EMP/AEMR Synthesis Memo Proposal

Lower Columbia Estuary Partnership

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Purpose of the Synthesis Memo

- EMP and AEMR program reports focus on **ANNUAL status** of wetland ecological conditions and function.
- Previous EMP Synthesis Memo drafted in 2013, looked back at data from 2005 – 2010 (5 years of data).
- We suggest synthesizing the historic dataset of 14 years (2005-2019).
- Several Level 2 and Level 3 AEM Monitoring sites have crossed year 3 and 5 post-restoration since the 2018 CEERP Synthesis Memo.
- COVID-19 travel restrictions has resulted in patchy data collection effort in 2020

Objectives of the 2020 Synthesis Memo

- Integrate critical uncertainties, recent studies, and past synthesis works into synthesis research questions and discussions.
- Develop understandings of trends and correlations observed across ecosystem conditions from 2005-2019.
- Work towards identifying trends, relationships, and future research questions and hypotheses with a focus on the potential **ecological implications of climate change and sea level rise**

Objectives of the 2020 Synthesis Memo

- Take a critical lens to current data collection methods across ecological components to identify where improvements or adjustments should be made

- Each research team will develop their hypotheses, while collaboratively sharing datasets and ideas.

- Ecological components currently being considered:

- ***LCEP**: Habitat structure: Plant communities, marsh elevations and hydrology*
- ***OHSU**: Mainstem and Site-specific water quality conditions, Food web dynamics*
- ***UW**: Macroinvertebrate community composition*
- ***NOAA**: Salmonid density and growth rates*

PNNL-15793

Protocols for Monitoring Habitat Restoration Projects in the Lower Columbia River and Estuary

G. C. Roegner
H. L. Diefenderfer
A. B. Borde
R. M. Thom
E. M. Dawley
A. H. Whiting
S. A. Zimmerman
G. E. Johnson

Final Report
April 25, 2008

Prepared for the U.S. Army Corps of Engineers
Portland District, Portland, Oregon
Under a Related Services Agreement
with the U.S. Department of Energy
Contract DE-AC05-76RL01830

US Army Corps of Engineers

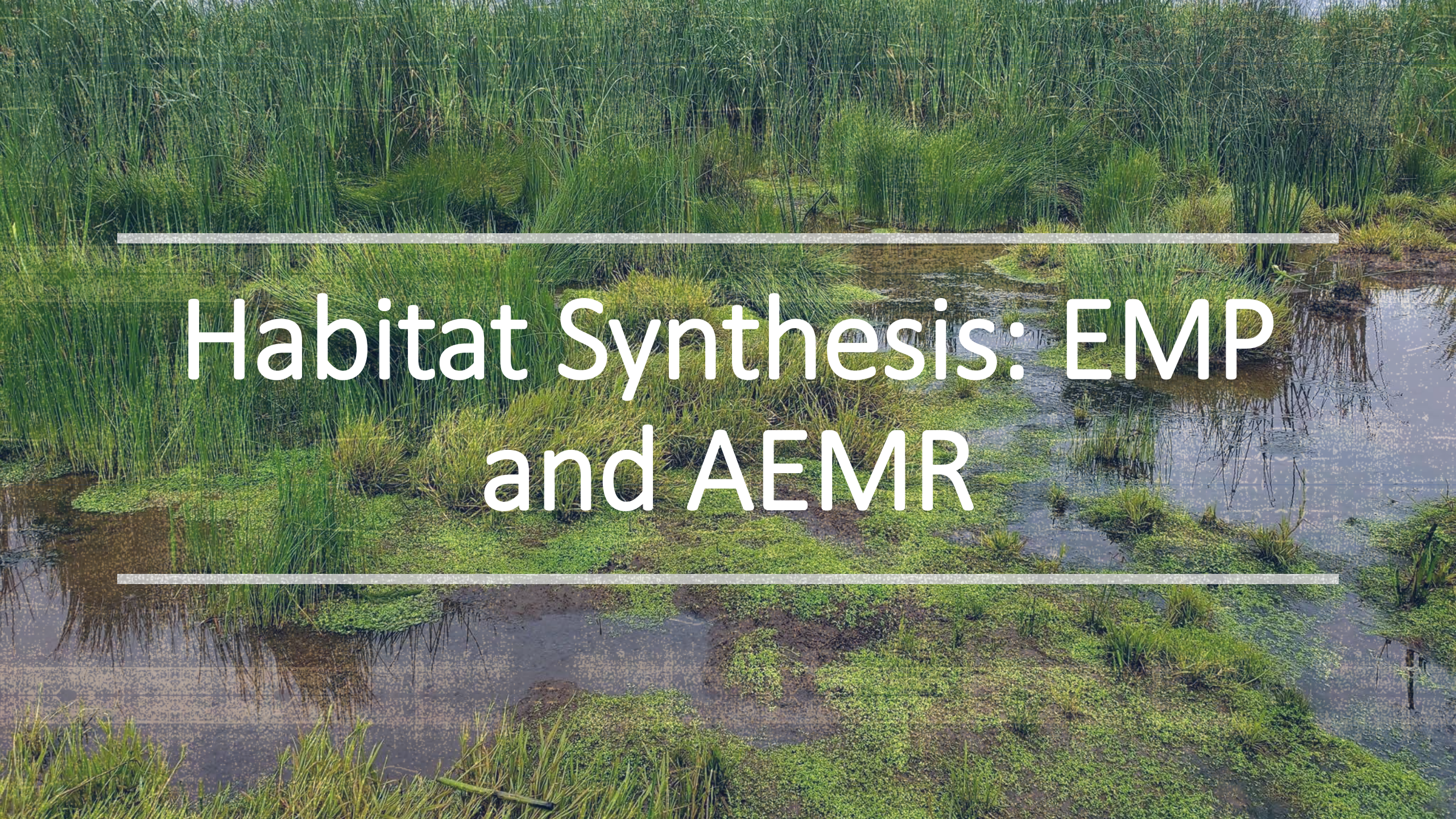
Pacific Northwest National Laboratory
Operated by Battelle for the U.S. Department of Energy

