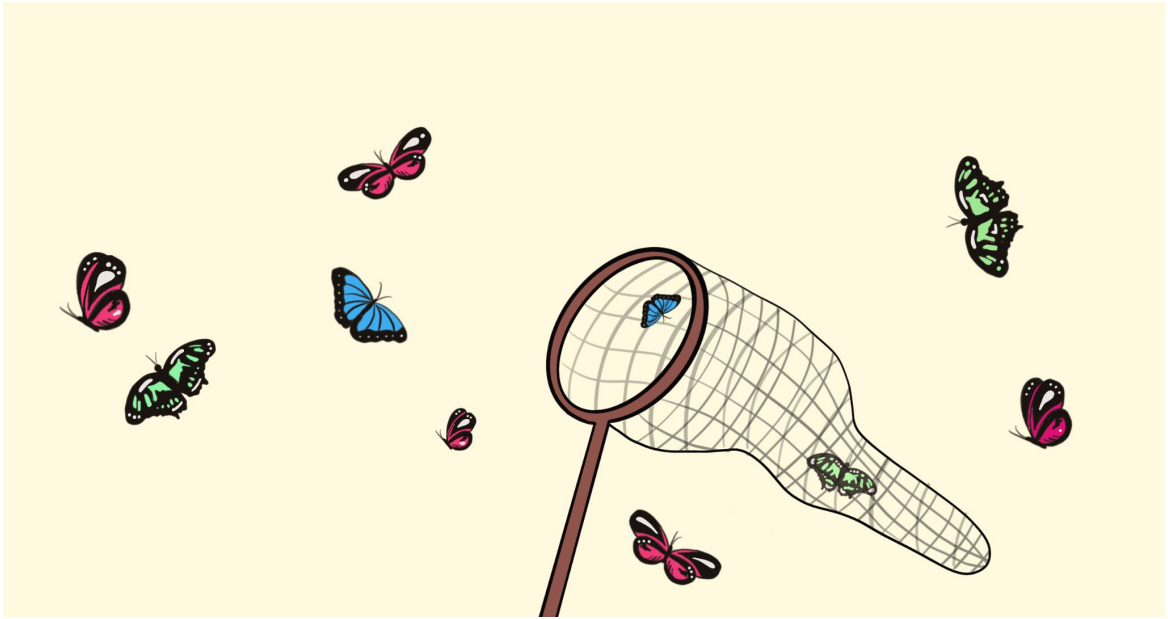
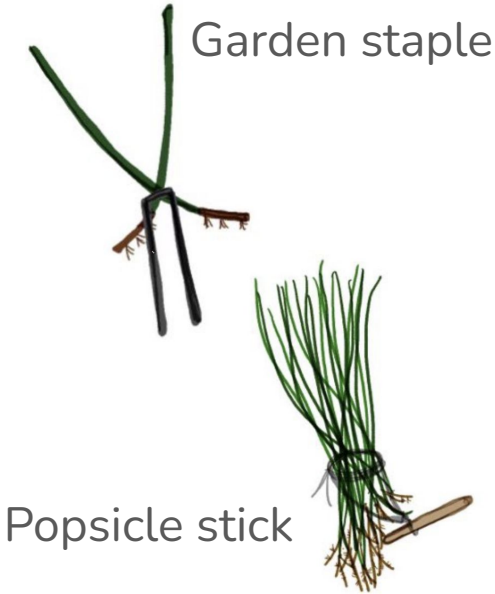
Week 5 Lecture 1:
Adventures in inference

