Biodiversity in National Parks

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Objectives

- Categorize data provided from the National Parks Service by conservation status
- Determine likelihood of endangered status using significance calculations
- Recommend methods for conservationists to better protect species
- Detail findings and associated confidence levels from the Foot and Mouth study

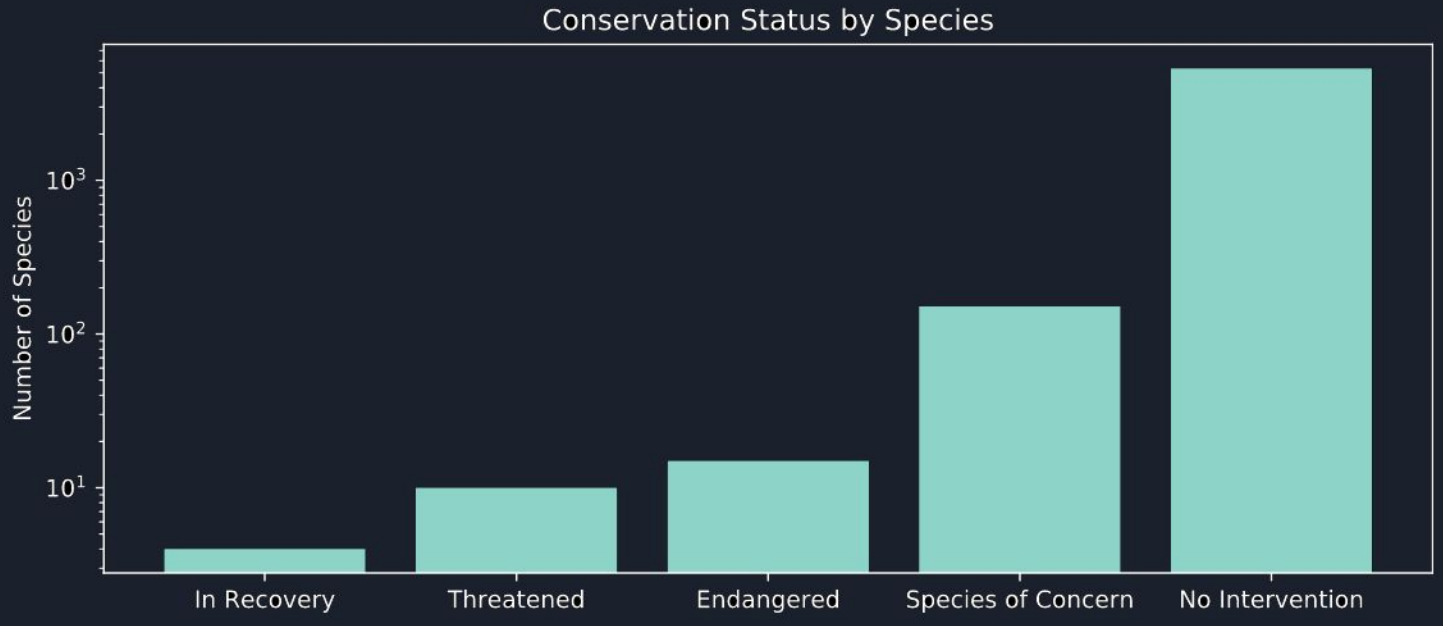
National Park Conservation Data

Species Count by Conservation Status

Conservation Status	Species Count
Endangered	15
Threatened	10
Species of Concern	151
In Recovery	4
No Intervention	5363

- A total of 5543 species reported by the National Park Service
- Only 180 have been given a conservation status

Species Count by Conservation Status (Log Scale)



Percentage of Species Protected by Type

Type of Species	Protected Status	Not Protected	Percent Protected
Amphibian	7	72	8.9%
Bird	75	413	15.4%
Fish	11	115	8.7%
Mammal	30	146	17.0%
Nonvascular Plant	5	328	1.5%
Reptile	5	73	6.4%
Vascular Plant	46	4216	1.1%

Number of Unique Species Per Conservation Status

Type of Species	Species of Concern	Threatened	Endangered	In Recovery
Amphibian	4	2	1	-
Bird	68	-	4	3
Fish	4	4	3	-
Mammal	22	2	6	1
Nonvascular Plant	5	-	-	-
Reptile	5	-	-	-
Vascular Plant	43	2	1	-

