Wisconsin Wolf Analysis & Final Demonstration

Team Wolf

Contents

Background

- Wisconsin's wolf population has been increasing since the 1990s
- Locals believe the wolves are dangerous to animals and humans, and want their population significantly reduced
- This project aims to answer the following questions about the wolf population to investigate the local's claims:
    - How has the growth in Wisconsin's Gray Wolf population impacted the Wisconsin deer population?
    - Has the growing wolf population impacted people?
    - How have the lives and deaths of wolves changed over the reporting period?

Use Cases

User Profile 1: Reader

- Who: Interested in findings
- Wants:
  - Wisconsin local - personal impact
  - Academic - findings and process
- Interaction Methods:
  - Report

User Profile 2: Research Replicator

- Who: Possesses technical and research skills
- Wants: Repeat analysis to verify validity or learn from it
- Interaction Methods:
  - Access to Python code
  - Link data with scripts
  - Review project documentation

User Profile 3: Research Expander

- Who: Possesses significant technical and research skills
- Wants: Build upon project and take in new direction
- Interaction Methods:
  - Access to Python code
  - Link data with scripts
  - Review project documentation
  - Identify necessary modifications

Data

- All data from the Wisconsin Department of Natural Resources (DNR):
  - Wolf Monitoring Reports from 2017 - 2022:
    - Wolf population, Cattle killed, Dogs killed, Wolf health
  - Deer Statistic Website:
    - Deer population, Deer chronic wasting disease, Deer harvest and hunter observations
- Limitations:
  - Originally planned to do all data extraction using camelot, but many of the deer datasets could not be interpreted by that package or tabula-py
    - Pivoted to hand extraction for these datasets
  - Some parameters are only available for a few years

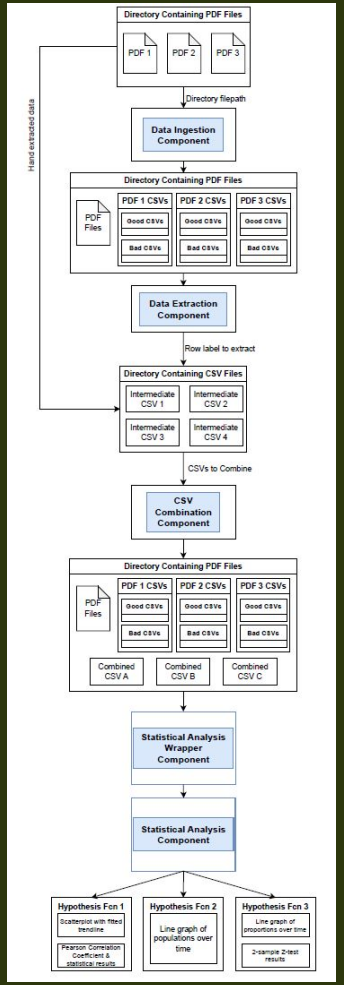
Design

01 Data Gathering and Processing

- PDF Parser or Hand extraction
- Data Extractor & CSV Combiner

02 Statistical Analysis

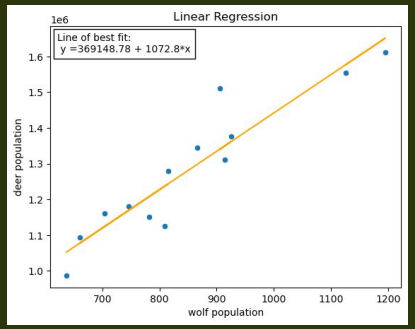
- Wrapper
- Analysis Functions



Demo

Statistical Results (1/3) - How has the growth in the Wisconsin Gray Wolf population impacted the Wisconsin deer population?

Deer Population Size



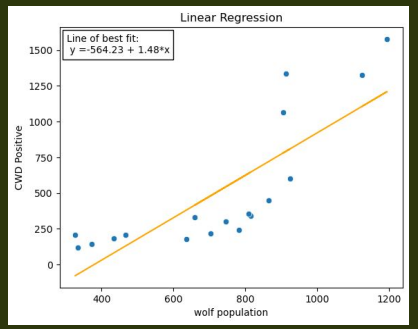
Correlation coefficient: 0.9312

p-value: 3.8e-06

Conclusions:

- Results may be confounded by ongoing human intervention
- Additive killing of deer appears insufficient to limit the population

Chronic Wasting Disease (CWD)



