



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.



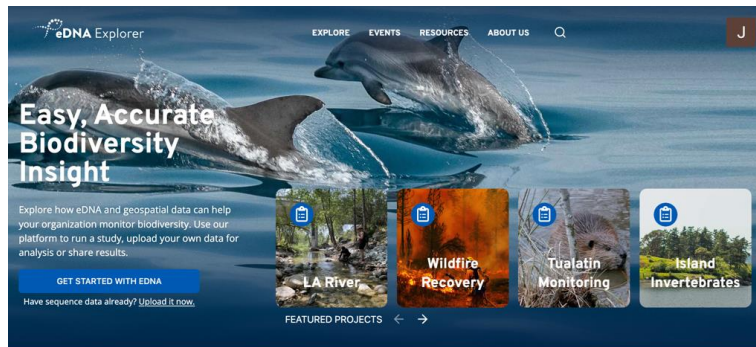
Analyze results

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.



How it Works



Explore

Explore eDNA projects shared from around the world and get inspired to run your own.

EXPLORE PROJECTS



Run a study

Leverage our automated bioinformatics platform to run your own eDNA study. Work with your team to see how easy it is to get accurate, actionable results.

GET STARTED



Analyze data

Have your own eDNA sequence data already? Upload it to create automated organism lists, compare with environmental variables and review trends.

UPLOAD YOUR DATA

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

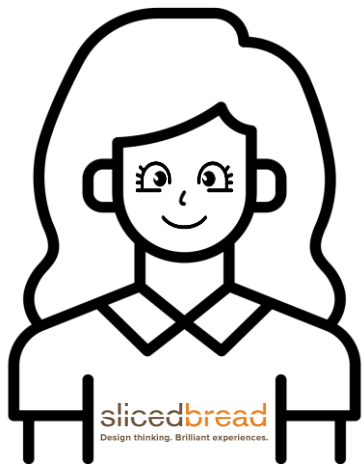
*Assistant Professor, UC Santa Cruz.
Director of CALeDNA*
**Expert in genomics, evolution,
bioethics and eDNA.**



Jim Jeffers, CTO

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

4 years ago...



What are the blockers to eDNA adoption and impact?



Three networks

life



people



methods



How can eDNA connect in?

How might eDNA help inform understanding and conservation?



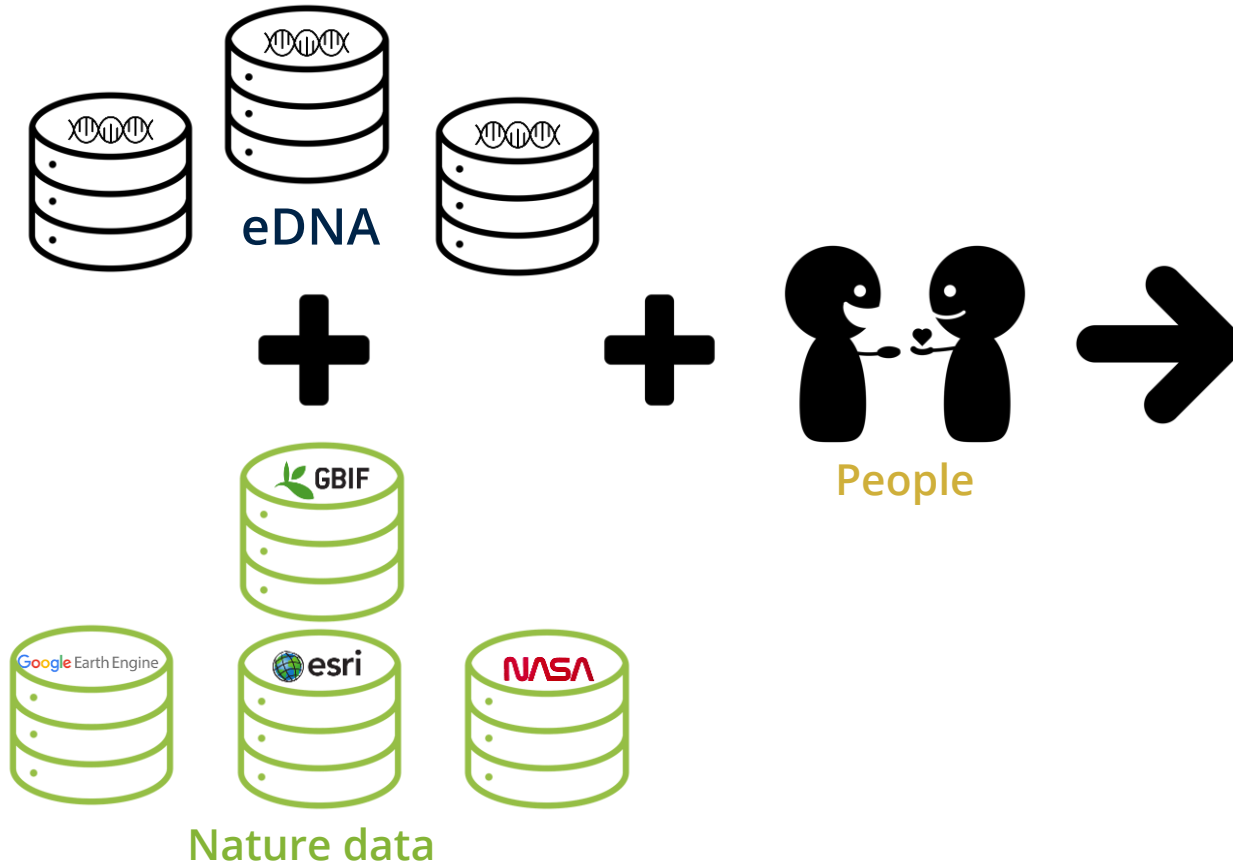
people

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?

