

Evaluation of Restoration Projects in the Columbia River Estuary: Preliminary Findings Based on Revisits in Fall 2022



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Why does the ERTG exist?

We review *proposed* and *completed* ecosystem restoration projects in the floodplain of the 234-km lower Columbia River and estuary to assess the potential benefit to **juvenile salmon**



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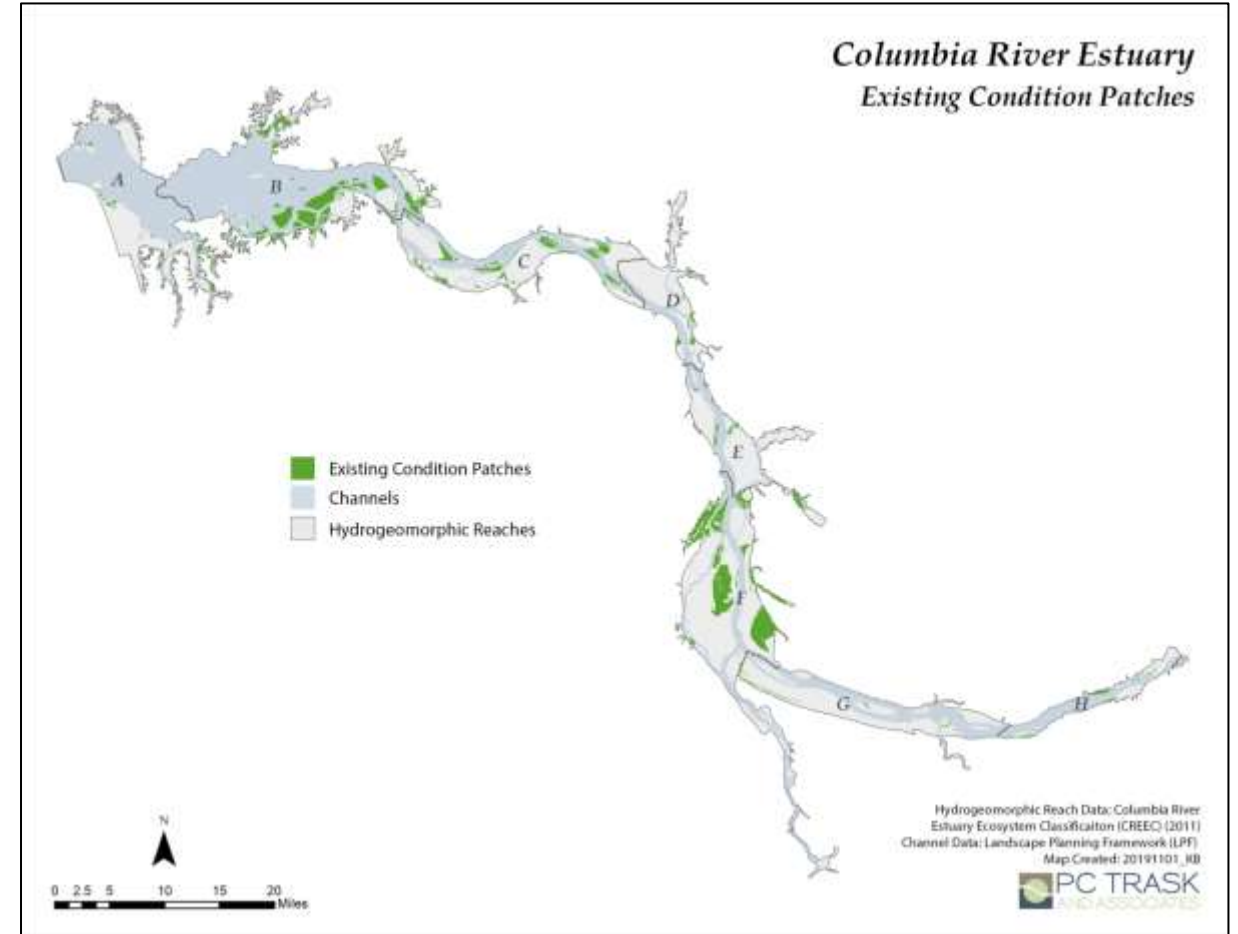


Kirk Krueger,
Research Fish Scientist
WDFW



Gary Johnson,
ERTG Coordinator
PNNL-retired

Fragmentation of the Columbia River estuary



65-70% of historical estuarine floodplains and wetlands have been lost (Marcoe and Pilson 2017)

Role of ERTG in CEERP* and Adaptive Management

- **Template** for CRE Habitat Restoration Projects – standard format for all proposed projects; Specifically addresses topics related to scoring.
- **Scoring Criteria**, which defines the criteria and the scoring process –
 - the probability of successfully meeting project goals
 - opportunity for fish to fully access the project,
 - capacity of the project to support salmonids
- **Calculator** – a simple model that uses criteria scores to calculate survival ‘lift’ for juveniles provided by the projects
- **Landscape principles**
- **Peer review publications with conceptual models**
 - Kruger et al. 2017
 - Hood et al. 2021
 - Ebberts et al. 2017
 - Littles et al. 2022



