BAT ECOLOGY IN A NORTHEASTERN IOWA FOREST:

DETERMINING SPATIAL AND TEMPORAL PATTERNS AND EXPOSURE RISK TO THE WHITE-NOSE SYNDROME FUNGUS

MEAGAN ALBON

MADELEINE ZUERCHER

OBJECTIVES

- Assess spatial and temporal patterns associated with the bat community at Effigy Mounds National Monument
- Assess the exposure to *Pseudogymnoascus destructans (Pd)*, the fungus that causes White-nose syndrome at Effigy Mounds National Monument
- Determine whether *Myotis septentrionalis* exhibit habitat preferences at Effigy Mounds National Monument

HYPOTHESES

- H_o: There is no spatial difference in bat community structure at Effigy Mounds National Monument
- H_o: There is no temporal difference in bat community structure at Effigy Mounds National Monument
- H_o: There is no pattern of exposure to *Pd* at Effigy Mounds National Monument by bats
- H_o: *Myotis septentrionalis* exhibits no habitat preferences at Effigy Mounds National Monument

BACKGROUND

Hibernating

- *Eptesicus fuscus* (Big Brown bat; EPFU)
- *Myotis lucifugus* (Little Brown bat; MYLU)
- *Myotis septentrionalis* (Northern Long-eared bat; MYSE)
- *Myotis sodalis* (Indiana bat; MYSO)
- *Perimyotis subflavus* (Tricolored bat; PESU)

Migrating

- *Lasionycteris noctivagans* (Silver-haired bat; LANO)
- *Lasiurus borealis* (Red bat; LABO)
- *Lasiurus cinereus* (Hoary bat; LACI)

Lasiurus borealis

Lasiurus cinereus

Eptesicus fuscus

Perimyotis subflavus

Lasionycteris noctivagans

Myotis lucifugus

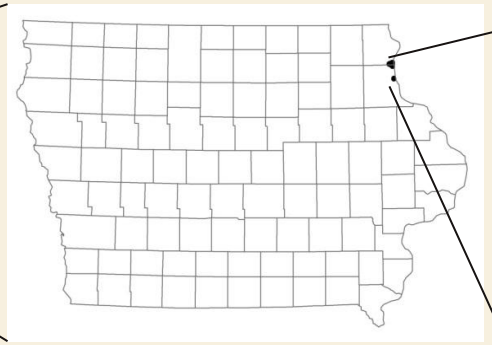
Myotis septentrionalis

Myotis sodalis

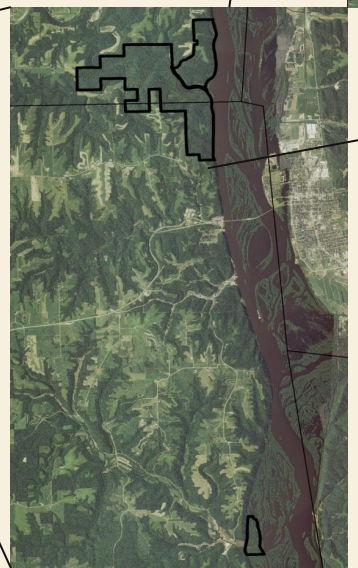
BACKGROUND

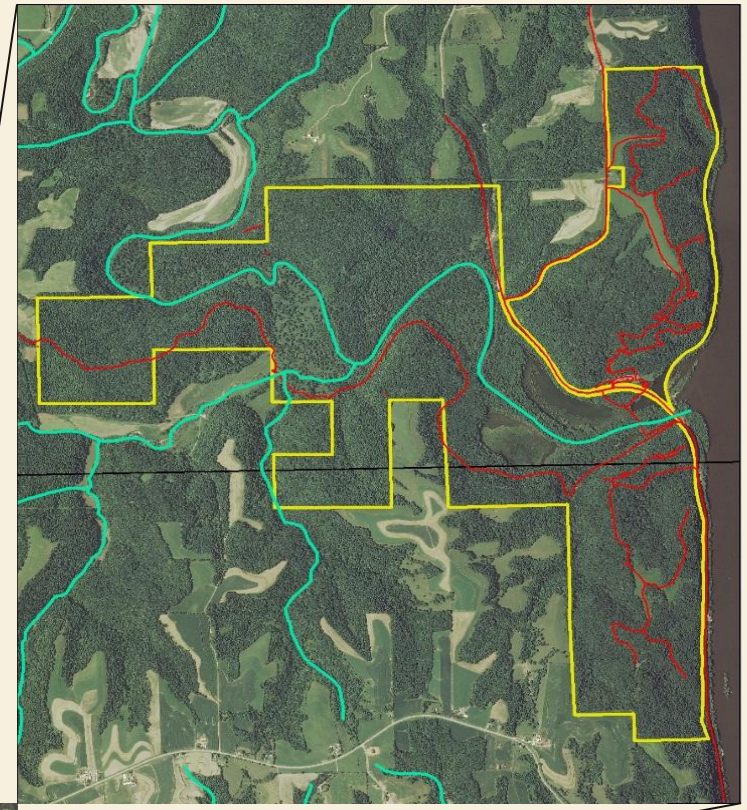
- Effigy Mounds National Monument
  - *Myotis septentrionalis*: Federally Threatened
  - *Myotis sodalis*: Federally Endangered