EDS 222: *Statistics for Environmental Data Science*



Eelgrass restoration

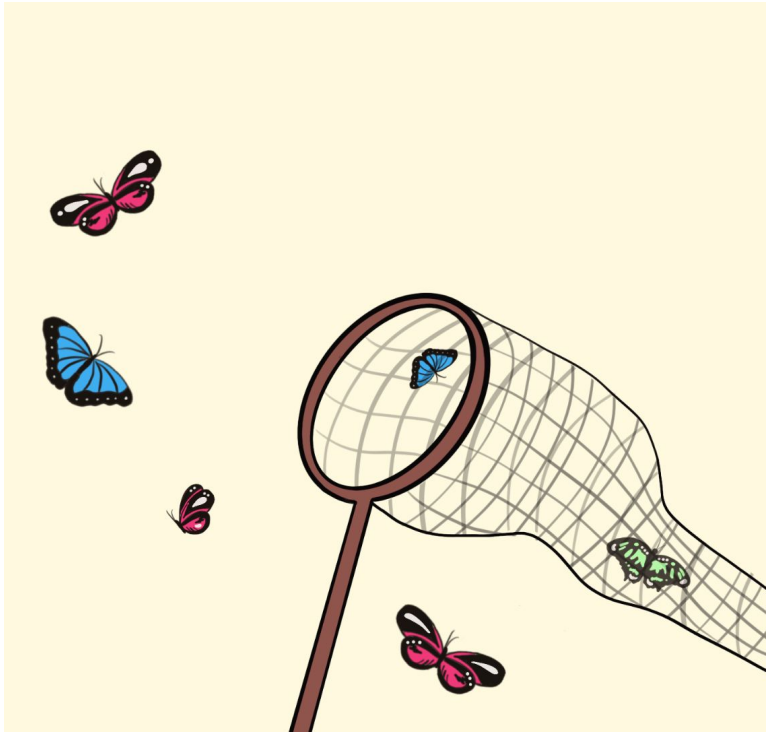
Photo: Hakai Institute



Artwork: Kat Beheshti

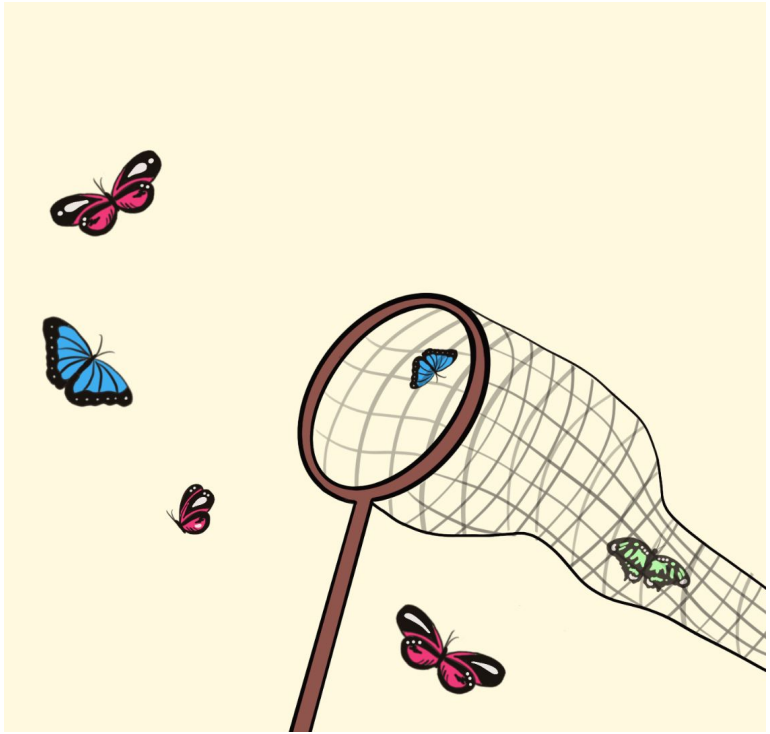
Today’s agenda

- ➔ Conducting statistical “experiments”
- ➔ One sample mean
- ➔ Two sample difference in means

