The Utility of Tableau for Data Sharing and Analysis

May 13, 2025

Columbia River Estuary Conference

Ian Edgar (He/Him)
Derek Marquis (he/Him)
Sarah Kidd, PhD (She/Her)
Sneha Rao *(She/Her)*

Lower Columbia Estuary Partnership

Outline of Talk

- Program backgrounds
- What is Tableau?
- Data Sharing and Analysis
  - Vegetation Dashboard Example
- Conclusions and next steps

Monitoring – Program Level

Lower Columbia Estuary Partnership

Ecosystem Monitoring Program (EMP)

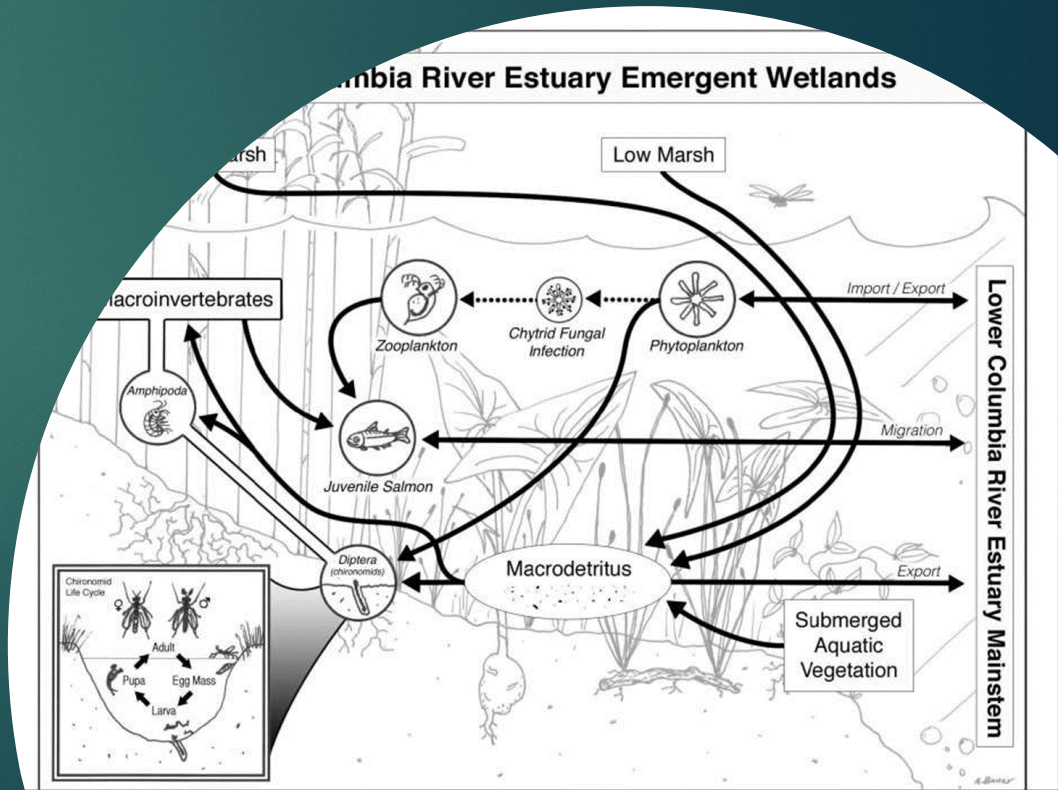
- Status and trends monitoring of ecosystem condition – suite of reference sites throughout the estuary

Action Effectiveness Monitoring & Research Program (AEMR)

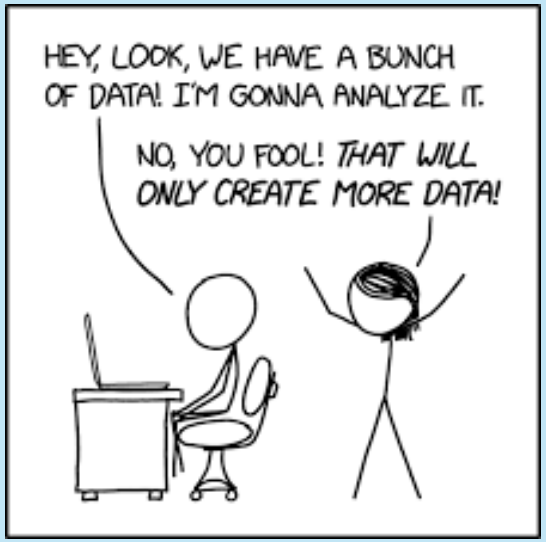
- Evaluation of restoration actions- if projects achieve the goals of the project, inform adaptive management

Overarching Goals

- Improve our understanding of the ecology of the estuary so we may continue to inform and improve our restoration and conservation efforts!



Need for a Proper Data-Sharing Management System



80+ Sites with over a decade of data

>10gb of non drone data.

