eDNA Explorer

UX Marks the Spot: Exploring the eDNA visualizations that activate biodiversity action

Mission: Make eDNA **easy, accurate & actionable**

Run a study

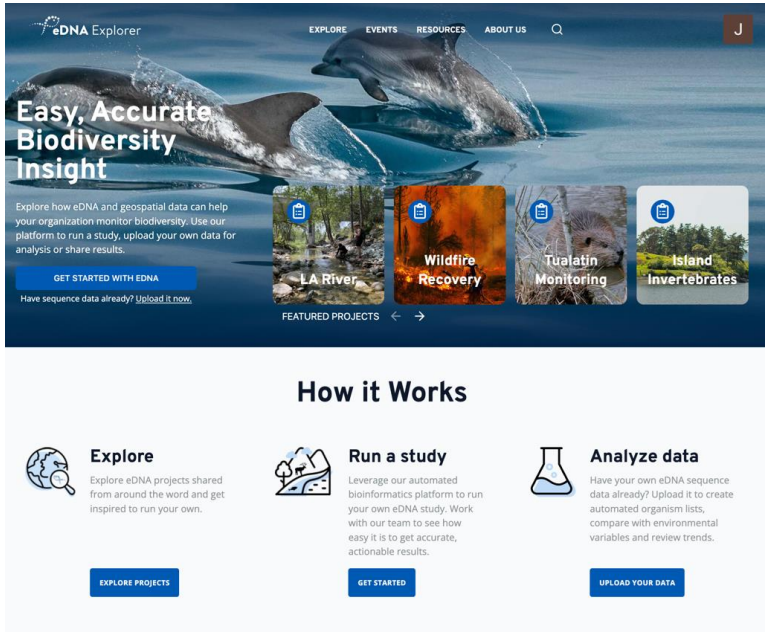
Help anyone easily **run eDNA project from planning to analysis** using our cloud platform.

Analyze results

Review easy-to understand **actionable insights** that **integrate eDNA and geospatial data** and facilitate collaboration.

Explore projects

Explore **eDNA projects from around the world** and download data and download data to complement your own research.



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Founding Team

Science + User Experience + Technology Expertise

Julie Stanford, CEO

Principal, Sliced Bread Design
Lecturer, Stanford Computer Science
Expert in user research, design, and tech innovation.

Rachel Meyer, CSO

Assistant Professor, UC Santa Cruz.
Director of CALeDNA
Expert in genomics, evolution, bioethics and eDNA.

Jim Jeffers, CTO

Founder, Sumo Creations Dev and Design
Full stack engineer and architecture specialist.

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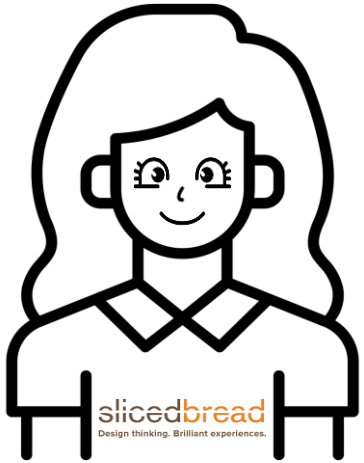
4 years ago...



What are the blockers to eDNA adoption and impact?

oceankind

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Three networks

life

people

methods

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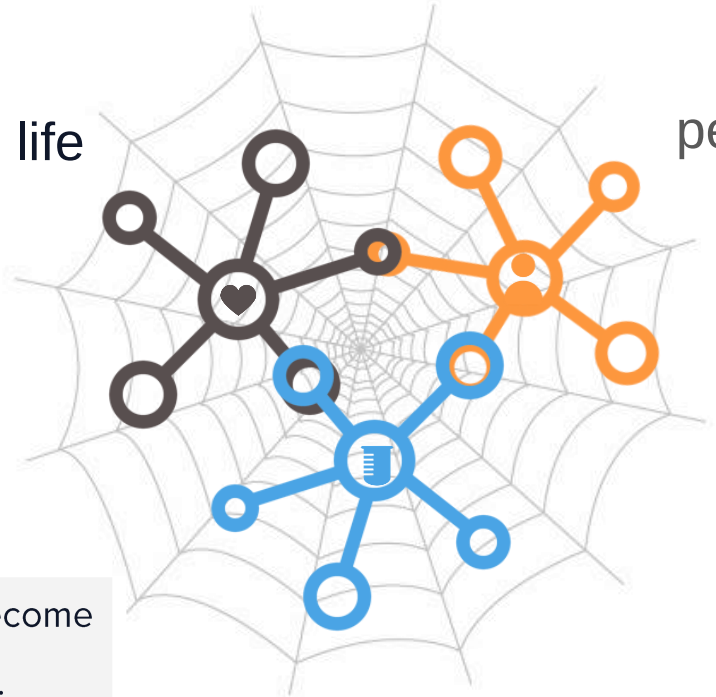
How can eDNA connect in?

How might eDNA help inform understanding and conservation?



How might we cross-pollinate and spread knowledge about what eDNA is and what it's good for?

How might eDNA become an accessible complement to existing methods?

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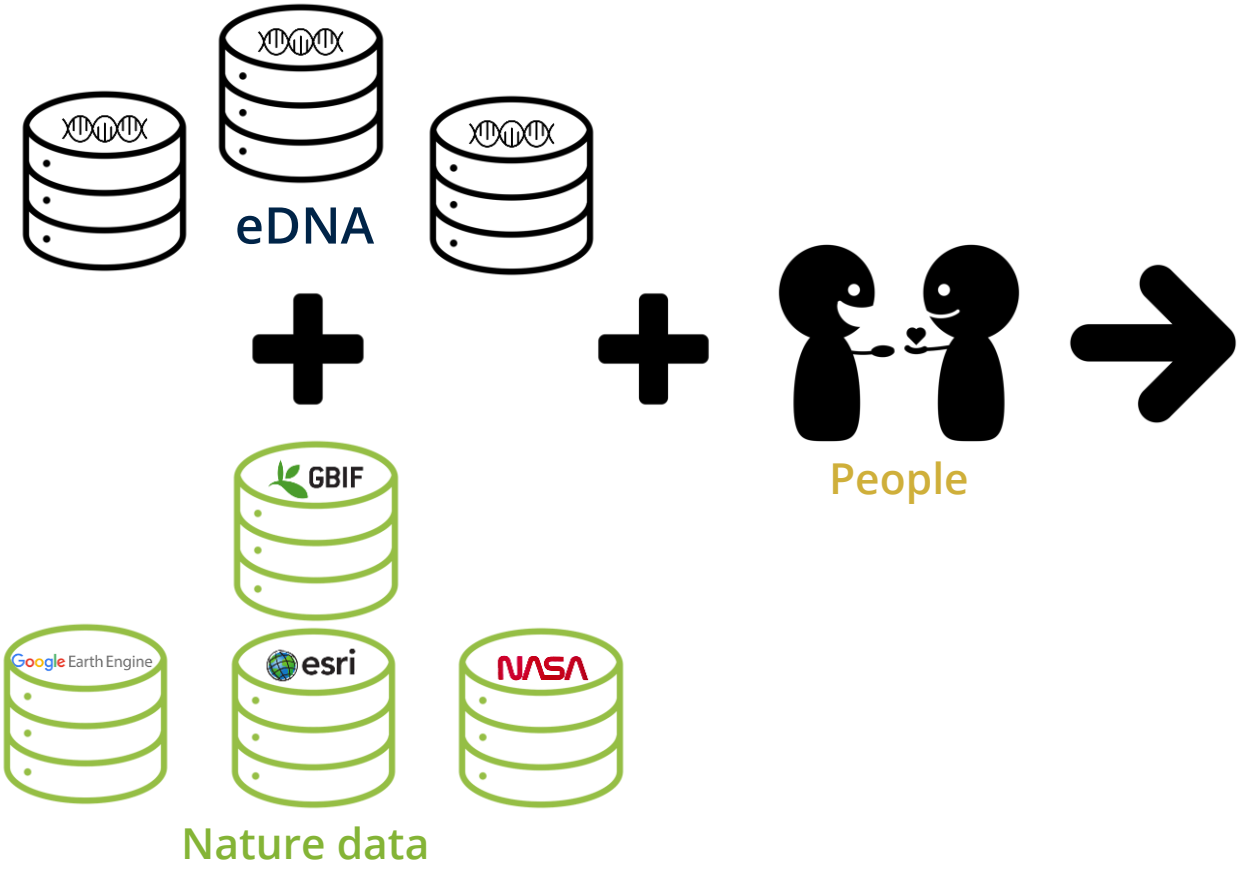
Big idea: **Interoperable, integrated, shareable, well designed platform**