USA



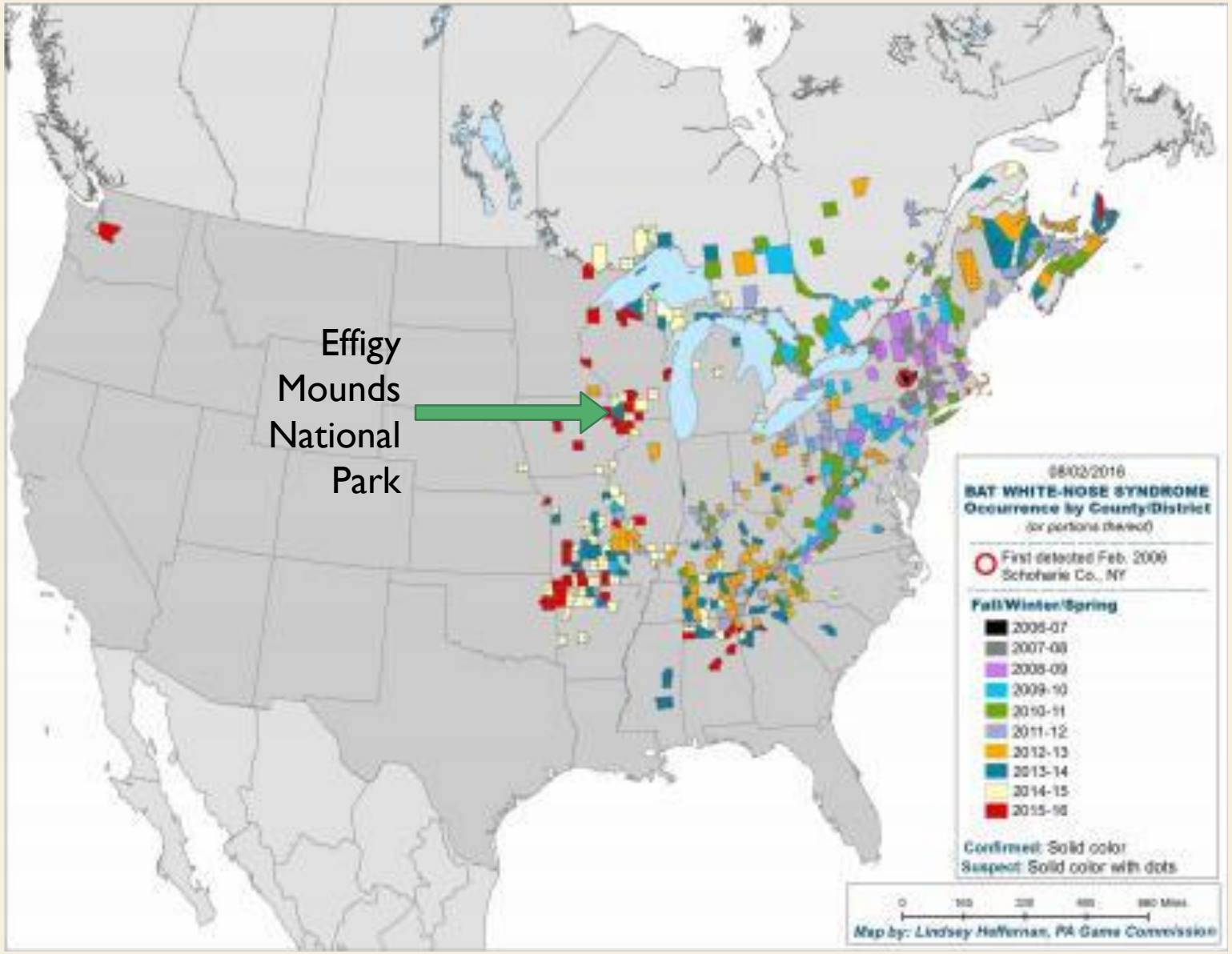
Iowa





BACKGROUND

- *Pseudogymnoascus destructans* (*Pd*)
  - Causes White-nose syndrome
  - Detected in New York in 2006
  - Disrupts hibernating bats
  - Disproportionately affects myotine bats
  - Localized population declines up to 99%



This figure shows the progression of White-nose syndrome across North America since its first detection in 2006.