*Columbia Estuary Ecosystem Restoration Program (CEERP)

Key Publications:

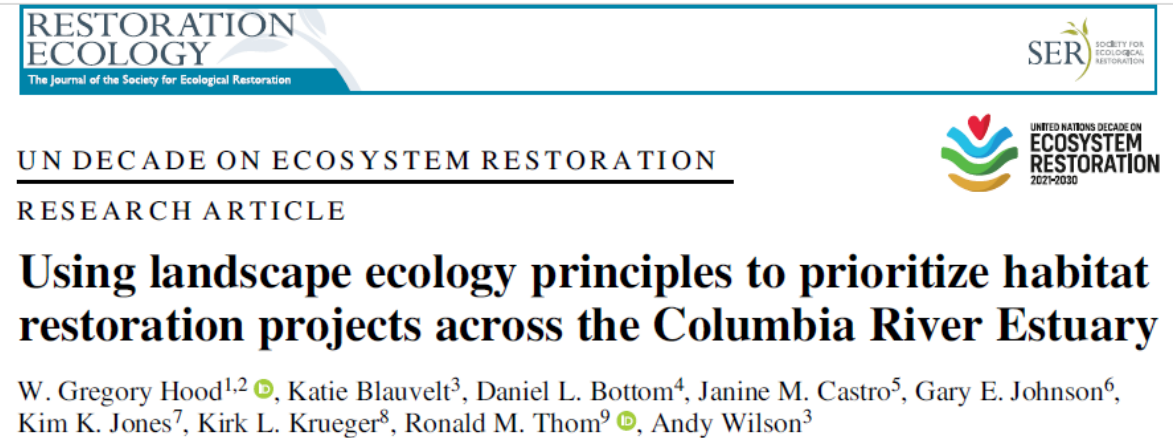
Krueger et al. 2017. J Environ Management



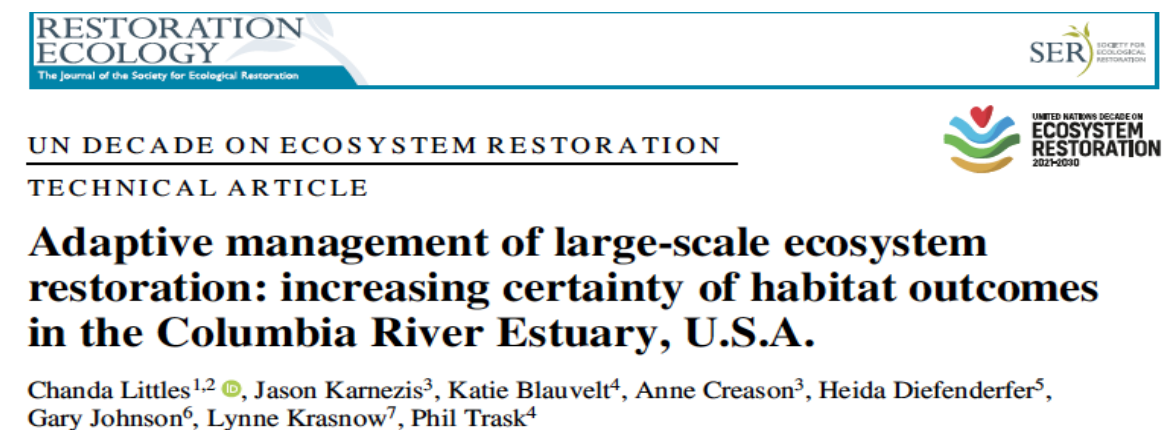
Ebberts et al. 2017. Restoration Ecology



Hood et al. 2021. Restoration Ecology

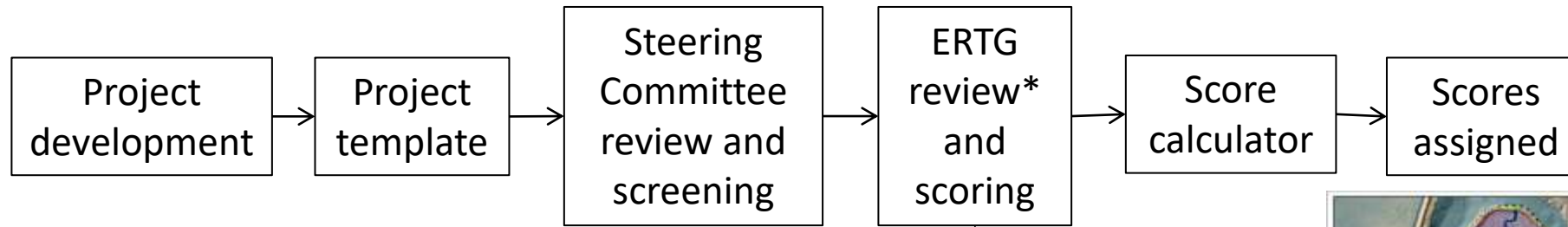


Littles et al. 2022. Restoration Ecology



Process of project development & assessment

➤ *Philosophy: transparent, science-based, documented*



**Site visits,
presentations,
meetings,
discussions*



➤ *Then what?*

- *How did the project(s) perform*
- *Every project is unique and novel*
- *Revisit and evaluate*