>60tb of drone data

Habitat

Hydrology
- 10+ million datapoints

Sediment Accretion
- 10000+ datapoints

Food Web

Vegetation and Soil
- 10+ million datapoints

Biomass
- 70,000+ datapoints

Drone

LiDAR and high-res multispectral
- 2.7 cm pixels. 60 TB of data
- Veg classifications, habitat opportunity, etc

Animals

Macroinvertebrates
- 5,000+ datapoints

Fish
- 10,000+ datapoints

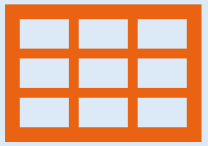
Others

Zooplankton

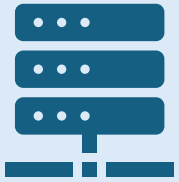
Isotope analyses

Nutrients

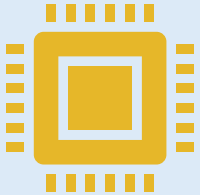
SOFTWARE OPTIONS AND CONSIDERATIONS



Excel



MS Access, mySQL, ArcPro, ArcCatalog - etc.



R, Python, MATLAB, SASS, Exploratory, etc.

Tableau

- **Data Limits** – What data limits are imposed (such as Excel's row limits)
- **Database Capacity** – Does it provide a structure for storing and connecting data?
- **Accessibility and Ease of Use** – How hard is it for someone to use?
- **QA/QC, Analysis, Visualization Capacity** – Can you edit/analyze/graph your data?
- **Mapping and Geospatial Analysis** – Can you make maps and geolocate your data?
- **Collaboration** – Easy to share with others? (Proprietary data formats? Software requirements?)
- **Online/Desktop Data Sharing** – How easy is it to access and present data – online data hosting?
- **Costs** - How expensive is the software? Does everyone need to purchase the software to collaborate?

SOFTWARE CONSIDERATIONS

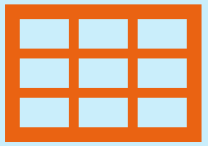
Data Limits, Challenges with Time Series Data

Excel

MS Access, mySQL, ArcPro, ArcCatalog - etc.

R, Python, MATLAB, SASS, Exploratory, etc.

SOFTWARE CONSIDERATIONS



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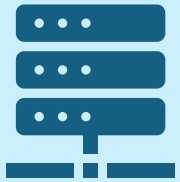
Data Limits, Challenges with Time Series Data



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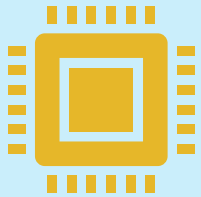
MS Access, mySQL, MongoDB – Great options but require substantial time and knowledge to set up well

Arc Products – While story maps exist, the program is best saved for specific geospatial analyses, not timeseries data



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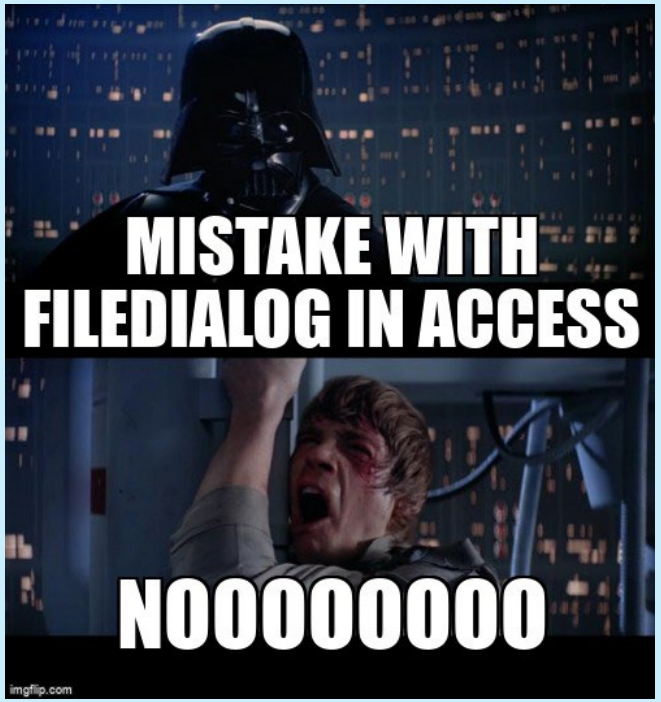

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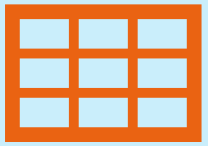

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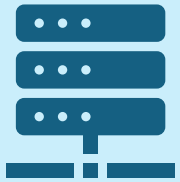

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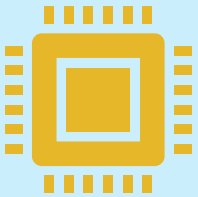