Correlation coefficient: 0.809

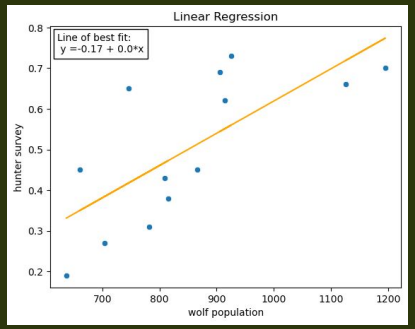
p-value: 4.8e-05

Conclusions:

- Speed and initial subtlety of contagion, interest in other prey, lack of proximity to infected animals, and/or insufficient number of wolves could hamper wolves' impact

Statistical Results (2/3) - Has the growing wolf population impacted people?

Deer Seen by Hunters



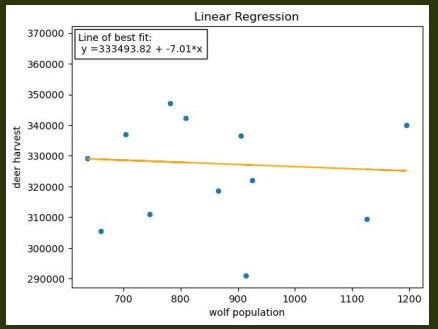
Correlation coefficient: 0.7189

p-value: 0.0056

Conclusions:

- Alleviates concern of fewer visible deer for both successful and unsuccessful human hunters

Deer Killed by Hunters



Correlation coefficient: Fail to reject null hypothesis

p-value: 0.86

Conclusions:

- No correlation between wolf population and deer harvested
- Numbers set by the state, no correlation unsurprising

There was insufficient evidence to conclusively correlate wolf populations with the numbers of cattle and dogs killed or wolf-related police investigations

Statistical Results (3/3) - How have the lives and deaths of wolves changed over the reporting period?

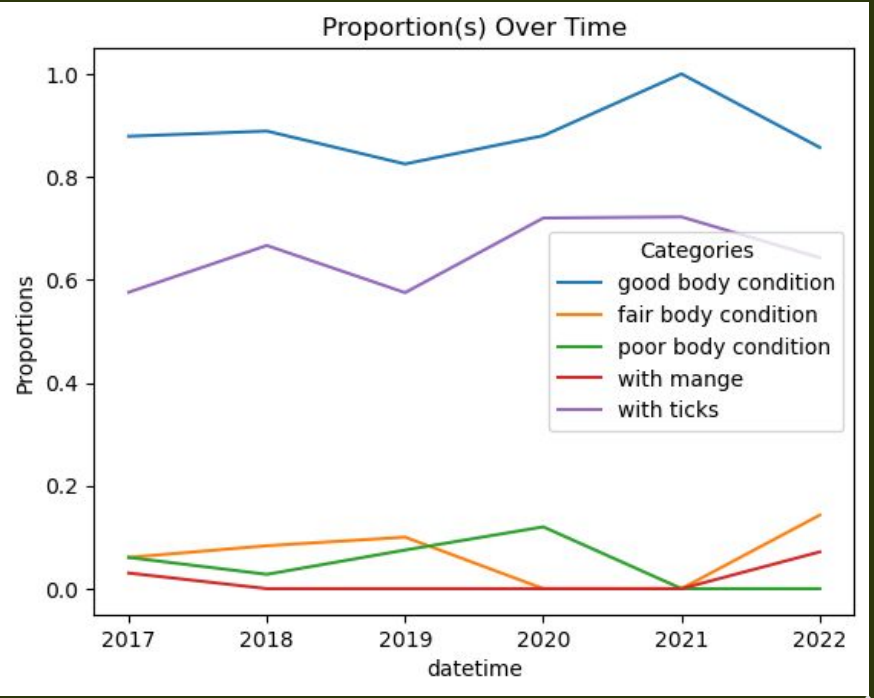
Changes in Wolf Population Health

Test: 2-sample Z tests

Characteristics of research-captured wolves:

- Good / fair / poor body condition
- Mange (y/n)
- Ticks (y/n)

Failed to reject null hypothesis for all characteristics



Lessons Learned & Future Work

- Lessons Learned:
  - Difficulty of making documentation for users with non-technical background
  - Challenge of expanding on years of research with limited data
- Future Work:
  - Adding data validations to statistical tests
  - Using tools on 2023 Wolf Report
  - Sending our report and tools to the DNR

via: https://www.wolfeducation.org/