methods

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**

**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/conservate 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



SPECIES (186)	6 ELYSIAN_VALLEY	7 GLENDALE	8 GLENDALE_NARROWS	9 LONG_BEACH	10 MAYWOOD
 Sockeye salmon <i>Oncorhynchus nerka</i>	 4.3%	 33.3%	 30.8%	 0.0%	 10.5%
 Red-billed Scimitar Babbler <i>Pomatorhinus ochraceiceps</i>	 34.8%	 11.1%	 38.5%	 5.0%	 5.3%
 Red Fox <i>Vulpes vulpes</i>	 0.0%	 33.3%	 15.4%	 5.0%	 0.0%
 Cat <i>Felis catus</i>	 0.0%	 11.1%	 0.0%	 30.0%	 5.3%
 Tristram's Bunting <i>Emberiza tristrami</i>	 0.0%	 11.1%	 0.0%	 0.0%	 0.0%
 Black-crowned Night Heron <i>Nycticorax nycticorax</i>	 4.3%	 11.1%	 0.0%	 5.0%	 5.3%

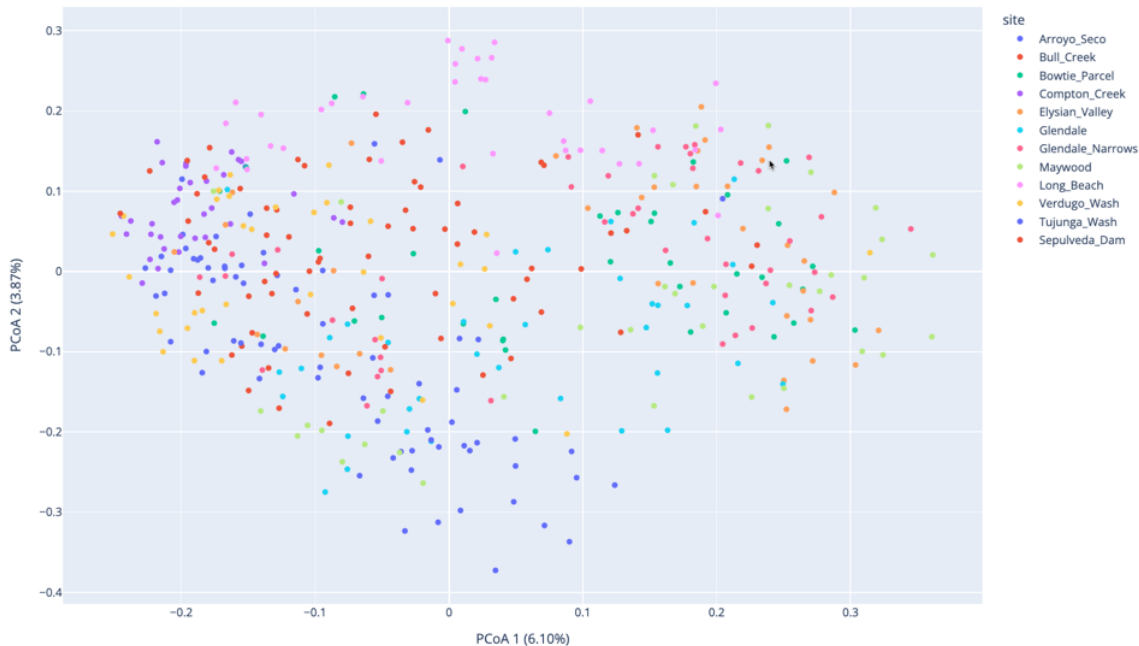
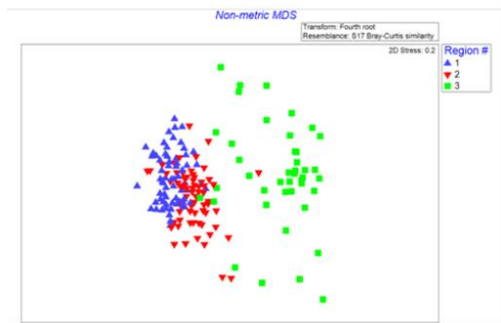
Ordination charts: How are things connected?

Beta Diversity, by site on a PCA plot on eDNA Explorer

Example from original study: Patterns

in community structure using Bray

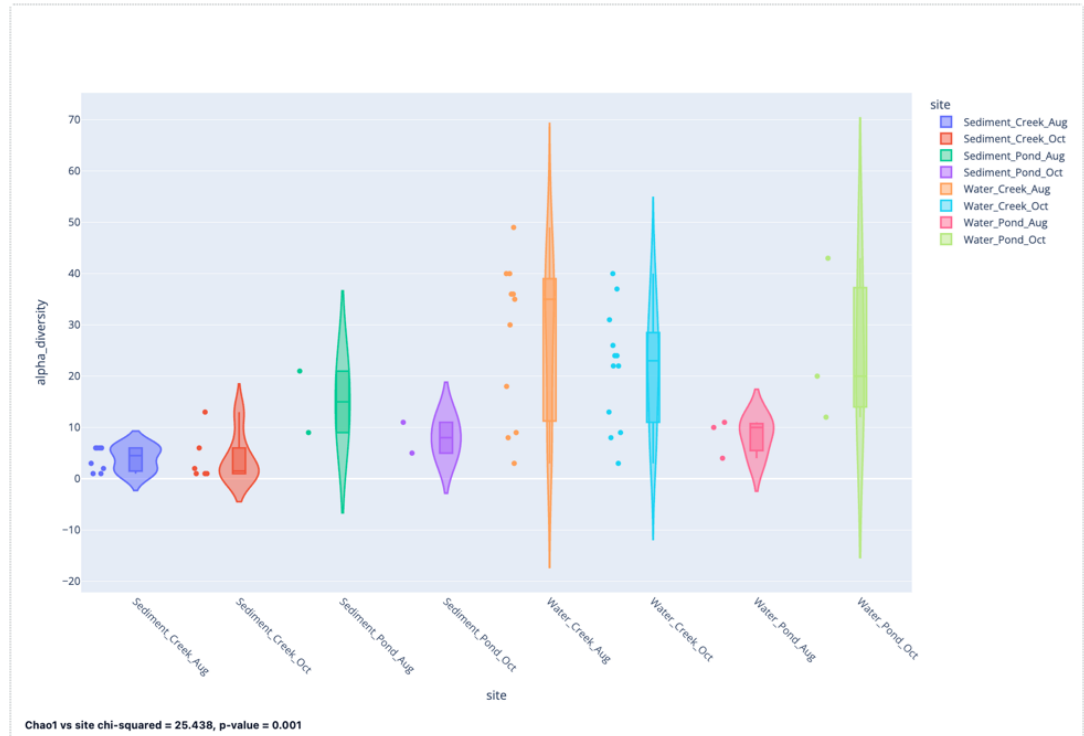
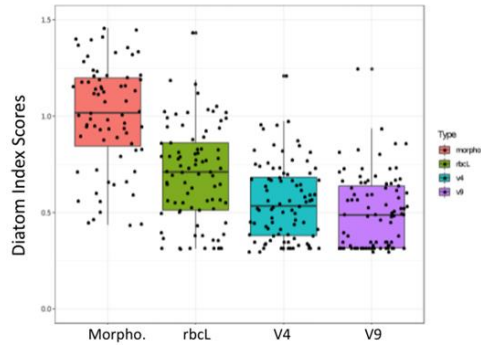
Curtis



