EXERCISE

➤ Take the *Bullock et al., 2001* paper and write on a flipchart:

➤ Research question

➤ Study design (number of samples, location, time frame….) with sketch

➤ Statistical analysis and Figures

➤ Results

➤ One group will present their result in class.

➤ You have ~ 30 min.

FIRST:

➤ Please take some time to do the teaching evaluation you should have gotten as email!

Restoration of biodiversity enhances agricultural production
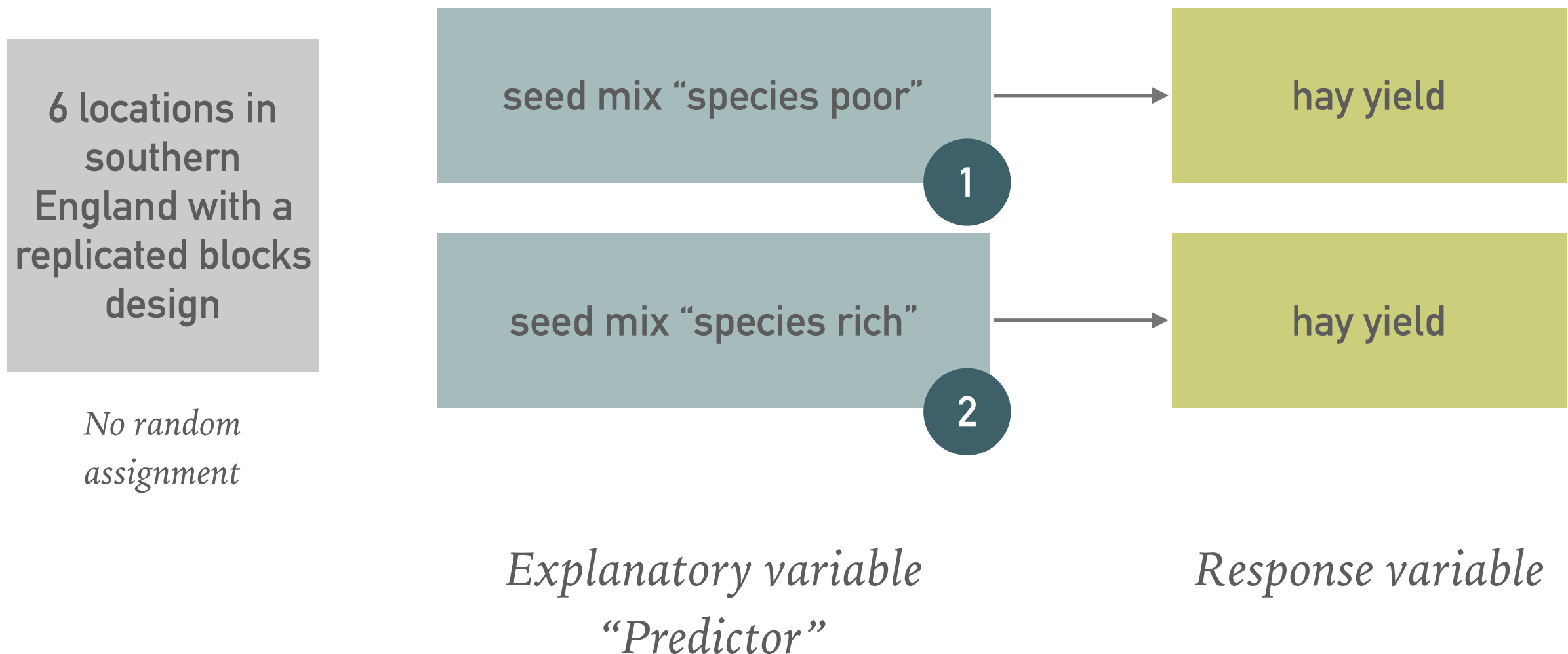
Abstract

Restoration of ecological communities is important to counteract global losses in biodiversity. However, restoration on agricultural land is perceived as being costly because of losses in agricultural production. We suggest the reported positive relationship between diversity and productivity means biodiversity could be used to enhance agricultural production. We examined this in hay meadow restoration experiments at seven sites across southern Britain. At each site two seed mixes ("species-poor" with 6–17 species and "species-rich" with 25–41 species) were applied in a randomised block experiment. Hay yield was higher in the species-rich treatment from the second year onward, by up to 60%. Comparing the two treatments in all sites, there was a simple linear relationship between the difference in species number and the amount of increase in hay production. Fodder quality was the same in both treatments. This suggests farmers can maximize high quality herbage production in re-sown grasslands by maximizing biodiversity.