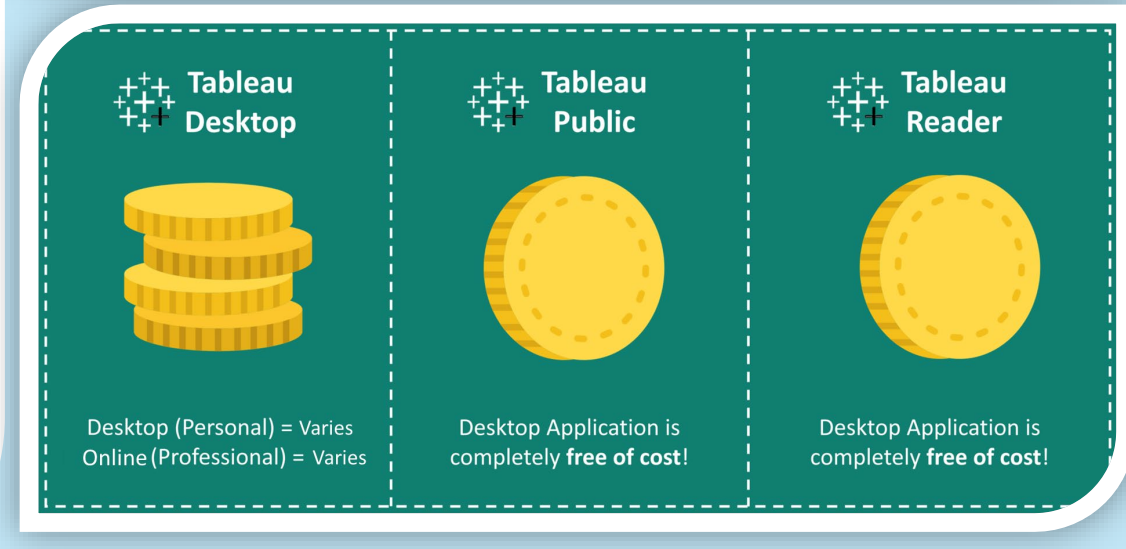
R, Python, MATLAB, SASS, Exploratory, etc.

Coding isn't for everyone

Tableau: Software Options and Considerations

- ✓ **No data limits**
- ✓ Use databases across multiple projects; no information repeating required
- ✓ **No required coding knowledge/ Low barrier for entry**
- ✓ Easy Data Visualization and Analysis - **Can import/use R and Python code** and pivot inside Tableau
- ✓ Includes **Geospatial** Data Management, **Mapping** and Analysis
- ✓ **Easy collaboration** and dissemination of results
- ✓ No Application Required (can be used via web browser)
- ✓ Cost: Varies – but can be **FREE for most collaborative needs**

More info: https://www.tableau.com/why-tableau/what-is-tableau



Vegetation Development Example

Based on AEMR report

Designed for Monitoring and Adaptive Management Plans (MAMP)

Vegetation Data Download

Action Guide:

1. Toggle the Project Name to the site of interest.
2. Next, adjust the date filter to the dates of interest.
3. Click "Download to Excel" to download the data.
4. Click "Return to Analysis Page" to return to the initial page.

Authors must be contacted before data use -- monitoring@estuarypartnership.org.

It may take a few minutes to download the information, depending on the size of the download. Try shortening the timespan or reducing the number of sites if you are running into issues downloading data.

Download to Excel

Return to Analysis Page

Project Name Common

- ○ Campbell Slough
- ○ Cunningham Lake
- ○ Daggett Point
- ○ Dibblee
- ○ Flight's End
- ○ Franz Lake
- ○ Ilwaco Slough
- ○ La Center Phase 2
- ○ La Center Wetlands
- ○ MCNA
- ○ North Unit Ph 1 Ruby
- ◉ Reed Island
- ◉ Steigerwald
- ○ Wallacut River
- ○ Wallooskee-Youngs
- ○ Welch Island
- ○ Whites Island

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All data are provisionary. While every effort has been made to ensure data accuracy, we take no responsibility for errors. If an error is found or suspected, please let us know and we will address it.

Vegetation data collected by LCEP 2017-present; PNNL 2008-2017
Data curated by I. Edgar and S. Kidd.

Suggested Data Citation: I. Edgar, D. Marquis, S. Kidd, S. Rao, M. Schwartz, C. Corbett, A. Borde; Ecosystem Monitoring Program and Action Effectiveness Monitoring and Research Level 2 Data. 2025. Prepared by the Lower Columbia Estuary Partnership for the Bonneville Power Administration. Available from the Lower Columbia Estuary Partnership, Portland, OR and for download through Tableau Public.

Methods citation: Kidd, S., I. Edgar, S. Rao, A. Silva. 2023. Chapter 5.1 Plant Community Monitoring for Tracking Detailed Plant Species Composition. In: Protocols for Monitoring Juvenile Salmonid Habitats in the Lower Columbia River Estuary. Edited by Kidd, S., I. Edgar, S. Rao, and A. Silva, pp. 86-91. https://www.estuarypartnership.org/our-work/monitoring

Lower Columbia Estuary Partnership

Vegetation Development

Click here to download data

Vegetation Transect Locations

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- ☐ Cunningham Lake
- ☐ Daggett Point
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- ☐ Dibblee Slough
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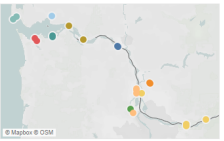
- ☐ Ilwaco Slough
- ☐ John R Palensky
- ☐ Kandoll Farm
- ☐ La Center Phase 2
- ☐ La Center Wetlands
- ☐ MCNA
- ☐ North Unit Ph 1 Ruby
- ☐ North Unit Ph 2 Millionaire
- ☐ North Unit Ph 2 Widgeon
- ☑ Reed Island
- ☐ Sandy R Delta (dam)
- ☐ Steamboat Slough
- ☑ Steigerwald
- ☐ Wallacut River
- ☐ Wallooskee-Youngs
- ☐ Welch Island
- ☐ Whites Island