Source: whitenosesyndrome.org

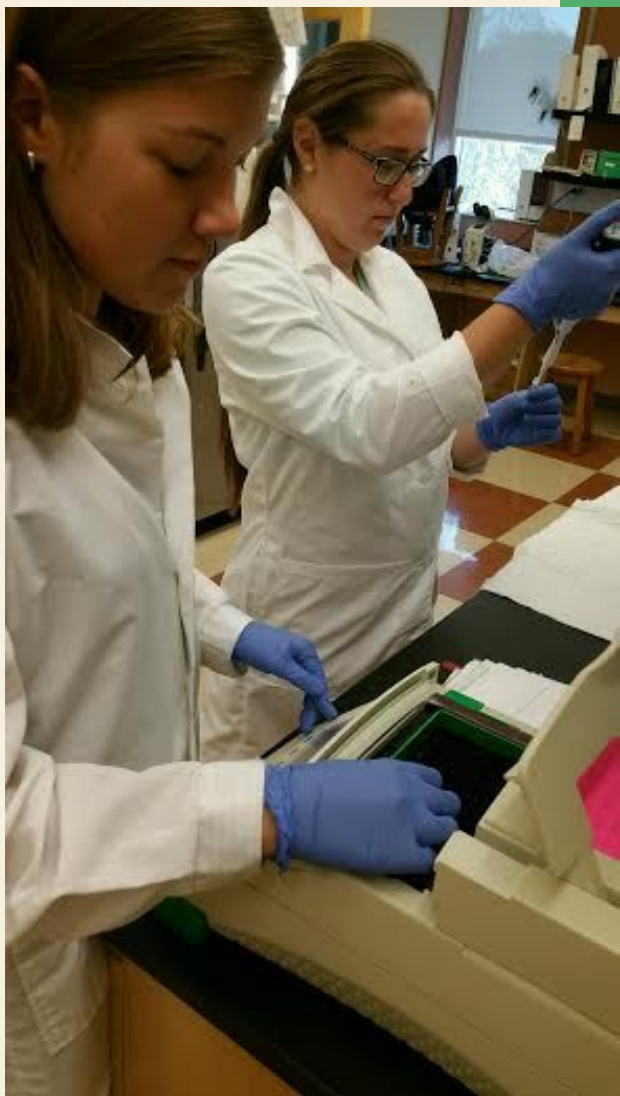
METHODS: BAT COMMUNITY

- Mist-netting
- Animal processing
  - Characteristics: species, sex, age, wing score
  - Measurements: weight (g), forearm (mm), body (mm), tragus (mm)
- Acoustic surveys
  - Wildlife Acoustics SM3
  - Titley Scientific Anabat-2