NOAA

CREST

Additional Efforts – Monitoring Protocols Update

- 2018 & 2019 - Provided Update to WSE/Temp Monitoring
- 2020 – Provided Update to Sediment Accretion Monitoring, Soil Monitoring, Channel Cross-Sections
  - April Silva (CREST) started drafting an ***updated Protocol Document*** incorporating some of these updates
- 2021
  - Winter-Summer: Continue to Update the New DRAFT Protocols
  - Fall: Distribute Draft Protocols for Comment



Habitat Synthesis: EMP and AEMR

Habitat Synthesis: EMP and AEMR

Up through 2019 - Across the EMP reference sites we've found significant interactions with freshet timing, duration, spring and summer water levels, and seasonal shifts in salinity with

- Non-native, Reed Canarygrass, Abundance
- Native Plant Community Abundance
- Overall Biomass and Macro-detritus Production
- Soil Conditions

See 2019 EMP Report and SWG PPT

These findings have significant implication for predicting wetland habitat response to sea level rise and climate change

Habitat Synthesis: EMP and AEMR

For the current Synthesis effort (2020)

- Expand EMP habitat analyses to include the AEMR sites
- Utilize EMP reference site data to develop more robust restoration evaluation criteria which incorporates sitewide:
    - Topographic Complexity
    - Plant Community
    - Water Depth and Temperature

Research Questions

Focusing on Habitat Conditions: Plant Community Composition, Water Depths, and Temperatures

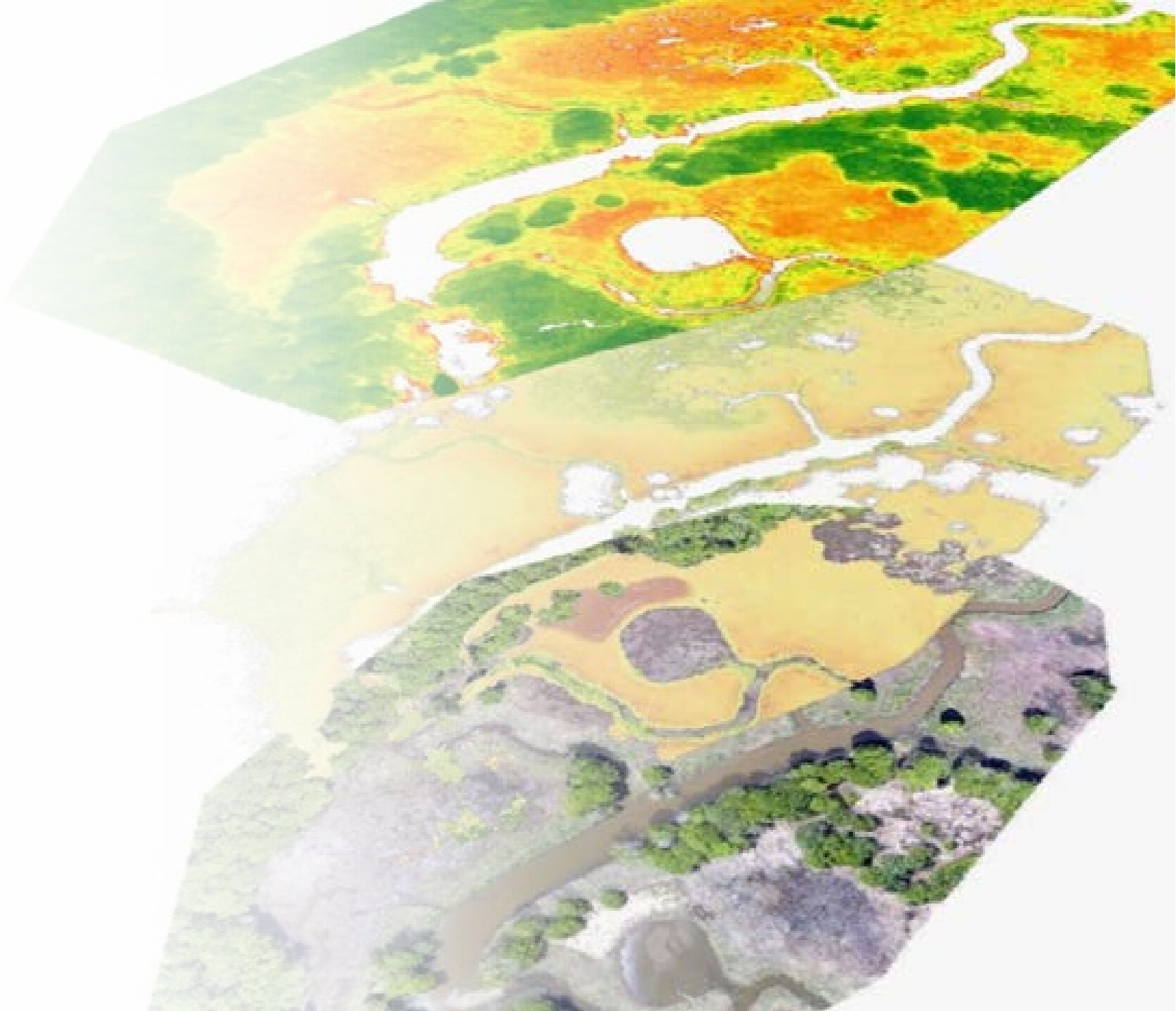
- How are restoration sites responding to restoration actions over time?
- How do restoration sites compare to EMP/reference sites?
- How will **sea level rise and climate change** impact wetland habitat conditions?