Site Locations



Action Effectiveness Group

- Dibblee
- Kandoll
- La Center
- North Unit
- Palensky
- Sandy River
- Steamboat
- Steigerwald
- Svenson
- Wallacut
- Wallooskee

Summary: At each site, we surveyed vegetation cover and composition to assess changes to habitat structure related to restoration actions. Vegetation cover and composition is an indicator of the production of organic matter and the detritus produced by decaying vegetation forms the base of the food web for many species in the lower Columbia River and estuary (Borde et al. 2010, Maier and Simenstad 2009). Vegetation plot elevation was recorded to track the effectiveness of lowering marsh elevations (i.e., soil scrape down) to control invasive vegetation, track local hydrology, and promote native plant species growth. In general, at each restoration site, two vegetation monitoring areas are established – one in an area directly impacted by restoration actions (e.g., Palensky Snipe Lake - PSL) and one in an area indirectly impacted by restoration actions (e.g., Palensky Bur Reed Lake - PBRL). Two vegetation sampling areas provide an overview of overall site condition pre- and post-restoration. The data is generally paired with a nearby un-impacted reference site (e.g., MCNA).

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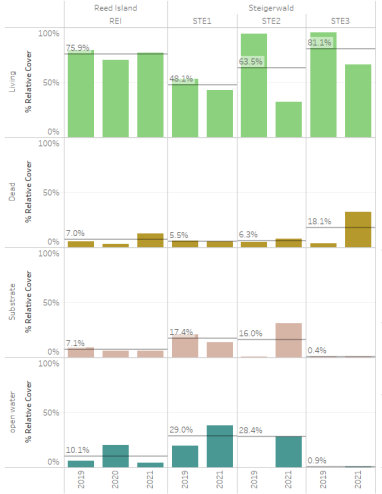
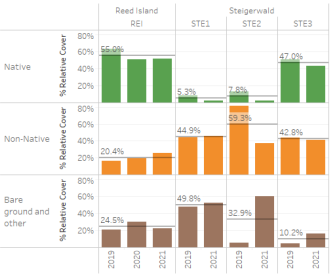
Reed Island & Steigerwald Relative Cover by Habitat Type



Reed Island & Steigerwald Relative Cover By Native Status



Reed Island & Steigerwald Relative Cover by Species and Status - Organized by Paired Mean % Abundance across Restoration and Reference Site

		Average	2019 Reed Island REI	2019 Steigerwald STE1	2019 Steigerwald STE2	2019 Steigerwald STE3	2020 Reed Island REI	2021 Reed Island REI	2021 Steigerwald STE1	2021 Steigerwald STE2	2021 Steigerwald STE3
Phalaris arundinacea	Reed canary grass	28.0%	15.0%	41.0%	57.1%	37.5%	16.7%	24.6%	41.3%	24.4%	34.8%
open water	open water	12.1%	6.3%	19.9%			20.8%	4.1%	38.1%	28.4%	0.9%
bare ground	bare ground	9.2%	9.1%	21.0%	0.7%	0.5%	6.3%	6.2%	13.8%	31.1%	0.3%
Eleocharis palustris	Common spikerush	9.1%	15.2%			2.4%	14.8%	19.1%			
detritus	detritus	6.0%	5.3%	5.8%	5.0%	3.8%	2.8%	12.5%	0.3%	0.2%	14.0%
Leersia oryzoides	Rice cutgrass	4.9%	11.3%			0.2%	9.2%	5.7%	0.0%		1.2%
Polygonum amphibium	water ladysthumb, wat.	3.3%			0.0%	23.9%	0.1%				20.3%
Ludwigia palustris	False loosestrife	2.9%		0.7%	1.9%	19.9%	0.1%	0.1%			16.9%
Carex lyngbyei	Lyngby sedge	2.8%	3.7%				7.0%	4.9%			
Juncus oxymeris	Pointed rush	2.4%	5.6%				4.2%	3.3%			
Sagittaria latifolia	Wapato	2.1%	3.4%	0.1%			4.7%	3.4%			
Lotus corniculatus	Birdsfoot trefoil	1.6%	0.1%	1.0%	9.6%	1.5%	0.1%	0.0%	0.8%	7.2%	0.8%
Equisetum palustre	marsh horsetail	1.4%	4.0%				2.9%	0.6%			
Agrostis exarata	spike bentgrass	1.3%						7.0%			
Polygonum hydropiper, P. hy...	Waterpepper, mild wat...	1.1%	1.0%			6.7%	1.0%				6.0%