Measurements

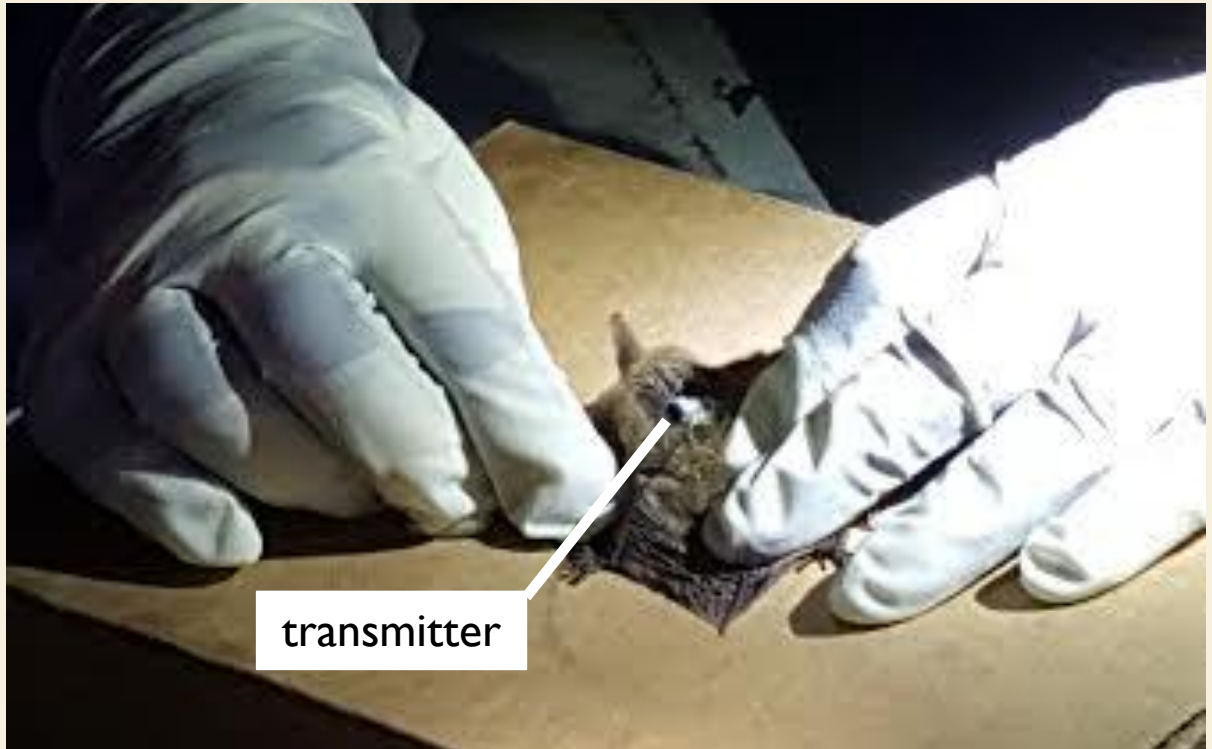
METHODS: *Pd* EXPOSURE

- Isohelix swabbing
- Molecular analyses
  - DNA extraction
  - BLAST analysis



