

NAME: _____

Aligned to the following standards:
FFA.PL-A; FFA.PL-C; FFA.PL-E; FFA.PL-F; FFA.PG-J; FFA.CS-N; CCSS.ELA.SL.9.10.1;
CCSS.ELA.RST.9-10.7; CCSS.ELA.WHST.9.10.4; CCSS.ELA.RST.9.10.7; CRP.02; CRP.04;
CRP.06; CRP.07; CRP.08

Let Your Research Be Seen

Directions:

Look at the two research posters below and answer the questions. Critique the visual aspects of the poster, not the content.

Native Bees
Land Use Effects on Pollinators in Grasslands and Forests
Marisa McCaskey

Zumwalt Prairie Preserve

- Largest remaining Pacific Northwest Bunchgrass prairie in North America
- Bordered by the Imnaha River and Hells Canyon, the Willows Mountains, and the Seven Devil Mountains
- Used by Nez Perce, and then various grazing operations
- Important habitat for various insects, birds, ungulates and smaller mammals
- Owned and managed by The Nature Conservancy since 2001

Research Goals

- Compare native bees and the flowers they use in native prairie and fields formerly cultivated and reseeded
- Examine effects of livestock grazing and fire on native bees and flowers

Field Work

Bees

- Hand-netting
- Pan traps
- Emergence traps
- Blue vane traps

Plants

- Blooming plant surveys (abundance and species richness)

Other Variables

- Soil moisture
- Soil compaction (penetrometer)
- Soil surface cover (quadrat surveys)
- Shading and solar input (Solar Pathfinder™ and densitometer)

Challenges

- Cattle and elk trampling pan traps
- Unpredictable weather
- Carcass beetles within emergence traps

Why

- Bees are diverse (>20,000 species globally) and are important pollinators of native plants and crops
- Looking at how agriculture and wildlife management influence native bee communities in grasslands and forests

Zumwalt

- Able to compare formerly cultivated fields to native prairie
- DNA barcoding: able to identify plant species in pollen collected from various bees

Starkey

- Able to see if and how grazing by cattle and ungulates change bee populations
- All data collected can be used to inform restoration, grazing practices, and conserve plants and insects

Lab Work

Planning

- Wash and dry all bee samples
- Sort bees from other insects
- Pin all bees uniformly
- All bees are sent to a taxonomist in Utah for species identification

Data Entry

- Tally all hard copies for richness, blooming plant surveys, soil sampling
- Input into spreadsheets
- Quality control

Challenges

- Learning the difference between bees and other insects
- Proper pinning techniques
- Deciphering scientific names

USFS Starkey Experimental Forest and Range

- 28,000 acre of mixed forest and meadows enclosed with a deer/elk proof fence
- Located in the Blue Mountains outside of La Grande, OR
- Area has been used for research since turn of the 20th century
- Gained current title in 1940s

Research Goals

- Monitor native bee responses to riparian restoration at Meadow Creek in the Starkey Experimental Forest
- Compare the effects of native ungulate herbivory, livestock herbivory, and no ungulate herbivory on bees and flowers at 12 riparian sites on Meadow Creek

Acknowledgements: I would like to thank Dr. DeBussche, OSU College of Agricultural Sciences and the Hermon Agricultural Research and Extension Center, and The Nature Conservancy for allowing this research to happen. I would also like to thank Scott Mitchell, Katie Astrigstad, and Heidi Schmidt for sharing their knowledge. This research was supported by the OSU Branch Experiment Station Internship program and a grant from the Foundation for Food and Agriculture (#549031).

What do you like about this poster?
What makes it catch your eye?

What about this poster do you not like,
and what could be improved?

What do these posters have in common? Why do you think they have these items in common?

What do you like about this poster? What makes it catch your eye?

What about this poster do you not like, and what could be improved?

The Effects of Emerging Amphibian Pathogens and the Implications on Natural System Health and Human Disease Incidence
Laura Fonseca
Sponsor: Michael Springborn, Ph.D. Department of Environmental Science and Policy

Introduction

Biodiversity decline due to anthropogenic drivers poses a threat to ecosystem services that underpin human well-being. The loss of key species can have cascading effects, for example when the loss of predators of disease vectors leads to increased threats to human health. This research study analyzes the linkage between biodiversity decline and resulting effects to human welfare.

In this case study we analyze a wave of *Batrachochytrium dendrobatidis* (Bd), an infectious fungus that spread west from Costa Rica westward into Panama, which caused mass die-offs of amphibian species beginning in 1989 until 2007 (Lips et al., 2008). Amphibians have been shown to be important providers of ecosystem services such as mosquito species. These biological vectors can transmit diseases such as dengue and malaria. Given the significant decline in these important predator species and the unique spatio-temporal pattern of their decline, this case study through statistical means the effect on human disease risk.