Currently we only use small amounts of data to answer these questions, making it challenging to infer meaningful answers

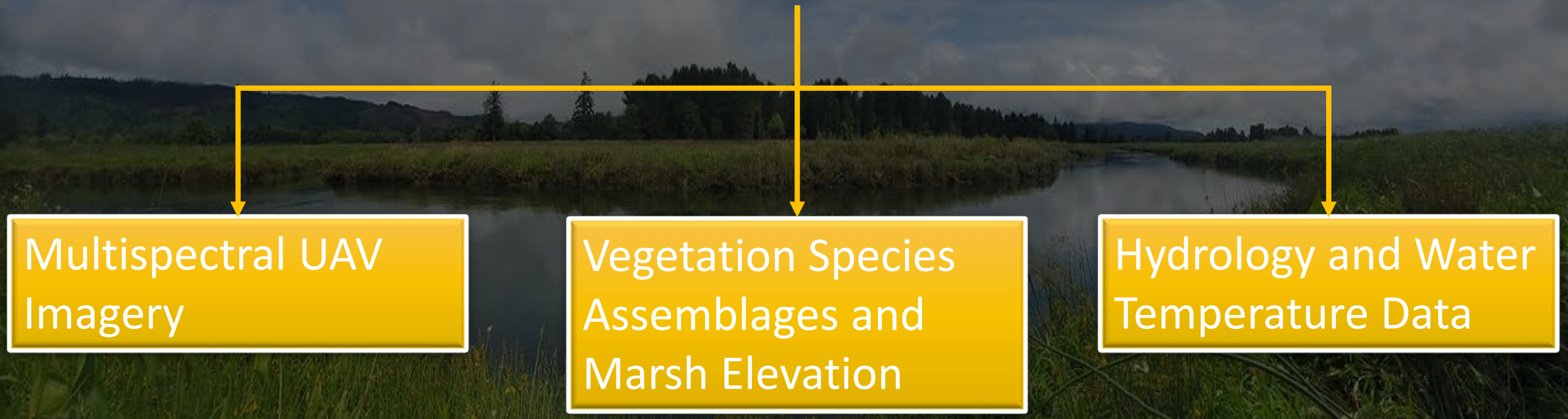
Synthesizing and Evaluating Habitat Data

Establishing a new method for **Synthesizing and Evaluating Habitat Data** integrating existing data collection methods and UAV drone imagery

- Provide more robust habitat condition assessments
- **Set the stage for modeling habitat shifts from climate change and future restoration efforts**



Habitat Assessment through UAV imagery and hydrology



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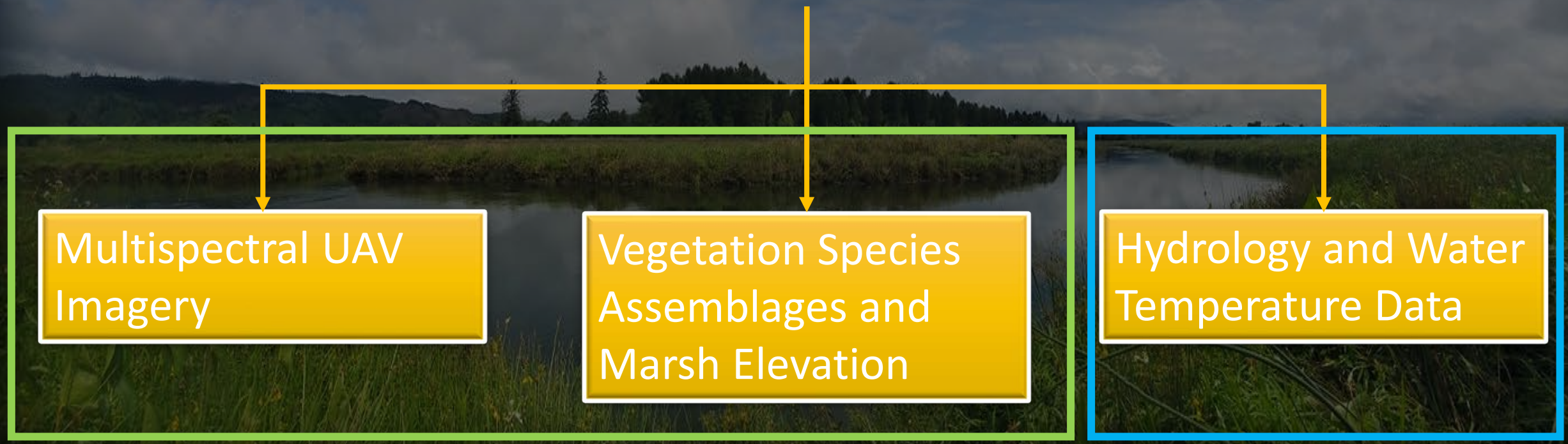
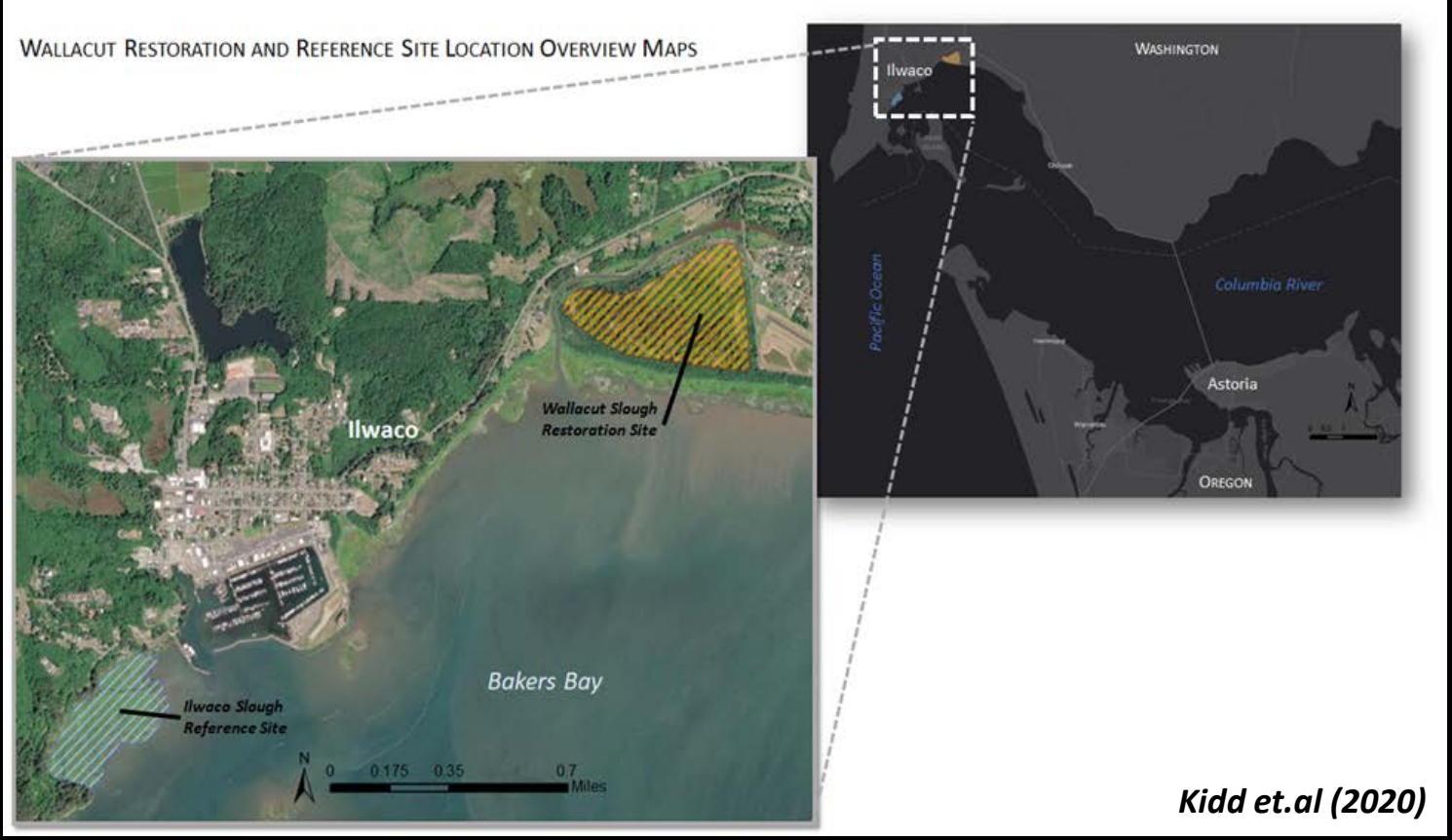


