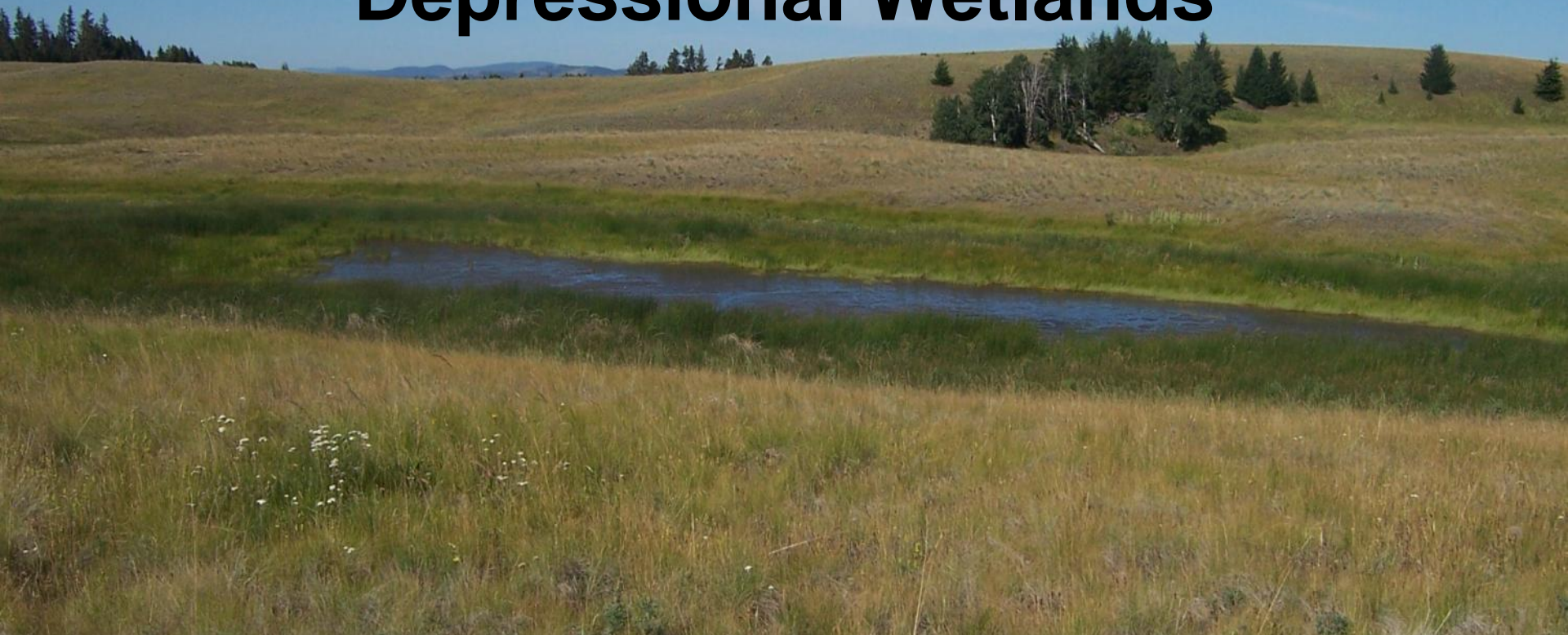


# The Effects of Cattle Grazing on Breeding Waterfowl in Intermountain Depression Wetlands



THOMPSON RIVERS  
UNIVERSITY

**Lauchlan H. Fraser, Marc Jones, Bruce Harrison, Ashleigh Gilbert, Denise Clark, Lindsey Smith, Brian Heise**

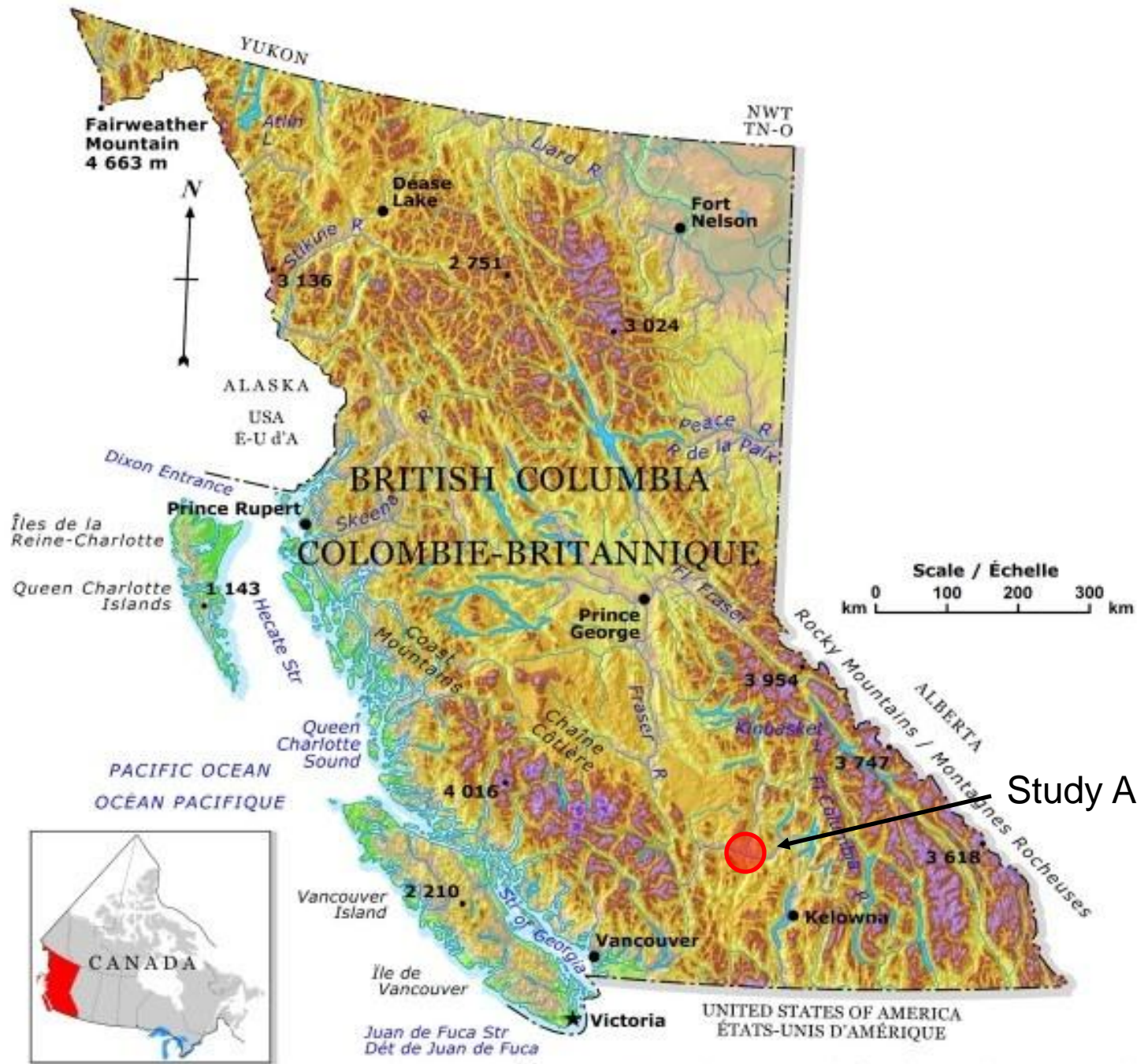
# Livestock & Wetlands

- Direct Impacts
  - Biomass removal
  - Trampling
  - Soil compaction
  - Altered microtopography
  - Altered soil nutrient status



# Questions:

1. Does the overall abundance and composition of wetland plant species vary with increased livestock use?
2. Does livestock use affect wetland invertebrate abundance and composition?
3. Does livestock use affect breeding and brooding waterfowl?