ERTG Development of Site Evaluation Cards

➤ Objectives of SECs

➤ **Develop standardized revisit template**

➤ **Evaluate the change in site condition since restoration and likely trajectory of the project**

➤ *Ecological, Hydrologic, Geomorphic*

➤ **Increase the ERTG's knowledge and that of the restoration community**

➤ *Quantify and qualitatively assess change*

➤ *Site conditions*

➤ *ERTG score*

➤ *Identify common themes that were successful or problematic*

➤ *Share lessons learned*

➤ *Discuss adequacy of monitoring*

➤ **Inform CEERP**

➤ **Inform cumulative effects studies**

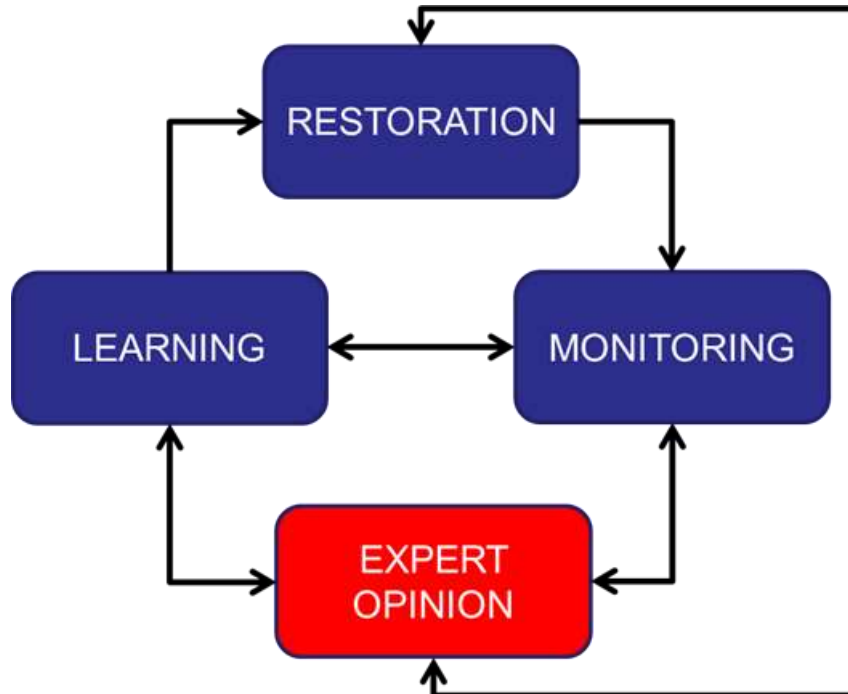


Adaptive Management Components

Revisit Template

Project sponsor self-assessment

- Describe the ecological trajectory of the restoration project



Revisit Template

- I. Project Description
 - I. Problem statement
 - II. Vision/goal
 - III. Objectives
 - IV. Goal map
- II. Construction
 - I. Proposed
 - II. Actual vs final subactions
 - III. Post construction actions
- III. Uncertainties
 - I. Pre-construction concerns
 - II. Post-construction concerns
- IV. Photos/videos/drone flights
- V. Sponsor's assessment
 - I. Most challenging
 - II. Least successful
 - III. Most successful
 - IV. Surprises
 - V. Lessons learned
- VI. Monitoring