BULLOCK ET AL., 2001: DIVERSITY AND PRODUCTIVITY

➤ **Research question:** 1) Does the 'species rich' seed mix lead to significantly more <u>hay yield</u> than the 'species poor' seed mix?

➤ **Method:** two categorical predictors, so ***t-test*** for each year of hay harvest

6 locations in southern England with a replicated blocks design

No random assignment

seed mix "species poor" → hay yield

1

seed mix "species rich" → hay yield

2

Explanatory variable "Predictor"

Response variable

➤ **Results:** Species-rich treatment had significantly higher hay yield than species-poor treatment.

A t-test for each year

year 1, $F_{1,69}$=0.01, P>0.05
year 2, $F_{1,69}$=7.04, P<0.01
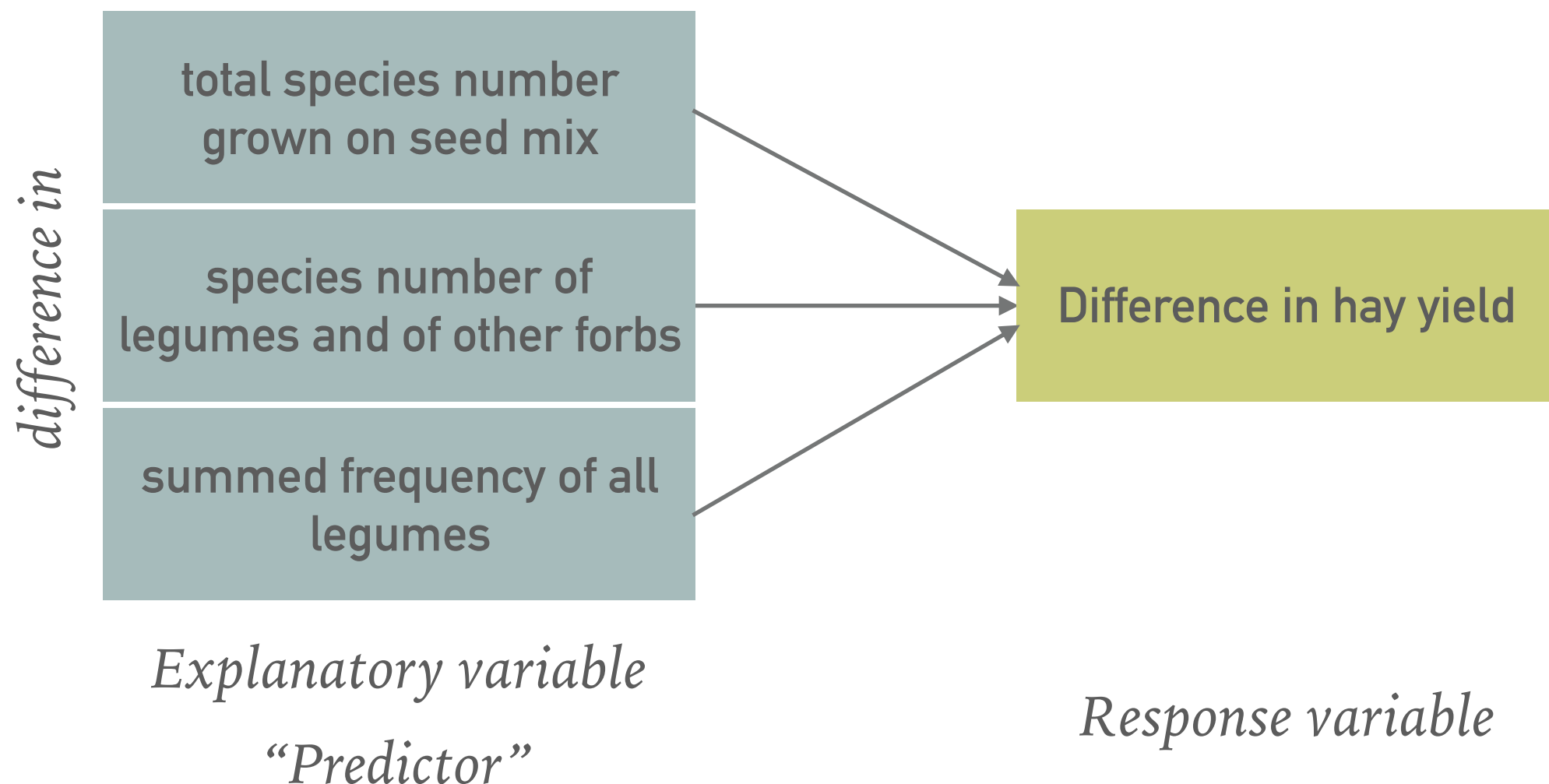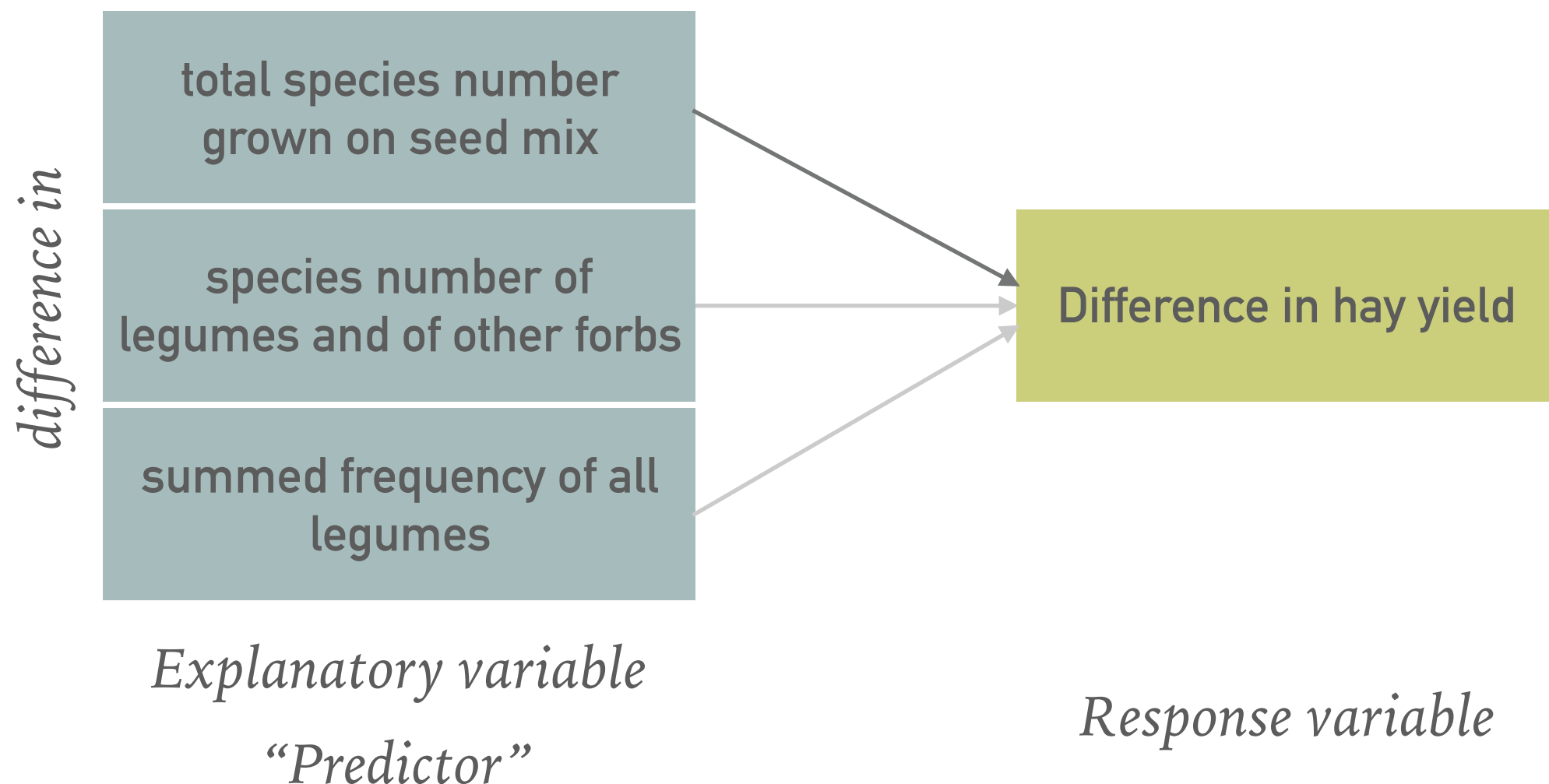*year 3, $F_{1,49}$= 29, P<0.001*
year 4, $F_{1,39}$= 10.2, P<0.001

➤ **Research question:** 2) Does the differences in species number (3 predictors) explain the difference in hay yield between treatments?