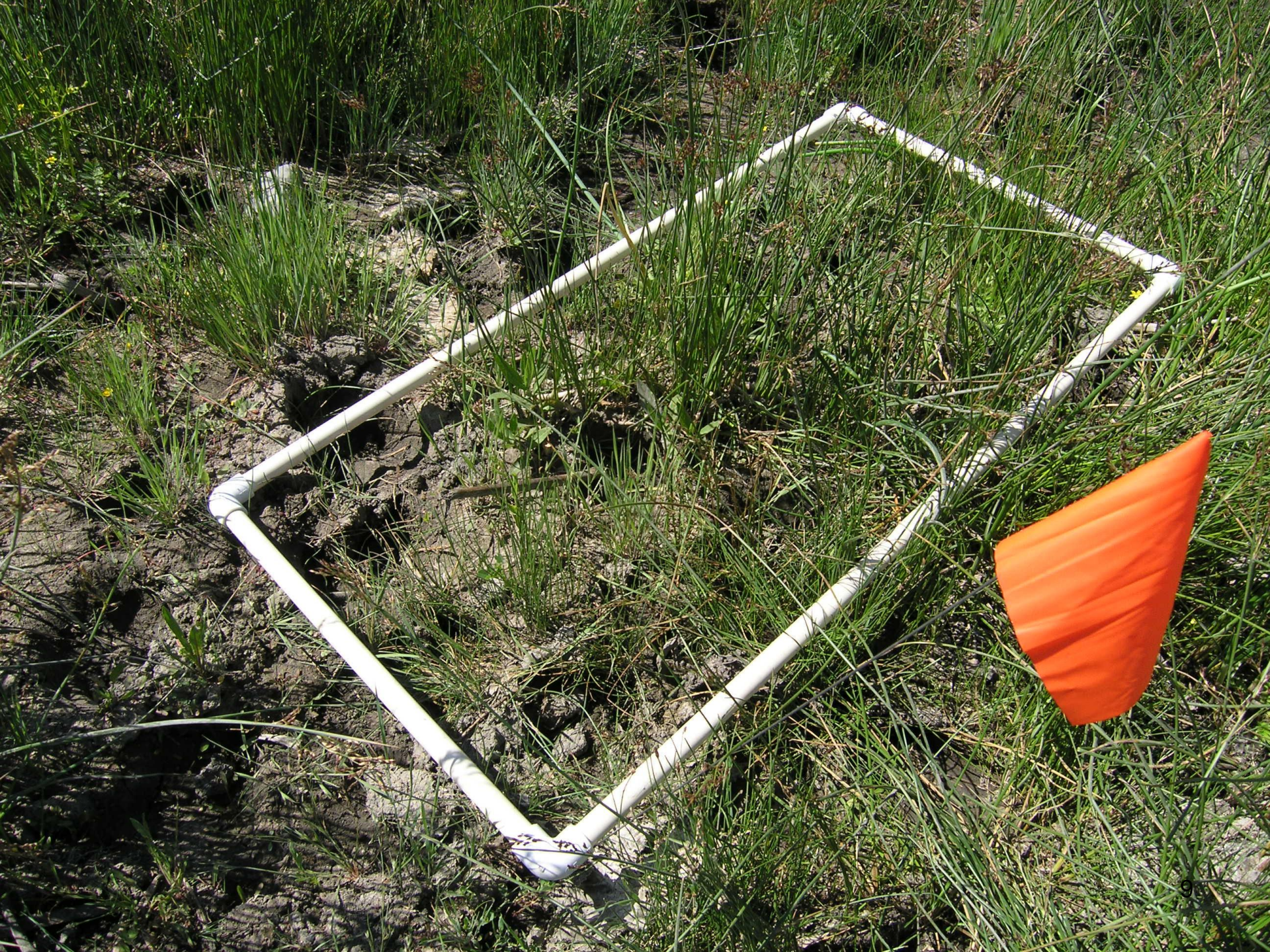






Livestock Use Intensity



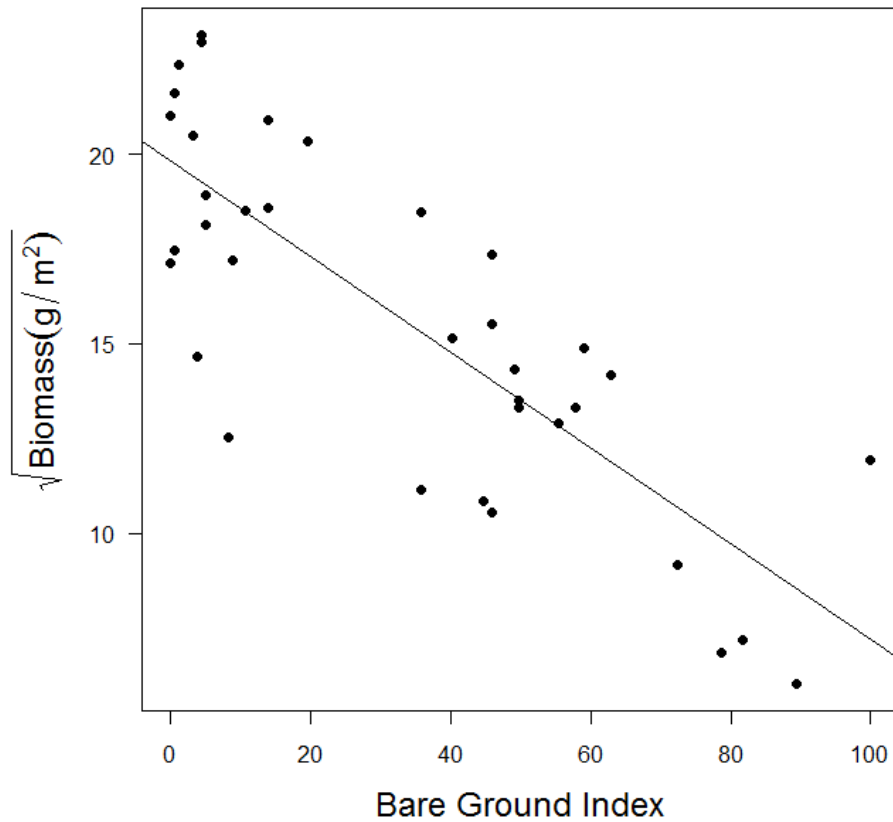


# Measuring Livestock Use

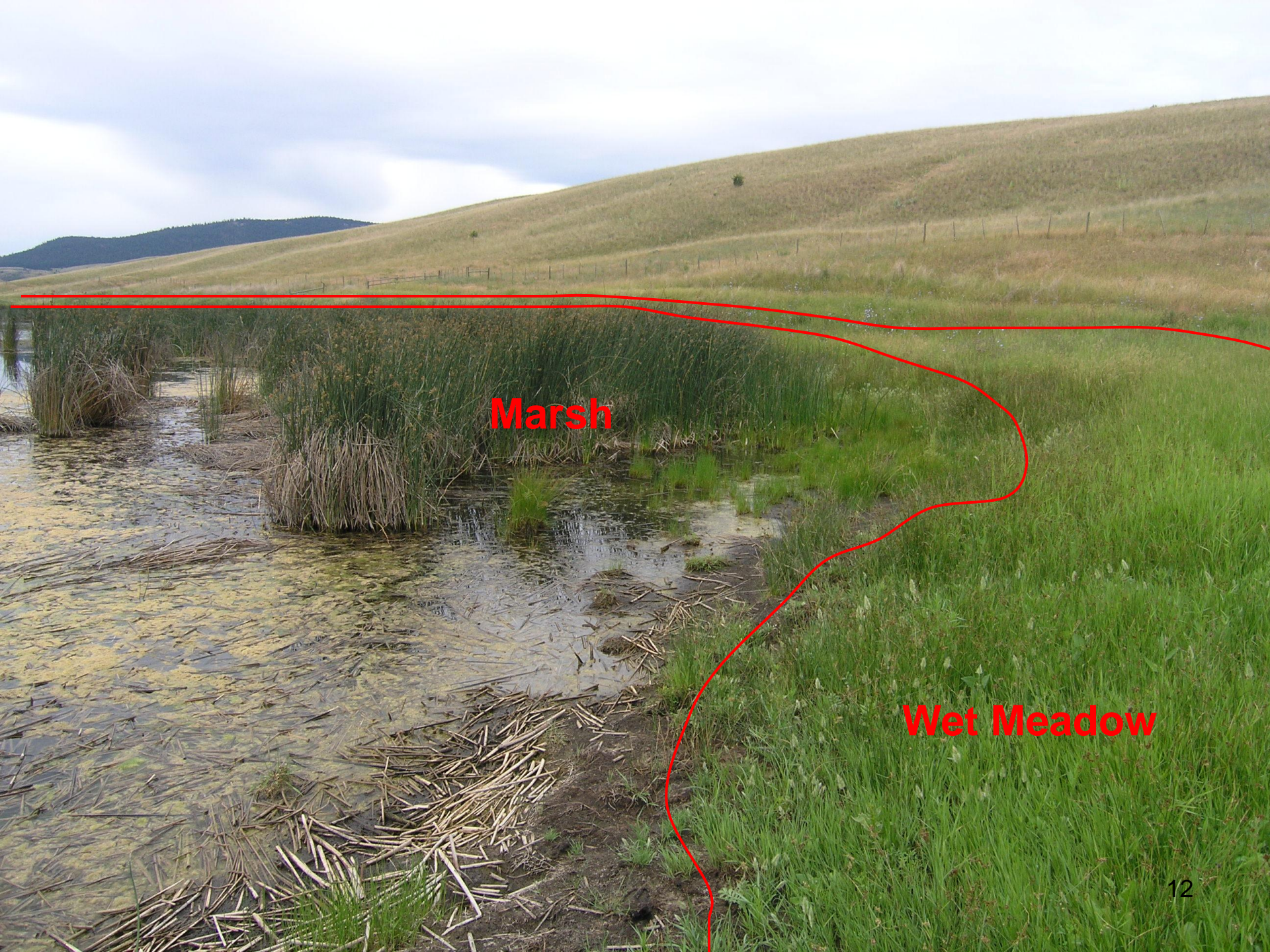
- Bare ground (number of quadrat corners that intersect bare ground)

