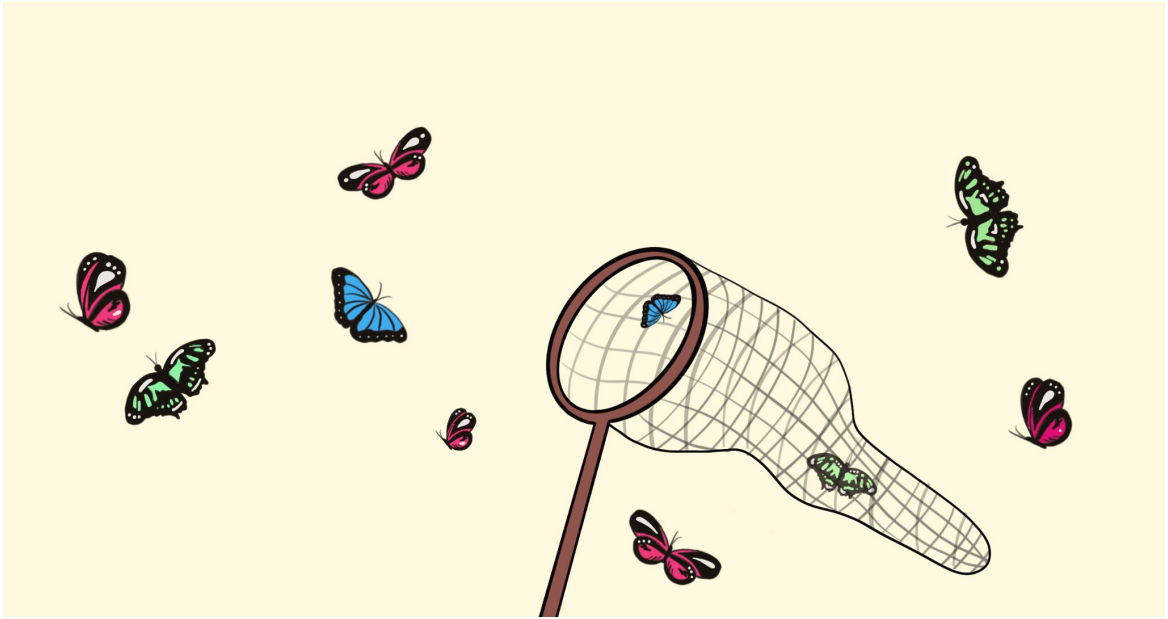
Week 3 Lecture 1:
Interactions

EDS 222: *Statistics for Environmental Data Science*



Indigenous stewardship

Credit: AP Photo/Eraldo Peres

Credit: Mkmult/Dreamstime

Indigenous stewardship

nature sustainability

Article

https://doi.org/10.1038/s41893-023-01073-0

Agricultural intensification, Indigenous stewardship and land sparing in tropical dry forests

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Current Biology

Report

Indigenous lands in protected areas have high forest integrity across the tropics

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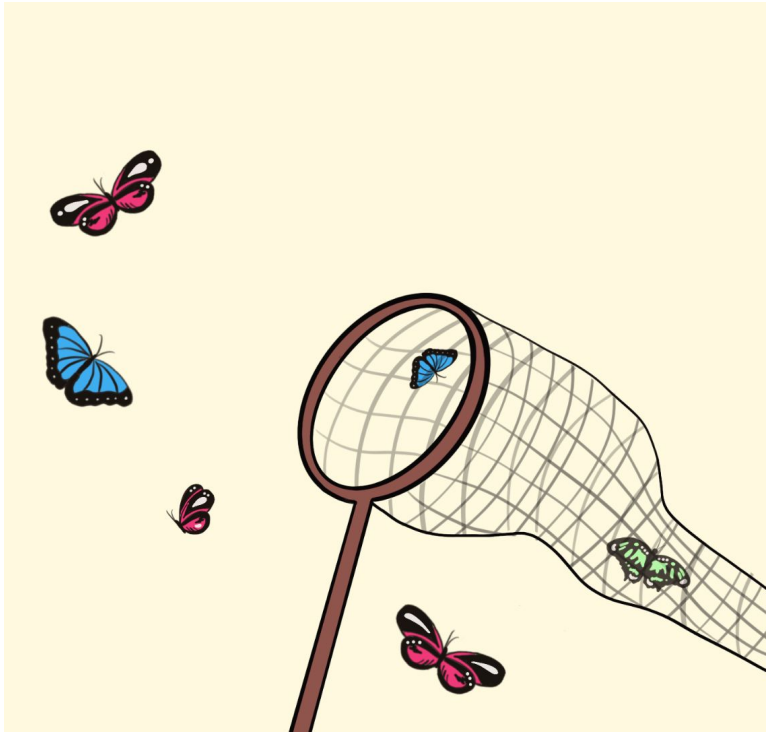
https://doi.org/10.1016/j.cub.2022.09.040