Table Legend

- Native
- Non-Native
- Bare ground and other
- Unknown

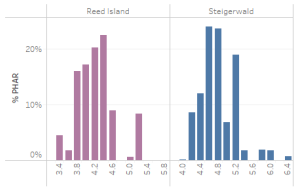
Year for Histogram → 2019

Show history

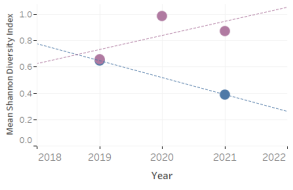
Site Name →

- Reed Island
- Steigerwald

Percent Reed Canarygrass by Elevation Band; 2019



Shannon Diversity Graph - Reed Island & Steigerwald

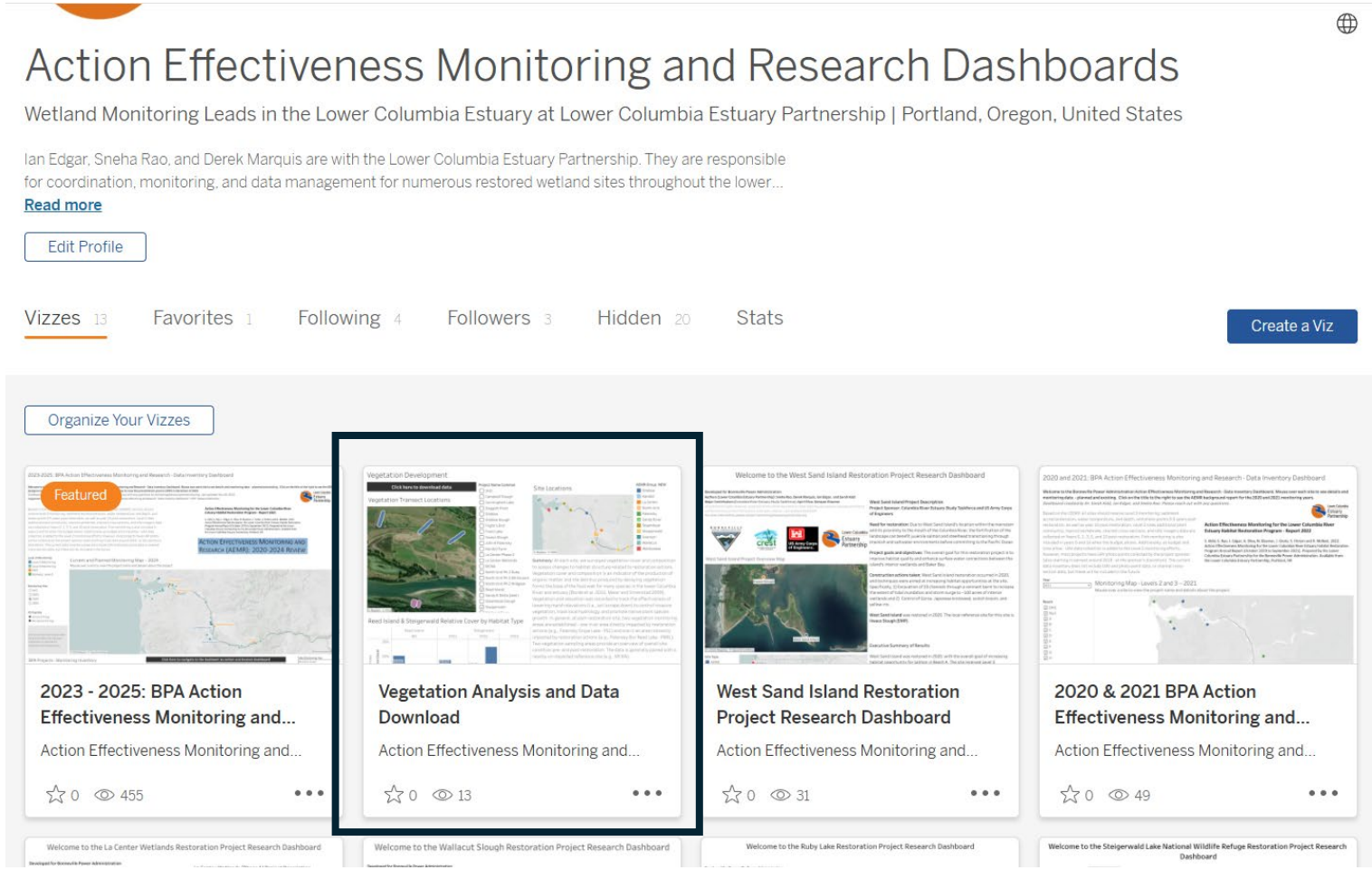


Developed for Bonneville Power Administration

Authors (Lower Columbia Estuary Partnership):Ian Edgar, Derek Marquis, Sarah Kidd, Sneha Rao