Preliminary Case Study: Wallacut Slough



Kidd et.al (2020)

Wallacut Slough is located in Bakers Bay.

In 2016, Wallacut Slough network was restored through the removal of barriers and channel enhancements

Data available:

- ❖RGB and NIR Orthomosaics, Digital Surface Model
- ❖RTK Elevations of plant community
- ❖WSE and water temperature data

Wallacut Restoration Site

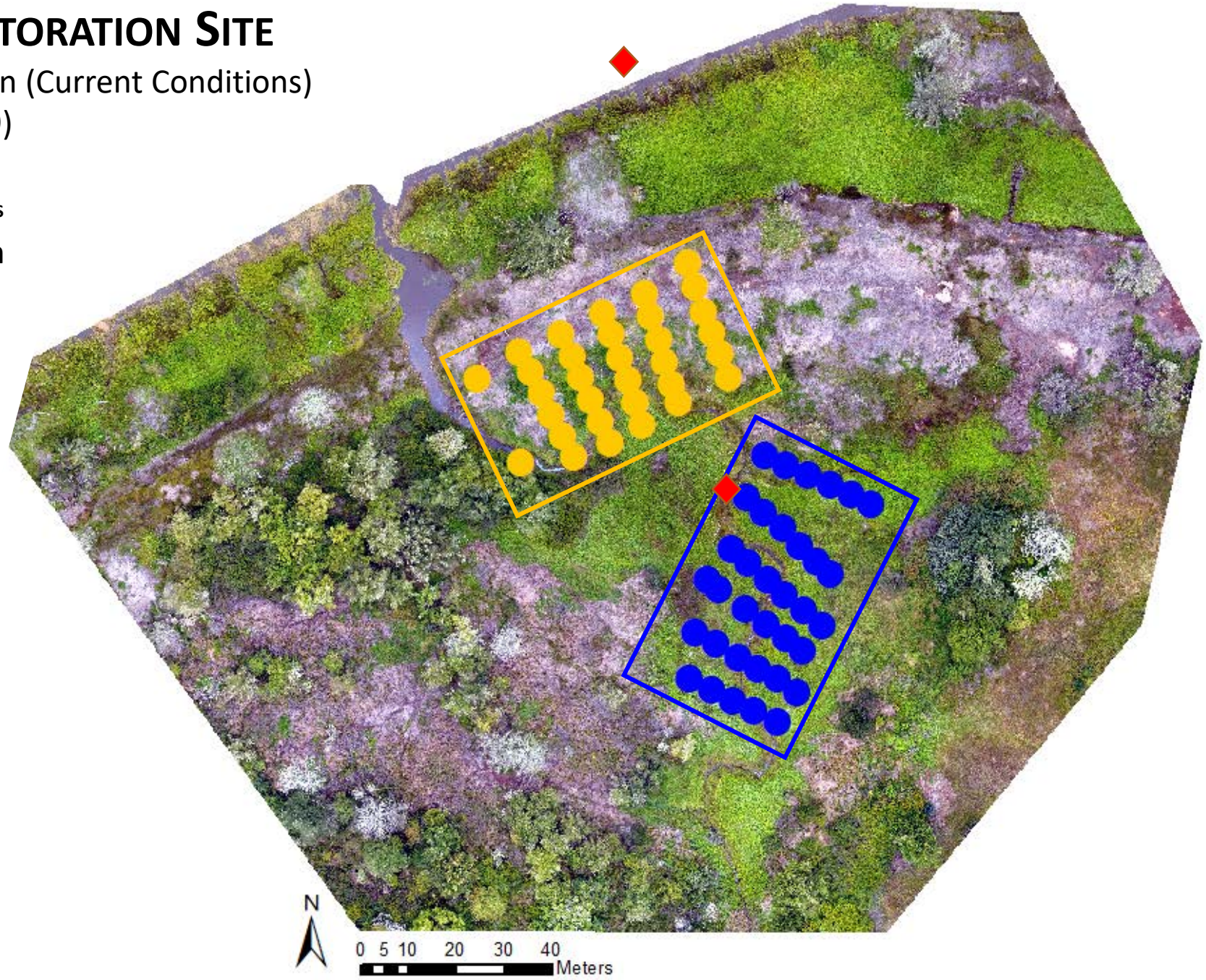
3 yrs. Post Restoration (Current Conditions)
Drone Imagery (2019)