Today’s agenda

- ➔ Limits of additive models
- ➔ Interactive terms
- ➔ Homework and final project check-in



Today’s agenda

- ➔ **Limits of additive models**
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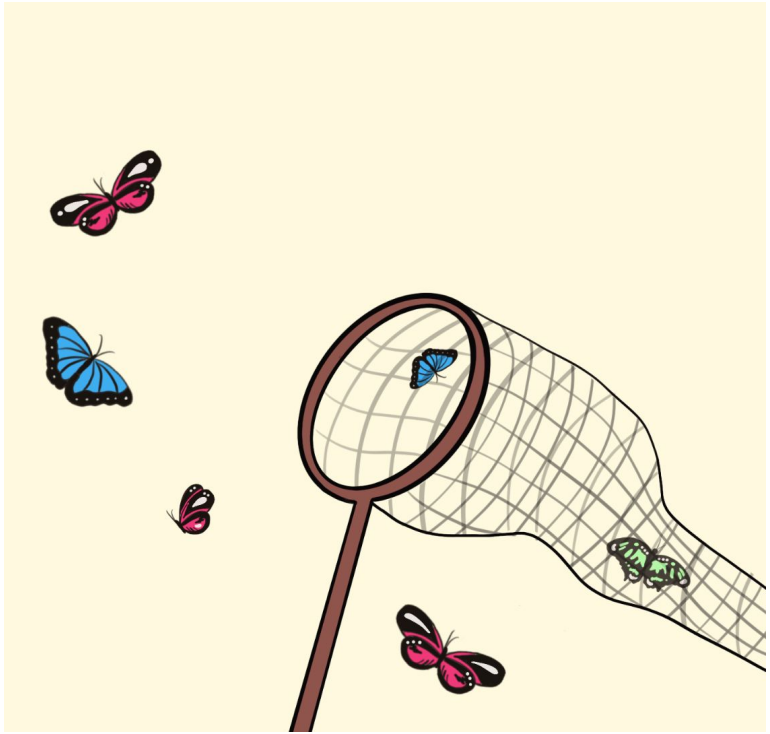
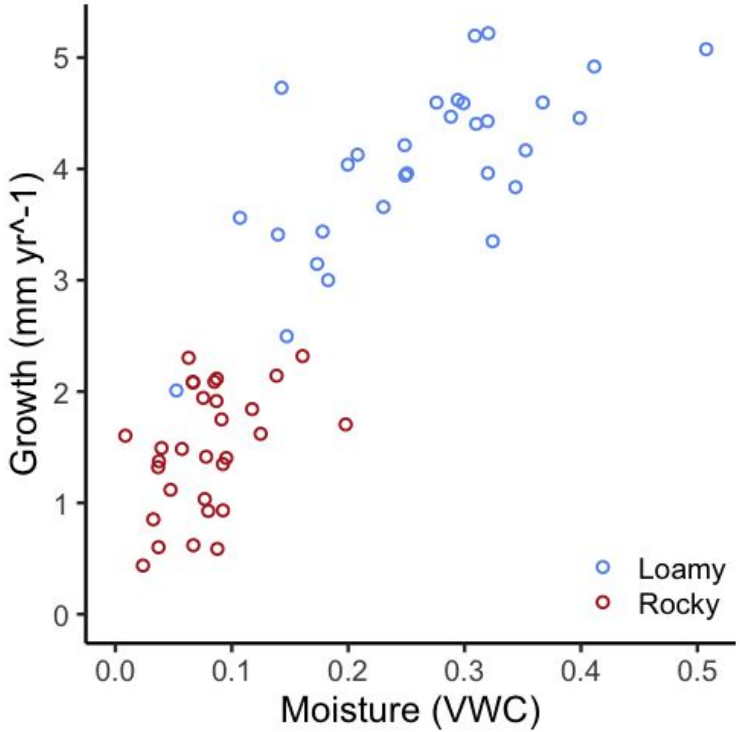