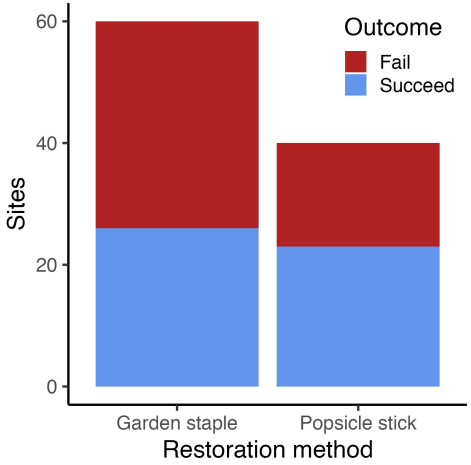


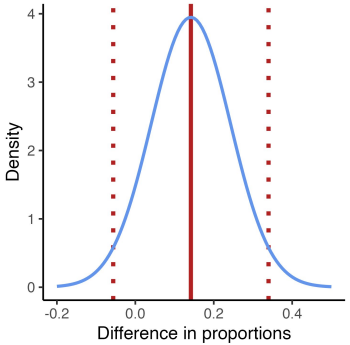
Today’s agenda

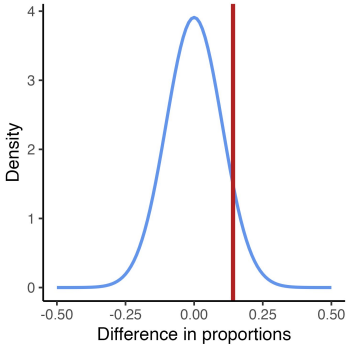
- ➔ **Conducting statistical “experiments”**
- ➔ One sample mean
- ➔ Two sample difference in means



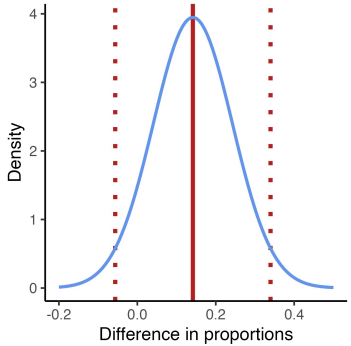
Inference for difference in proportions

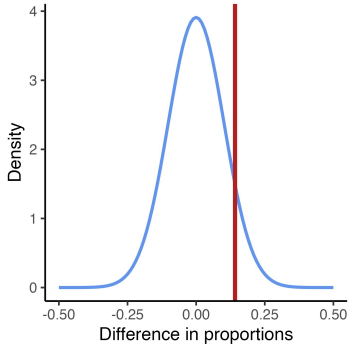




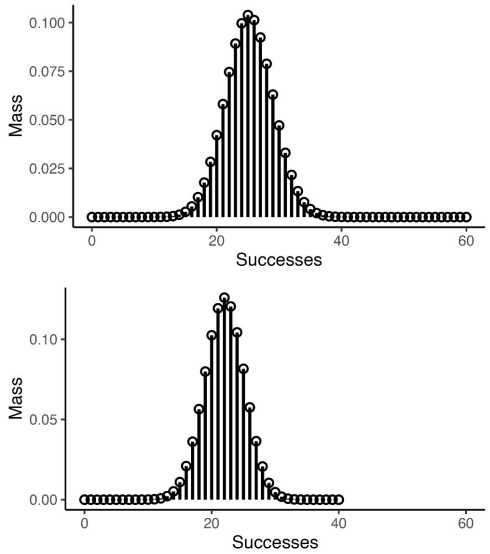


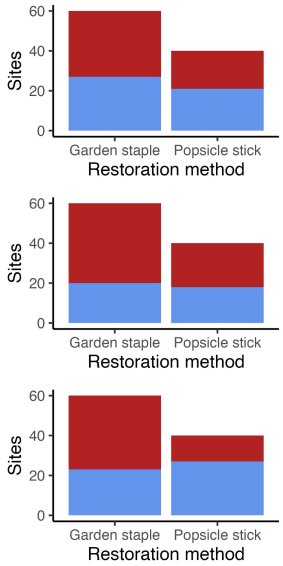
What do these claim?