Wallacut Restoration Site

3 yrs. Post Restoration (Current Conditions)
Drone Imagery (2019)

Intensive Veg Monitoring Areas

- Wallacut Mouth
- Wallacut Upper
- WSE Loggers

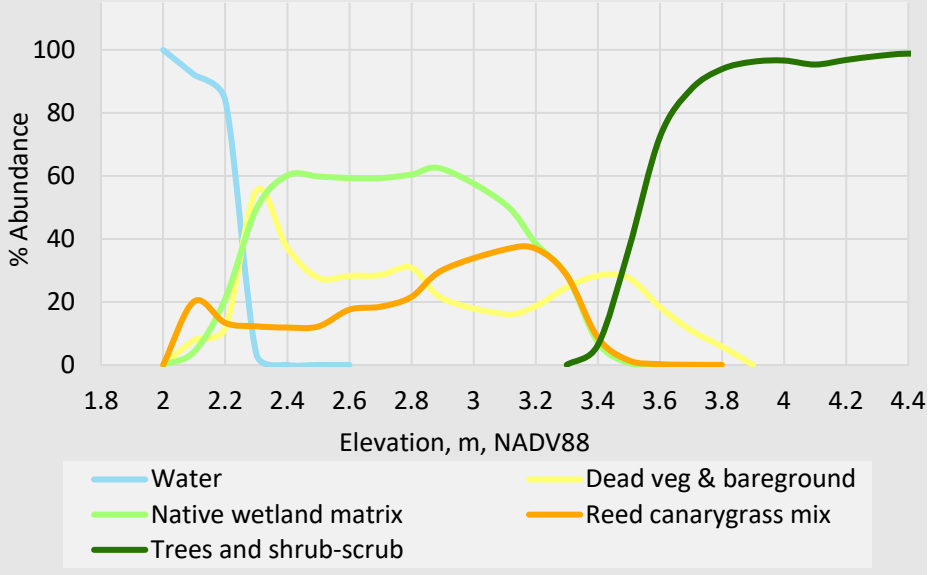


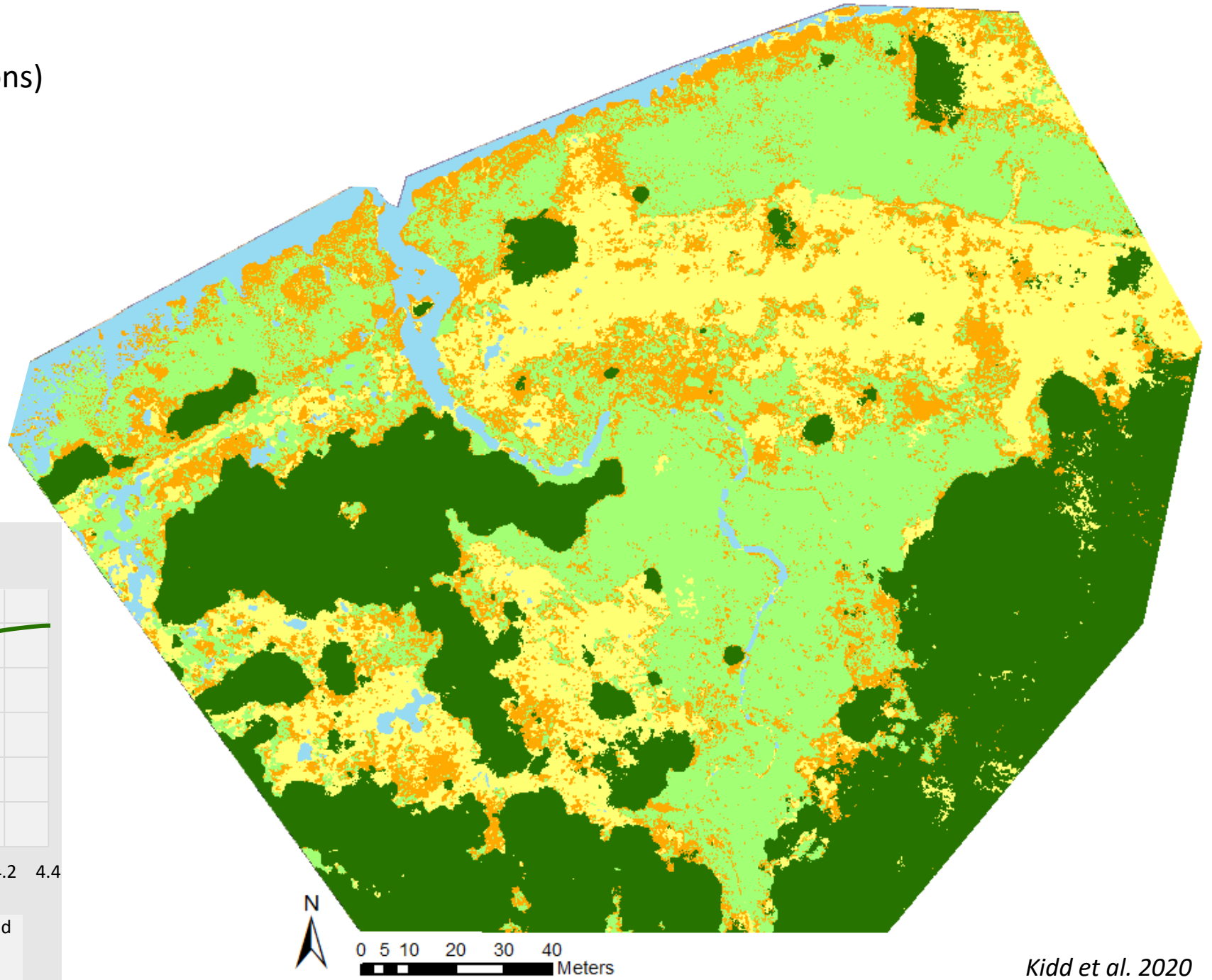
Wallacut Restoration Site

3 yrs. Post Restoration (Current Conditions)
Classification of Drone Imagery (2019)