- **INFORMATION** not data
- **Assess ecosystem health** eDNA integrated metrics
- Identify **environmental drivers**
- **Advise** on most effective nature-based solutions
- **Improve eDNA accuracy**

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V1: Focus on basic familiar visualizations for researchers

From our research: **User's key questions**

Who is in there now, and who was in there before?

- Who is or isn't in the system, where they are at different times
- Monitor invasives and endangered species
- Monitor complex systems

What's been changing over time?

- Biomonitoring at dedicated sites over a regular, long period
- Prioritize areas to monitor/conserve and what decisions to make about restoration

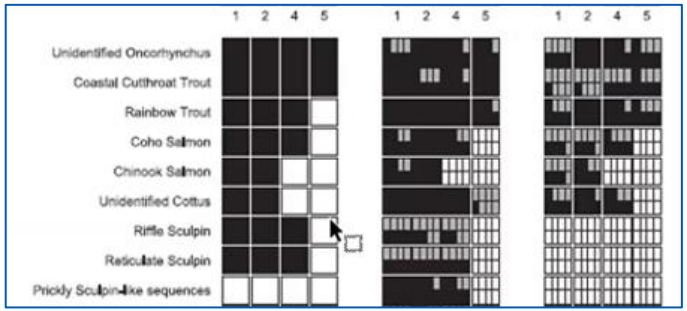
How are things connected?

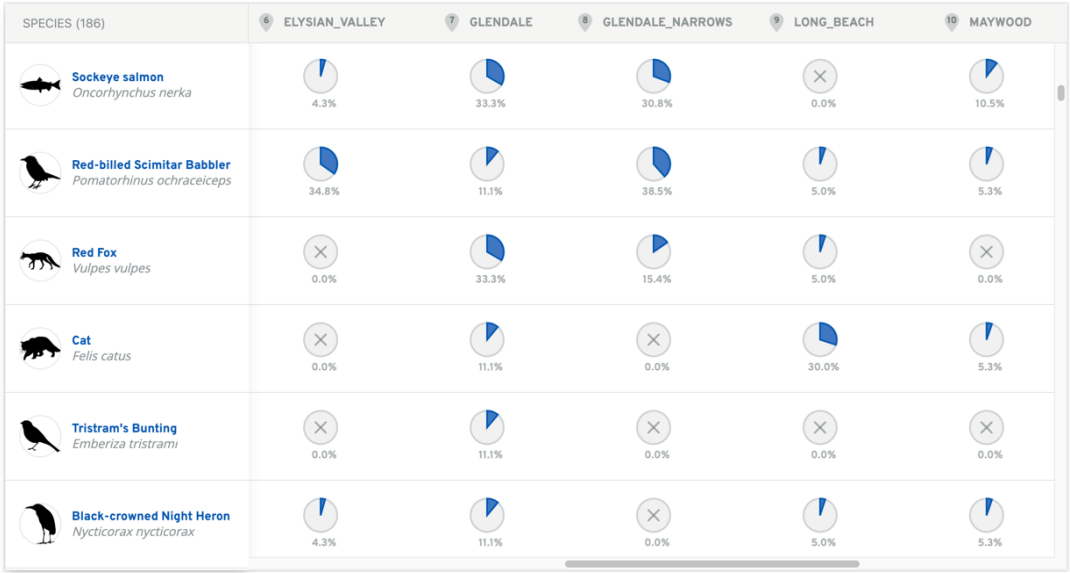
- Monitor the network of species
- How things are connected to explain why something is happening
- Be on the lookout for the unexpected - it's exciting and daunting

Species presence/absence charts: Who's in there?

Presence by Site or Sample Chart on eDNA Explorer

Example from our original study





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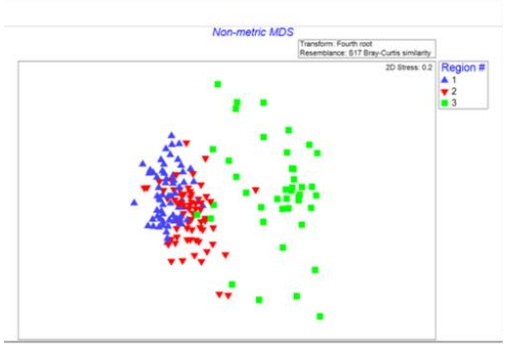
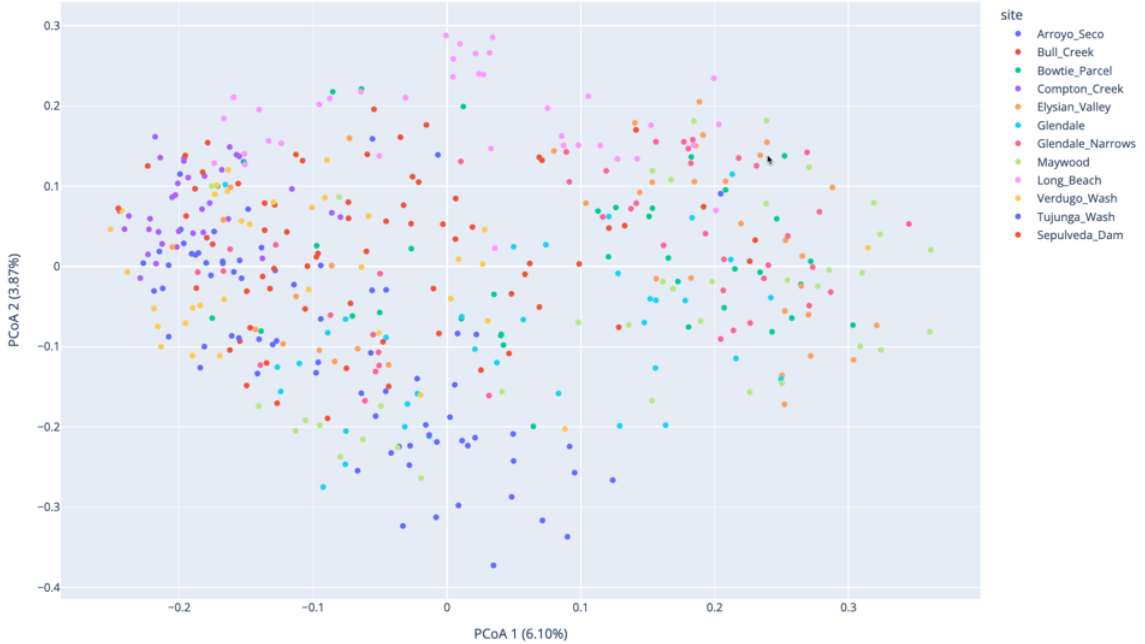
Ordination charts: How are things connected?