➤ **Method:** ratio predictors, so *multiple linear regression*
measured by difference between the species-rich & species-poor treatments for each site in each of the years 2-4

Explanatory variable
*"Predictor"*

Response variable

➤ **Research question:** 2) Does the differences in species number (<u>3 predictors</u>) explain the <u>difference in hay yield</u> between treatments?

➤ **Method:** ratio predictors, so *multiple linear regression* measured by difference between the species-rich & species-poor treatments for each site in each of the years 2-4

difference in

| total species number grown on seed mix |
| species number of legumes and of other forbs |
| summed frequency of all legumes |

Difference in hay yield

Explanatory variable
*"Predictor"*

Response variable

➤ **Results:** Only the **difference in total species number** was significant for the difference in hay yield.

➤ Here's a graph with just the one significant factor:

DM difference = 0.148 Species difference - 0.58
$r^2 = 0.46, n = 15, P < 0.01$
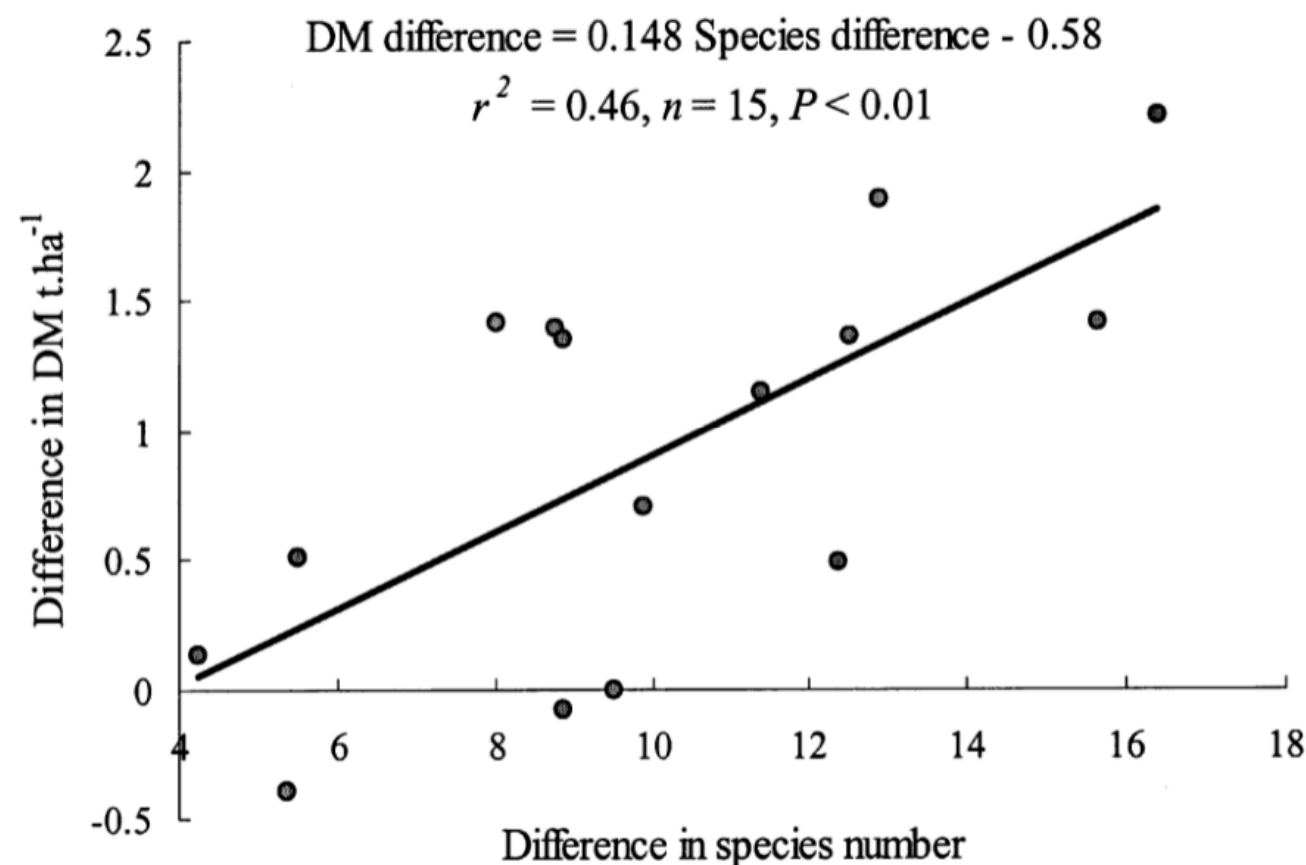
BULLOCK ET AL., 2001: WHAT'S FIGURE 1?