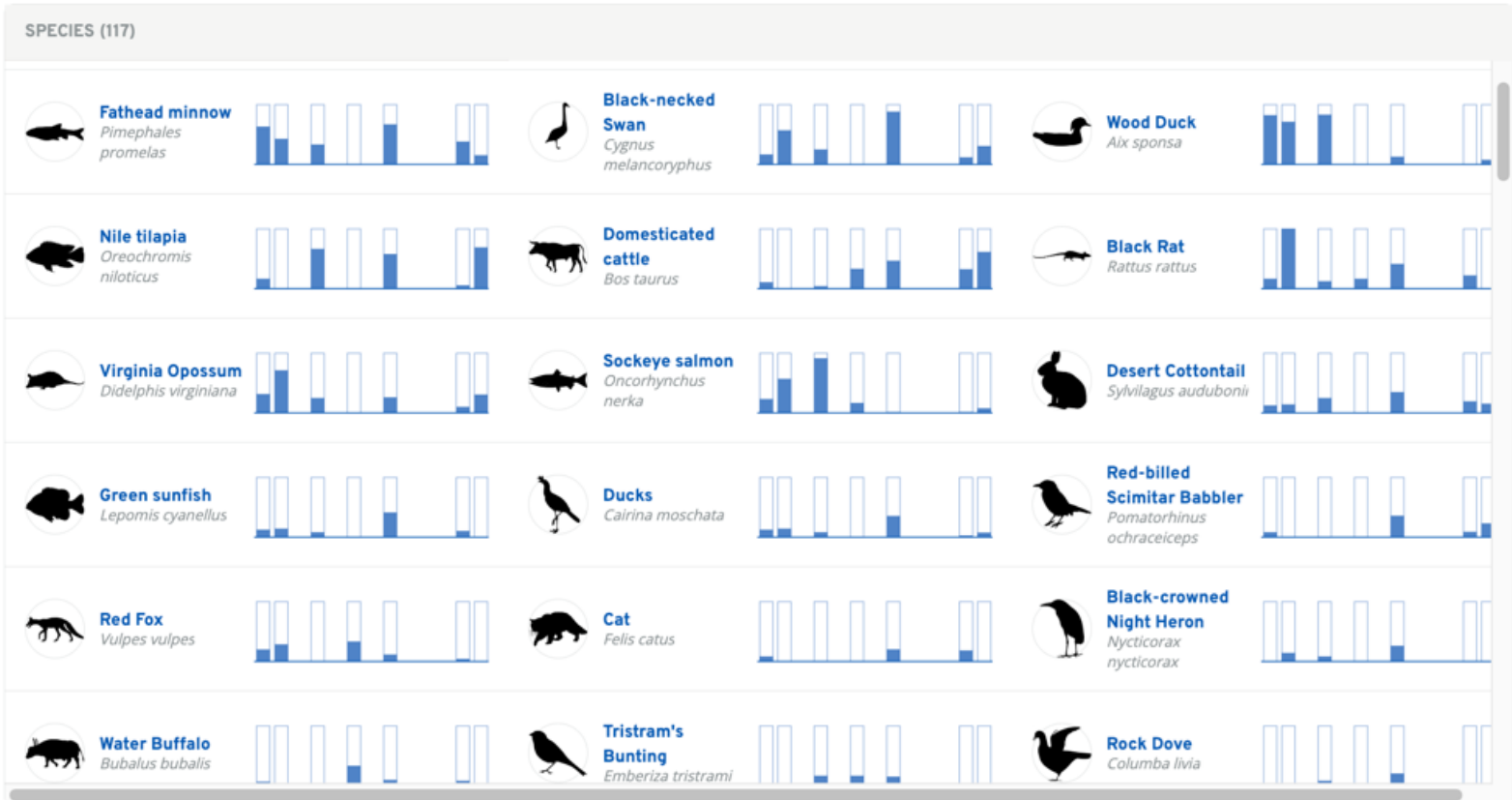
PCA plot. Results of PERMANOVA, using 999 permutations. jaccard beta diversity and site Sample size: 440. Number of groups: 12. Test statistic (pseudo-F): 5.305. p-value: 0.001

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?



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.



