

# The Effects of Soil Moisture on Coverboard Diversity

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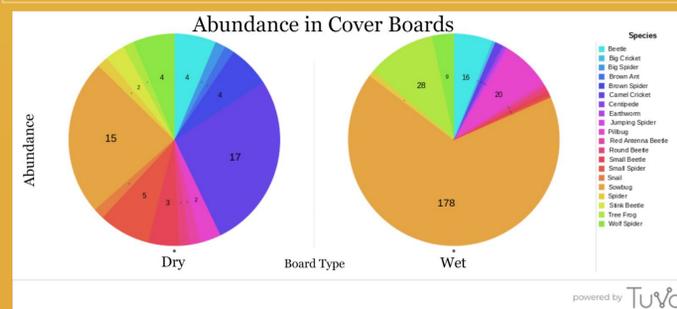
## Introduction

- Amphibians are species that are greatly impacted by our rapidly changing environment. We see this with their high extinction rates.
- They are important to food webs at Elkhorn slough because they transfer nutrients between bodies of freshwater and land.
- Our research project site was located at an oak woodland along the Long Valley Loop Trail at the Elkhorn Slough Reserve.
- Testable Question:** Does soil moisture affect the abundance of amphibians and terrestrial invertebrates under coverboards at Elkhorn Slough
- Hypothesis** - If soil moisture increases, then the diversity and abundance of amphibians in coverboards will increase.
- Multiple variables were tested including: soil moisture, soil NPK (Nitrogen, Phosphorus, and Pottasium), and soil temperature.
- Ultimately our most notable findings were those relating to moisture and weather.

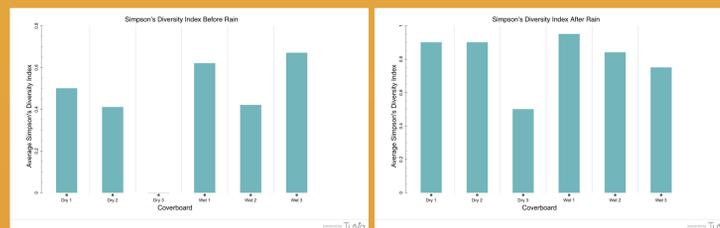


Group Photo (Left to Right)  
Simone Morton, Juan Escamilla, Vicente Martinez, Diego Vazquez

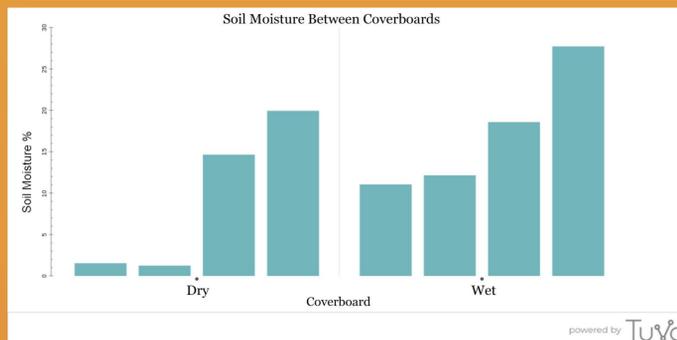
## Results



(Figure 1) The pie charts show the total abundance of species found under wet coverboards (Left) and dry coverboards (Right). The dry coverboards had a total of 1 frog throughout all days of data collection contrasting to wet coverboards which had a total of 28 frogs.



(Figure 2) These two charts compare the Simpson's diversity, measurement of diversity of the number of species present in an area) index between the two cover board types (wet and dry) before and after rain. The wet coverboards had a higher diversity index, at about .2 more than dry boards. After it rained there was a notable increase in the diversity index for dry boards. Overall though, wet cover boards tend to have higher diversity and evenness or regularity of species.



(Figure 3) This bar chart shows the soil moisture of wet coverboard #1(Right) and Dry coverboard #2 (Left). The first two cases are before precipitation began the last two cases are after precipitation began. The wet coverboards had higher moisture and diversity initially; however, after precipitation both boards almost evened out in both diversity and moisture.



(Figure 4) This graph shows the total precipitation throughout our data collection days. Significant precipitation began around 11/26/19.

## Conclusion

- Our project tested multiple factors that could have had an influence on diversity and abundance.
- The one factor that seemed to have the most effect on diversity and abundance is soil moisture. The NPK and canopy cover data we had collected seemed to have no correlation to our other data..
- Our data supported our hypothesis and showed that amphibians prefer wetter environments, but only certain invertebrates preferred wetter environments.
- We also noted that weather may have an affect on diversity and abundance. After it rained the diversity and abundance under all coverboards changed significantly .
- Finally the frogs themselves could have also influenced diversity and abundance since their diet consists of invertebrates, as shown in figure 3. The difference in certain species frogs eat, more specifically the camel cricket, is significantly larger compared to invertebrates frogs don't eat like sowbugs.
- Amphibians are essential parts of some ecosystems and are helpful in controlling populations of invertebrates. By looking at this project you can see how much of an influence they have on food chains and we also see that moisture is an important part of their range of tolerance.
- A project that focused on amphibians was something new to WATCH, with this research future groups could look at our project for inspiration . ESNERR may also find this information useful as tree frogs are important to ecosystems in the slough and our data may show what a suitable environment for an tree frog looks like.
- For future groups doing this project we encourage changing other conditions like leaf litter type, disturbance levels, nutrient inputs, etc...
- As for NPK, there were no correlations between that and any other part of our project. Same thing goes for leaf litter.

## Methods and Materials

- Take metadata, air temperature and relative humidity using SparkVue Kit (GLOBE protocol)
- Measure leaf litter using a meter stick to measure the depth.
- Team Roles: Recorder/Reporter, Coverboard Examiner, and Soil Collector
- Cover Board examiner would lift coverboard and safely catch any amphibians and/or terrestrial invertebrates
- Recorder/Reporter would write down what was found under coverboards
- Soil collector would take a soil sample to test with the NPK (Nitrogen, Phosphorus, Potassium) soil test kit using the GLOBE protocol (this was done only once for each coverboard)
- Soil collector would then collect soil at 5 cm deep and 30 cm following the GLOBE's pedosphere depth profile protocol
- Soil collector would then weigh the soil samples at the end of the data collection day. (These samples would be left to dry for a week then would be weighed again the following week.)
- If this process was done on a "wet" coverboard, we would then water the cover board with about 19 liters of water
- Finally we would place a HOBO sensor about 5cm deep in the soil which would measure soil temperature periodically every 15 minutes.



Overview map of our study site  
Red Star - Study Site

## Literature Cited

- Feliz, Dave. "Slough Life." *Elkhorn Slough*, 17 May 2017, www.elkhornslough.org/slough-life/.
- Davis, C. A, Austin, J. E., Buhl, D. A. (2006). Factors Influencing Soil Invertebrate Communities in Riparian Grasslands of the Central Platte River Floodplain (Vol 26.). *Wetlands*, 438-454.
- Stork, Nigel E, and Paul Eggleton. "Invertebrates as Determinants and Indicators of Soil Quality." *Semantic Scholar*, 1992, pdfs.semanticscholar.org/d878/271084789d4a4867947aa5047b3c8a097ec8.pdf.
- Malcolm L. McCallum "Amphibian Decline or Extinction? Current Declines Dwarf Background Extinction Rate," *Journal of Herpetology* 41(3), 483-491, (1 September 2007).



Pacific Chorus/Tree Frog



Recorder/Reporter (Diego) recording meta data.



Soil Collector (Diego) collecting soil samples for soil moisture



Terrestrial Invertebrates (Beetle, Isopod, and Spider)

## Acknowledgments:

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