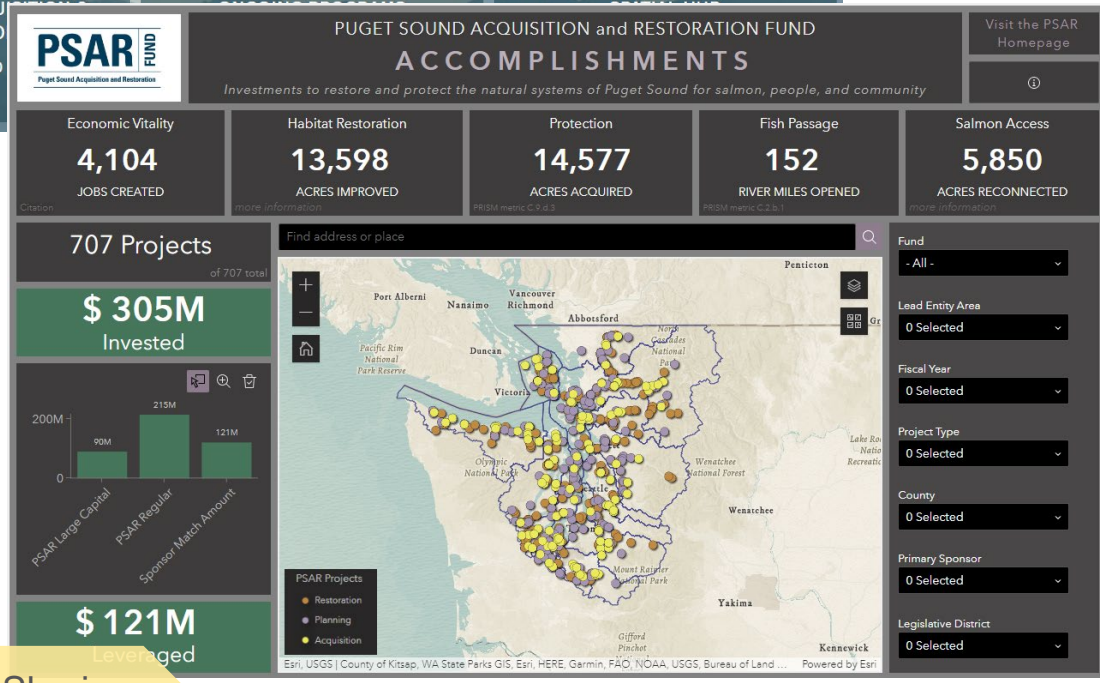
CEERP DATA SHARING AND TRANSPARENCY

Managers began a process to make CEERP data more accessible in 2012 (*Oncor*, Coleman et al. 2018), but that system's O&M was not pursued. We are now evaluating options for streamlined data sharing among program affiliates

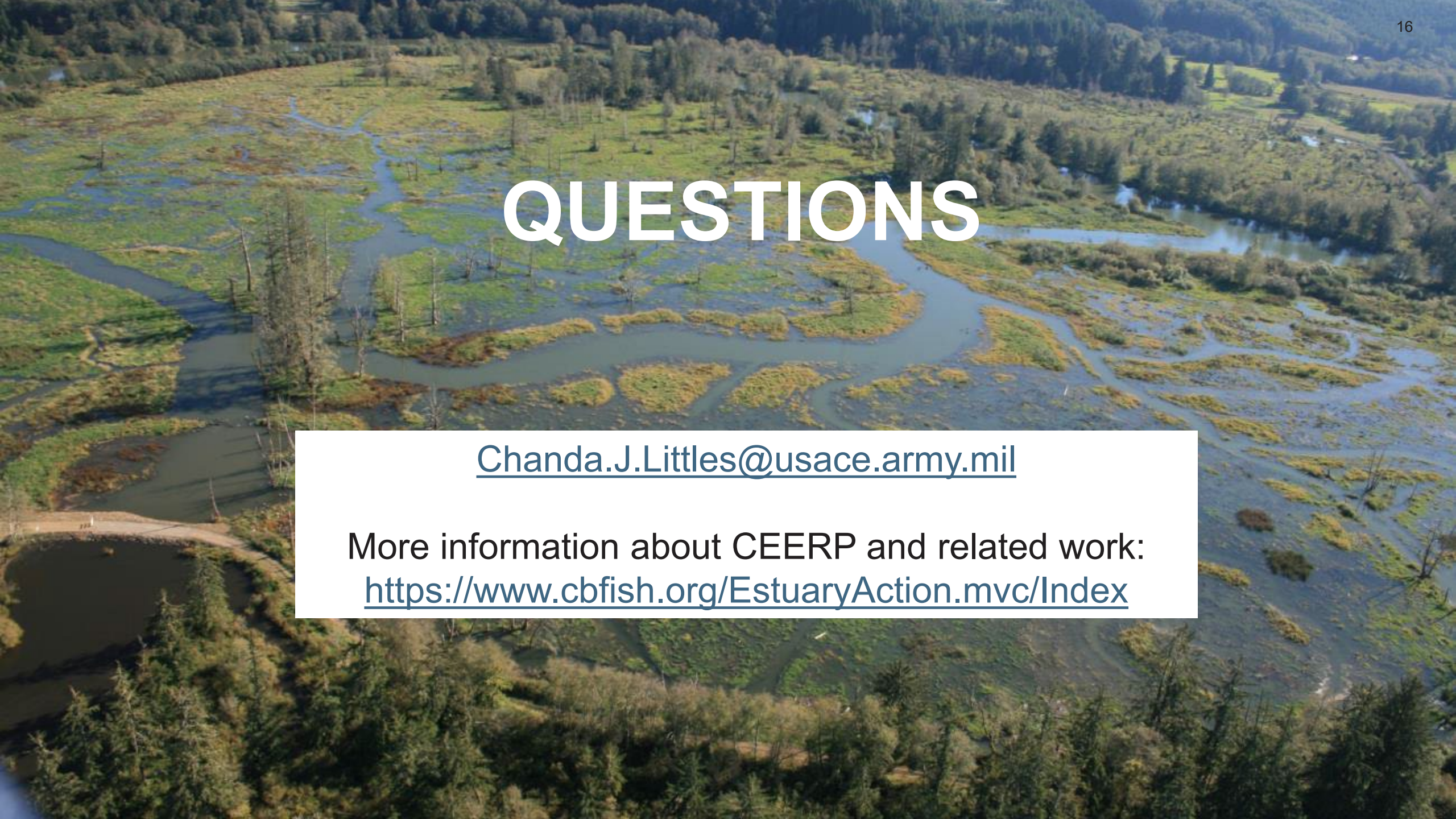
Estuary **revamp** within cbfish.org to more easily present the adaptive management framework, conceptual foundation, progress towards meeting restoration goals, new learning, monitoring results, and project details provided by Sponsors







CEERP AM → Restoration → Uncertainties → Pilot Studies → Data Sharing



QUESTIONS

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More information about CEERP and related work:
https://www.cbfish.org/EstuaryAction.mvc/Index