Methods

Stage I: Disease Identification

- Largest vector-borne diseases that were endemic or epidemic throughout the 20-year period of Bd wave infections present in Costa Rica and Panama
- Completed disease incidence data from various sources

World Health Organization, UNICEF, UNICEF Malaria Atlas Project, UNICEF Malaria Atlas Project, UNICEF Malaria Atlas Project

• Study centered to three major vector-borne diseases ranked by:

- 1) Strength of presence in both regions
- 2) Availability of temporal data during period of interest
- 3) Resolution of temporal data

The resulting set of four diseases we examine includes malaria, dengue, and schistosomiasis (in order of greatest to least importance).

Stage II: Establishing Share of Healthy Amphibian Population

- The location of the leading edge of the Bd wave and corresponding dissipation of amphibian populations is given by Lips et al. (2008) for the years 1987-1995, and 1996.
- Share of space covered by the Bd wave estimated using a grid system with following assumptions:
 - 100% of amphibian habitat is still uninvaded by the pathogen in 1987 when the leading edge of the wave is still west of Costa Rica
 - Constant rate of spread of Bd wave in intervening years between observations from Lips et al. (2008)
- Share of the country that is uninvaded used as a proxy for the share of healthy amphibian remaining

Stage III: Statistical Analysis

- We match this metric of amphibian health with malaria incidence data for Costa Rica
- The relationship between these two variables was analyzed utilizing the R programming language for statistical computing

Results

We estimate a log-linear regression model for the relationship between annual amphibian incidence and the share of healthy amphibians remaining. In Figure 3 the log of malaria cases is regressed on the share of healthy amphibians on the x-axis. Our regression model results (Table 1) show that there is a negative correlation between amphibian health and log-transformed malaria cases and that this correlation is significant (p=0.001). The adjusted R-squared value of 0.82 indicates that our metric of amphibian health can explain much of the variation in malaria cases.

We considered an alternative model which included an additional time trend. However, given that share of healthy amphibians follows a both linear trend over time, these two variables were strongly correlated and estimates of their separate contributions to log-malaria cases were not precise (i.e. standard errors were large).

Another alternative regression model was considered in which log-malaria cases were a linear function of just the time trend as the sole independent variable. This time trend only model does about equally as well as the amphibian health model, with an adjusted R-squared of 0.84.

Figure 1: Map of Costa Rica and Panama showing spread of Bd wave. Clear circles indicate ODD sites. Black lines indicate the beginning of the wave (approximate from Lips et al. 2008).

Figure 2: The number of annual malaria cases during the time period of study, 1980-1999.

Figure 3: Annual log-malaria cases plotted against the share of healthy amphibians remaining that year. The red line is a linear fit.

Table 1: Regression Table Results

	Amphibian Health	Time Trend	Combined Model	Time Trend
Constant	0.000	0.000	0.000	0.000
Amphibian Health	-0.001	0.000	-0.001	0.000
Time Trend	0.000	0.001	0.000	0.001
Observations	10	10	10	10
Adjusted R ²	0.000	0.840	0.820	0.840

Conclusion

The current results are preliminary but are useful in establishing the important relationship between decline of amphibian species and its connection with the incidence of human disease. In this case, the availability of finer-resolution spatial data for disease incidence and controlling for additional factors, for example, elevation (see e.g. ODD), incorporation into a multiple regression model will allow more robust estimates of the relationship between amphibian decline and human disease risk and create a more comprehensive model. For the purpose of this case study, we chose to only focus on the country of Costa Rica and malaria as the central disease of examination. However, the study can be extended to incorporate Panama and the two additional diseases (dengue, schistosomiasis) and additional data is collected. Following these extensions, the results can provide valuable insight into future conservation and risk-management strategies in regions like the United States that are under invasion threat from emerging amphibian pathogens such as Bd.

Acknowledgements

- I would like to acknowledge:
- Dr. Michael Springborn for his mentorship and guidance throughout the entirety of the project including the statistical analysis and paper design.
- Lisa A. O'Donnell for her assistance in the design of the poster.
- Michael Springborn for his help with the design of statistical plots.

Literature Cited

- O'Donnell, Lisa A. 2014. Dissertation of Ph.D. degree.
- Lips, K. A., O'Donnell, L., & Henkel, D. S. 2008. Bats, Bats, Bats: The Role of Bats in the Spread of Malaria in Costa Rica. *Journal of Tropical Medicine and Hygiene*.