Adaptive Management Components

Site Evaluation Card

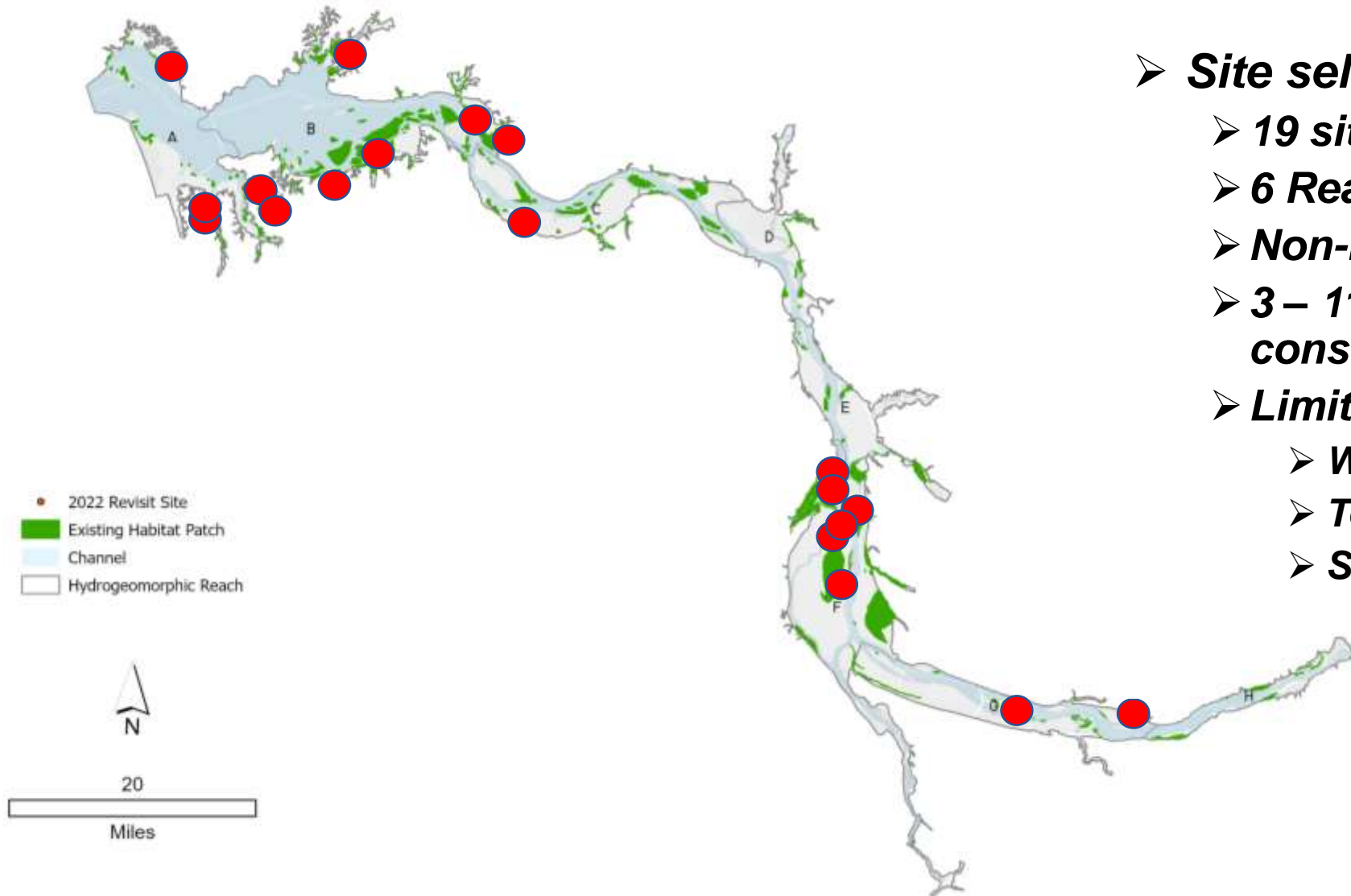
ERTG project evaluation and self-assessment



Site Evaluation Card

- I. Project Description
- II. Construction
 - I. proposed – observed subactions
- III. Design Concerns (ERTG, sponsor)
 - I. addressed and new
- IV. ERTG lens
 - I. ERTG process changes
- V. General Assessment (ERTG expectations)
 - I. Results comparable, better, worse than ERTG scores?
 - II. Assessment Scores
 - I. ERTG rescores
 - II. Compare scores
- VI. Summarize Common Themes & Lessons
- VII. Conclusions

Results & Examples of 1st Round of Revisits



➤ **Site selection**

- **19 sites, 16 visited on site**
- **6 Reaches A – C, E – G**
- **Non-random selection**
- **3 – 11 years post construction**
- **Limited monitoring data**
 - **Water levels**
 - **Temperature**
 - **Sediment accretion**