Lower Columbia Estuary Partnership

Tableau Public



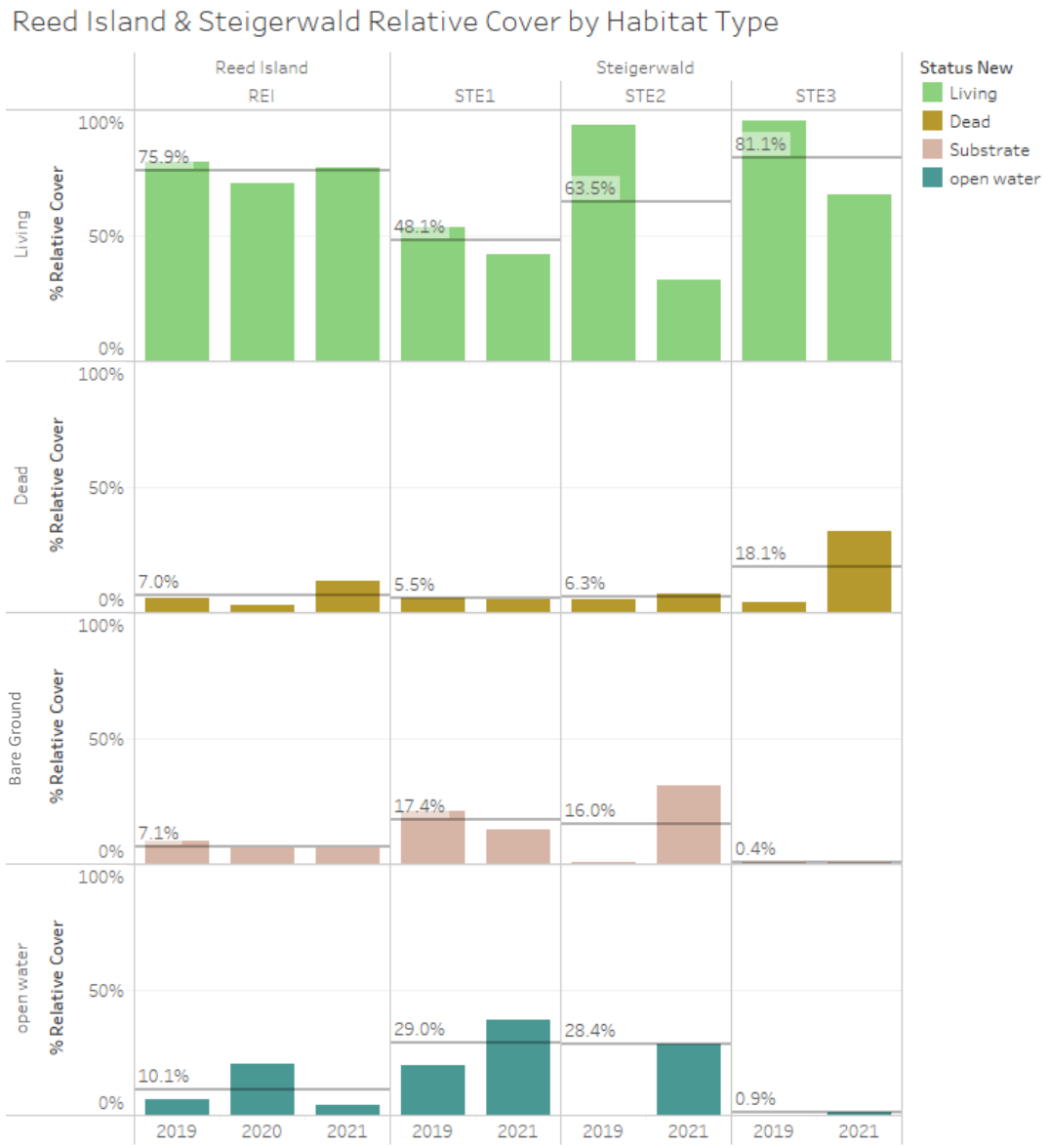
https://public.tableau.com/app/profile/aemr.epmonitoring/vizzes

AEMR Analyses

Relative Cover by Living, Dead, bare ground, open water

Key metric for restoration success

Was the restoration action successful?