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

#1

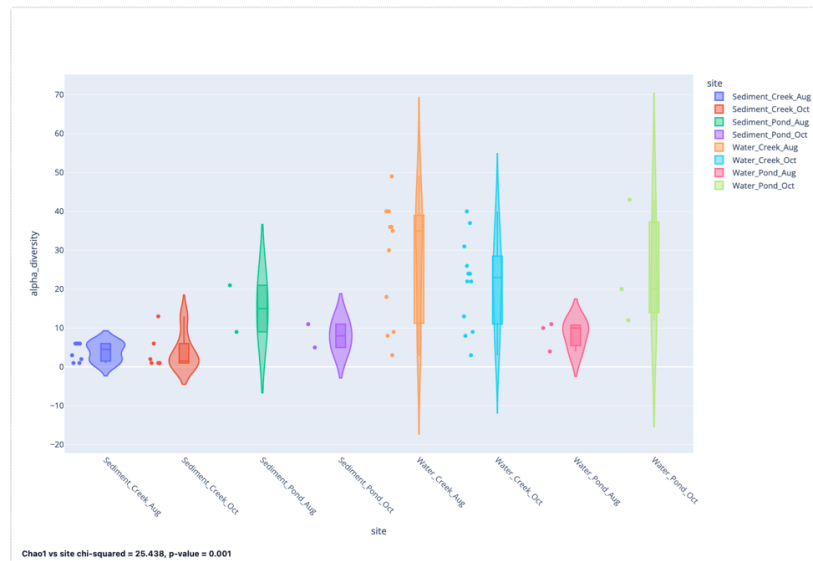
Location, Location,
Location

#1 Location, Location, Location

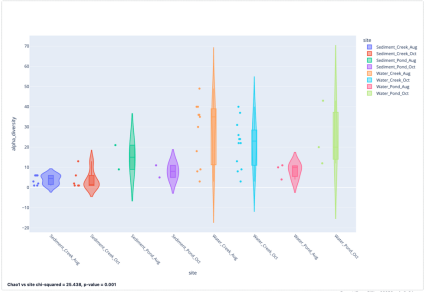
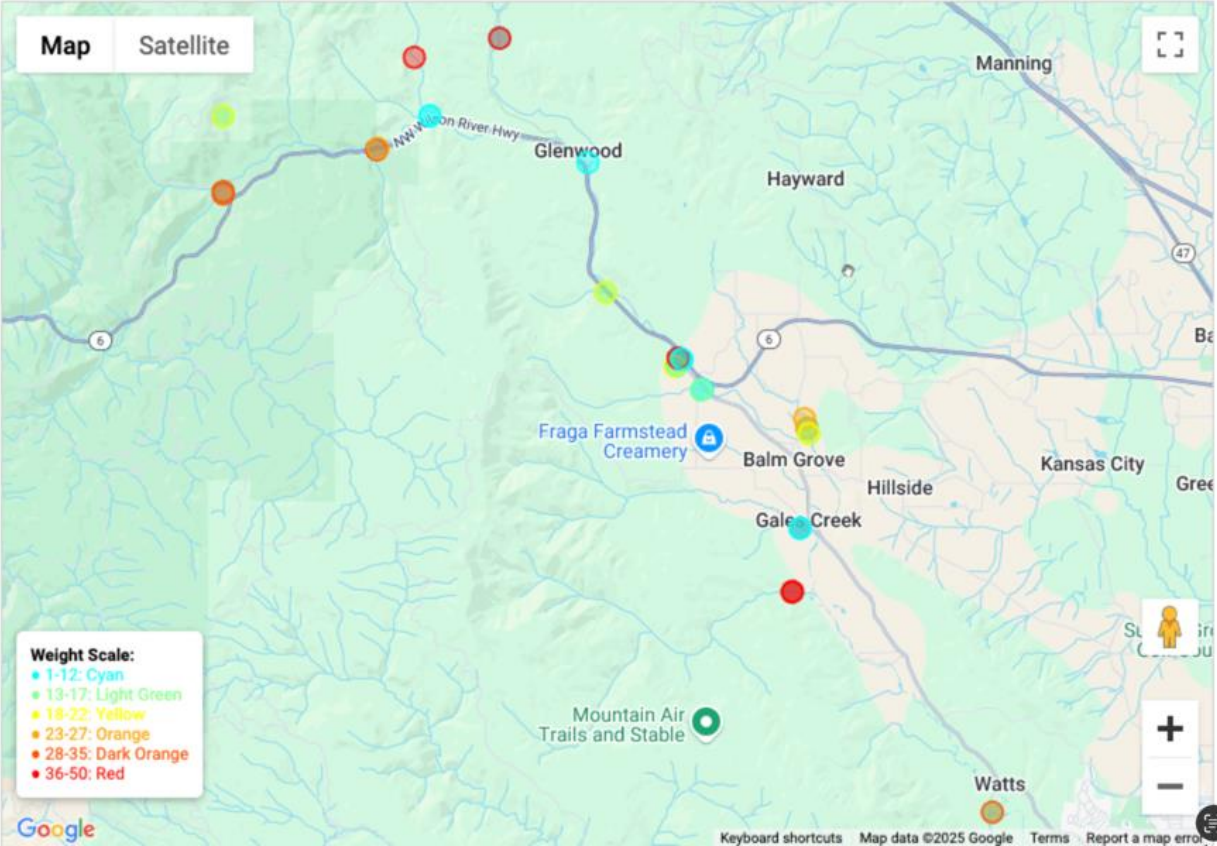
People care about the habitats **at their specific location**