Classification	Acers	%
Water	0.4	5
Native wetland matrix	2.5	29
Dead veg & bareground	1.6	19
Reed canarygrass mix	1.2	15
Trees and shrub-scrub	2.7	32

Plant Community Distributions
Extracted from Drone Imagery Digital Surface Model





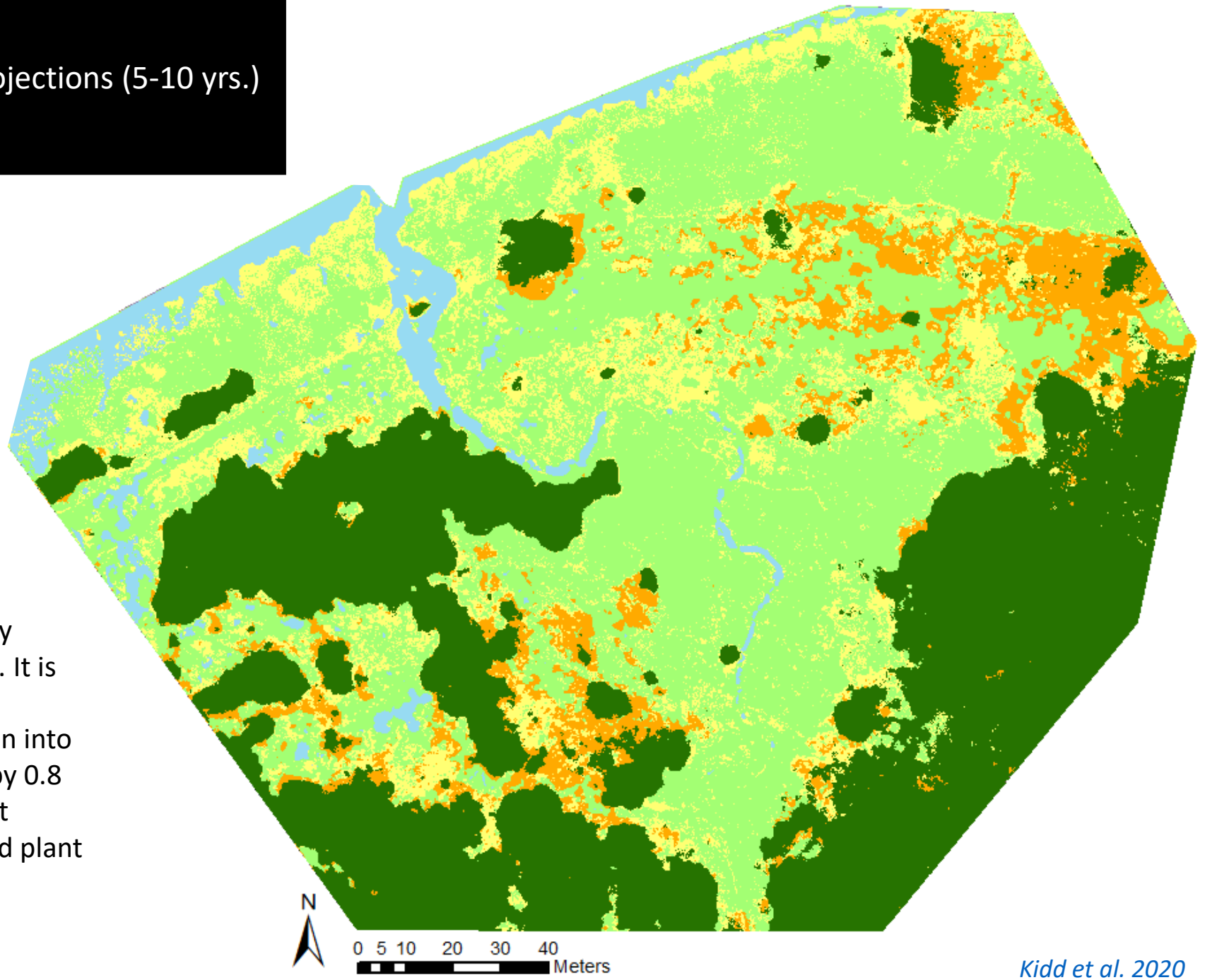
Kidd et al. 2020

Wallacut Restoration Site

Future Plant Community Development Projections (5-10 yrs.)
Classification of Drone Imagery (2019)

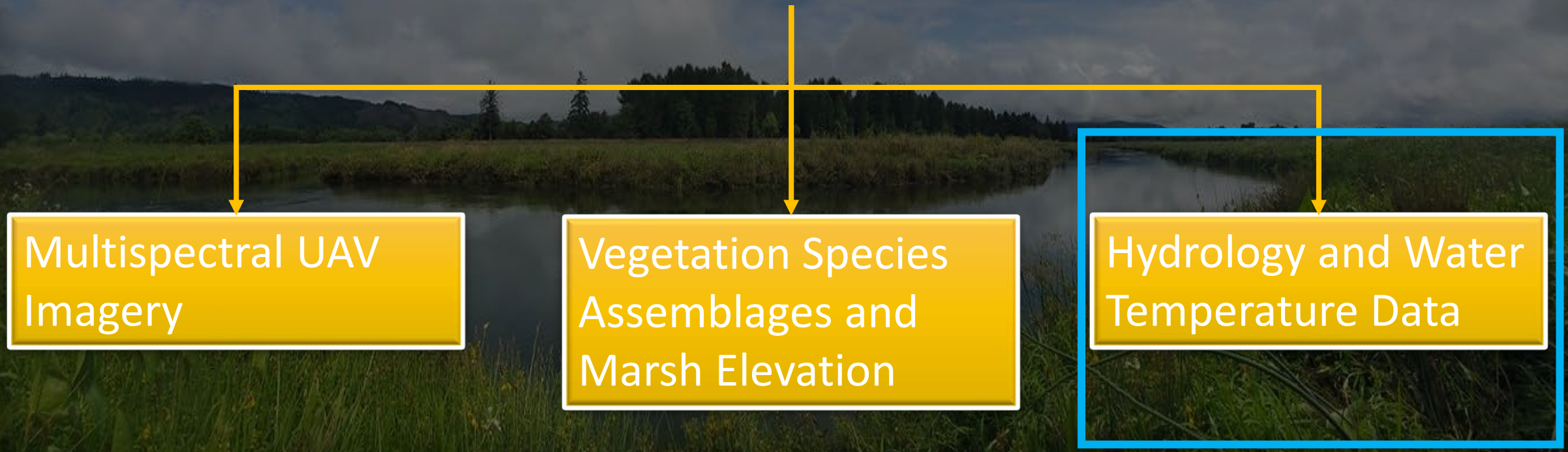
Classification	Acers	%
Water	0.4	5
Native wetland matrix	3.3	38
Mixed	2.0	25
Reed canarygrass		
Trees and shrub-scrub	2.7	32