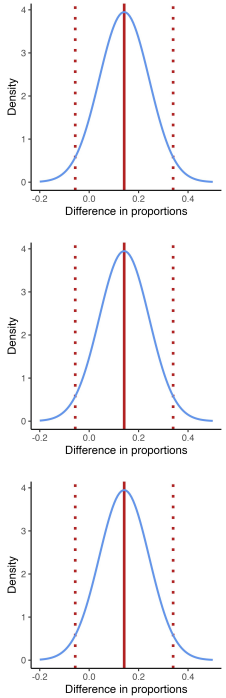




In other words...







How do we TEST that?

Claim: a 95% confidence interval contains the population parameter 95% of the time

How do we TEST that?

1. Choose parameters and predictors

How do we TEST that?

2. Simulate many samples

How do we TEST that?

3. Calculate statistic for each sample

How do we TEST that?

4. Calculate standard error for CI

How do we TEST that?

5. Calculate CI

How do we TEST that?

6. Check if CI covers parameter

How do we TEST that?

1. Choose parameters and predictors
2. Simulate many samples
3. Calculate statistic for each sample
4. Calculate SE of CI for each sample
5. Calculate the CI for each sample
6. Check if CI covers parameter

How do we TEST that?

Claim: at $\alpha=0.05$, the p-value rejects the null hypothesis correctly 95% of the time

How do we TEST that?

1. Choose parameters and predictors

How do we TEST that?

2. Simulate many samples

How do we TEST that?

3. Calculate statistic for each sample

How do we TEST that?

4. Calculate standard error for p-value

How do we TEST that?

5. Calculate p-value

How do we TEST that?

6. Decide whether to reject

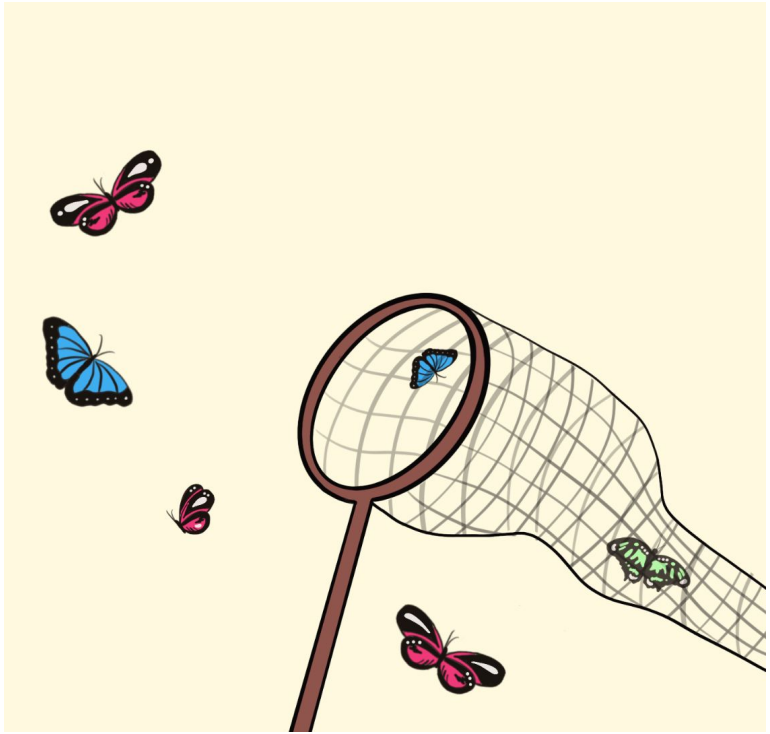
How do we TEST that?