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

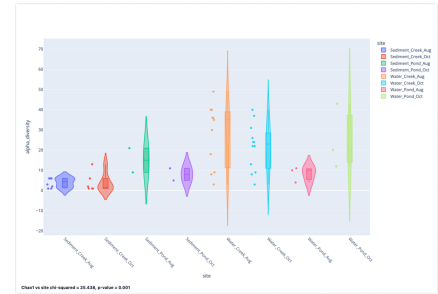
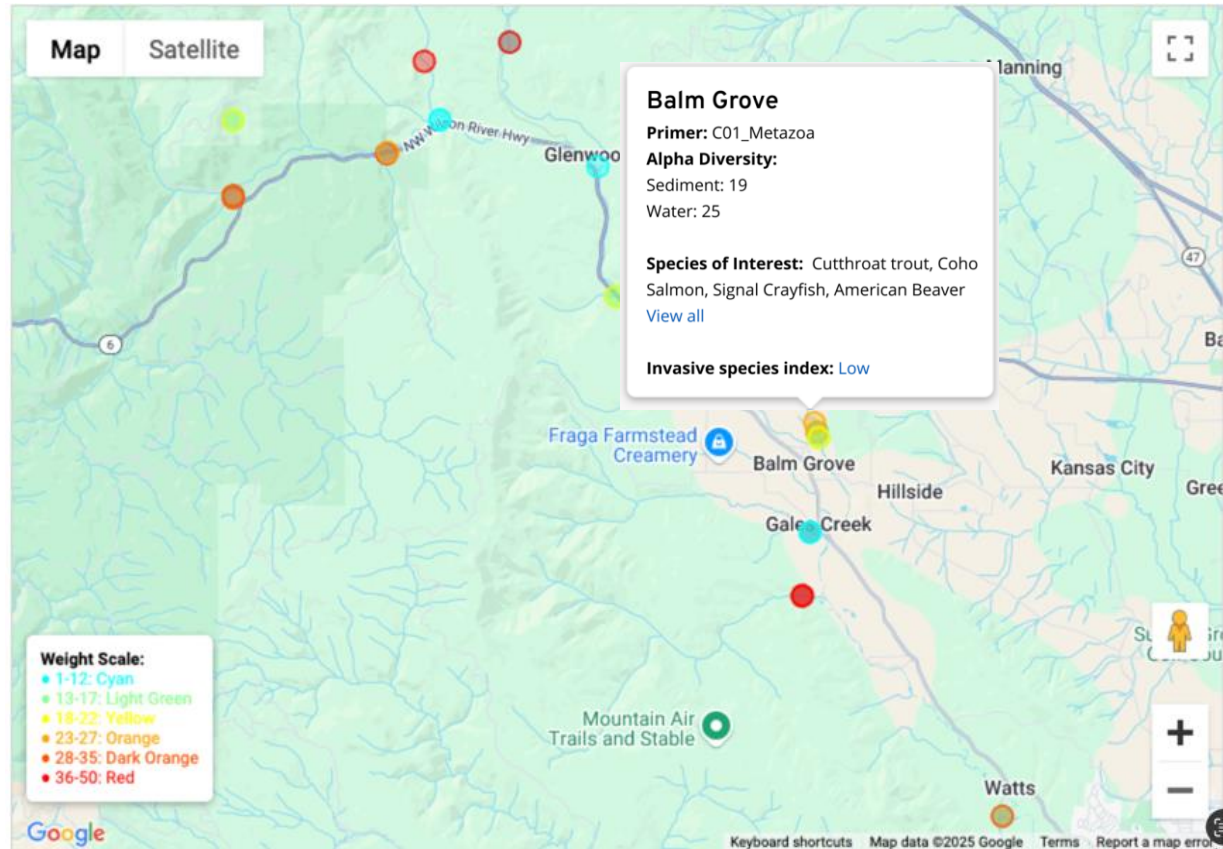
How might we integrate maps more effectively into analysis charts *beyond species distribution?*



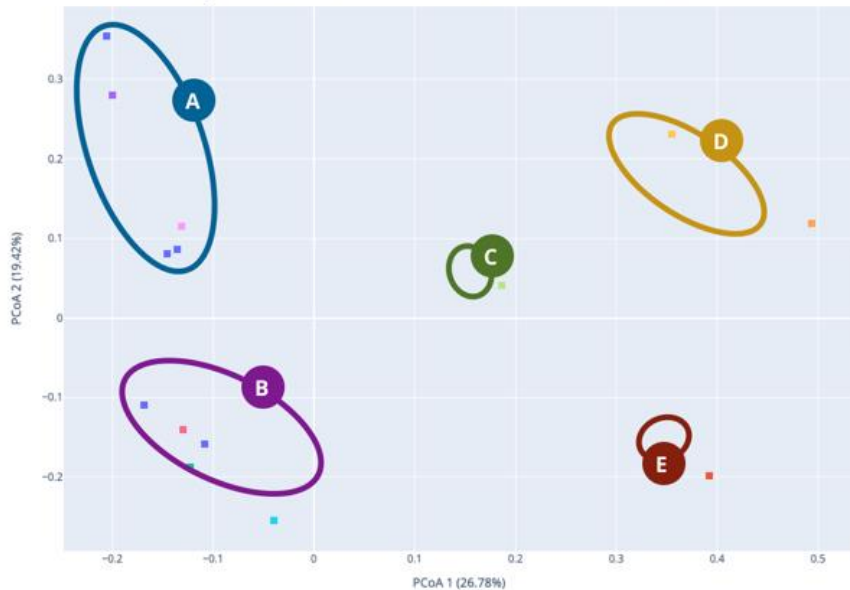
Alpha diversity heat map by location



Pop-ups to integrate species of interest



PCoA Chart by Location: Sites with similar communities form 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.