Highly correlated with soil bulk density ( $r = 0.8$ ;  $n = 34$ )

# Aboveground vegetation biomass and livestock use



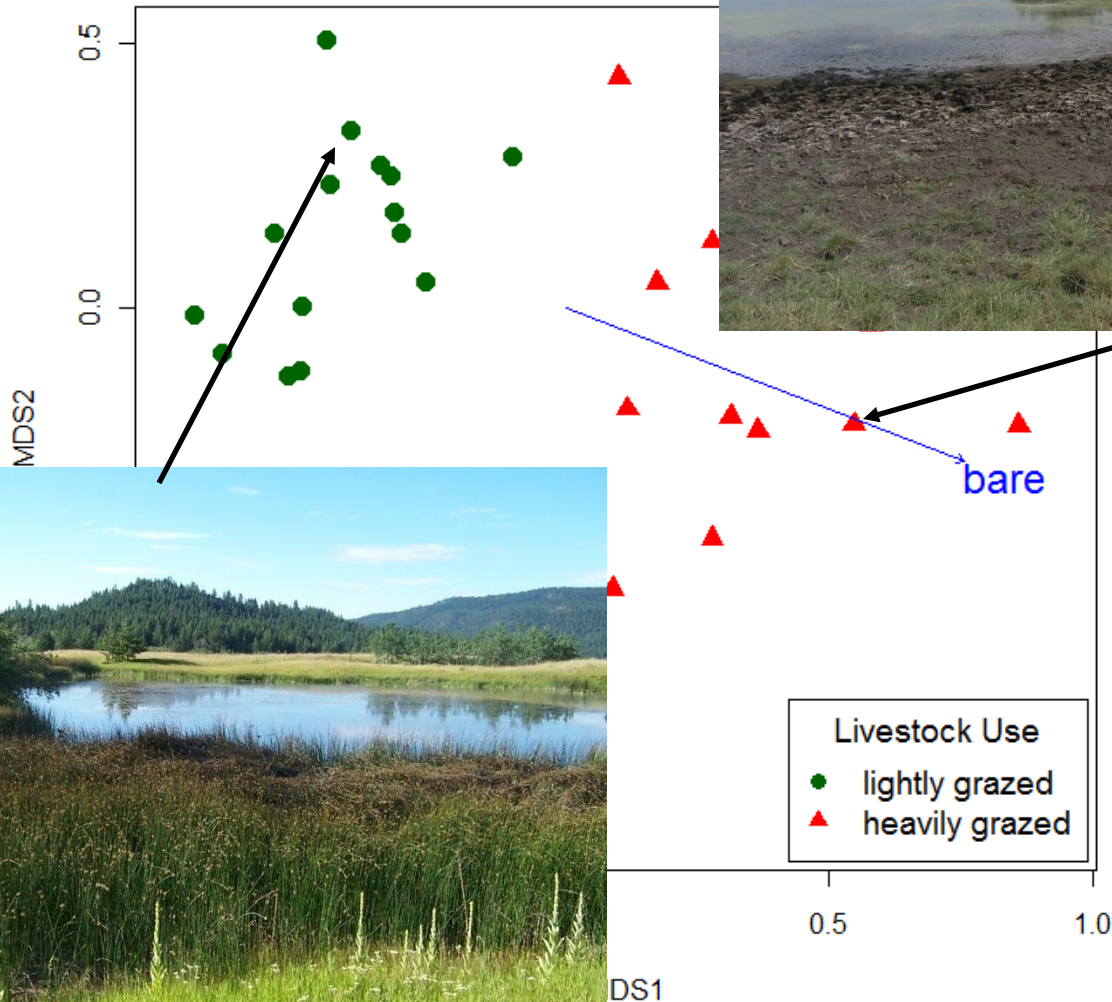
$R^2 = 0.62, P < 0.0001$



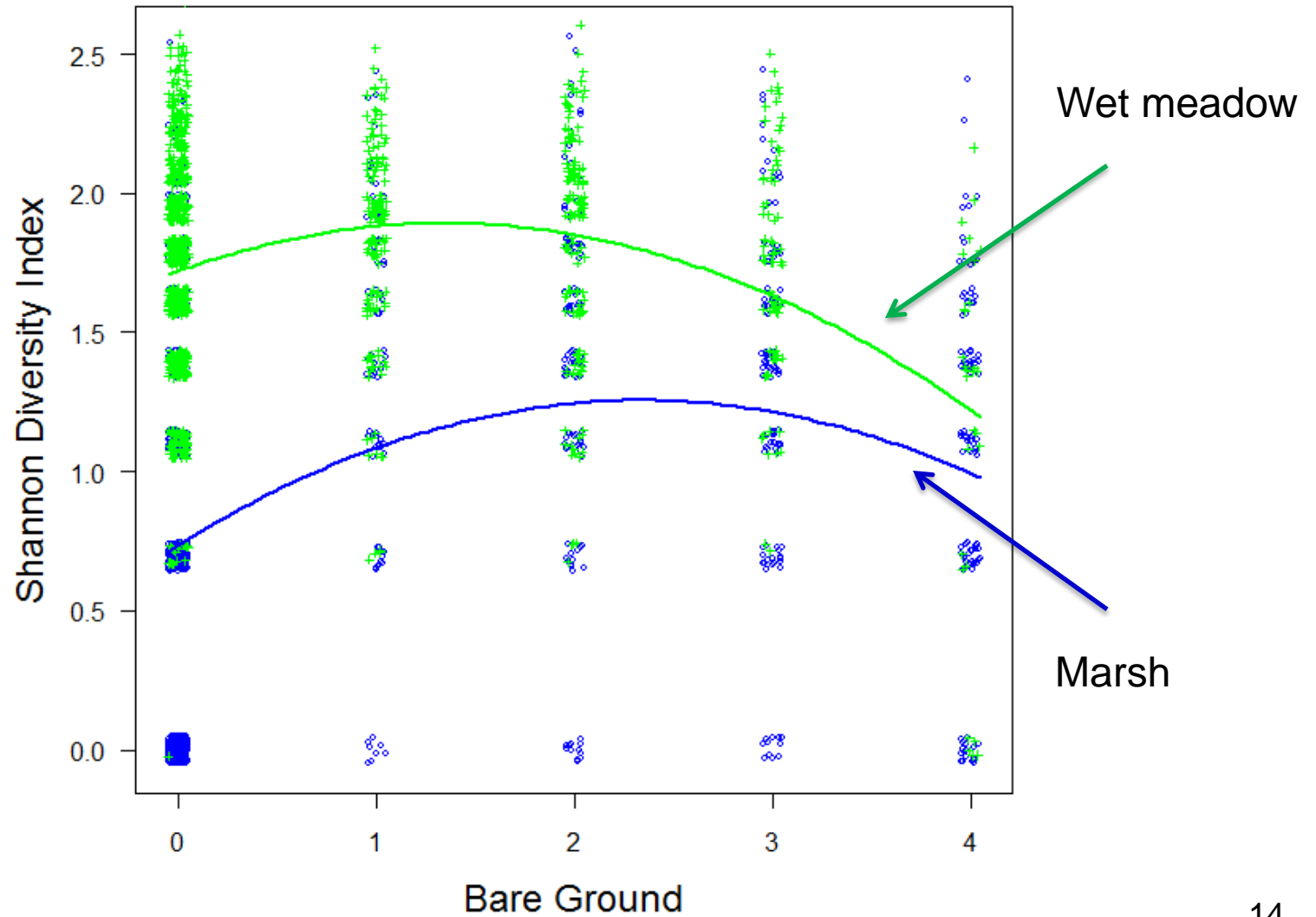