➤ Basically, this is "did my rich species seed mix work and there are more species"?

➤ It's a **measure validation**. Important, but not a **research question** technically.
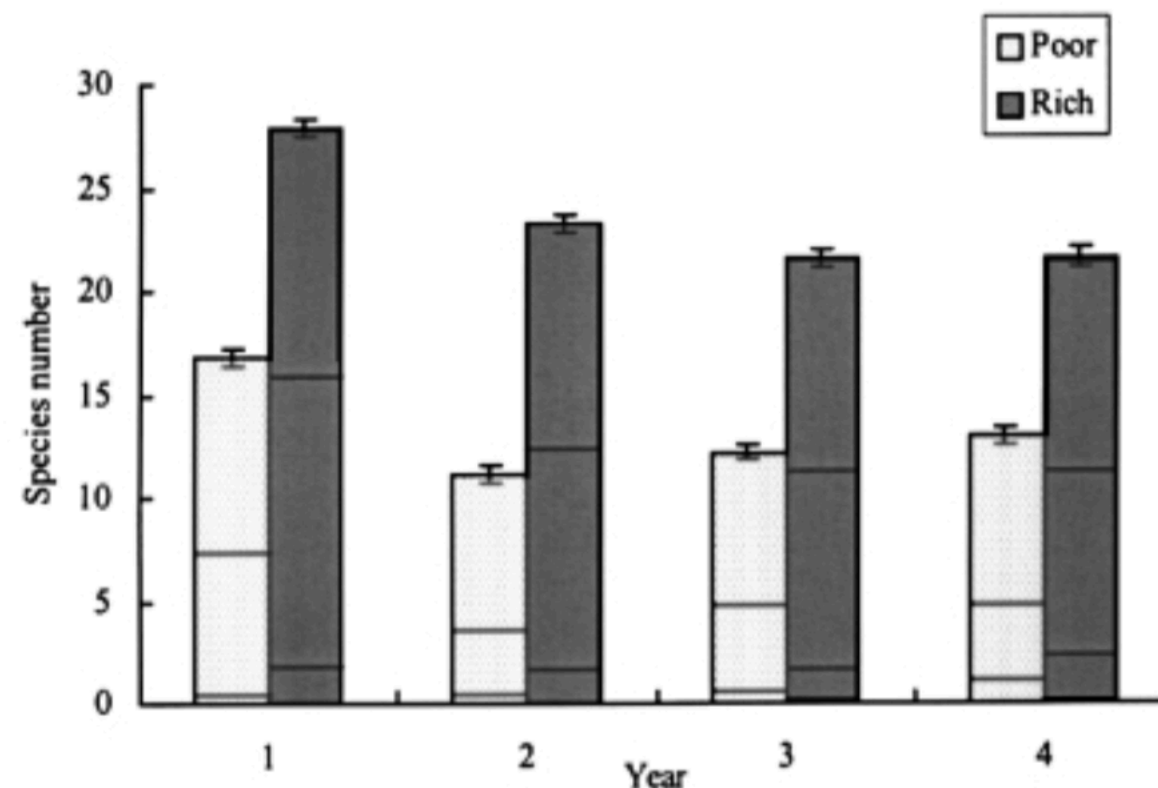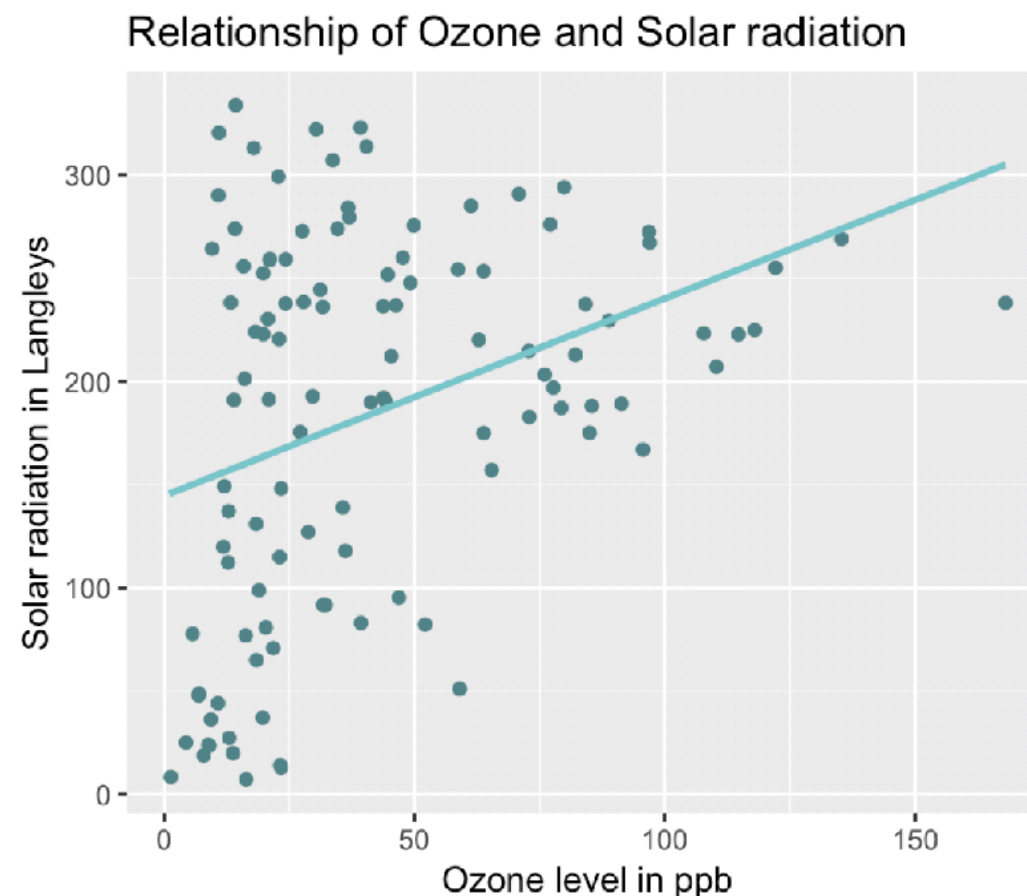
DESIGN AN EXPERIMENT YOURSELF!