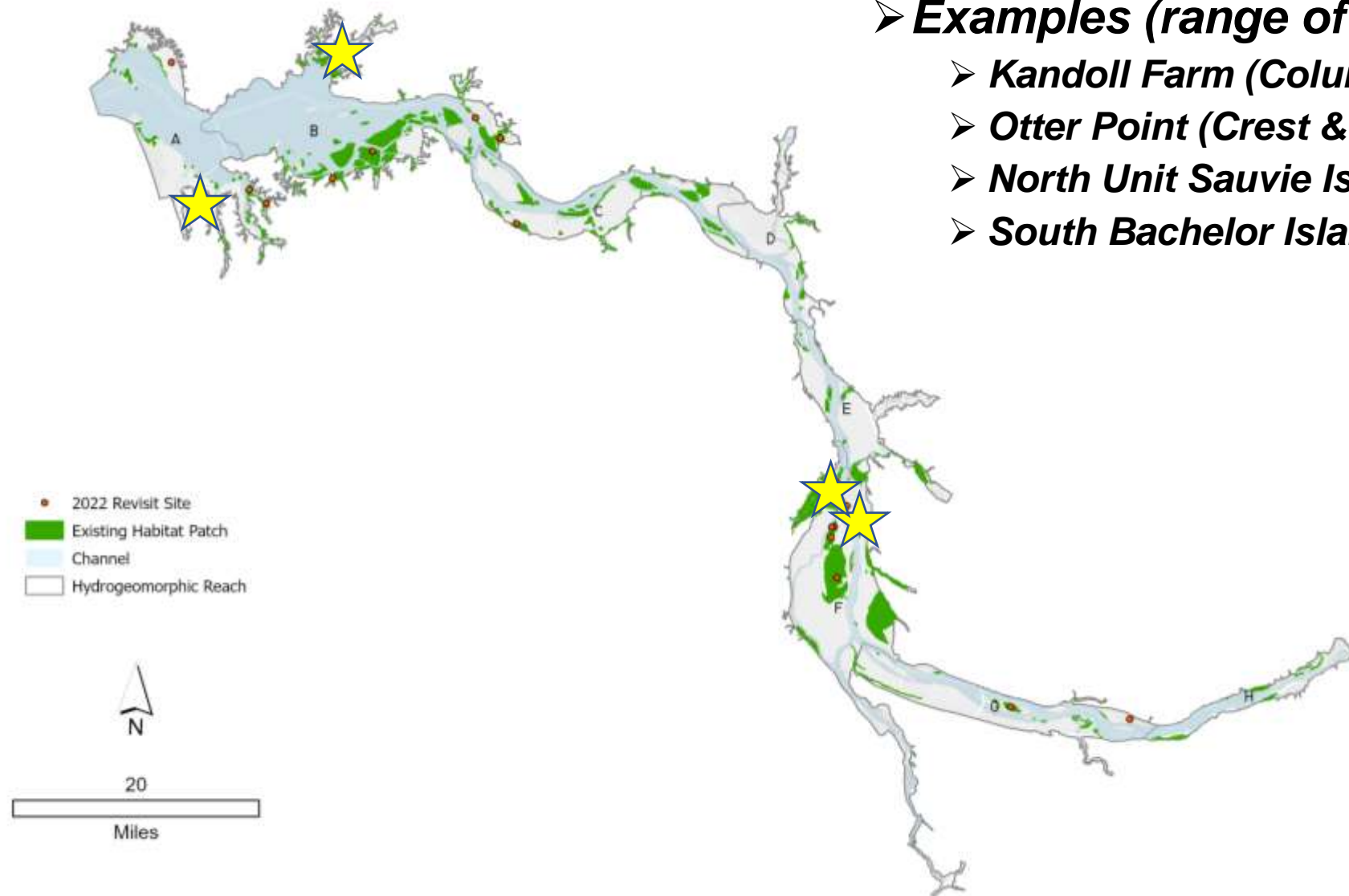
Themes

- **Themes relevant across many projects**
 - *Channel self-maintenance (excavated, passive)*
 - *Levee breaches, lowering, removal*
 - *Setback levees*
 - *Hummocks*
 - *Large Wood – amt and location*
 - *Beaver Dam Analog (BDA) structures*
 - *Invasives – e.g. Reed Canary Grass*
 - *“Scrapedown”*
 - *Treatments*
 - *Unexpected revegetation – e.g. cattails*
 - *Multi-species*
 - *Landscape perspective (e.g. Chinook River, Grays River, Sauvie Island)*
 - *Monitoring*

Sauvie Island



Results & Examples of 1st Round of Revisits



➤ **Examples (range of sites)**

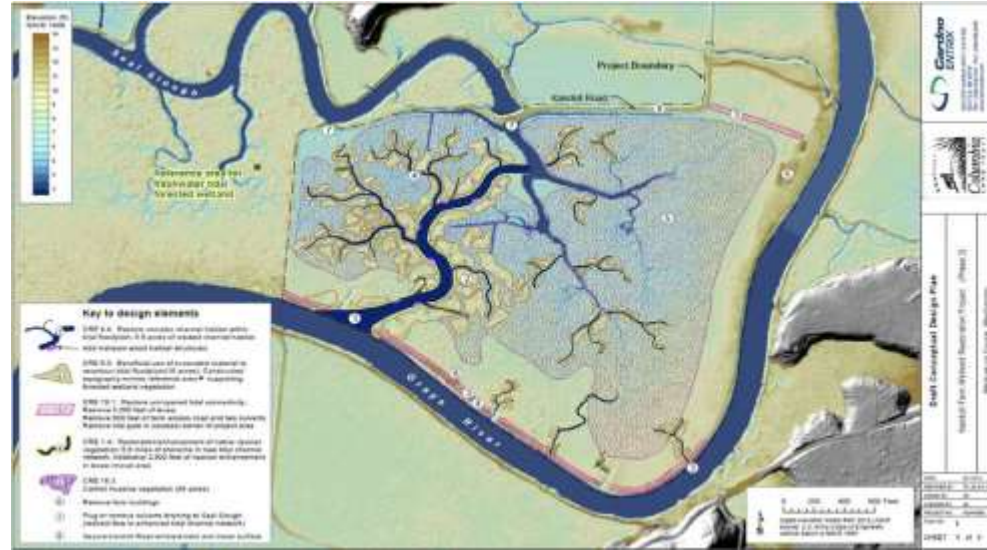
- **Kandoll Farm (Columbia Land Trust)**
- **Otter Point (Crest & NPS)**
- **North Unit Sauvie Island (CREST)**
- **South Bachelor Island (WDFW)**