Predictions based on existing plant community distributions and elevations observed in 2019. It is anticipated that current (2019) areas that are bareground and dead vegetation will transition into Native wetland plant communities (increase by 0.8 acres, 9%), Mixed Native and Non-native plant communities and Reed canarygrass dominated plant communities (increase by 0.8 acres, 10%).

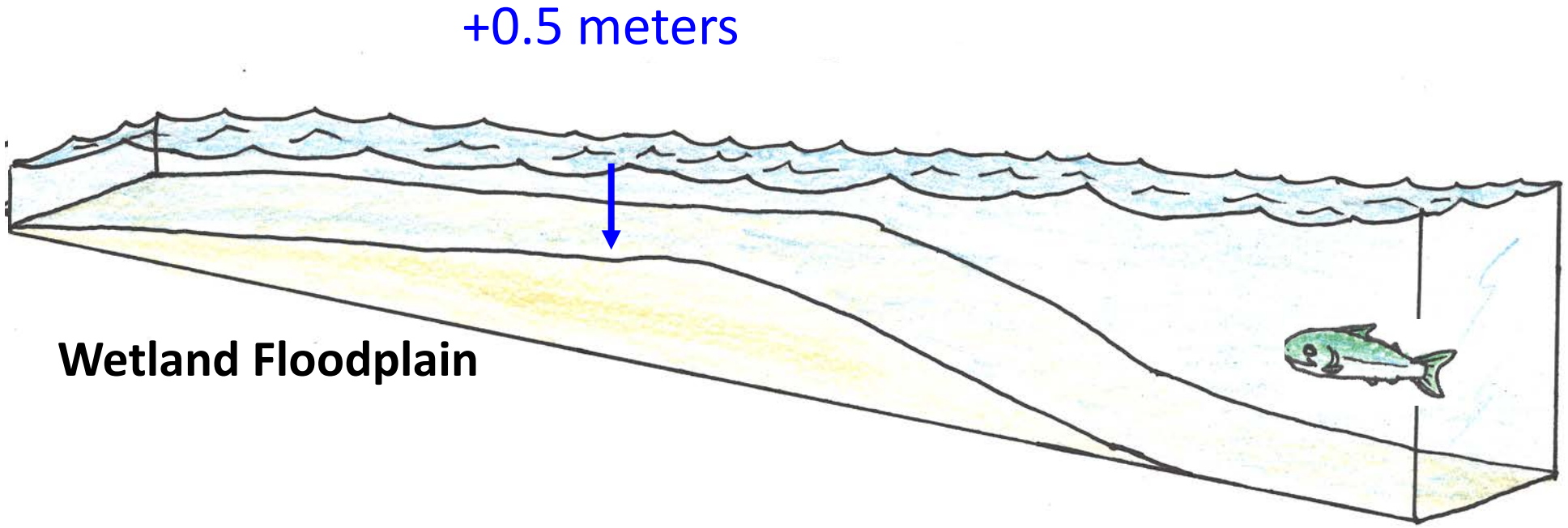


Kidd et al. 2020

Habitat Opportunity Assessment through UAV imagery and hydrology



Salmonid Habitat Opportunity



Opportunity Depth = Channel Elevation