1. Choose parameters and predictors
2. Simulate many samples
3. Calculate statistic for each sample
4. Calculate SE of null distribution for each sample
5. Calculate the p-value for each sample
6. Decide whether to reject

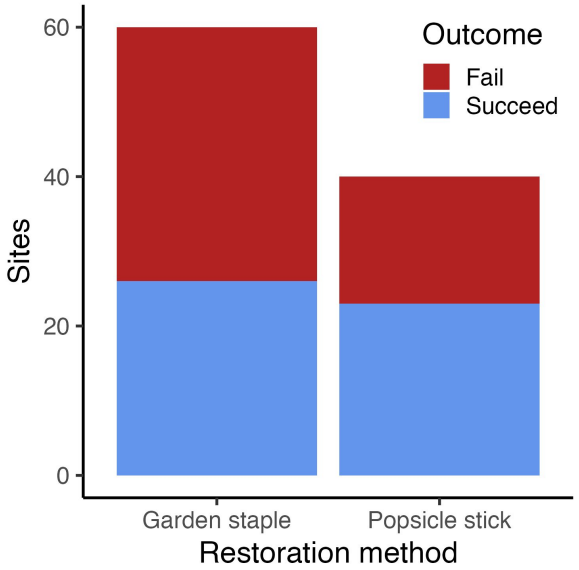
Conducting statistical “experiments”

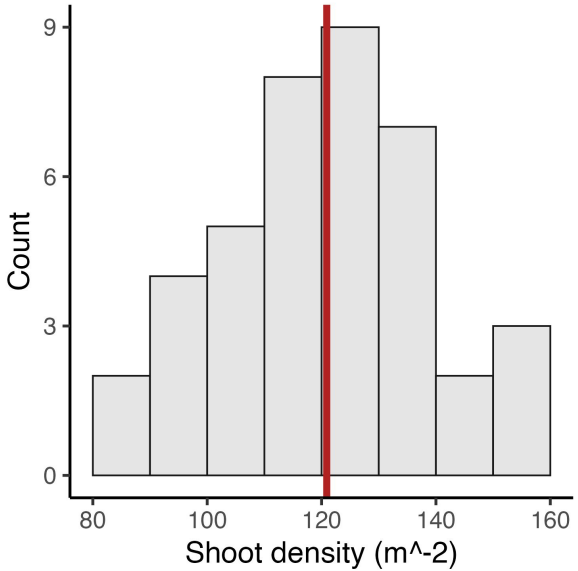
Today’s agenda

- ➔ Conducting statistical “experiments”
- ➔ **One sample mean**
- ➔ Two sample difference in means