Kandoll Farm (CLT) – Reverse drainage, Hummock research

Pre-project (2011)



Design Template – proposed restoration



Post construction (2014)



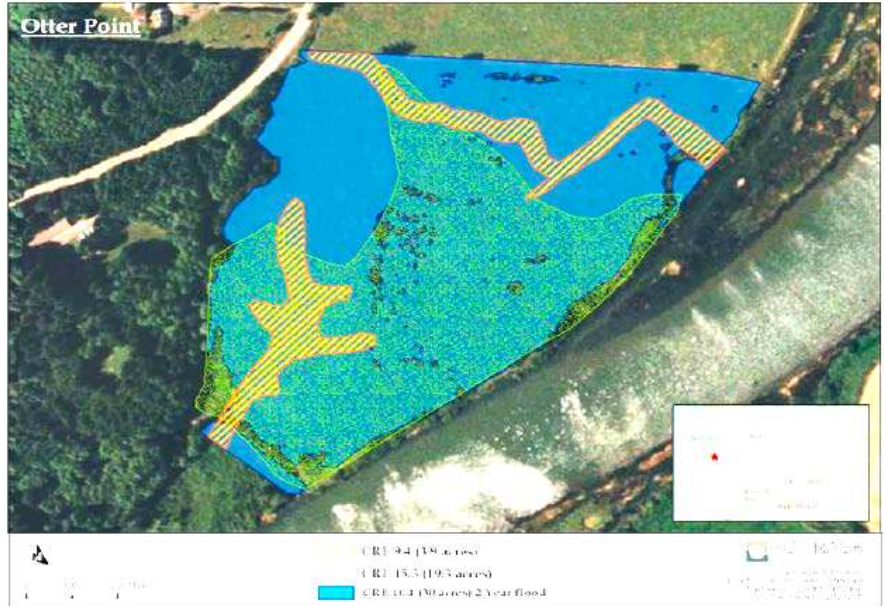
Post construction (2020)



Otter Point (CREST & NPS) – LWD, Elk Proposed restoration



Post restoration 2022



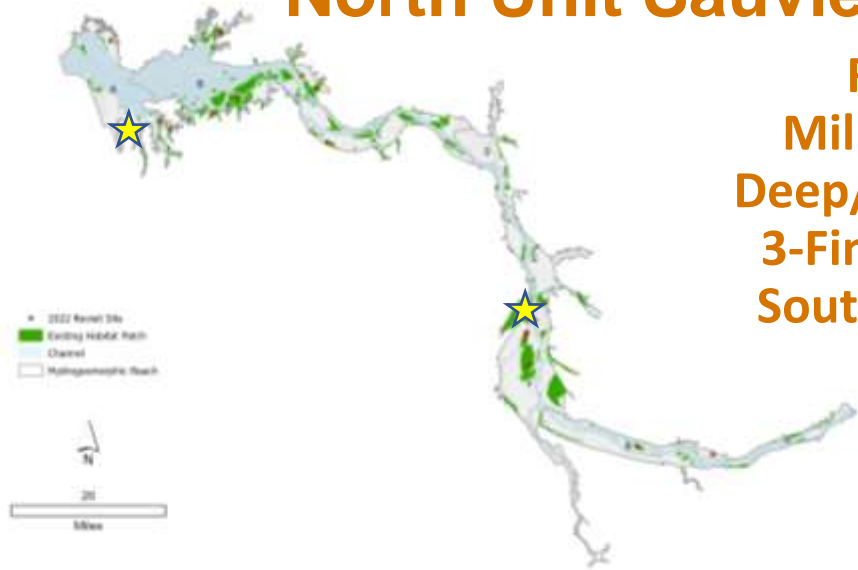
South Bachelor Island (WDFW)