Example from original study: Patterns in community structure using Bray Curtis



Beta Diversity by site on a PCA plot on eDNA Explorer



PCA plot. Results of PERMANOVA, using 999 permutations. jaccard beta diversity and site Sample size: 440. Number of groups: 12. Test statistic (pseudo-F): 5.305. p-value: 0.001

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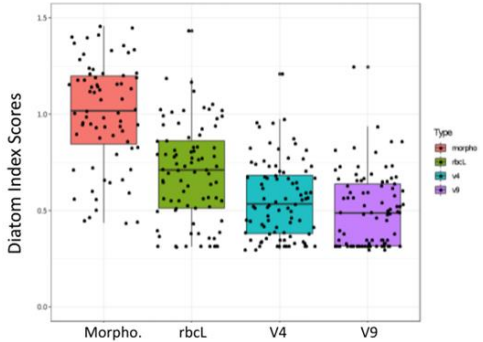
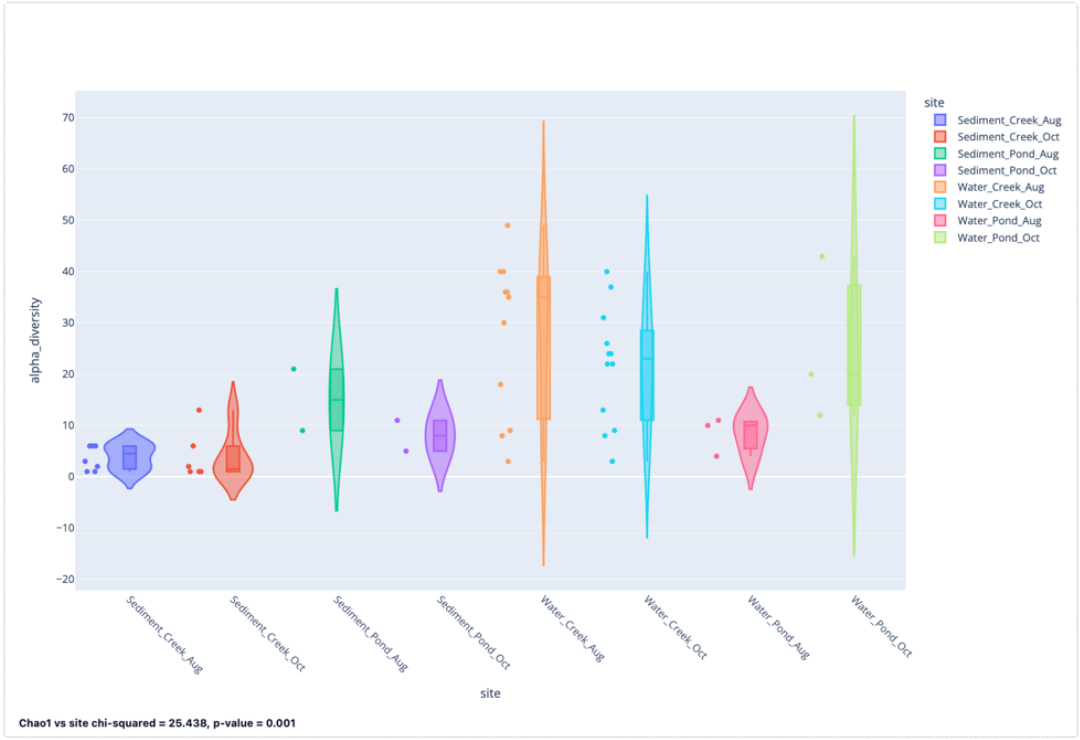
Box plots for index scores: What is happening?

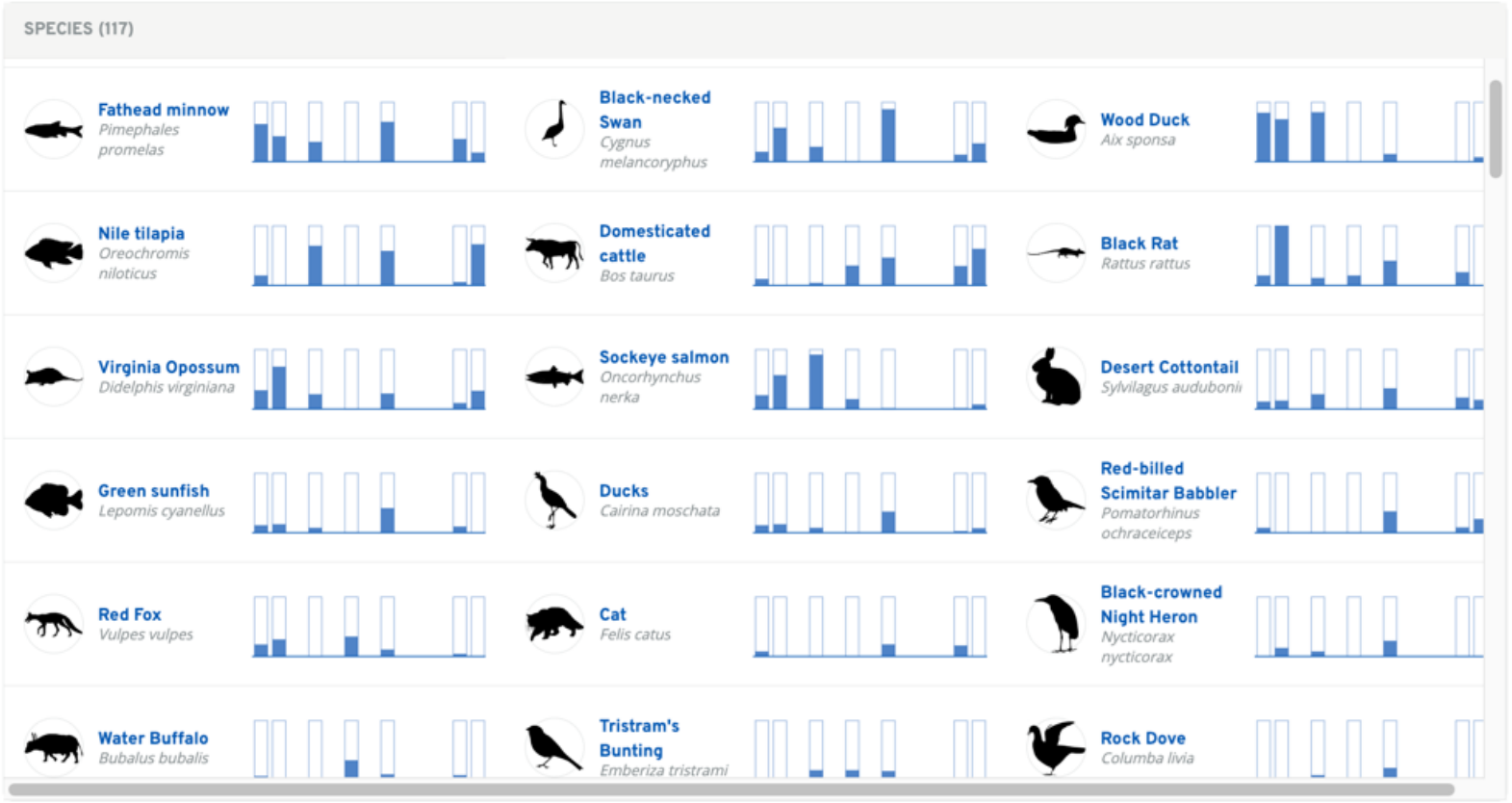
Box plots for Alpha Diversity index scores: sediment vs. water for different locations / sample dates