+ 0.5 m

Opportunity Temp = Optimal ≤ 17.5 C
Marginal 17.5-22 C

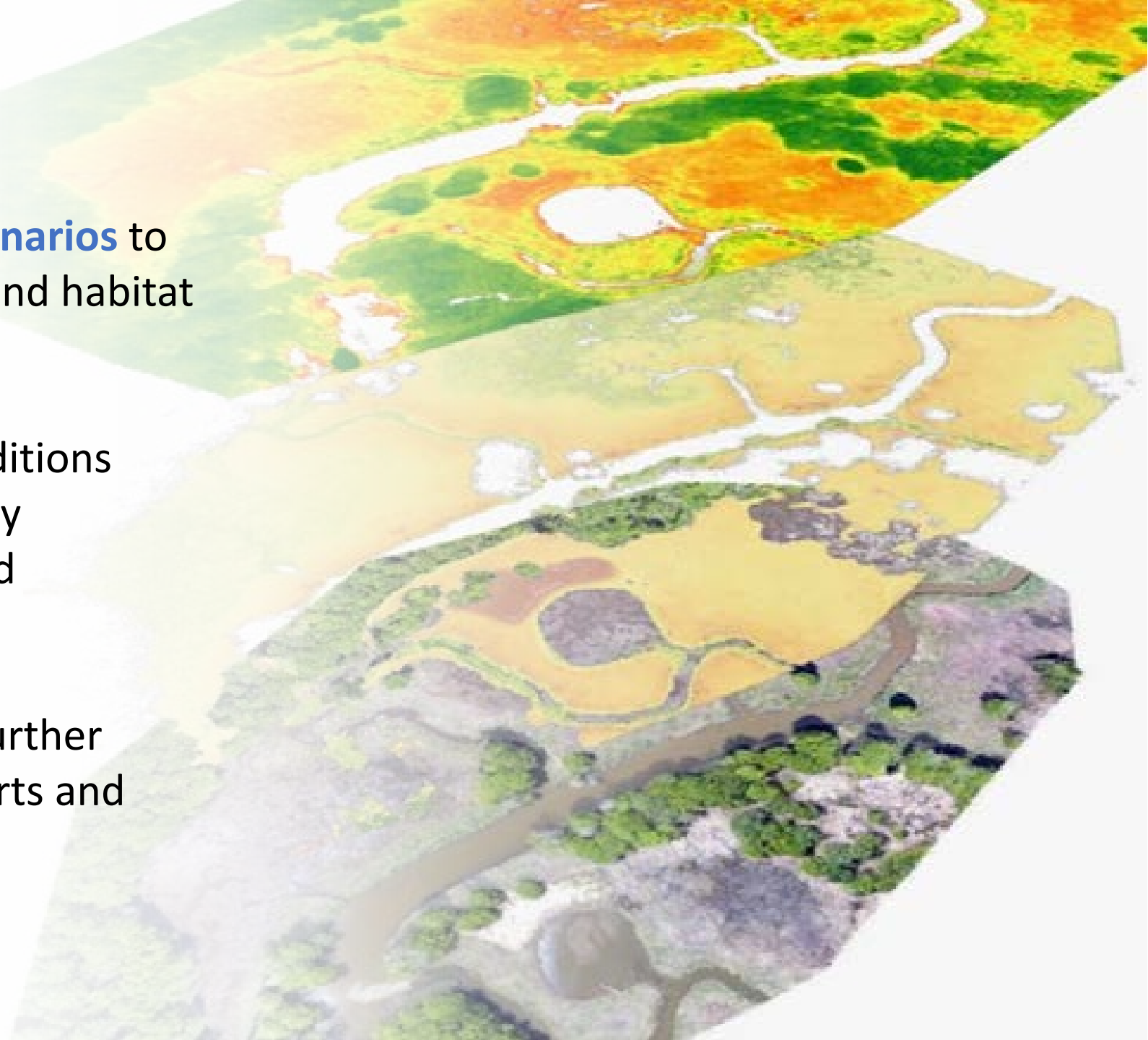
See SM2 2018 for details

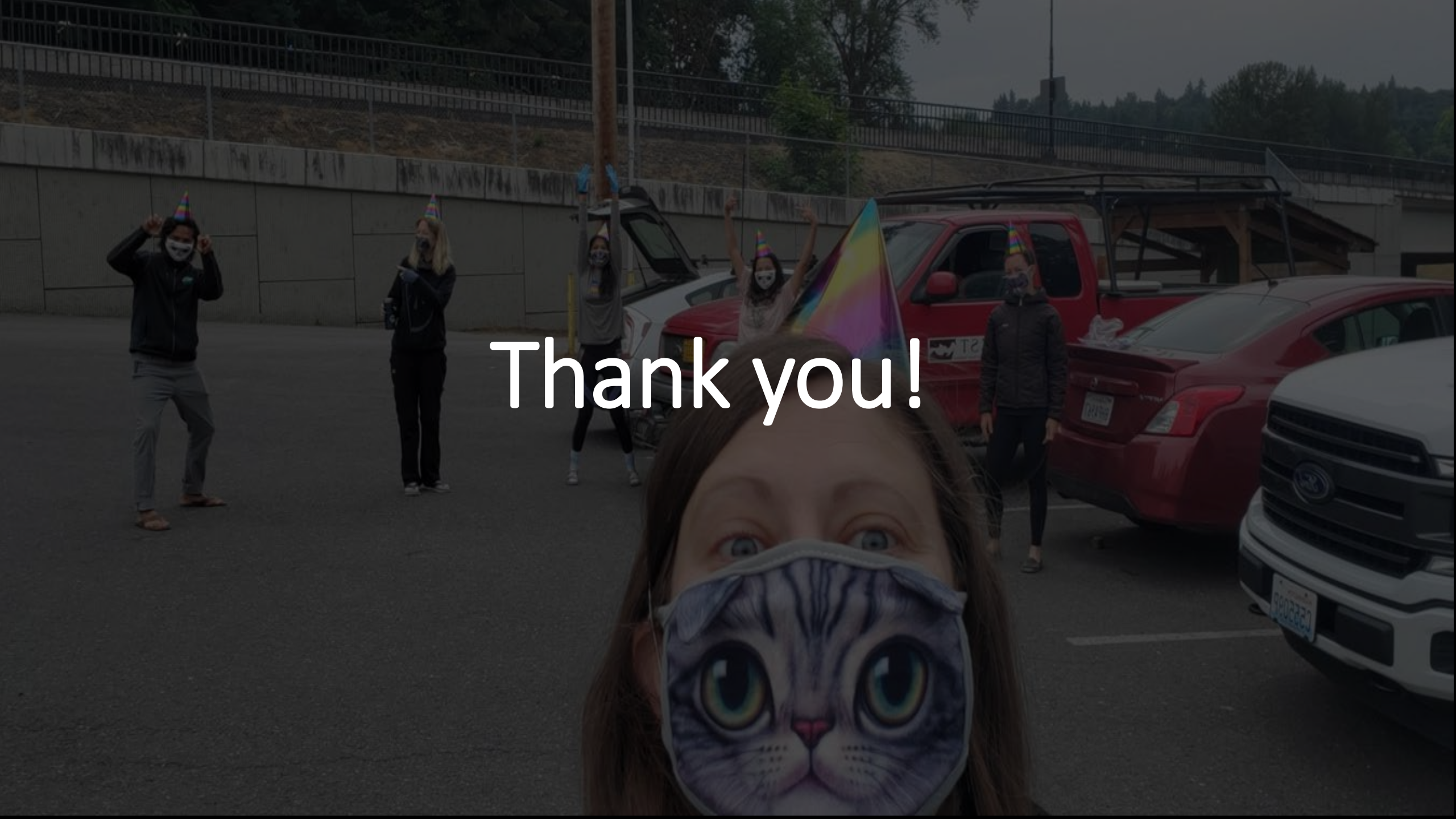
Next Steps:

-Use **Habitat Opportunity Scenarios** to define active floodplain/wetland habitat areas across each site

-Assess collective habitat conditions incorporating plant community composition, water depth, and temperature

-Utilize outcomes to predict further changes from restoration efforts and climate change




Thank you!

Action Effectiveness Monitoring Sites, 2019