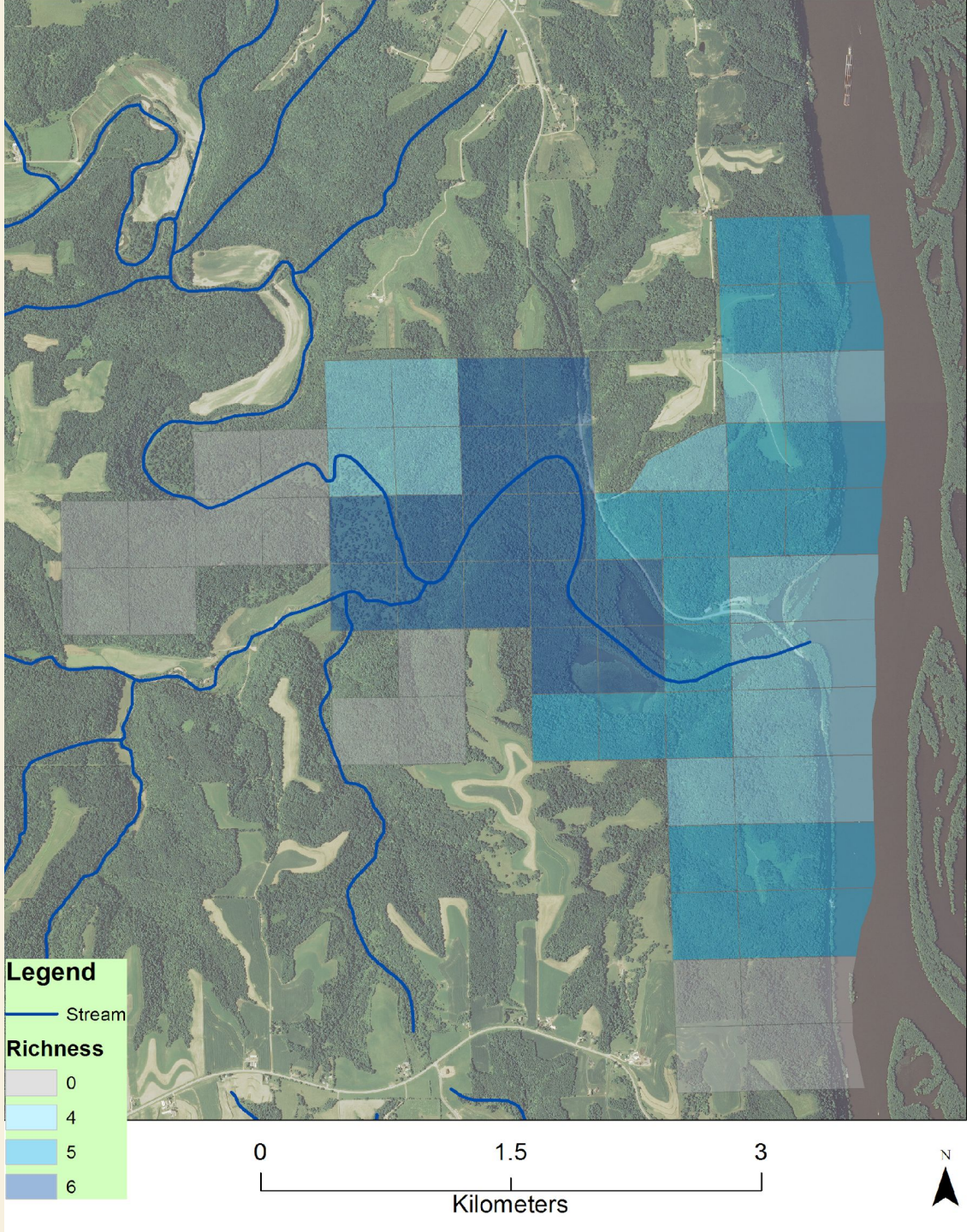
METHODS: HABITAT PREFERENCES

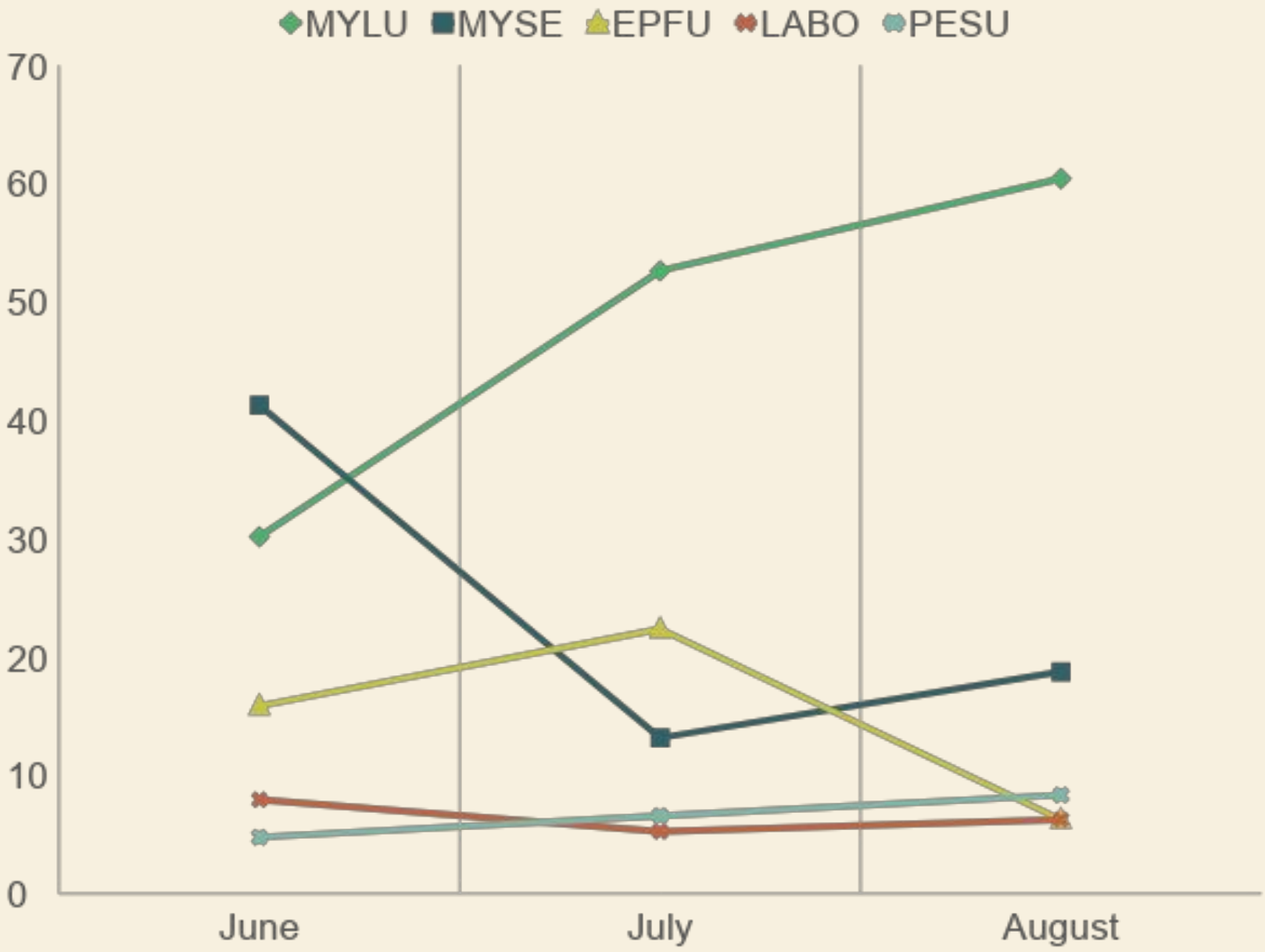
- Transmitter attachment
- VHF Radio-telemetry
- Vegetation assessment