Example from original study: Box plots for diatom index scores





What's been changing over time?



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Familiar does not equal effective

Familiar charts are a good first step

They are not really answering the questions for managers and researchers

What did we miss?

Time to review our original research and the 50+ people we have spoken to since launching the site.

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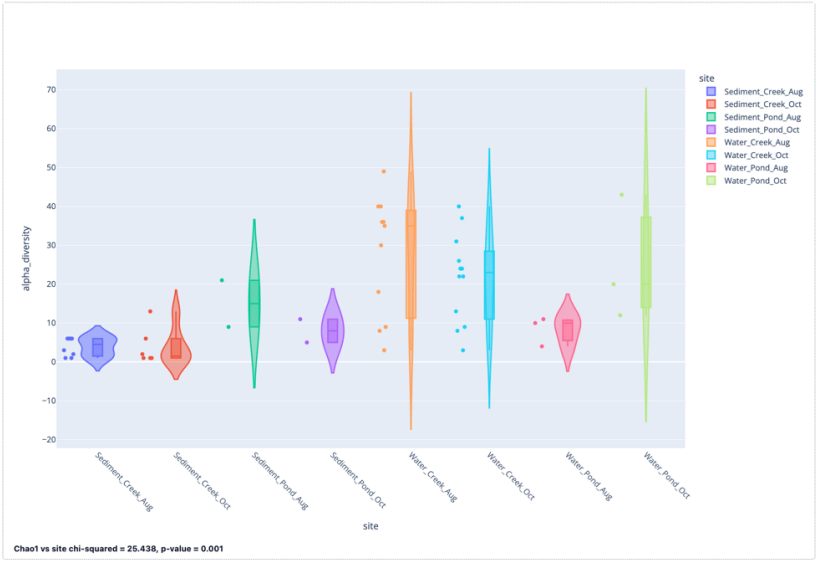
V2: What should we focus on to help researchers AND managers actually answer their questions with eDNA?

#1
Location, Location, Location

#1 Location, Location, Location

People care about the habitats at their specific location

- Managers wonder: “**Where should we focus our energy in the short term** to preserve the long-term?”
- Organisms don’t exist without a place.



How might we integrate maps more effectively into analysis charts *beyond species distribution?*

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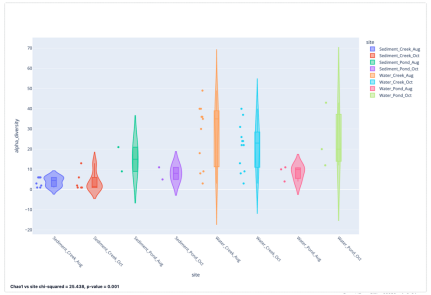
Alpha diversity heat map by location



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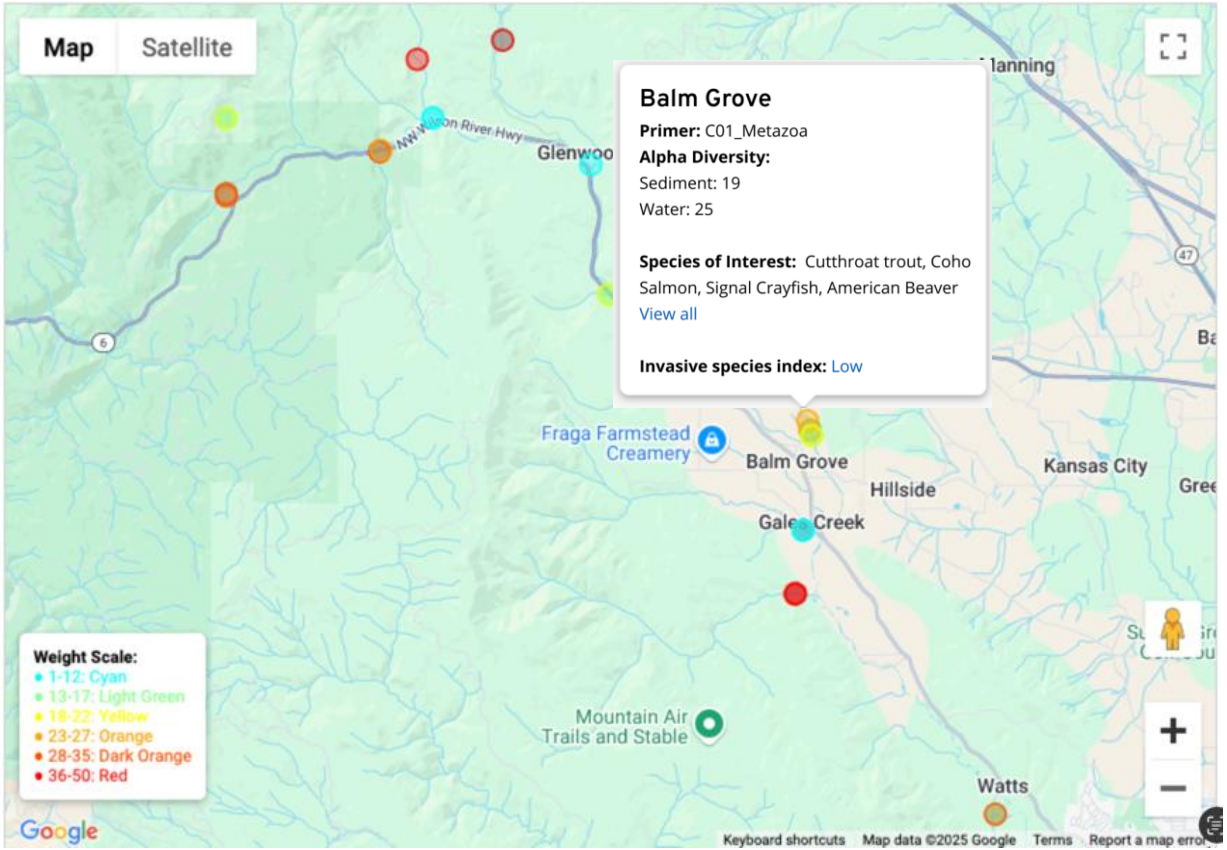
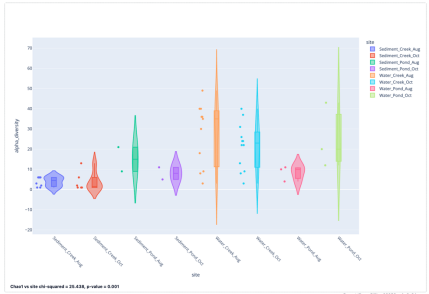
Pop-ups to integrate species of interest