**Marsh**

**Wet Meadow**

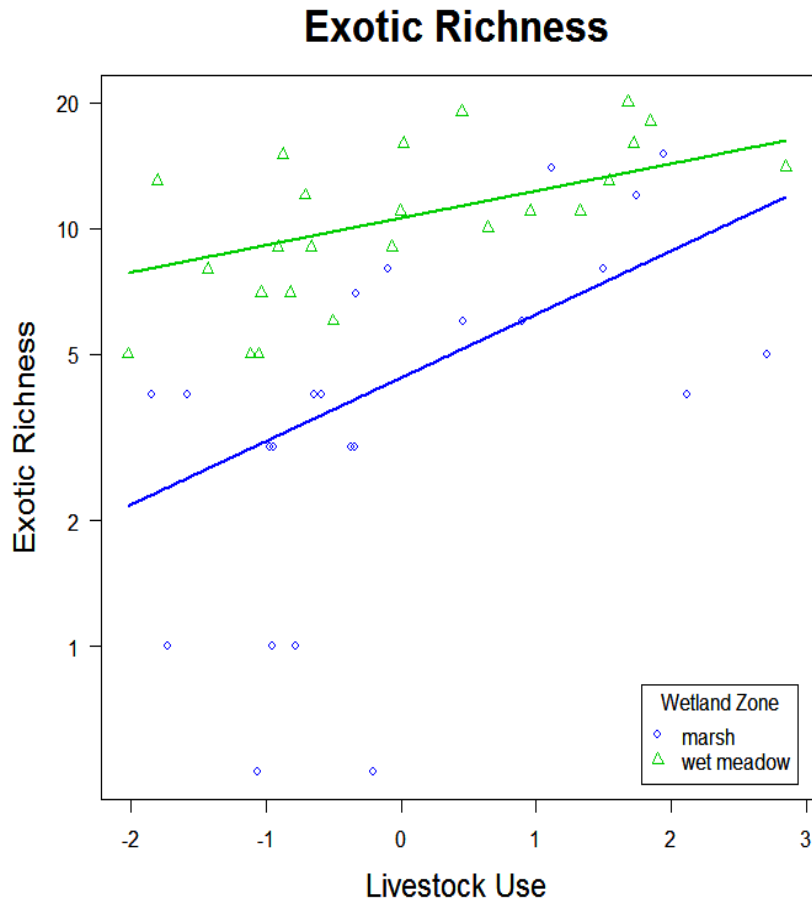
# Does livestock use community co



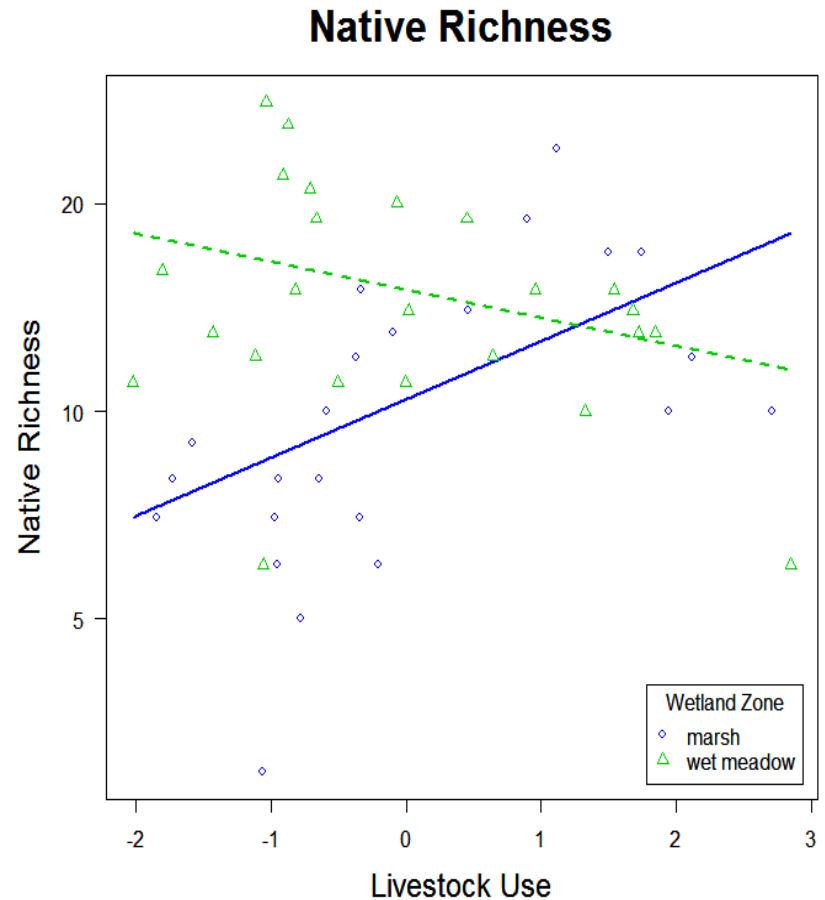
# Effect of livestock on vegetation diversity