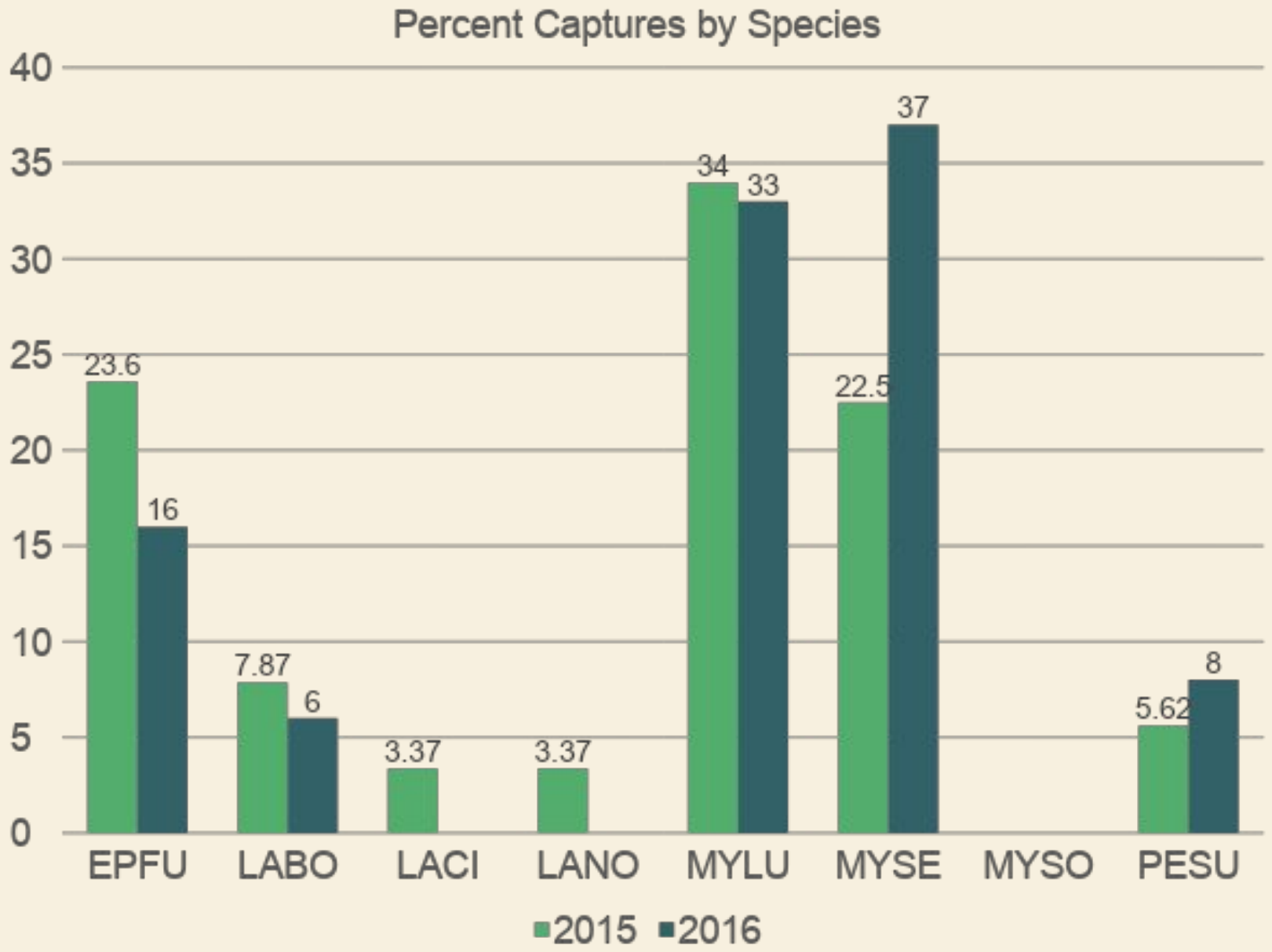
RESULTS:
BAT COMMUNITY

Species bat richness at Effigy Mounds National Monument, 2015-2016. Highest species richness occurs along lowland river floodplain corridor.