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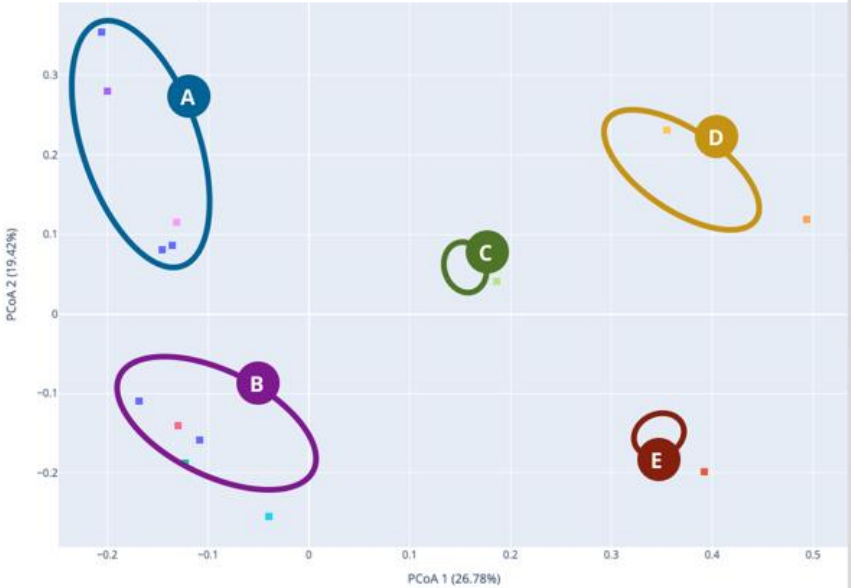
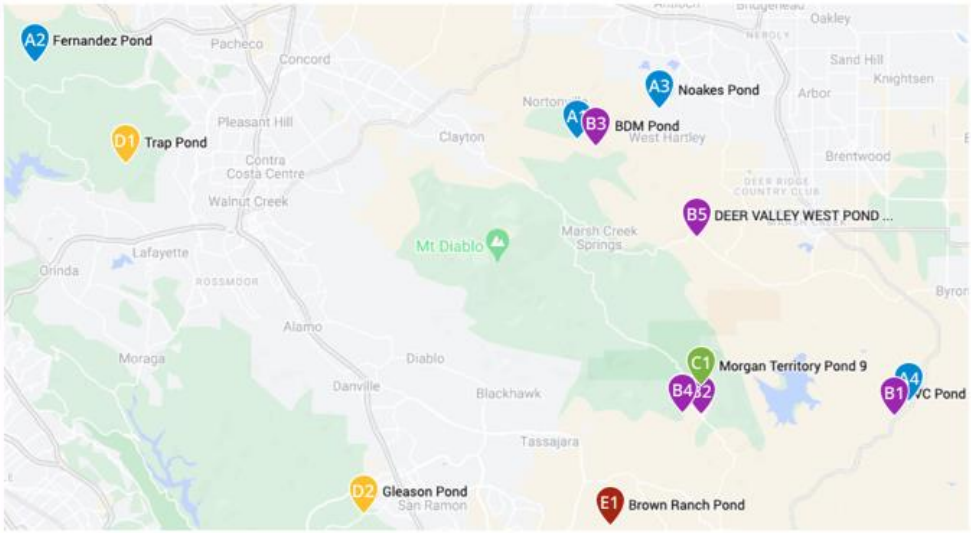
PCoA Chart by Location: Sites with similar communities fom clusters.



Key: Sites

- BDM Pond
- Brown Ranch Pond
- Deer Valley West Pond MC-5
- Fernandez Pond
- Gleason Pond
- Morgan Territory Pond 7
- Morgan Territory Pond 8
- Morgan Territory Pond 9
- Noakes Pond
- Trap Pond
- VC Pond

Map: Sites in the same cluster are the same color below.

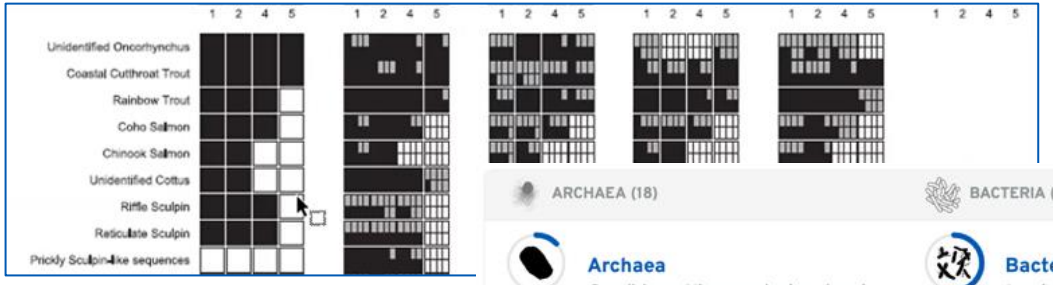


Key: Clusters of sites

- A1 BDM Pond
- A2 Fernandez Pond
- A3 Noakes Pond
- A4 VC Pond
- D1 Trap Pond
- D2 Gleason Pond
- B1 VC Pond
- B2 Morgan Territory Pond 8
- B3 BDM Pond
- B4 Morgan Territory Pond 7
- B5 DEER VALLEY WEST POND MC-5
- C1 Morgan Territory Pond 9
- E1 Brown Ranch Pond

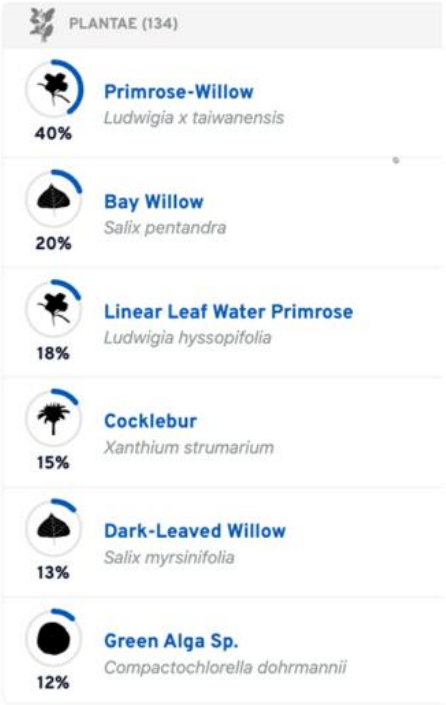
#2
Cut through the Clutter

#2 Cut through the clutter



ARCHAEA (18)	BACTERIA (1330)	CHROMISTA (29)	FUN
13% **Archaea** *Candidatus Nitrosopelagicus brevis*	49% **Bacteria** *Luteitalea pratensis*	23% **Amphora** *Amphora ovalis*	1%
3% **Archaea** *Methanoregula formicica*	48% **Γ-Proteobacteria** *Sulfurisoma sediminicola*	15% **Cymatopleura** *Cymatopleura solea*	0%
3% **Archaea** *Candidatus Giganthauma karukerense*	44% **Bacteria** *Verrucomicrobium sp. IMCC25901*	7% **Diatom** *Phaeodactylum tricornutum*	0%
3% **Archaea** *Methanosarcina sp.*	41% **Bacteria** *Oligoflexus tunisiensis*	7% **Diatom** *Melosira varians*	0%
2% **Archaea** *Methanobrevibacter smithii*	40% **Γ-Proteobacteria** *Dechloromonas sp.*	6% **Yellow-Green Algae** *Nannochloropsis oceanica*	0%
Archaea *Methanospirillum psychrodurum*	**A-Proteobacteria** *Beijerinckia sp. URHD0026*	**Yellow-Green Algae** *Trachydiscus minutus*	