# Does livestock use affect richness of exotic and native species?

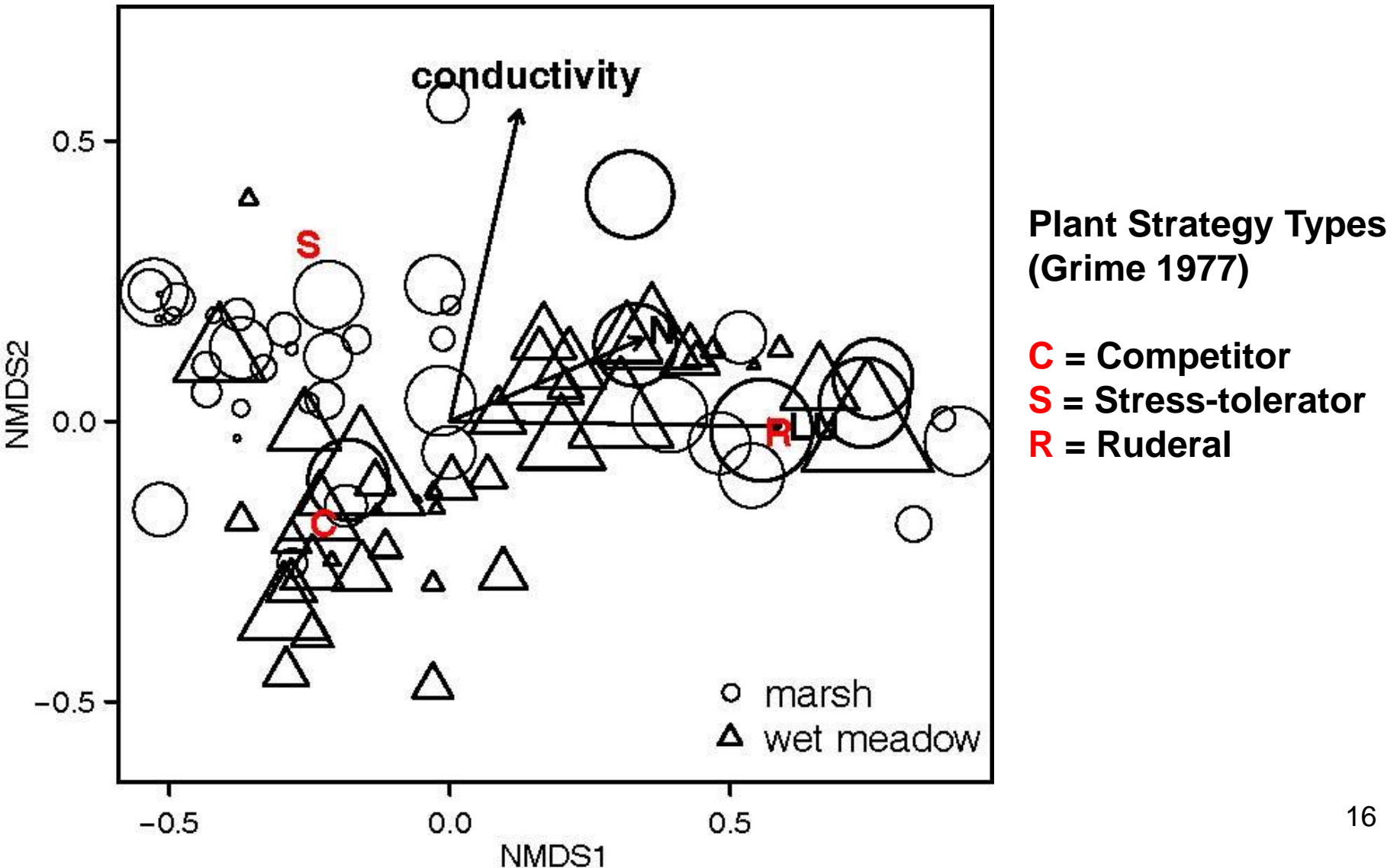


$$D^2_{\text{adj}} = 0.63, P < 0.0001$$



$$D^2_{\text{adj}} = 0.30, P = 0.0004$$

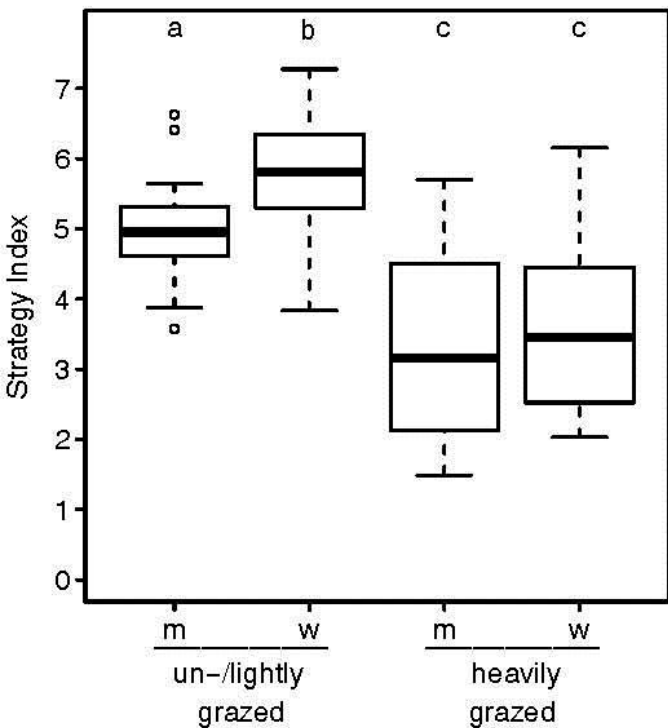
# Does livestock use affect vegetation functional status?