Inference for one sample mean



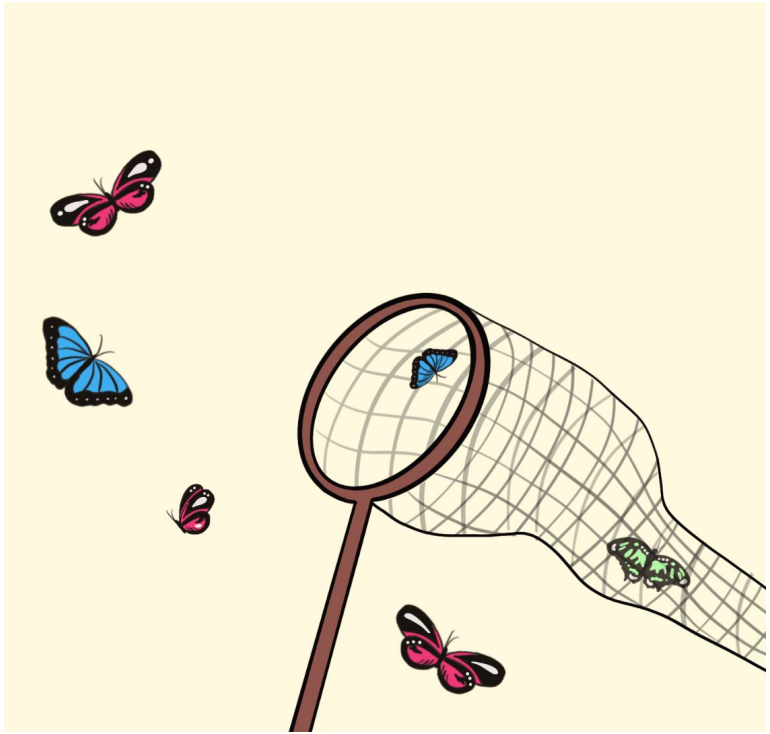


Standard error for one sample mean

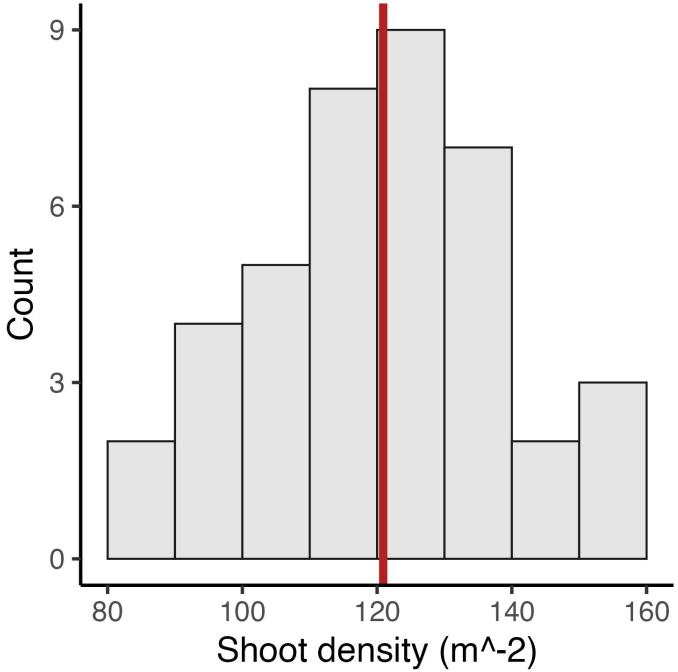
How would you make a CI?

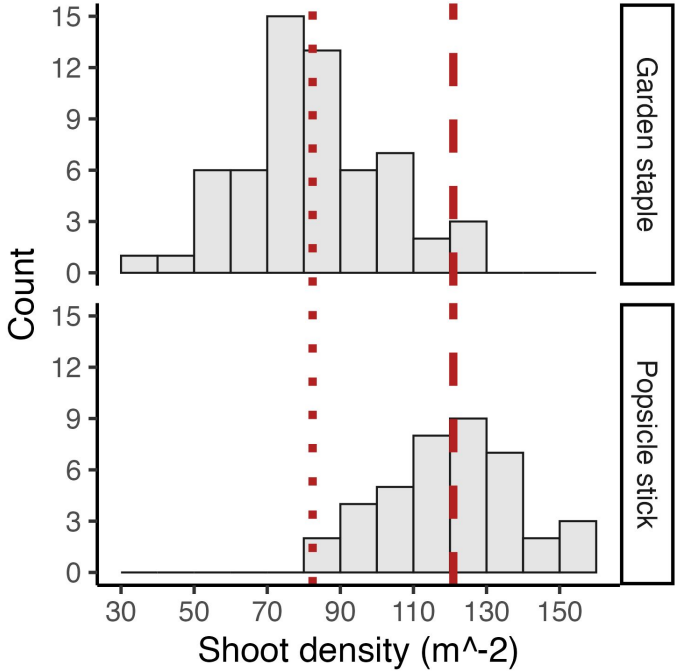
Today’s agenda

- ➔ Conducting statistical “experiments”
- ➔ One sample mean
- ➔ **Two sample difference in means**



Inference for difference in means





Standard error for difference in means' null hypothesis

How would you calculate a p-value?

Recap

For tomorrow