Channel maintenance and riparian vegetation



North Unit Sauvie Island (CREST)– RCG, grazing, mowing

Ruby
Millionaire
Deep/Widgeon
3-Finger Jack
South Slough



Ruby Lake 8 years post restoration



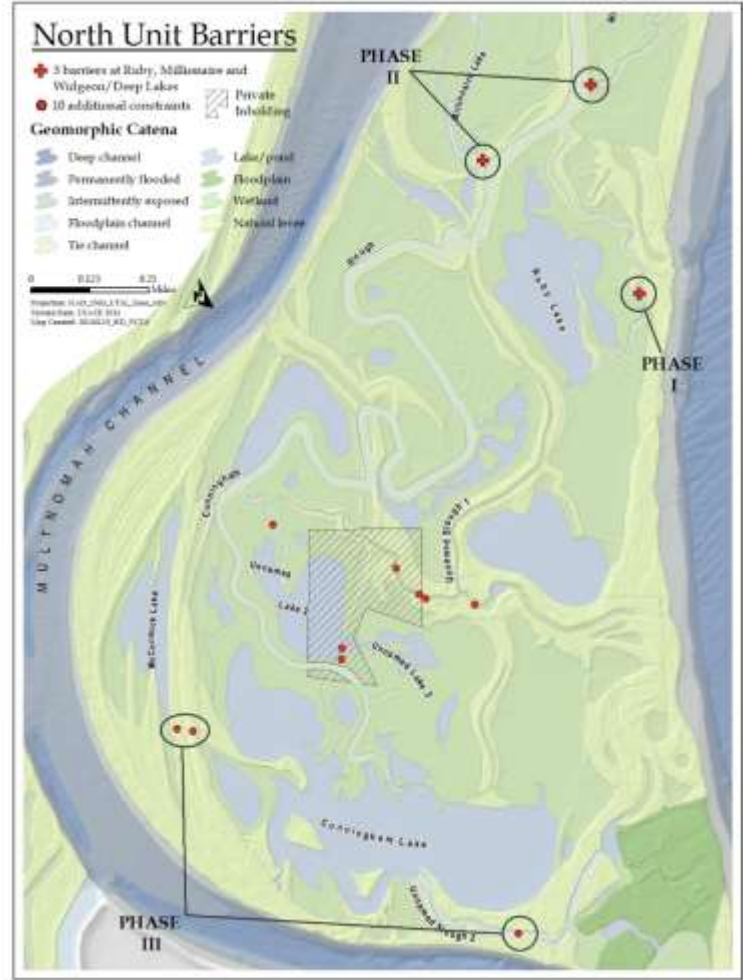
Photo credit CREST

Pre-project (2011)