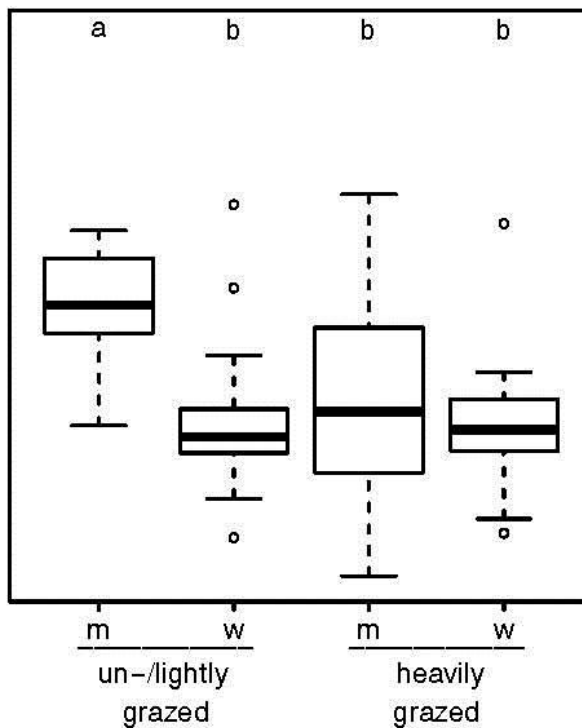
# C

## Competition



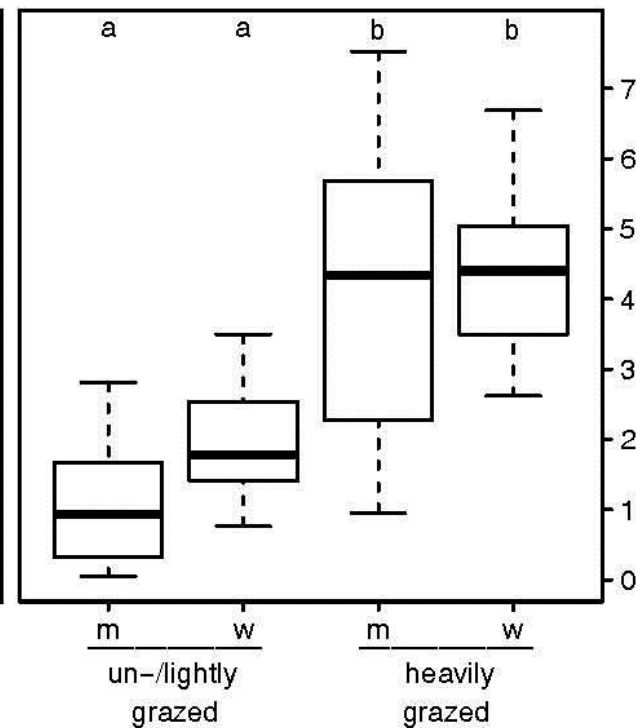
# S

## Stress tolerance



# R

## Ruderal



m = Marsh

w = Wet meadow

# Implications

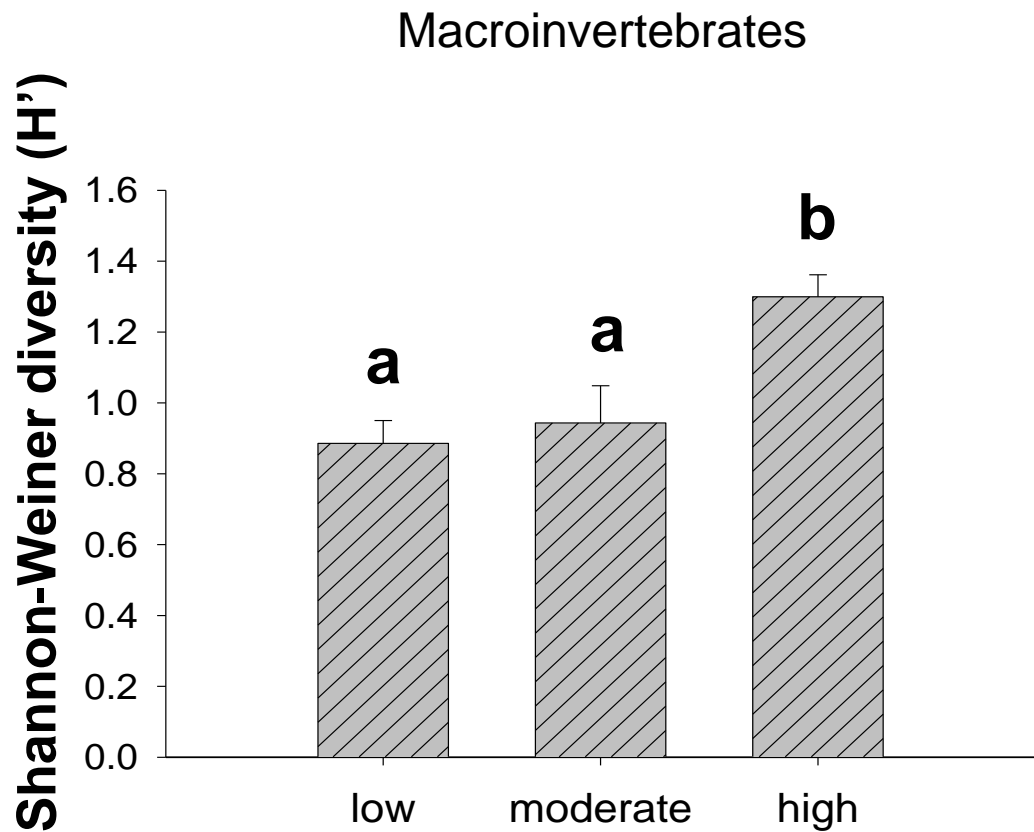
- Plant community composition strongly associated with cattle use of wetlands
- Community diversity and “quality” also associated with cattle use

# Aquatic invertebrates

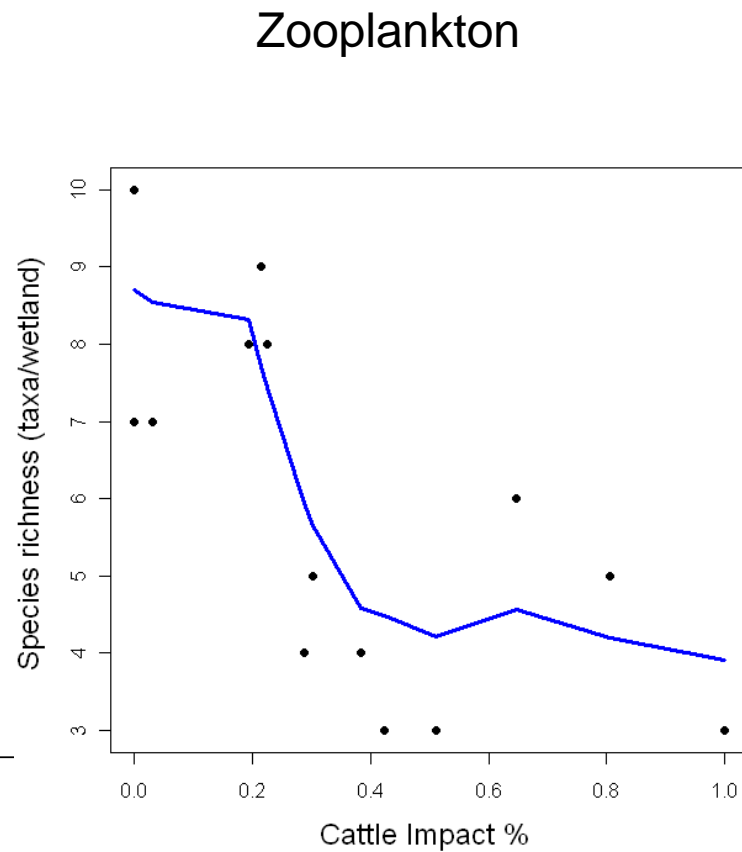
- Aquatic invertebrates play an important role in trophic dynamics of wetlands
  - Primary consumers
  - Food for secondary consumers
- Aquatic invertebrates as indicators of wetland health



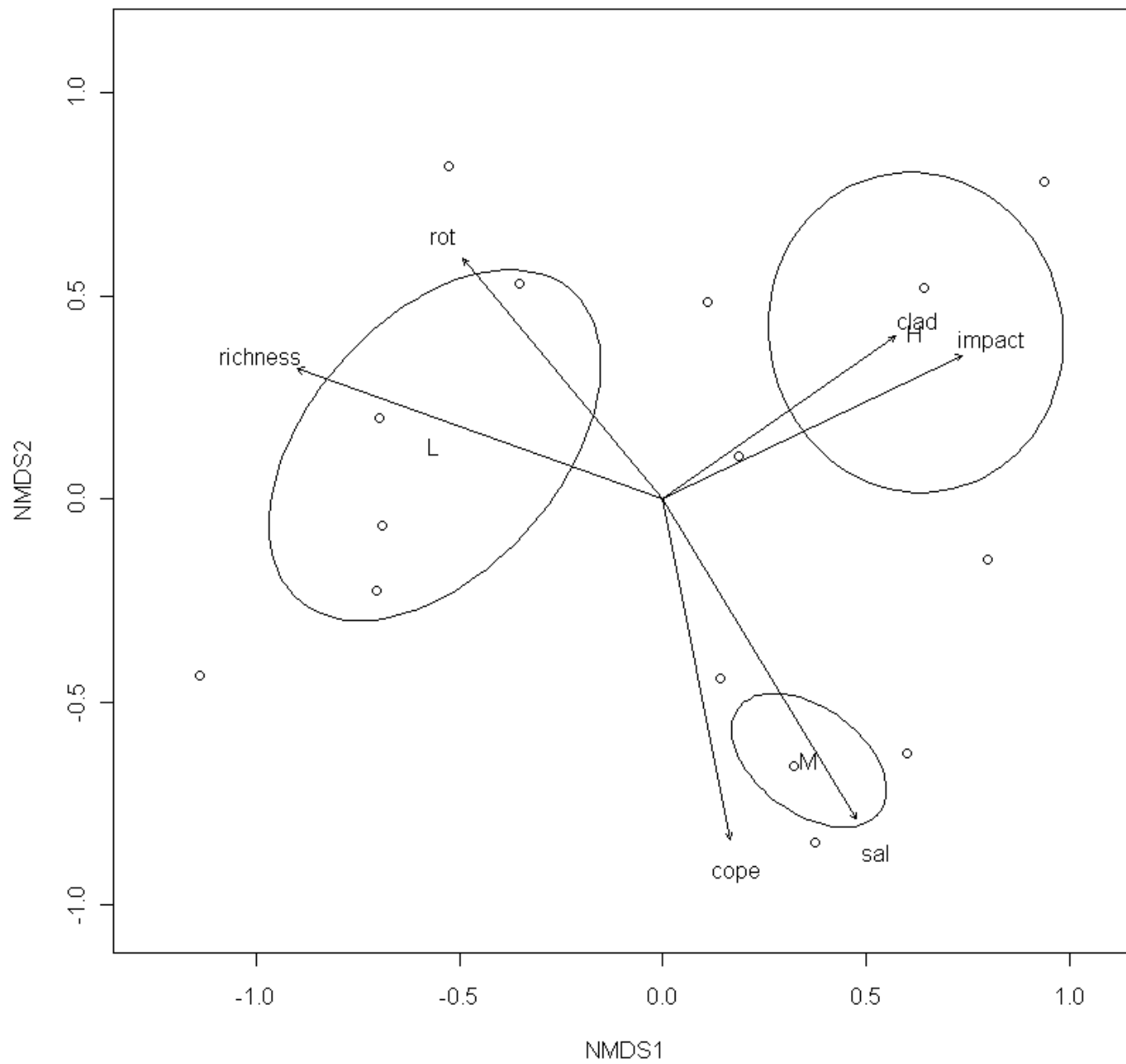
# Diversity of invertebrates for wetlands with low, moderate and high cattle disturbance



Cattle disturbance



# Nonmetric multidimensional scaling model of zooplankton community similarity by wetlands associated with cattle impact and abiotic properties