Growth model

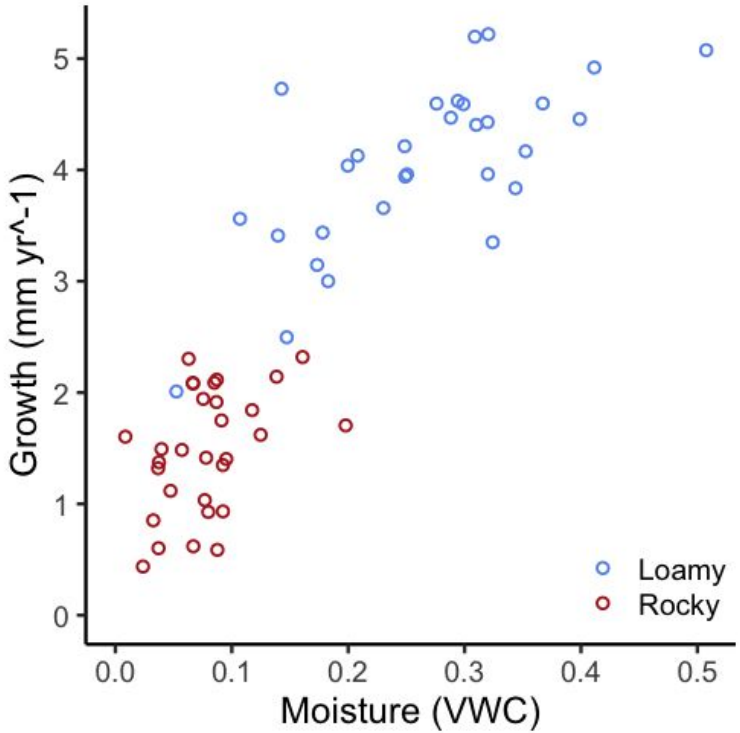


Eyeball *two* best fit lines

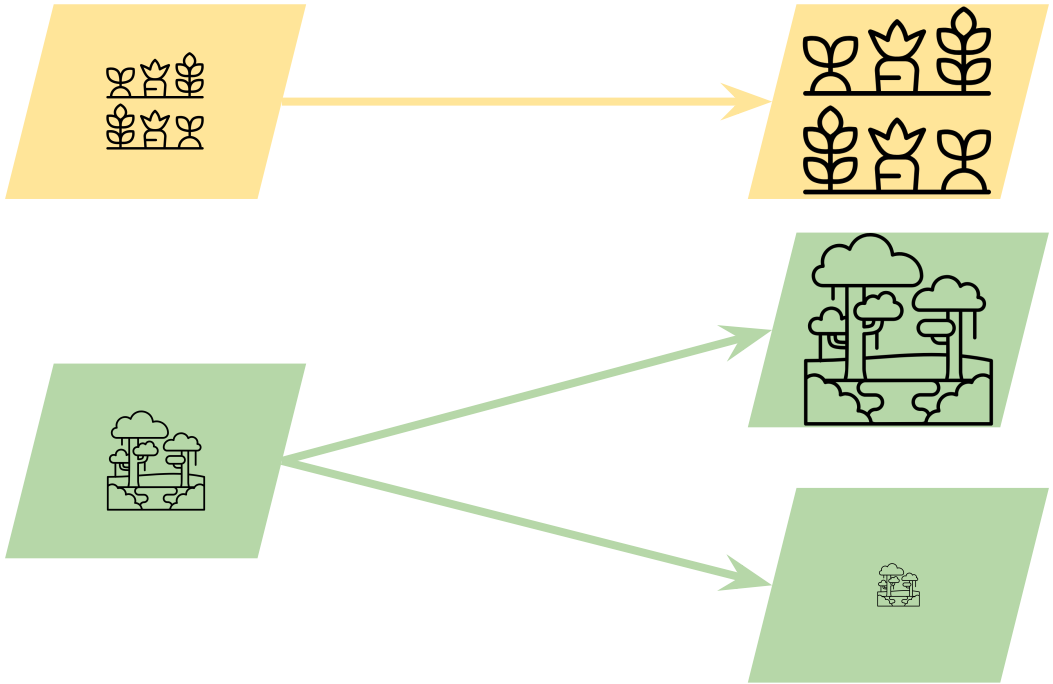
What do your lines imply about your assumptions?