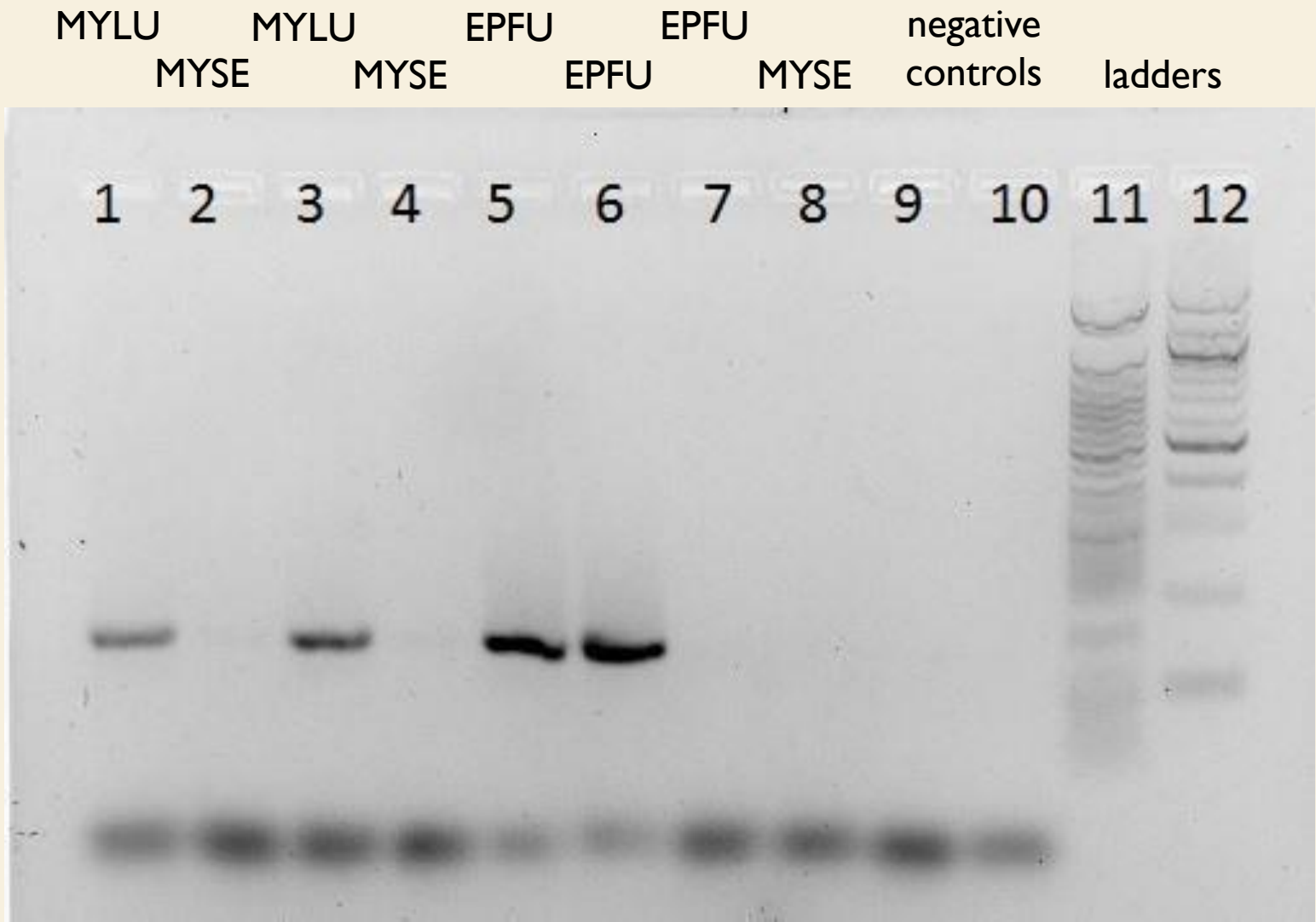
Temporal variations in relative bat capture at Effigy Mounds National Monument, 2016.



