Biodiversity in National Parks

Our data

▶ We are looking at over 5,000 different species in our data

▶ In addition, we are looking at seven different types of species:

  ▶ Mammals, Birds, Reptiles, Amphibians, Fish, Vascular & Nonvascular Plants

▶ All 5541 unique species are categorized in the following statuses:

  ▶ **Species of Concern**: declining population or appears to be in need of conservation

  ▶ **Threatened**: Vulnerable to endangerment in the near future

  ▶ **Endangered**: Seriously at risk of extinction

  ▶ **In Recovery**: Previously Endangered, but not currently in danger of extinction

  ▶ **No Intervention**: No action is being taken to assess the future

Snapshot of Our Data

	conservation_status	scientific_name
1	In Recovery	4
4	Threatened	10
0	Endangered	15
3	Species of Concern	151
2	No Intervention	5363

Conservation Status by Species
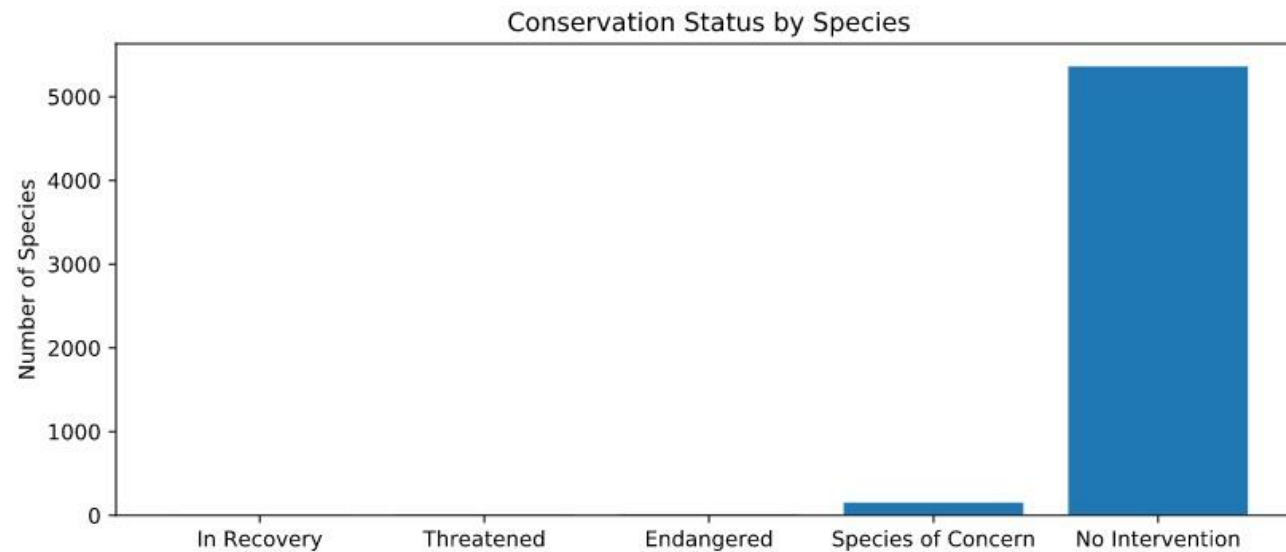
What does this tell us?

- The level of intervention of these species is vastly minimal
- There are different perspectives in this situation:
  - It is difficult to determine the status of this many species
  - There are 15 species that are currently endangered
  - However, only 4 are in recovery, meaning the conversion rate is less than 50%
  - Determining which species need attention and more importantly how to ensure that they are no longer endangered requires in depth analysis
  - We must find a way prioritize the unique conservation statuses, focusing all the attention to just one area will provide skewed results
  - Species of Concern might require less work even though there are more species
  - However, the amount of time spent on that group might take away attention from groups with more imminent threats, such as Endangered

Are there certain types of species more likely to be endangered? Is this due to chance?

```
    category          not_protected    protected    percent_protected
0   Amphibian                    72            7             8.860759
1   Bird                        413           75            15.368852
2   Fish                        115           11             8.730159
3   Mammal                      146           30            17.045455
4   Nonvascular Plant           328            5             1.501502
5   Reptile                      73            5             6.410256
6   Vascular Plant             4216           46             1.079305
```

- This is not down to chance, some species are more likely to be endangered

- To arrive at this conclusion we ran a Chi-Squared Test

- We categorized the different species classifying them on protection status (see previous slide for table)

- Initially we, examined birds an mammals, giving us a p-value of 0.68, which is not significant

- However, examining reptiles and mammals, gave us a p-value of 0.038, which is significant

- Furthermore, we ran more of these chi-squared tests to provide more insight

The Chi-Square Test

```
      category  not_protected  protected  percent_protected
0     Amphibian             72          7           0.088608
1          Bird            413         75           0.153689
2          Fish            115         11           0.087302
3        Mammal            146         30           0.170455
4  Nonvascular Plant       328          5           0.015015
5       Reptile             73          5           0.064103
6  Vascular Plant         4216         46           0.010793
0.687594809666
0.038355902297
0.0328051018293
0.82794298152
1.44050673099e-55
0.00014052154947
1.48186891576e-10
```