- Macroinvertebrate diversity was greatest in most disturbed wetlands
  - Zygoptera (Damselflies) & Diptera (true flies) most numerous in low disturbance wetlands
  - Gastropoda (snails) most abundant in highly disturbed wetlands
- Zooplankton diversity greatest in wetlands with least cattle disturbance
  - Rotifers were most abundant in low disturbance.
  - Cladocerans and copepods were most abundant in high disturbance



# How do waterfowl correlate with wetland properties?

## DABLERS



Blue-winged teal

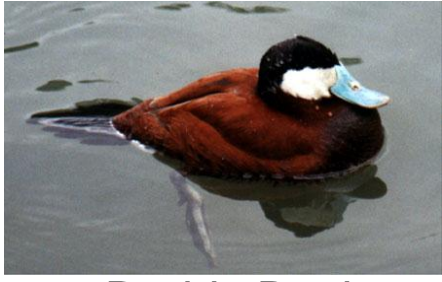


Mallard



Canada Goose

## DIVERS



Ruddy Duck



Barrow's Goldeneye



Redhead

## CAVITY NESTERS



Barrow's Goldeneye

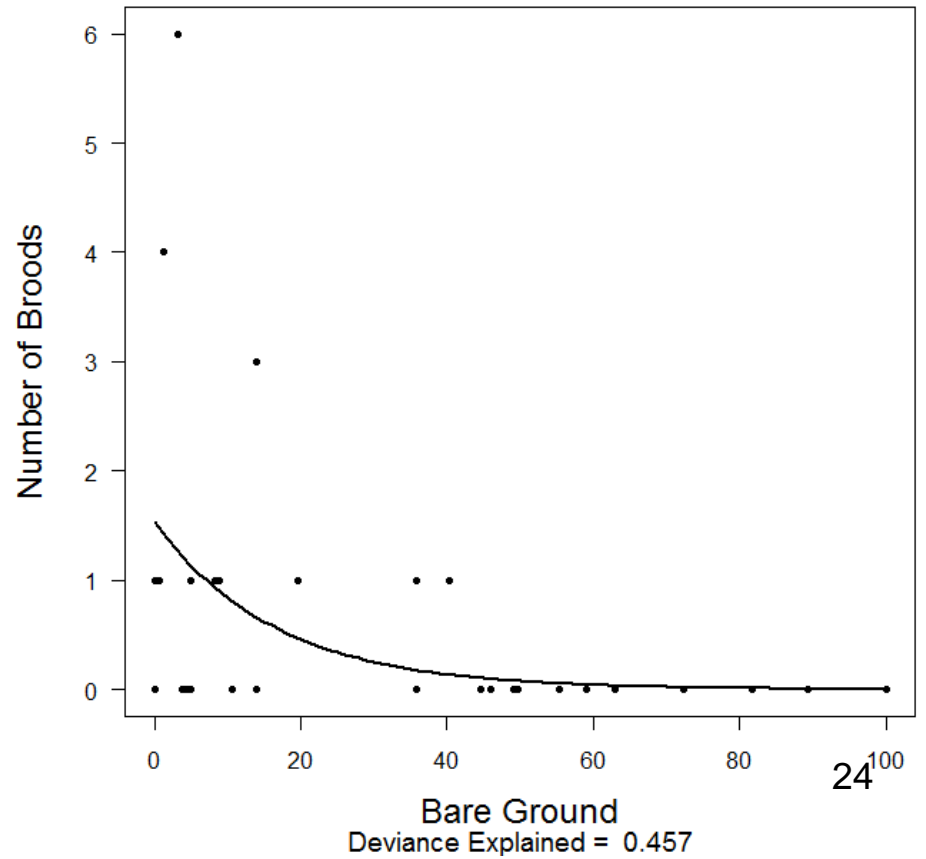
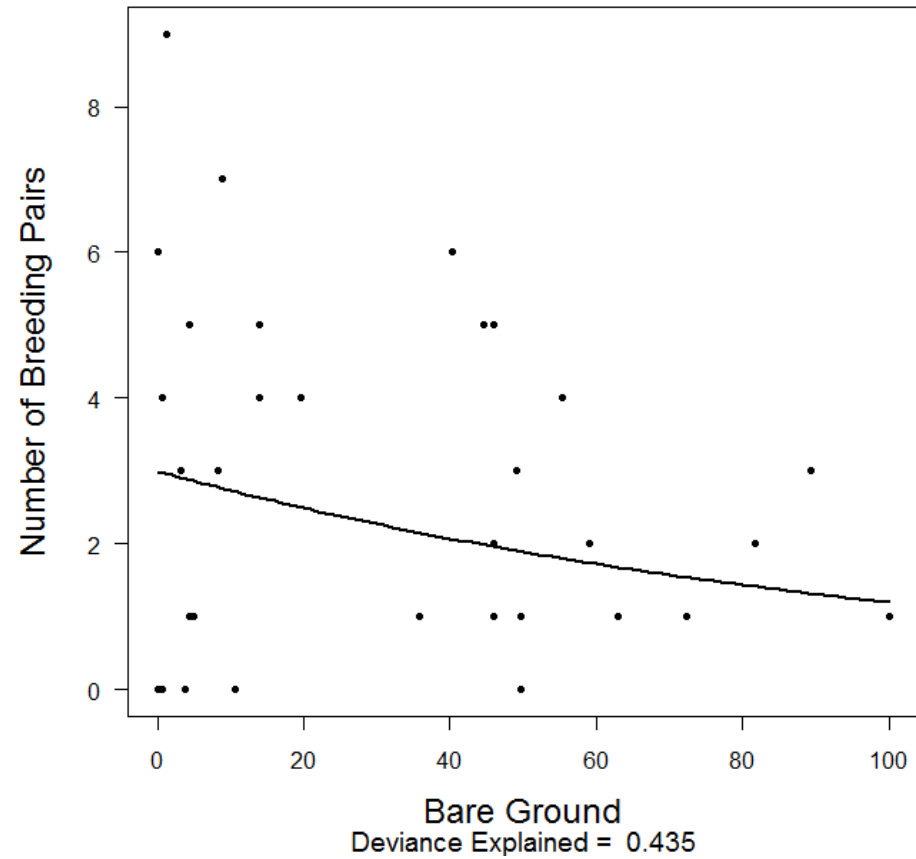