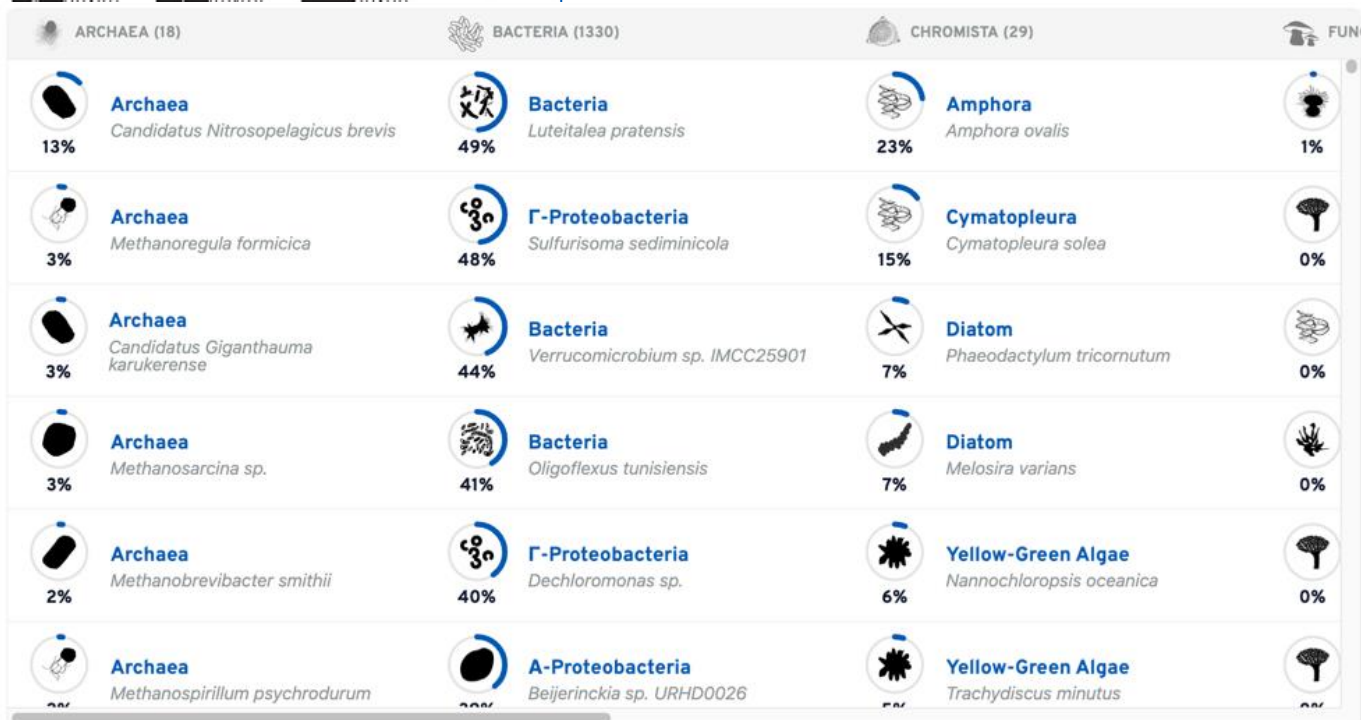
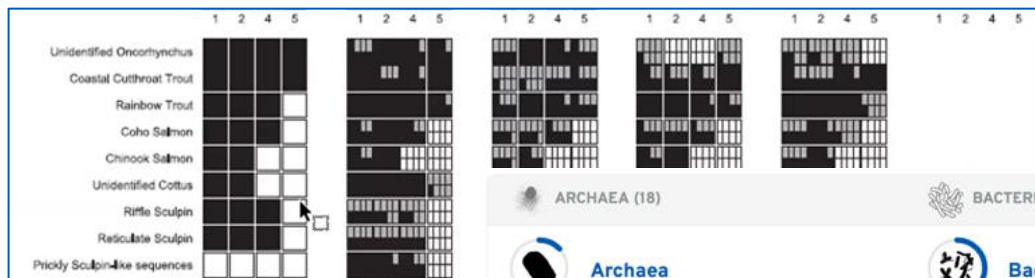
Key: Clusters of sites