▶ The table to the left shows us the p-value per test

  ▶ Birds and Mammals: ~0.68, not significant

  ▶ Reptiles and Mammals: ~0.038, significant

  ▶ Vascular and Nonvascular: ~0.032, significant

  ▶ Fish and Amphibians: ~0.824, not significant

  ▶ Vascular Plants and Mammals: ~1.44e-55, significant

  ▶ Reptiles and Vascular Plants: ~0.0001, significant

  ▶ Nonvascular Plants and Mammals: ~1.48e-10, significant

Recommendations

- Certain groups are more prone to endangerment than others
- This analysis and tests behind it allow us to focus our attention on how to begin our work
- Fish, Amphibians, Birds, and Mammals require less attention than Reptiles, Plants, and Plants, both Vascular and Nonvascular
- Where do we begin?
  - There are 15 endangered species, meaning these are under imminent threat
  - It is best to start here and focus on the aforementioned species more likely to be endangered
  - This should provide a blueprint on how to assess the problem going forward

In Depth Analysis

Sheep Case Study

- To understand what is happening in to the various species, a closer look on a specific group can give us insight

- Observations of Sheep in the National Parks over the course of seven (7) days will allow us to better understand the nature of the problem

- The following slides will provide a visual aid and a snapshot of the real time observations
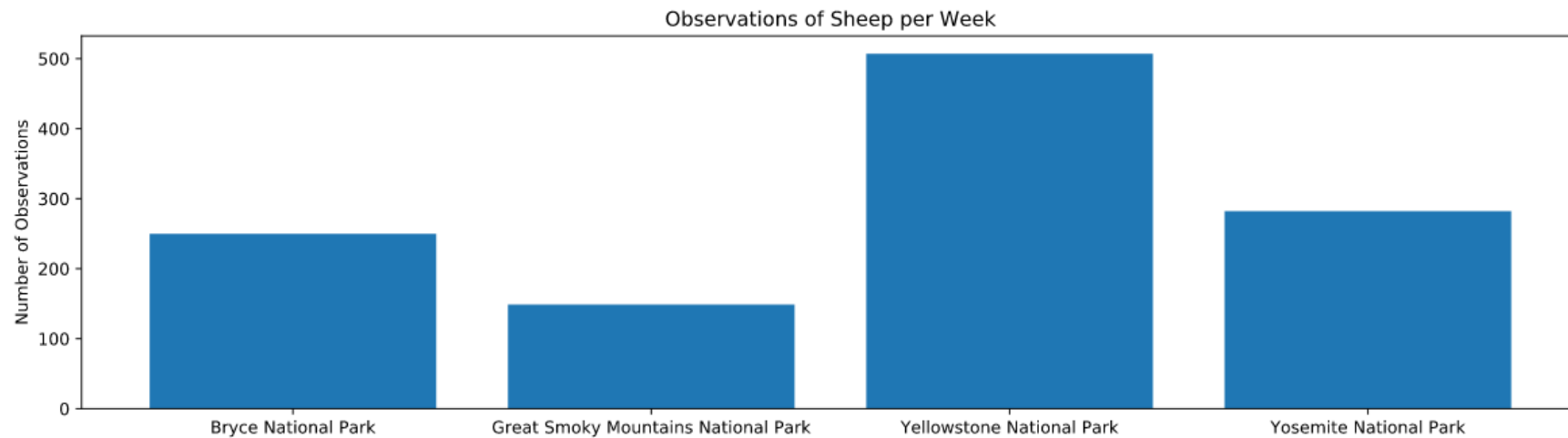
Snapshot of our Data

	park_name	observations
0	Bryce National Park	250
1	Great Smoky Mountains National Park	149
2	Yellowstone National Park	507
3	Yosemite National Park	282

Observations of Sheep per Week

Observations of Sheep per Week

Foot and Mouth Reduction Effort - Sample Size Determination

- Our data shows us that Yellowstone has the highest number of observations

- We want to use these observations to see if the program to reduce Foot and Mouth Disease is working

- We know for a fact that 15% of the Sheep at Bryce National Park were infected

- Using this metric, we can extrapolate and attempt to understand how much data is needed to draw a conclusion

- Using the 15% as a baseline, we can calculate minimum detectable effect of 33%, since we want to be within 5%. We want to be 90% confident.

- This results in a projected sample size of 890, meaning scientists would have to spend 2 weeks and 4 weeks at Yellowstone and Bryce National Parks, respectively, to get enough observations

Conclusion

► Preserving species in the national parks is no easy task considering the variety and volume of species

► Focusing on species with a higher endangerment probability is a good place to start

► However, ensuring that other species are not becoming endangered is also important. Don't lose the moon while counting the stars.

► Detailing the data on how a certain species was saved will play an important role for future reference, setting a precedent on success

► The disease reduction study can also provide insight on how to proceed in terms of preservation efforts, specifically KPI's coming from the study