Iluminate species of interest



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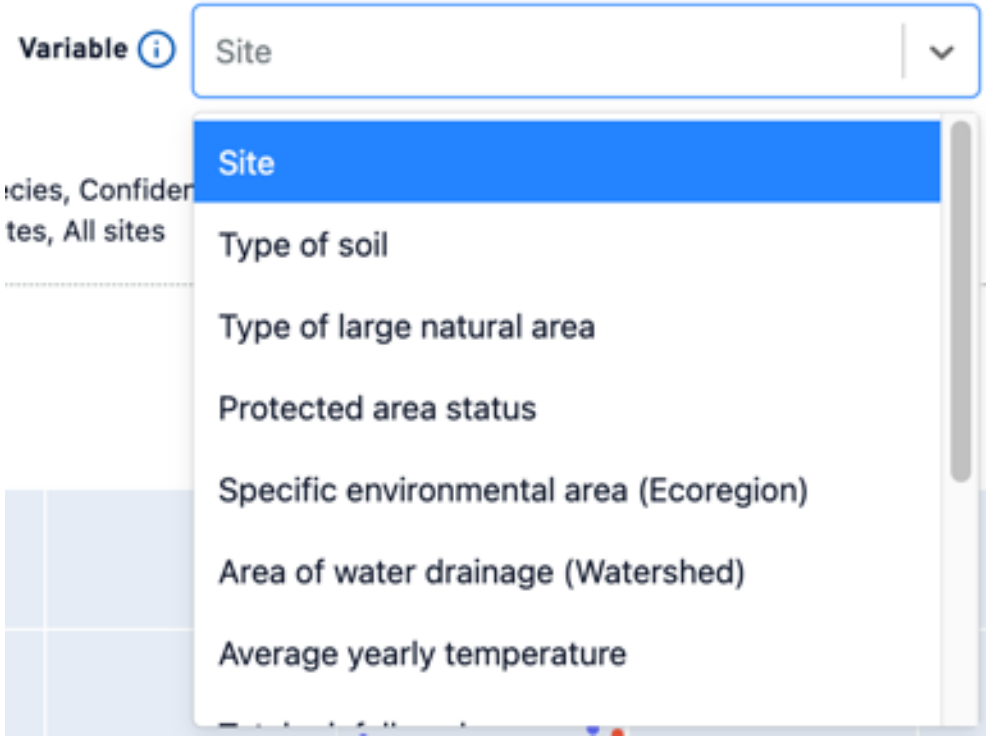
So many geospatial variables...



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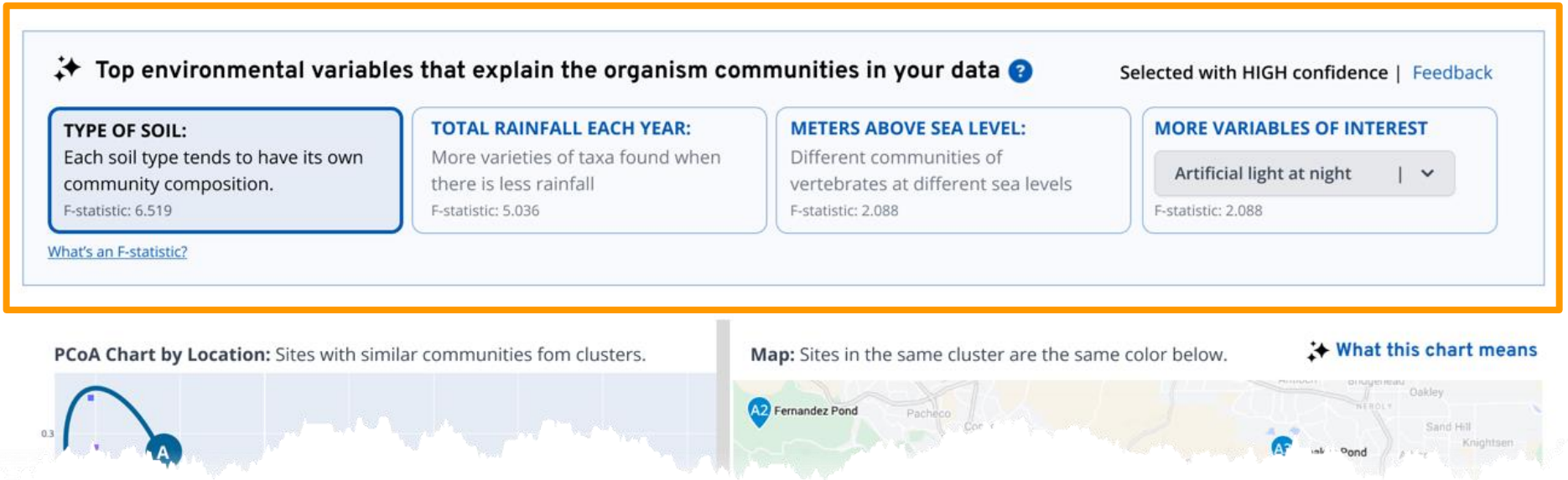
Prioritize the interesting variables