Bufflehead



**Dabbling Ducks**

**Dabbling Ducks**

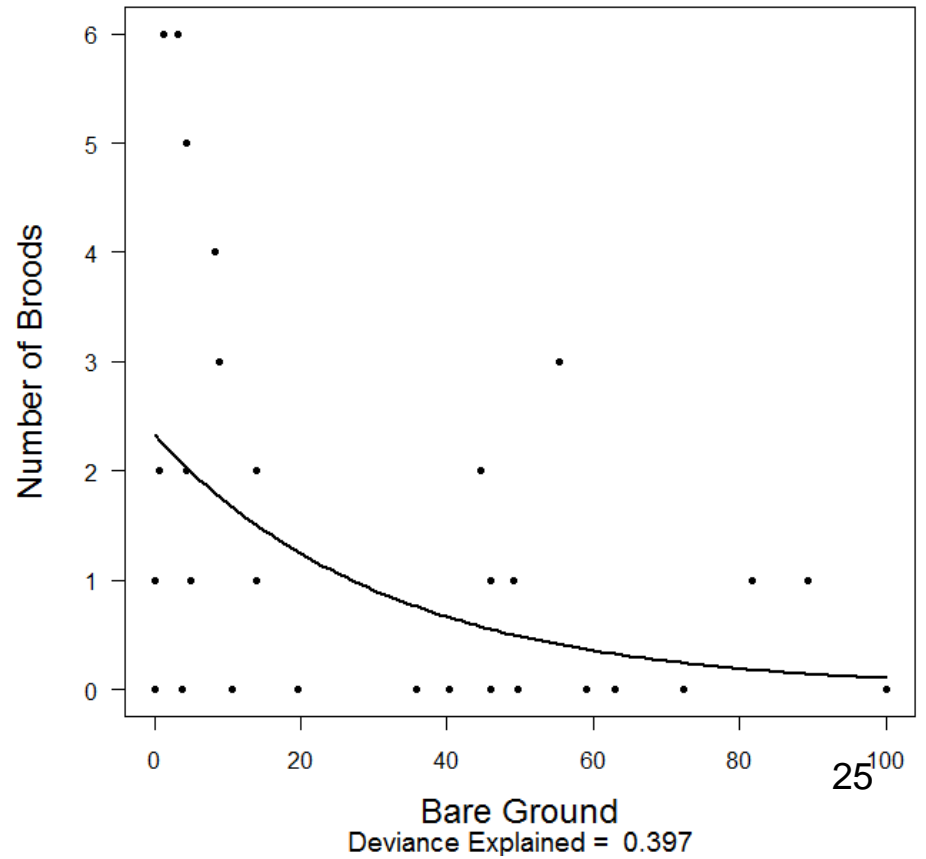
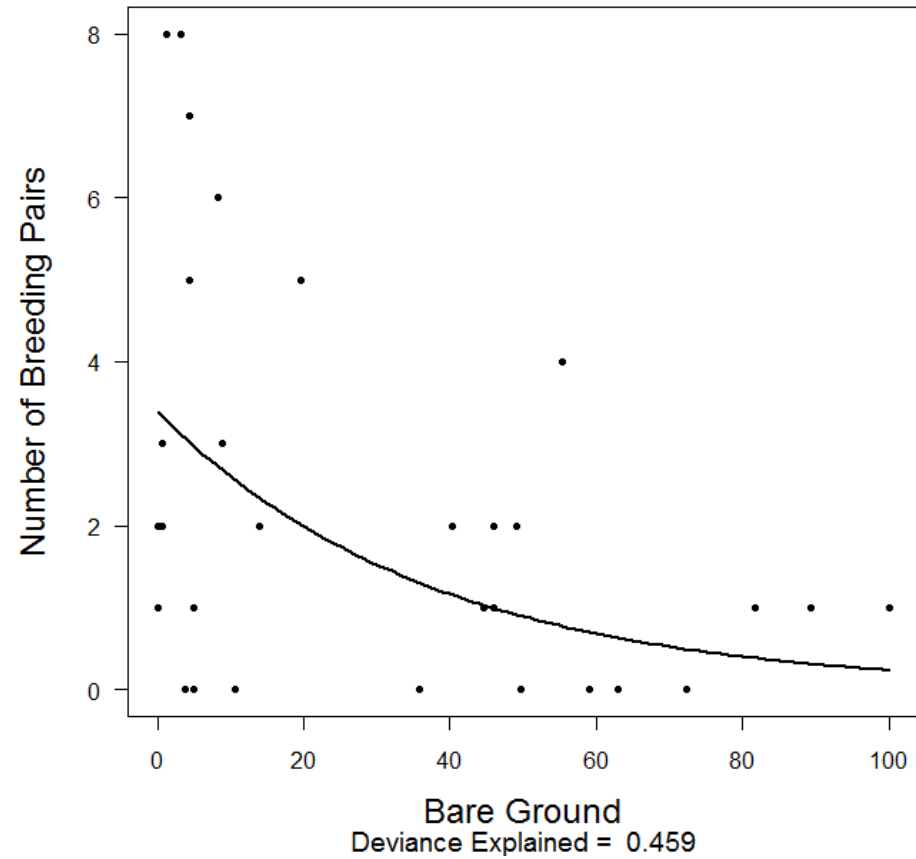




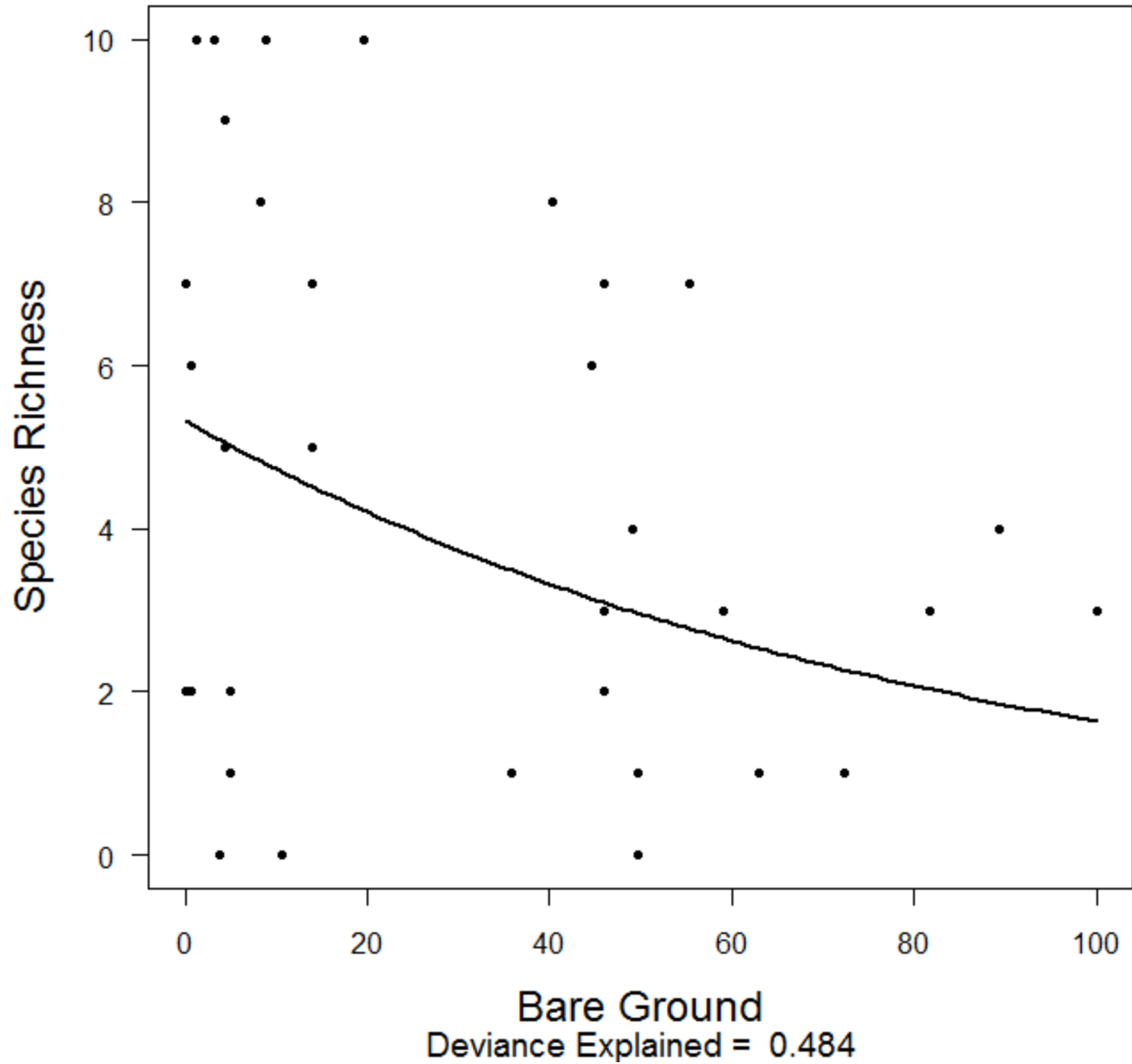


**Diving Ducks**

**Diving Ducks**



# All Waterfowl (Breeding Pairs)



# Implications

- Breeding and brooding waterfowl respond to grazing intensity and changes in vegetation structure

# Future Research

- Use GPS collars on cattle to monitor land use around wetlands.
- Experiment with alternative water sources for cattle, or restricted access to wetlands.
- Decouple effects of salinity and cattle disturbance on wetland ecosystem properties.
- Manipulative experimental field and mesocosm studies to better understand mechanisms.

# Partners

- Dr. Brian Heise (TRU)
- Dr. Jeff Curtis (UBC-O)
- Bruce Harrison (DUC)
- Marc Jones (PhD student)
- Denise Clark (MSc student)
- Ashleigh Gilbert (MSc student)
- Lindsey Smith (MSc student)
- Montana Burgess (RA)
- Eleanor Bassett (RA)
- Becky Smith (RA)

# Funding

- NSERC
- DU IWWR
- BC Ministry of Forests Forest Science Program
- BC Ministry of Environment