➤ Just like you did with the paper, go through the following points:

  ➤ Come up with one research question for a study. More are ok if you eg would like to test a pre-condition etc.

  ➤ Explain your study design (number of samples, location, time frame….) with sketch

  ➤ What exactly would you have to test for?

  ➤ How would results look like? What could be the significance?

➤ One group will present their result in class.

➤ You have ~ 20 min.

SOME ANNOUNCEMENTS

➤ Describes the relationship of two variables

➤ can be written as: y~x (y *"depends on/is explained by"* x)

➤ requires (ordinal)/interval/ratio data

➤ **result**: the so-called correlation coefficient, can be between -1 and 1

> Note: those are ways to phrase the "~". Correlations are not causal, hence it is not really 'explained by'

Relationship of Ozone and Solar radiation

Y-axis: Solar radiation in Langleys (0, 100, 200, 300)
X-axis: Ozone level in ppb (0, 50, 100, 150)

HOMEWORK

➤ Please do exercise #5 from Mathematics___Statistics_Problem_Set_1.pdf in mystudy.

Is your teen texting about sustainable farming?

OMG = Organic Mushroom Gardening

WTF = Where's The Fertilizer

LMAO = Left My Axe Outside

LOL = Lots Of Lettuce

DTF = Down To Farm

WYD = Weed Your Dandelions

BRB = Better Results than Borlaug

TBH = This Bountiful Harvest

SMH = Share My Harvest

BTW = Bring The Wheelbarrow

ILY = Increased Land Yield

BS = Big Snail

Next time: **Distributions**

See you there!