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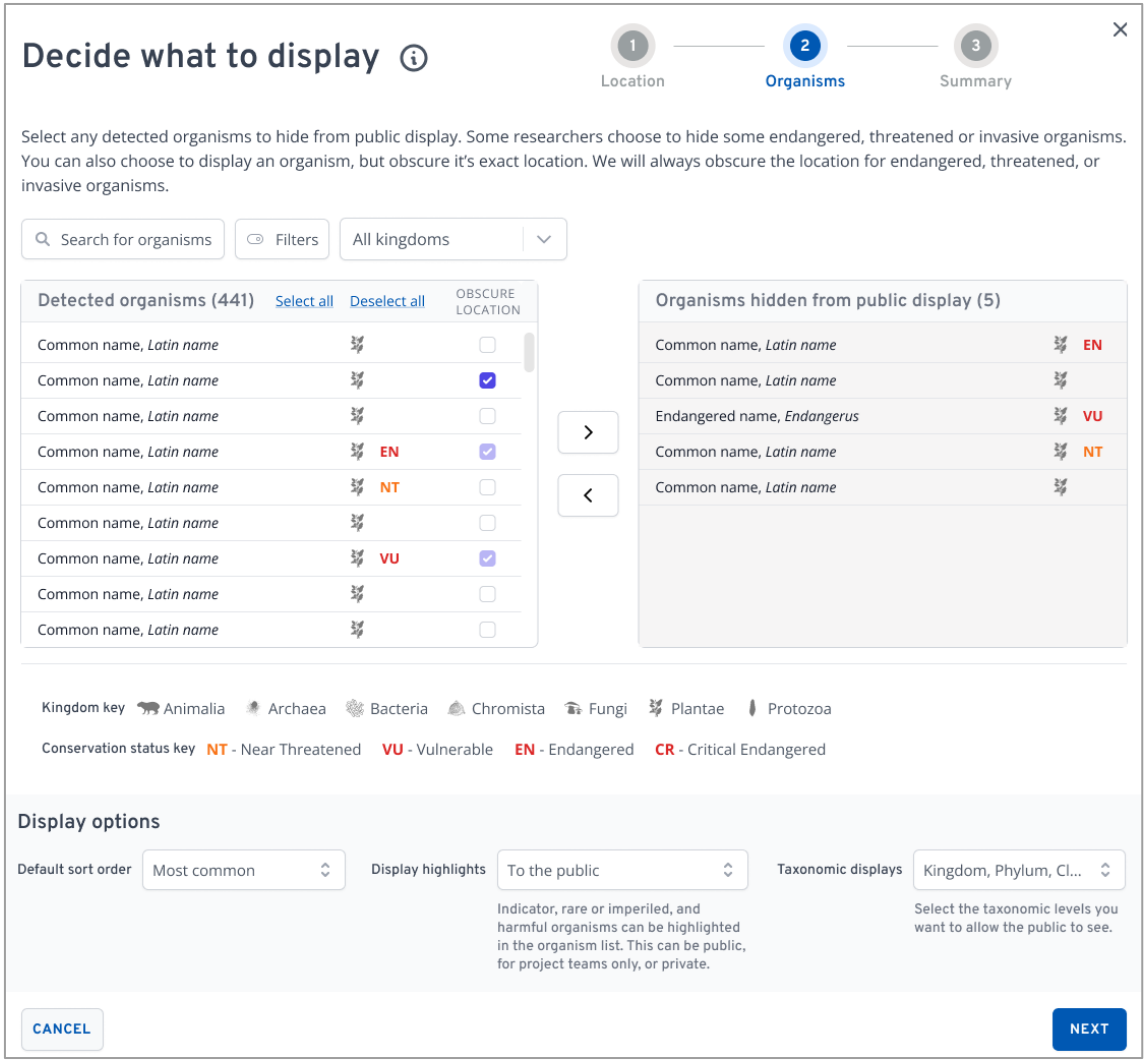
Sharing tools:
Control over curating the clutter



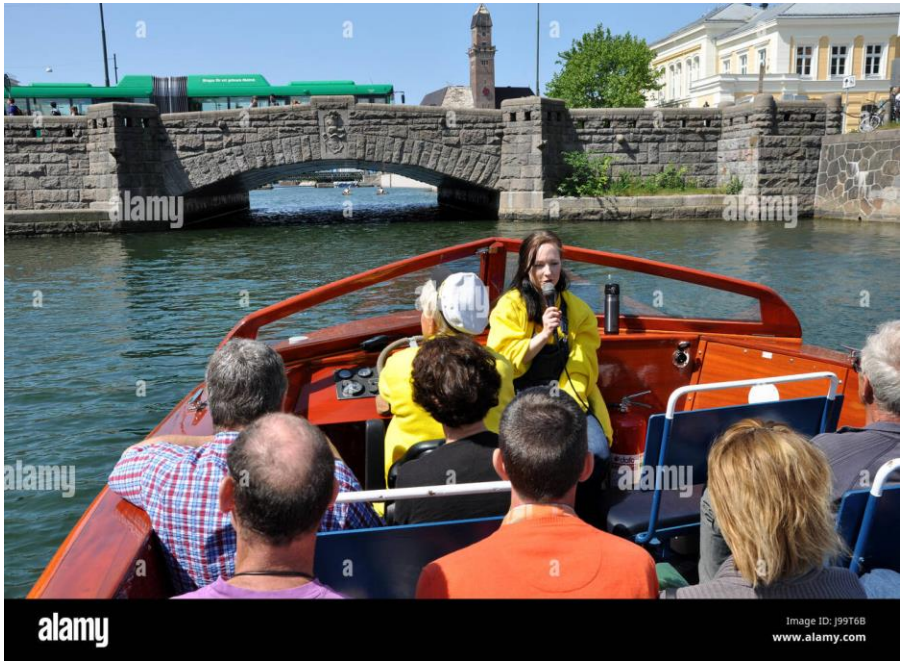
#3
A Three Minute Tour

#3 A three minute tour

What does this mean?

Is this good or bad?

How can I orient myself here?



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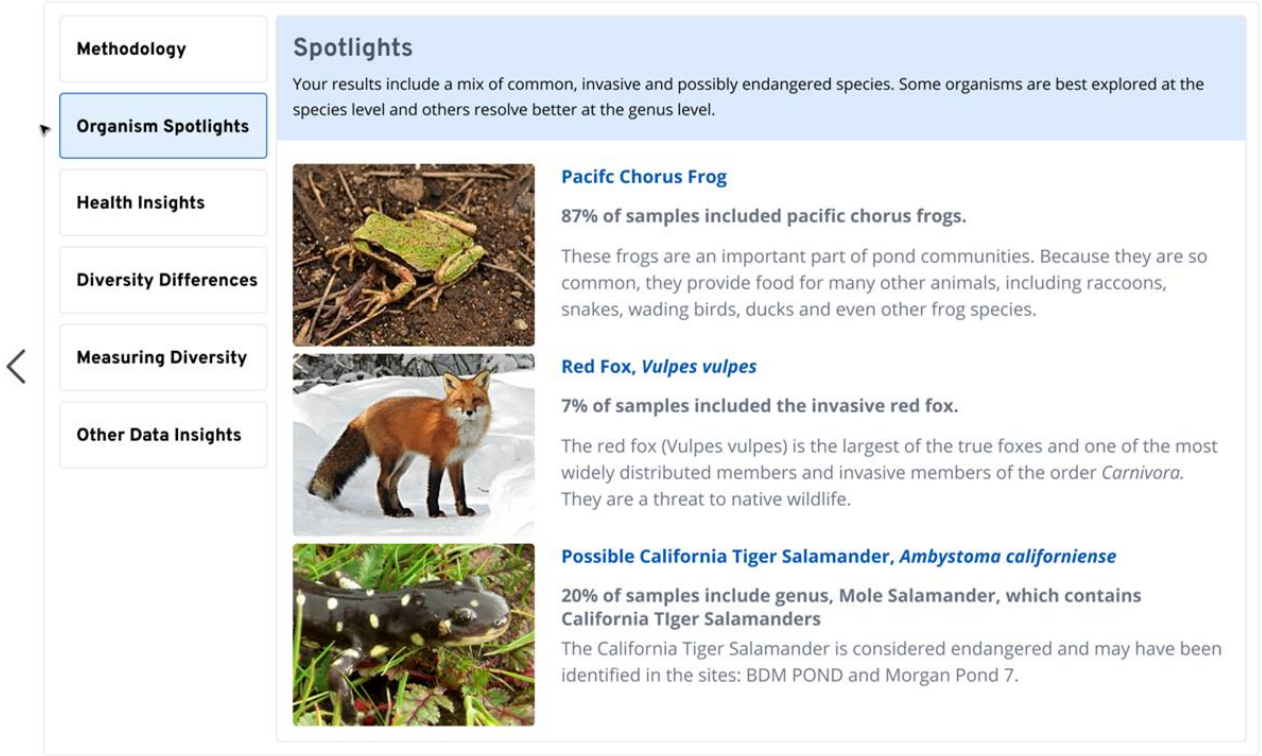
Bare minimum: Mini tour for you and your friends