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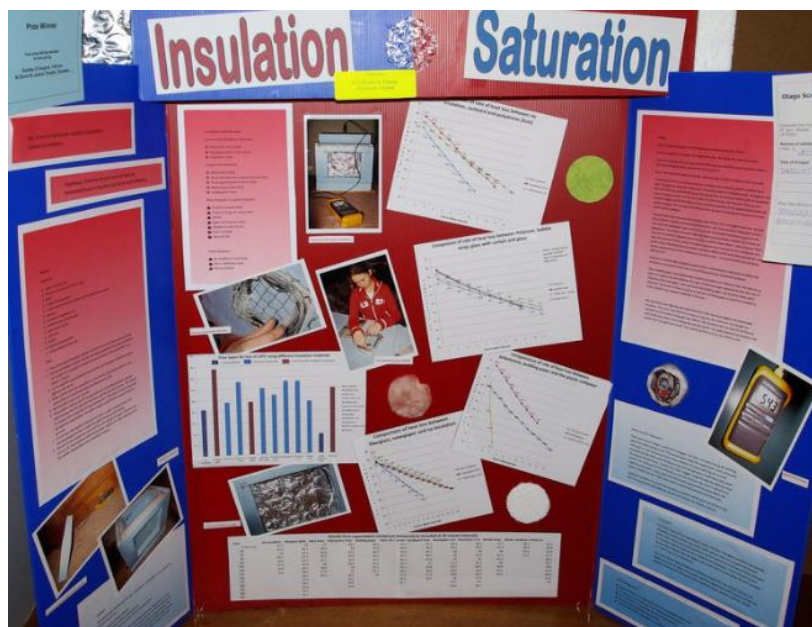
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What do you like about this poster? What makes it catch your eye?

What about this poster do you not like, and what could be improved?

What do you like about this poster? What makes it catch your eye?



What about this poster do you not like, and could be improved?

What do you think is the purpose of a research poster?

1. Circle the poster that you think is the best.
2. Why did you select this poster? What makes it the best option for a research poster?

How Will You Show What You Know?

Directions:

Research posters are a great way to share your research in a concise and visual manner. Watch the video "Making a Better Research Poster," available at https://youtu.be/AwMFhyH7_5g, and answer the questions below.

What is the number one mistake people make when developing their research posters?

Why do you think this mistake is made so often?

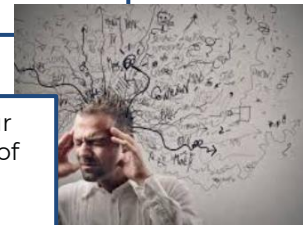
How will you avoid this mistake for your poster?

Full sentences can be used, but you should also try to use what?

- a. Bullet points
- b. Fragments
- c. Clips directly from your paper

Figures and graphs are important for your poster. But what should you be cautious of doing with your graphs and figures?

B_____ them in t_____



How do people naturally read?

Why is it important to think about this when designing your poster?

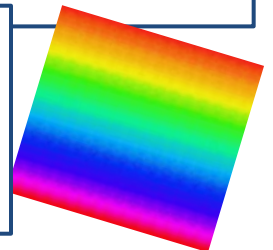
How many colors are recommended when designing your poster?

- a. 1-2
- b. 3-5
- c. 6-7
- d. 8-9



At what distance should all content be viewable?

- a. Two feet
- b. Three feet
- c. Six feet
- d. Seven feet



Lastly, describe how you will present your poster.

NAME: _____

Let's Brainstorm

Directions:

Now that you understand how a research poster should be constructed, use the space below to plan your poster. Be sure to consider all the elements we have learned, such as flow of the content, bullet points, colors, concise title, and labels, figures and charts to be included as well as the images you will include.

Note: Do NOT just copy and paste sentences and information from your paper! You should always think about your audience and how to display content concisely and in a readable format.

Poster Rubric

Area	4 points	3 points	2 points	1 point
Overall Appearance	- Well organized - Bullet points used - Not text heavy - Draws attention	- Some organization is present. - Text is somewhat heavy. - Draws attention	Some organization is present. However, readability is still difficult.	Organization is poor with lots of text. Does not capture your attention
Color	Only three to four colors were used.	More than four colors were used or colors do not work or dark background was used.	Colors are not cohesive.	Color was not well considered in the development of the poster.
Graphics/tables	Two to three graphics/tables were used in the correct places and enhanced the overall poster flow and readability.	Less than two graphics/tables were used.	One or less graphics/tables were included.	No graphics/tables incorporated
Text	Text and images are well balanced. Bullet points were used to help break up information.	Text heavy, with 20% or more of the poster having text directly copied and pasted from the paper	Very text heavy, with over 50% of the poster text having been copied directly from the paper	Paragraphs of text were copied and pasted to the poster.
Readability	Text and images can be read from 6 feet away.	_____	_____	Text and images are not able to be read from 6 feet away.
Total				_____/20