- 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

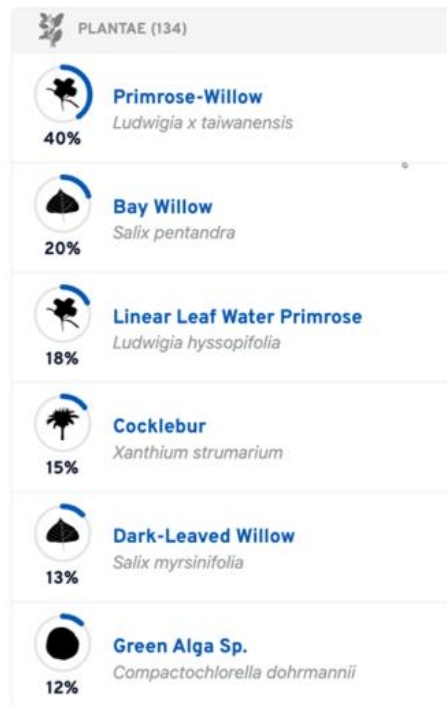
#2

Cut through the Clutter

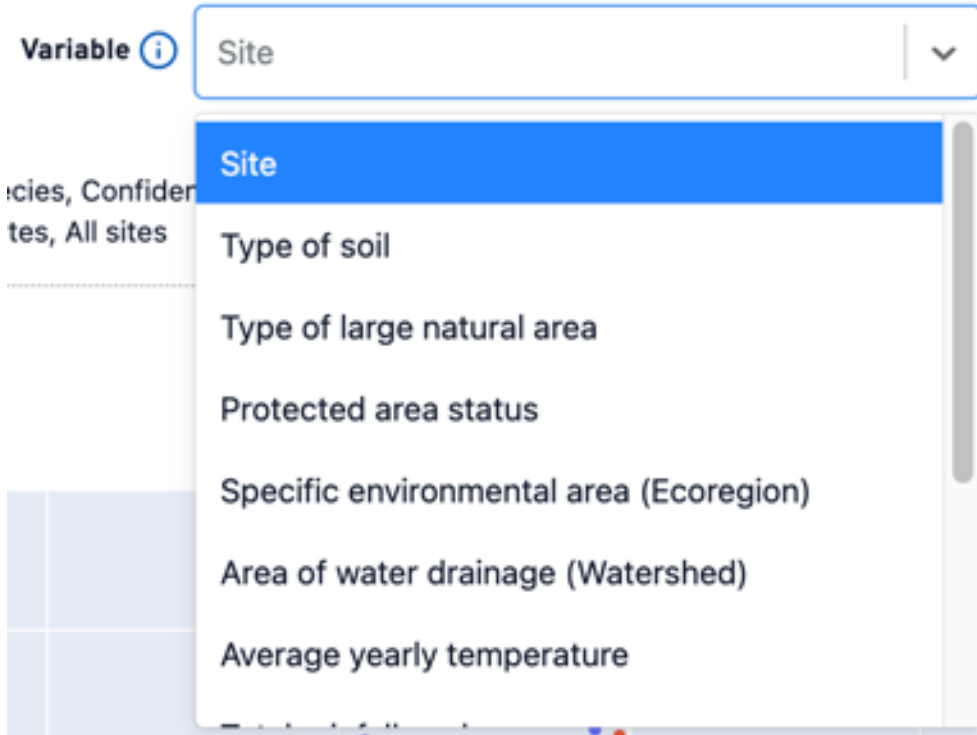
#2 Cut through the clutter



Illuminate species of interest



So many geospatial variables...



Prioritize the interesting variables

✦ Top environmental variables that explain the organism communities in your data ?

Selected with HIGH confidence | [Feedback](#)

TYPE OF SOIL:

Each soil type tends to have its own community composition.

F-statistic: 6.519

[What's an F-statistic?](#)

TOTAL RAINFALL EACH YEAR:

More varieties of taxa found when there is less rainfall

F-statistic: 5.036

METERS ABOVE SEA LEVEL:

Different communities of vertebrates at different sea levels

F-statistic: 2.088

MORE VARIABLES OF INTEREST

Artificial light at night | ▼

F-statistic: 2.088

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



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



✦ **What this chart means**

Sharing tools: Control over curating the clutter

Decide what to display ?

1 Location — 2 **Organisms** — 3 Summary

Select any detected organisms to hide from public display. Some researchers choose to hide some endangered, threatened or invasive organisms. You can also choose to display an organism, but obscure its exact location. We will always obscure the location for endangered, threatened, or invasive organisms.

🔍 Search for organisms Filters All kingdoms ▾

Detected organisms (441)	Select all	Deselect all	OBSCURE LOCATION
Common name, <i>Latin name</i>	🚫	<input type="checkbox"/>	<input type="checkbox"/>
Common name, <i>Latin name</i>	🚫	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Common name, <i>Latin name</i>	🚫	<input type="checkbox"/>	<input type="checkbox"/>
Common name, <i>Latin name</i> EN	🚫	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Common name, <i>Latin name</i> NT	🚫	<input type="checkbox"/>	<input type="checkbox"/>
Common name, <i>Latin name</i>	🚫	<input type="checkbox"/>	<input type="checkbox"/>
Common name, <i>Latin name</i> VU	🚫	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Common name, <i>Latin name</i>	🚫	<input type="checkbox"/>	<input type="checkbox"/>
Common name, <i>Latin name</i>	🚫	<input type="checkbox"/>	<input type="checkbox"/>

Organisms hidden from public display (5)

Common name, <i>Latin name</i>	🚫	EN
Common name, <i>Latin name</i>	🚫	
Endangered name, <i>Endangerus</i>	🚫	VU
Common name, <i>Latin name</i>	🚫	NT
Common name, <i>Latin name</i>	🚫	

Kingdom key 🐾 Animalia 🦠 Archaea 🦠 Bacteria 🦠 Chromista 🍄 Fungi 🌿 Plantae 🧫 Protozoa

Conservation status key **NT** - Near Threatened **VU** - Vulnerable **EN** - Endangered **CR** - Critical Endangered

Display options

Default sort order: Most common ▾ Display highlights: To the public ▾ Taxonomic displays: Kingdom, Phylum, Cl... ▾

Indicator, rare or imperiled, and harmful organisms can be highlighted in the organism list. This can be public, for project teams only, or private.

Select the taxonomic levels you want to allow the public to see.

CANCEL **NEXT**

#3

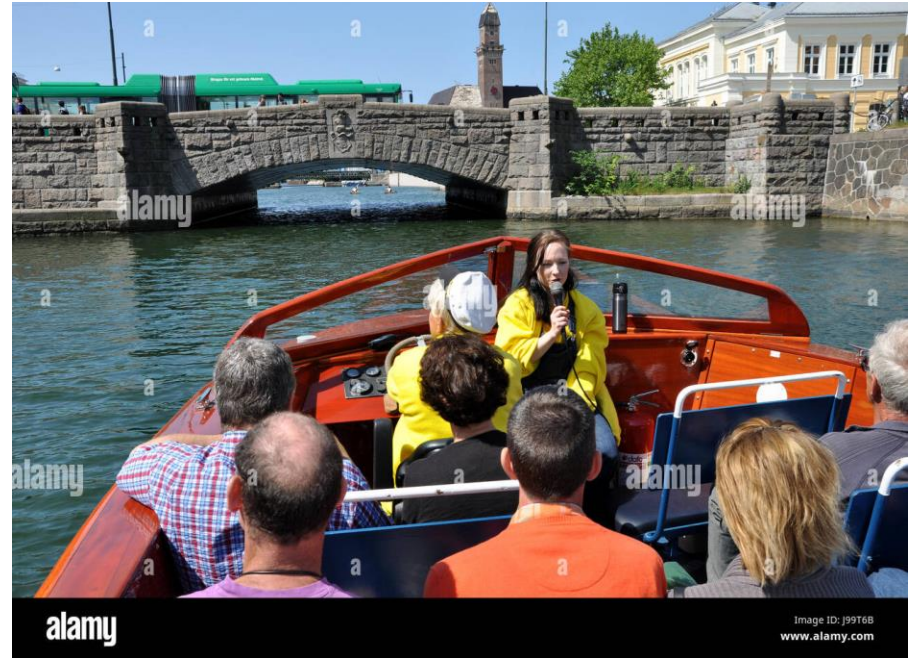
A Three Minute Tour

#3 A three minute tour

What does this mean?