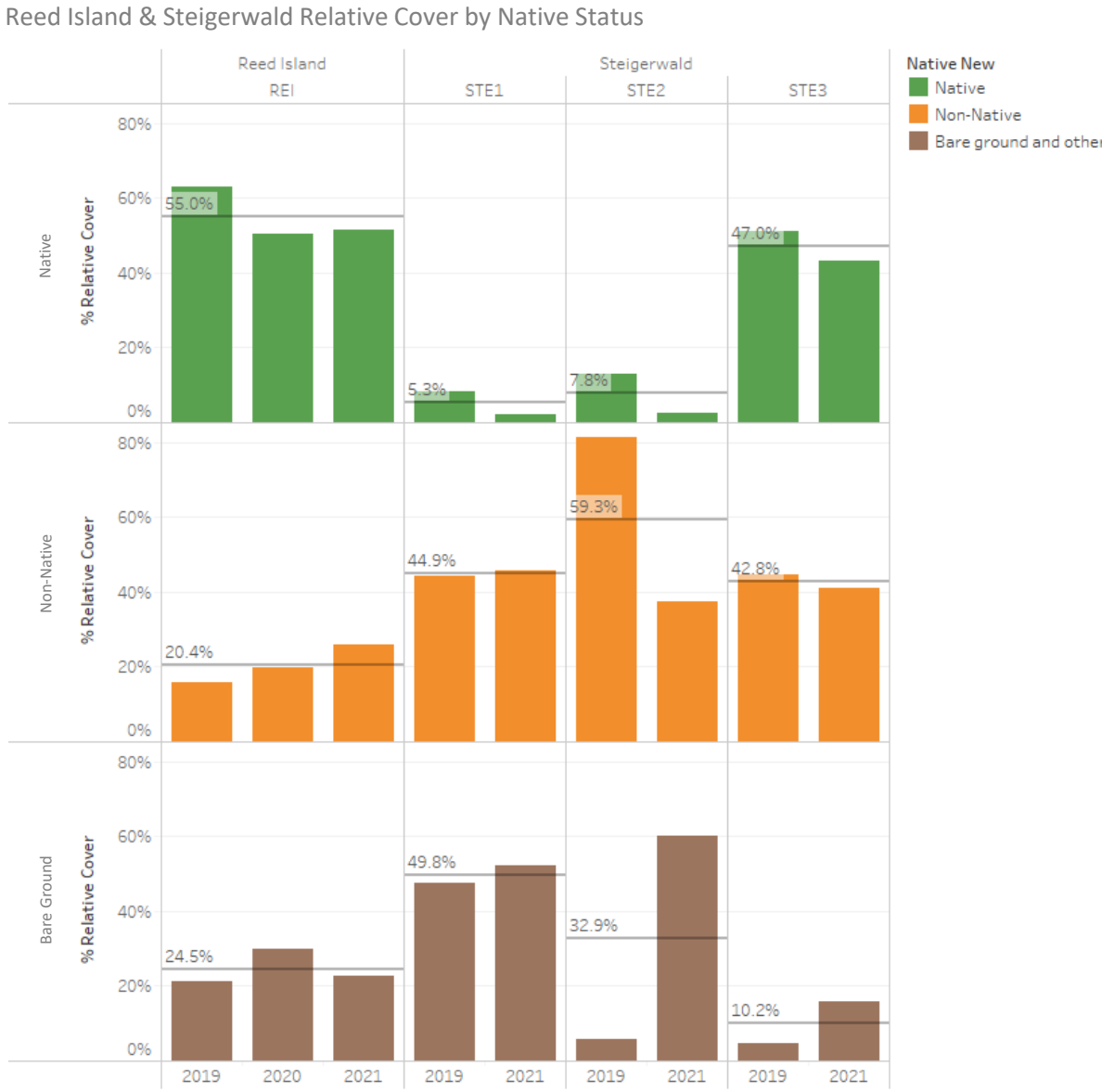


AEMR Analyses

Relative Cover of Native, Non-Native, and bare ground

Key metric for healthy vegetation habitat.

Is adaptive management needed?



Reed Island & Steigerwald Relative Cover by Species and Status - Organized by Paired Mean % Abunc

Reference Site

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			Reed Island	Steigerwald			Reed Island	
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AEMR Analyses

Relative Cover of each species

Vegetation species list

What species are at each site?

Vegetation Analysis and Data Download by Action Effectiveness Monitoring and Research Dashboards

Vegetation Development

Click here to download data

Vegetation Transect Locations

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- [ ] Cunningham Lake
- [ ] Daggett Point
- [ ] Dibblee
- [ ] Dibblee Slough
- [ ] Flight's End
- [ ] Franz Lake
- [ ] Ilwaco Slough
- [ ] John R Palensky
- [ ] Kandoll Farm
- [ ] La Center Phase 2
- [ ] La Center Wetlands
- [ ] MCNA
- [ ] North Unit Ph 1 Ruby
- [ ] North Unit Ph 2 Million...
- [ ] North Unit Ph 2 Widge...
- [x] Reed Island
- [ ] Sandy R Delta (dam)
- [ ] Steamboat Slough
- [x] Steigerwald

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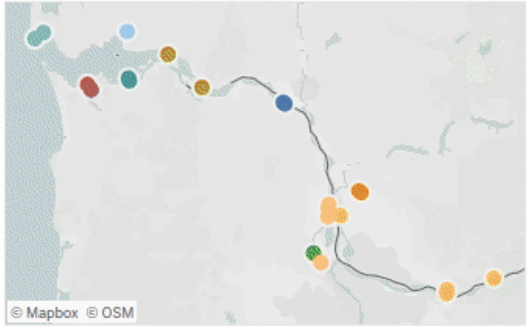