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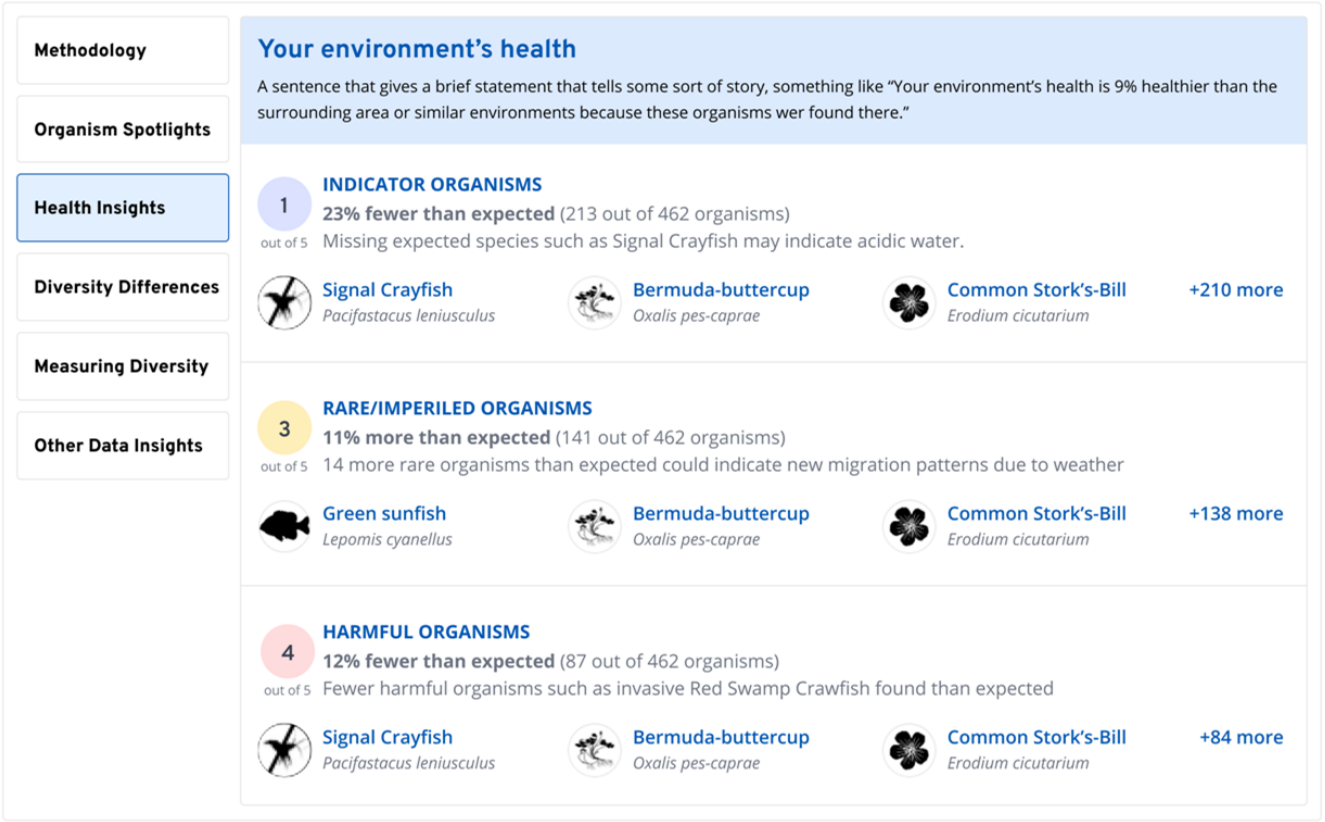
Level up: Is this healthy?



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Golden snitch: What are the health metrics to focus on?

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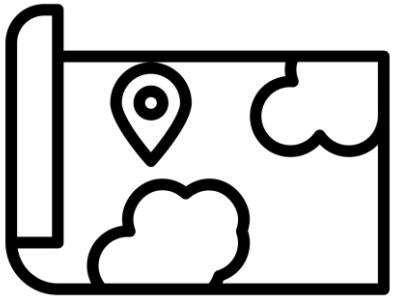
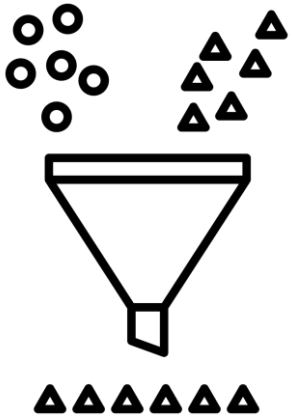
Design guidelines



Location,
Location,
Location



Cut through
the clutter

A 3 Minute Tour,
not just
DIY

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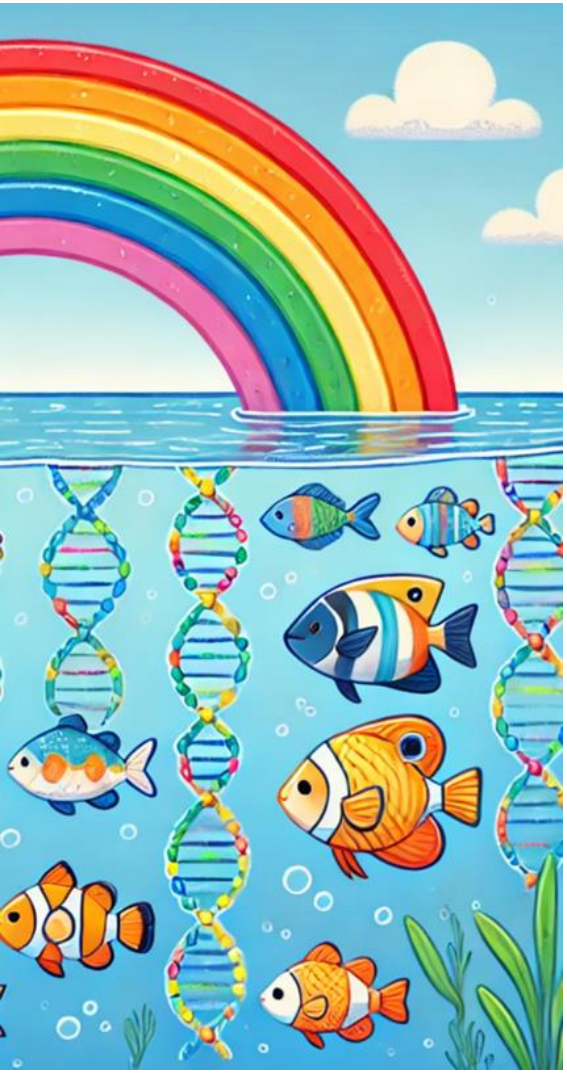

Want to talk further? Reach out!

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