Is this good or bad?

How can I orient myself here?



Bare minimum: Mini tour for you and your friends

Methodology

Organism Spotlights

Health Insights

Diversity Differences

Measuring Diversity

Other Data Insights


Spotlights

Your results include a mix of common, invasive and possibly endangered species. Some organisms are best explored at the species level and others resolve better at the genus level.

Pacific Chorus Frog

87% of samples included pacific chorus frogs.


These frogs are an important part of pond communities. Because they are so common, they provide food for many other animals, including raccoons, snakes, wading birds, ducks and even other frog species.



Red Fox, *Vulpes vulpes*

7% of samples included the invasive red fox.


The red fox (*Vulpes vulpes*) is the largest of the true foxes and one of the most widely distributed members and invasive members of the order *Carnivora*. They are a threat to native wildlife.



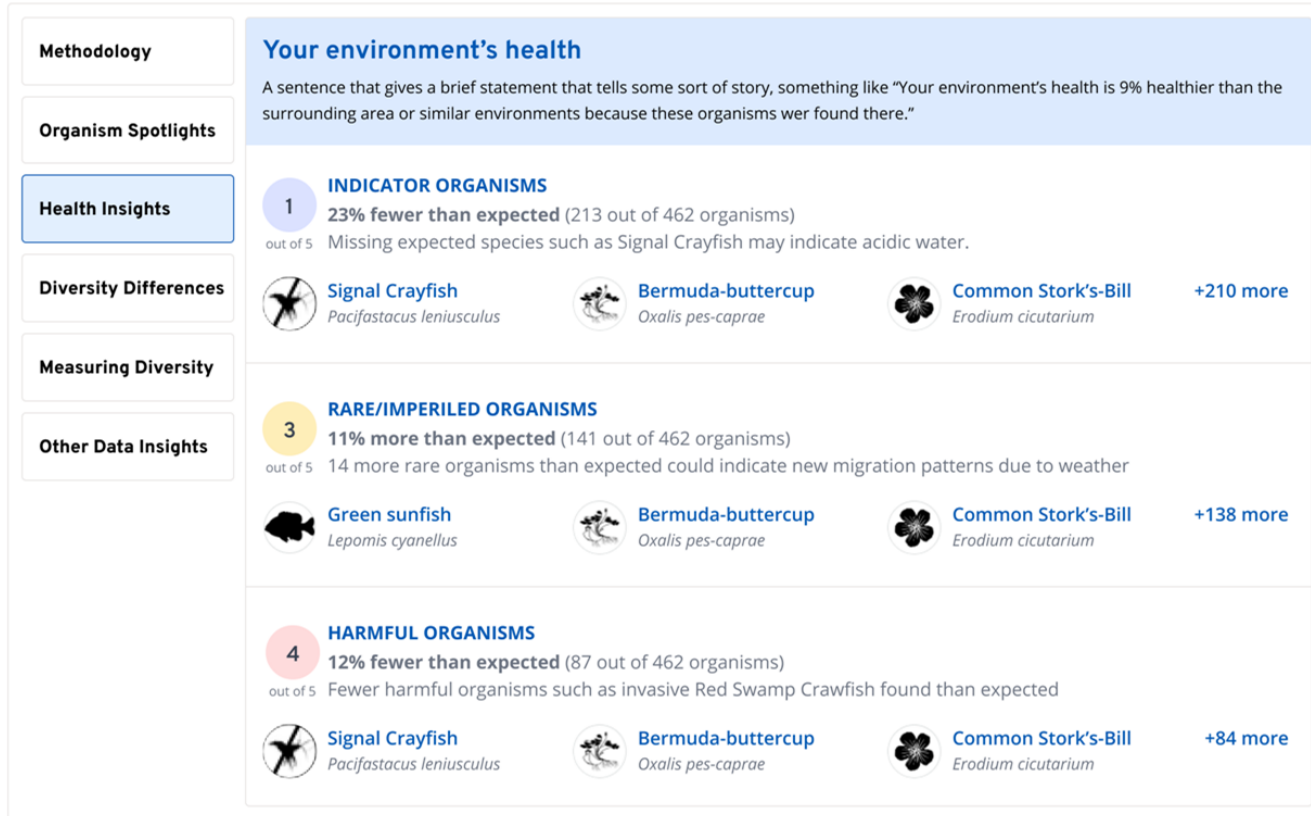
Possible California Tiger Salamander, *Ambystoma californiense*

20% of samples include genus, Mole Salamander, which contains California Tiger Salamanders

The California Tiger Salamander is considered endangered and may have been identified in the sites: BDM POND and Morgan Pond 7.



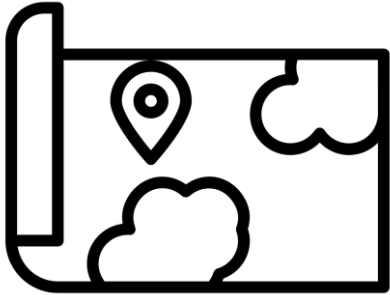
Level up: Is this healthy?



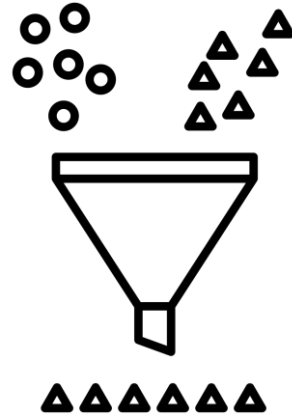
Golden snitch: What are the health metrics to focus on?



Design guidelines



Location,
Location,
Location



Cut through
the clutter



A 3 Minute Tour,
not just
DIY



Want to talk further? Reach out!

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650-799-7225