Growth model

Growth model



Agricultural intensification and deforestation



Icons by
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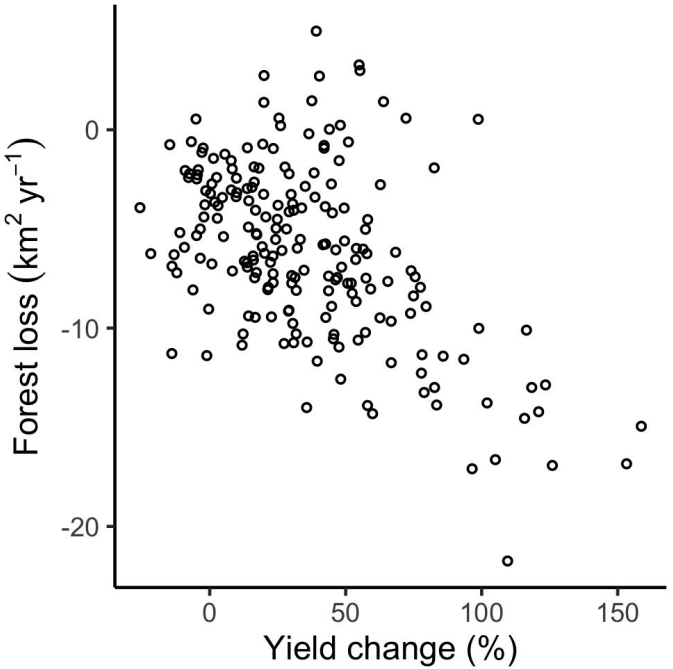
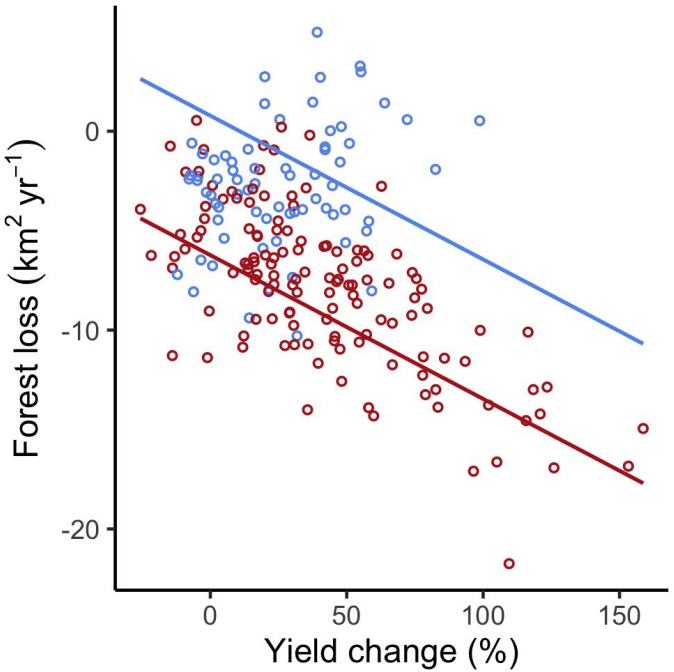
Agricultural intensification and deforestation



Which hypothesis do you think is supported by these data?

Agricultural intensification and deforestation



Write this model in statistical notation

What does this model assume about the *relationship* between yield change and forest loss?