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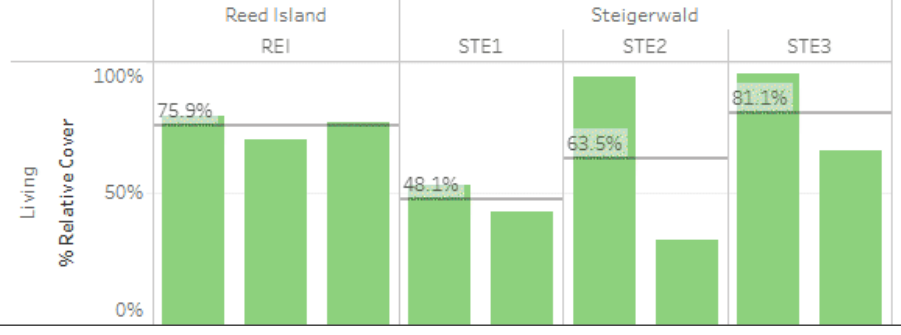
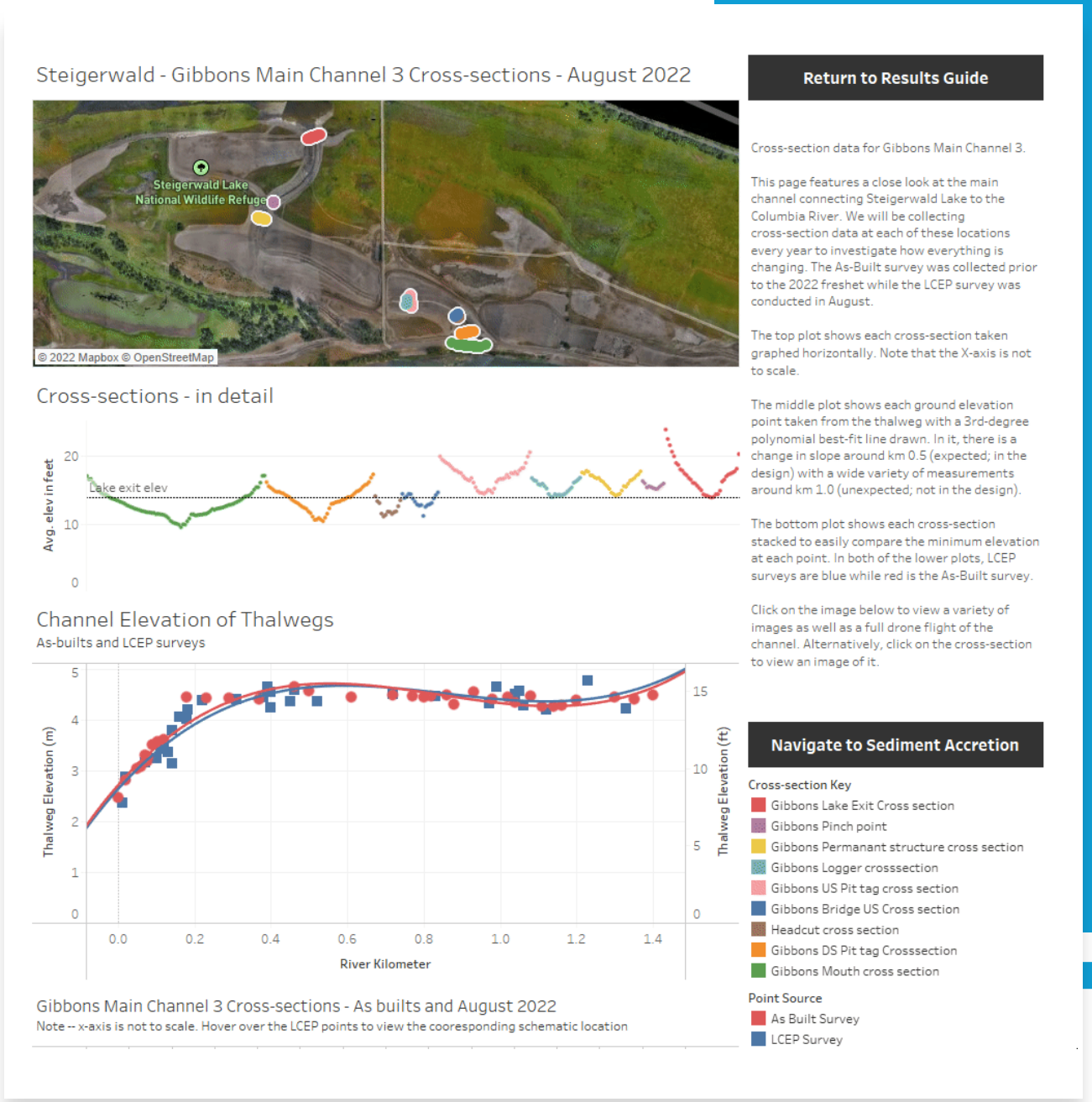
Reed Island & Steigerwald Relative Cover by Habitat Type



Methods for data collection can be found here: Kidd, S., I. Edgar, S. Rao, and A.

Explore for yourself

- Hydrographs
- Habitat Accessibility
- Soil Chemistry
- Sediment accretion
- Vegetation data
- Site specific AEMR reports
- Coming soon: cross sections, LiDAR-based habitat access, UAV-based Vegetation models, direct Monitoring and Adaptive Management Plan crosswalks



RESEARCH PARTNERS

THANK YOU

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

Bonneville Power Administration

Washington Department of Fish and Wildlife

OHSU

Cowlitz Indian Tribe

Columbia Land Trust

Oregon Fish & Wildlife

crest Columbia River Estuary Study Taskforce

University of Washington 1861

U.S. Fish & Wildlife Service

Pacific Northwest National Laboratory

Schott & Associates, Inc.

Institute for Applied Ecology

Fun in the field, I. Edgar, S. Kidd, S. Rao, D. Marquis, ongoing