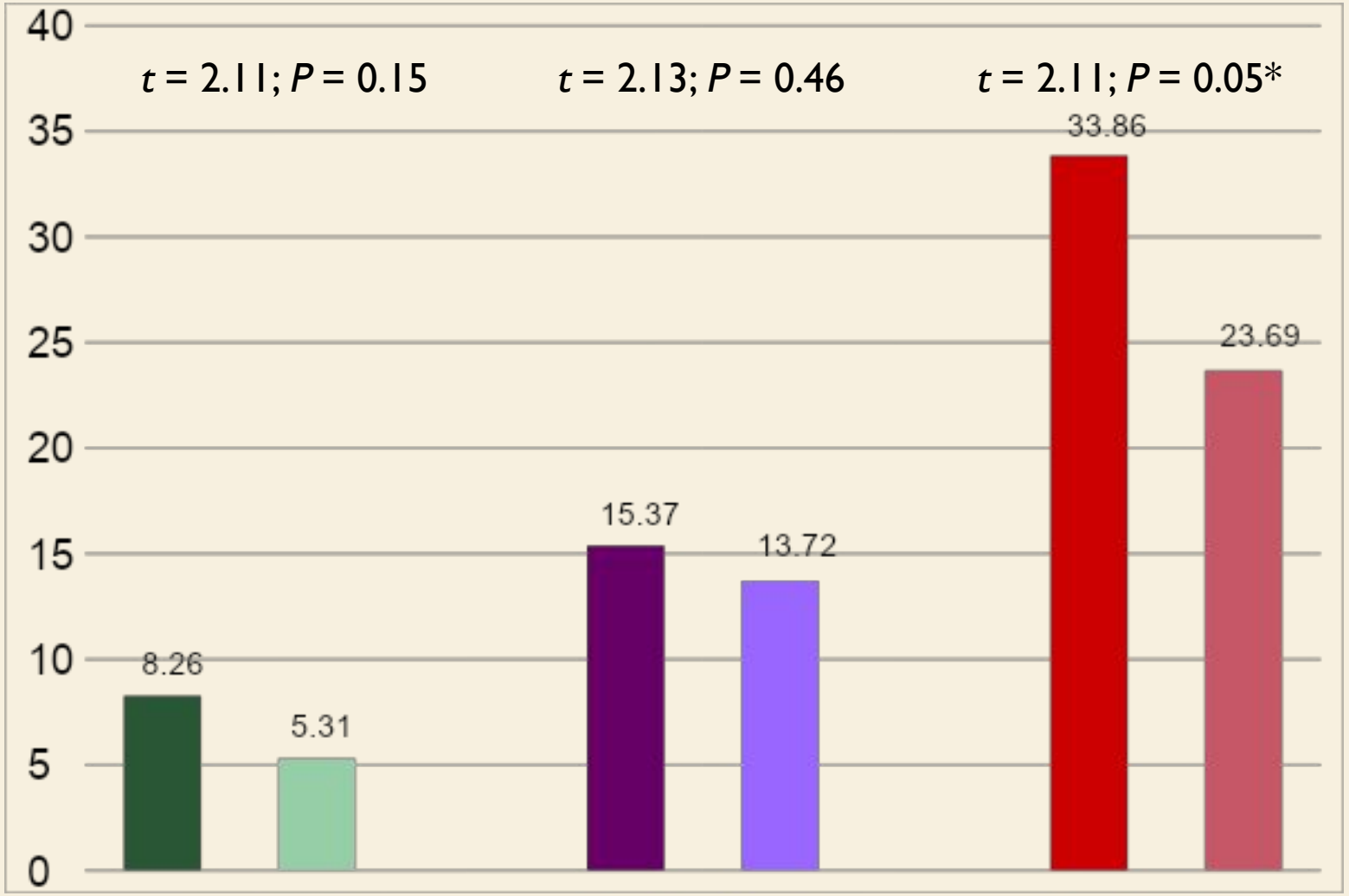
Yearly differences in relative bat capture at Effigy Mounds National Monument, 2015-2016.

RESULTS: *Pd* EXPOSURE

- Positive rate: 5.4%



RESULTS: HABITAT PREFERENCES



Female *Myotis septentrionalis* in 2015 exhibited preference for taller trees than the average in the available forest. No other significant habitat preference was detected.

CONCLUSION

- H_o: There is no spatial difference in bat community structure at Effigy Mounds National Monument
  - Status: **Reject**
- H_o: There is no temporal difference in bat community structure at Effigy Mounds National Monument
  - Status: **Reject**
- H_o: There is no pattern of exposure to *Pd* at Effigy Mounds National Monument by bats
  - Status: **Reject**
- H_o: *Myotis septentrionalis* exhibits no habitat preferences at Effigy Mounds National Monument
  - Status: **Reject**

FUTURE MANAGEMENT RECOMMENDATIONS

- Bat community structure
  - Current forest structure appears to be appropriate for the predicted bat community in the area
  - Climate change and White-nose syndrome may contribute to variation in the future
- Exposure to *Pd*
  - At present, exposure appears to be limited
  - We recommend continued monitoring of the bat community
- Management of *Myotis septentrionalis*
  - No significant changes in forest management appear to be necessary
  - We recommend continued evaluation of *M. septentrionalis* habitat needs

ACKNOWLEDGEMENTS

- National Park Service
- Effigy Mounds National Monument park staff and volunteers
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