Limits of additive models

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- ➔ **Interactive terms**
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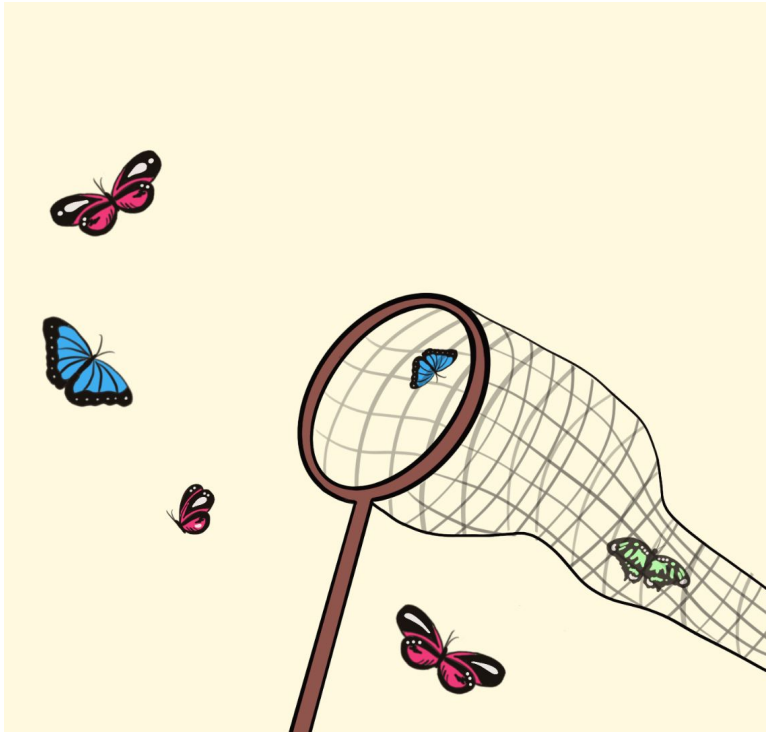
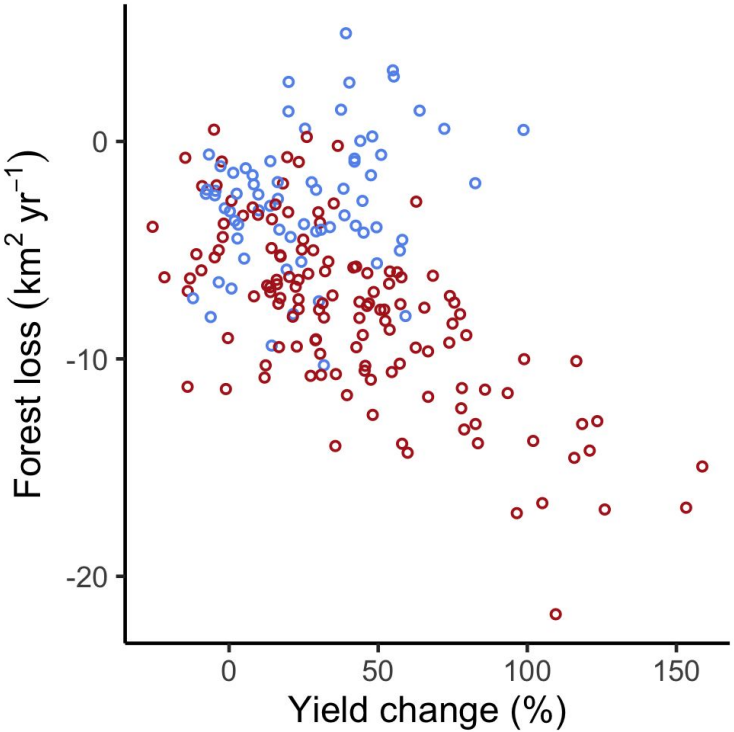
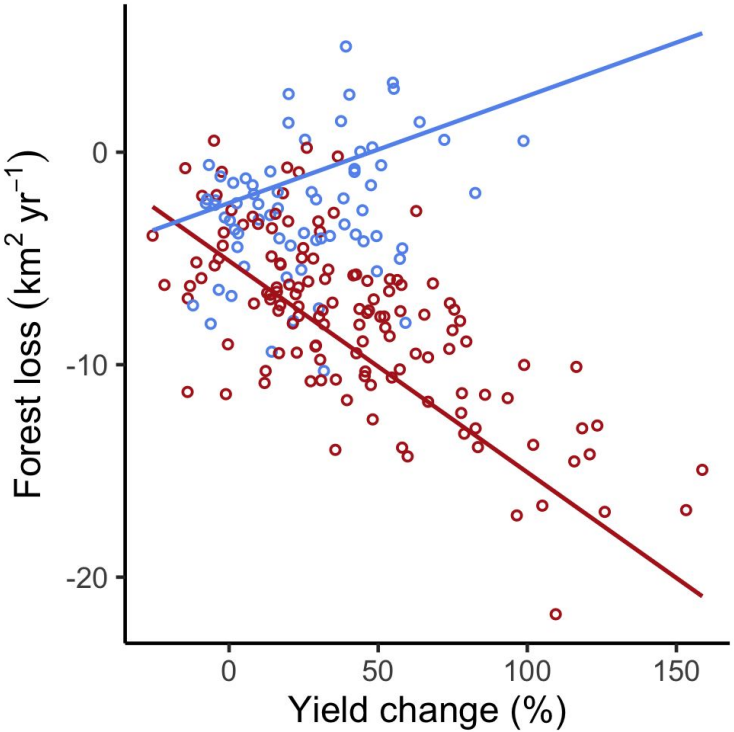


Adding interactive terms



Interactions modify slopes

Interactions modify slopes



Write this model in statistical notation

What's the *difference in slopes* between the lines? What's the blue slope?

Compare predictions

What's the predicted forest loss for a 100% yield change with and without indigenous stewardship?