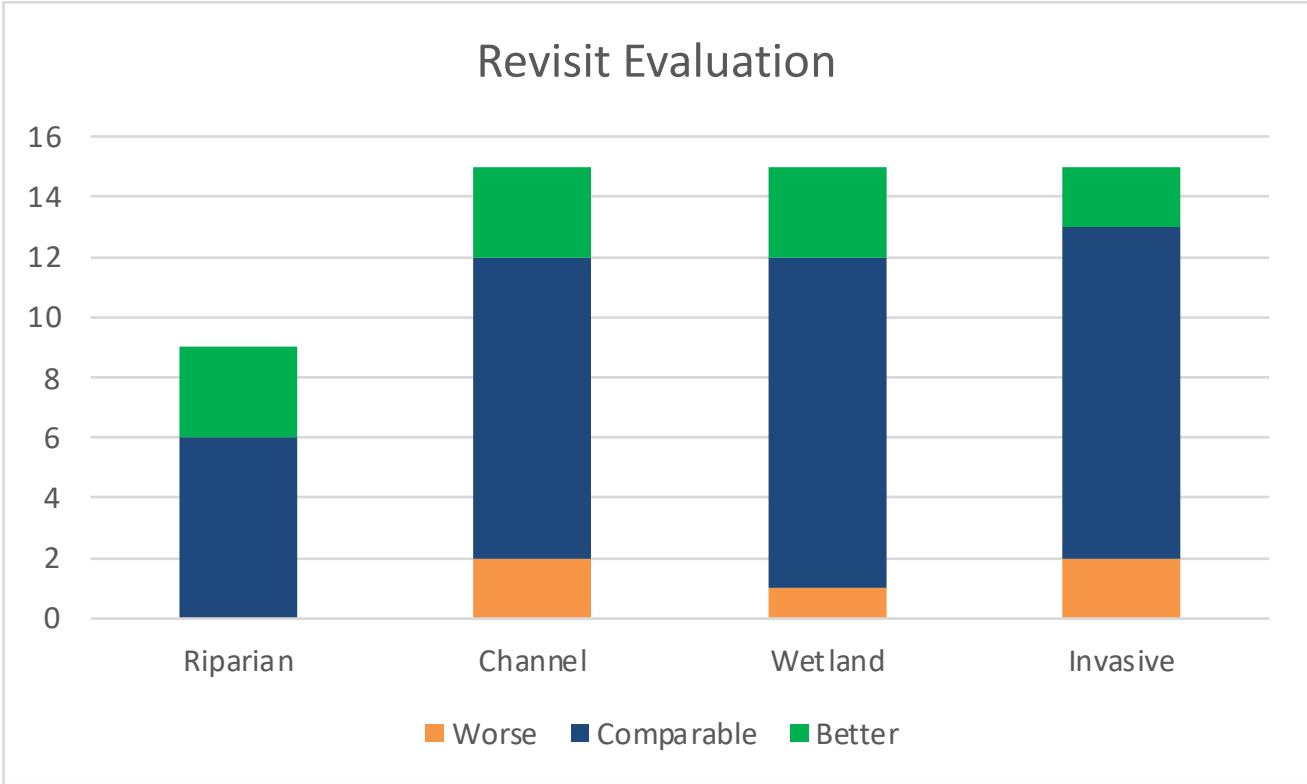


Google Earth

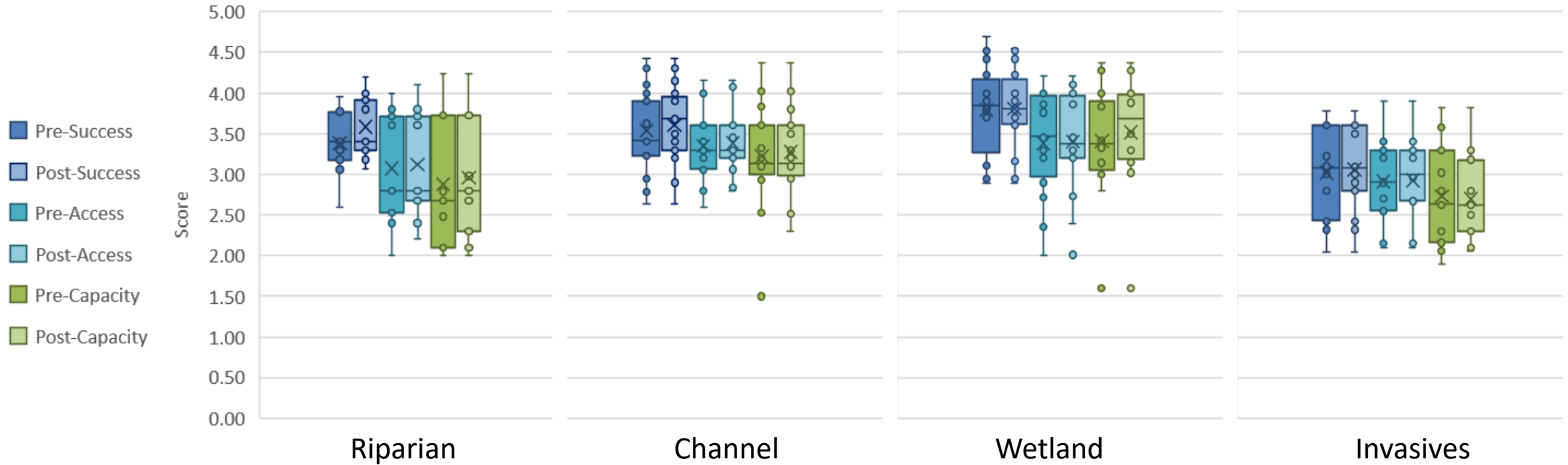
Design Template – proposed restoration



ERTG Qualitative Assessment Post Restoration by Subaction



Pre- and Post Scores by Subaction



Additional Information to Evaluate Projects

- **Underlying principle**

- *Projects are too big, expensive, and important to fail*

- **Monitoring**

- *Monitoring currently does not provide comprehensive evaluation of sites to facilitate SEC process*

- *Temperature*
- *Water levels*
- *Sediment accretion*
- *Photo points*

- **Additional needs**

- *Channel network evolution and expansion*
- *Water velocities post construction – informs breach & channel designs*
- *Fish use & performance – salmonids and non-native species*
- *Large wood - channel geomorphology, edge vegetation, fish use*
- *Contribution to adult population*

- **Does this process inform cumulative effects***

- *Site level evidence to inform system scale inferences*
 - *Landscape pattern, synergistic effects between projects, and temporal scale*
- *Recent systems scale research links site to system (indirect) effects*
 - *e.g. Weitkamp et al. 2022 TAFS*
 - *Roegner and Johnson 2023 PLoS ONE*

*Diefenderfer et al. 2016. Ecosphere. 7(3):e01242

Conclusions

- ***First comprehensive evaluation of how projects are performing – key component of adaptive management***
- ***Sponsors are open, honest, and candid***
- ***Did predictions of project trajectories meet expectations***
 - ***Yes – sponsors' visions and ERTG's predictions were met***
 - ***Projects were well designed***
 - ***Reflected in evolution and trajectory of sites***
 - ***Constructive review process as each site is unique***
- ***Collectively, SECs synthesize across projects***
 - ***Better ability to predict actions of future projects***
 - ***Facilitates information transfer among ERTG, practitioners, agencies***
- ***Monitoring currently does not provide comprehensive evaluation of sites to facilitate SEC process***
- ***SEC process will inform the cumulative effects***