Additive model

$$\text{loss} = \beta_0 + \beta_1 \text{yield} + \beta_2 \text{steward}$$

$\beta_0 = -6$

$\beta_1 = -0.05$

$\beta_2 = 7$

Interactive model

$$\text{loss} = \beta_0 + \beta_1 \text{yield} + \beta_2 \text{steward} + \beta_3 \text{yield} \times \text{steward}$$

$\beta_0 = -5$

$\beta_1 = -0.1$

$\beta_2 = 3$

$\beta_3 = 0.15$

Interactive terms

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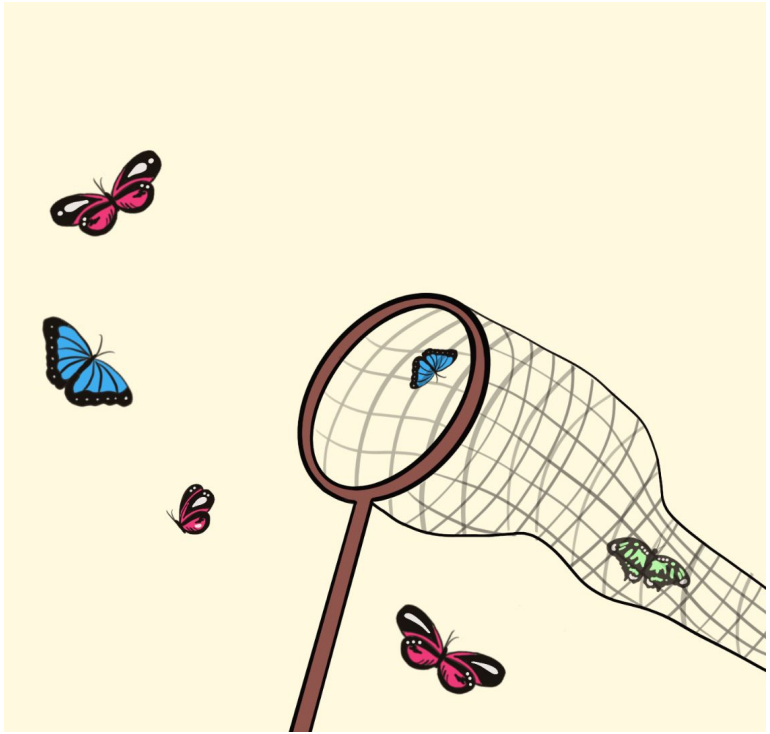
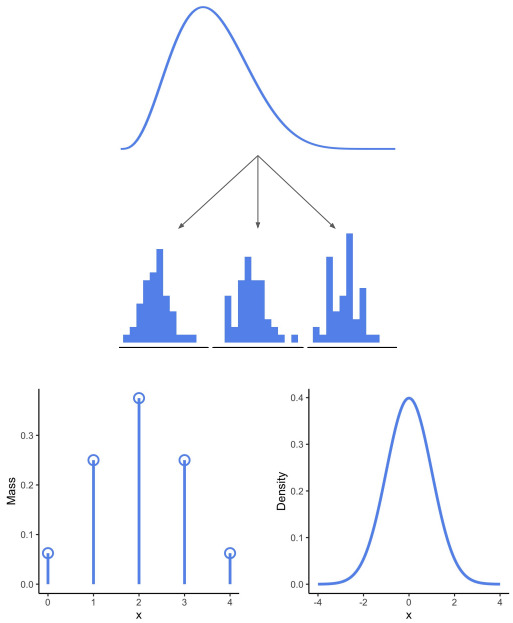
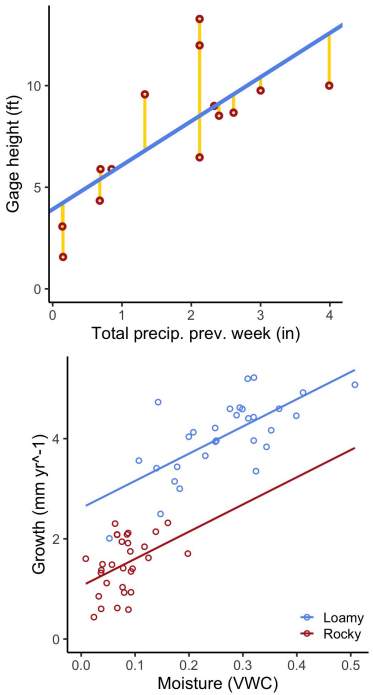


Exploring uncertainty

Week 1



Week 2



Week 3