Likelihood of Species Endangerment

- Birds and Mammals encompass the highest percentages of endangered species
  - Mammals are not significantly more susceptible to endangerment compared to Birds (17% vs 15.4%, p=0.688 by chi square test)
  - Mammals are significantly more susceptible to endangerment compared to Reptiles (17% vs 6.4%, p=0.039 by chi square test)
- Plants comprise the smallest percentage of endangered species
- Reptiles and Nonvascular Plants have no species in the Threatened or Endangered classifications
- Amphibians and Fish have similar percentages of species requiring protection (8.9% and 8.7%, respectively)

Recommendations for Conservation Measures

- Expand conservation efforts to preserve habitats and ecosystems of Mammals and Birds
- Provide further information for analysis that could reveal deeper trends related to the high percentage of Mammal and Bird concerns
  - Examples: physical characteristics, diet, migratory information, predator/prey comparisons
- Given similar rates of protection and shared habitats, Amphibians and Fish may benefit from exploring links that could be affecting both simultaneously
  - Examples: water quality, common food sources
- Conduct studies related to human behavior and interaction with wildlife in National Parks to see whether changes in visitation policies could improve conservation rates
- Continue National Park efforts to preserve plant life, as current measures appear to be working based on significantly lower percentages of species at risk

National Park Sheep Populations

In Search of Sheep

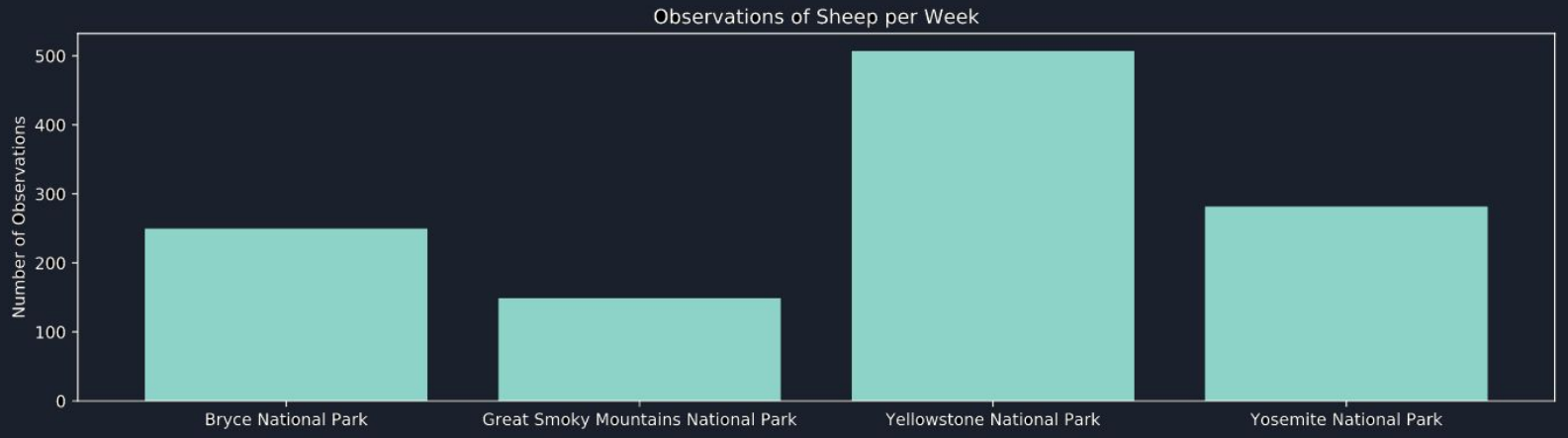
Scientific Name	Common Name	Conservation Status
Ovis aries	Domestic Sheep	No Intervention
Ovis canadensis	Bighorn Sheep	Species of Concern
Ovis canadensis sierrae	Sierra Nevada Bighorn Sheep	Endangered

- All common names containing ‘sheep’ were separated
- Since some species of plants also contain the word ‘sheep’, these were removed by selecting only the mammals
- Only 3 distinct species of sheep were observed

National Park Sheep Sightings (Last 7 Days)

Park Name	# of Total Observations	# of Sheep Observations
Bryce National Park	576,025	250
Great Smoky Mountains National Park	431,820	149
Yellowstone National Park	1,443,562	507
Yosemite National Park	863,332	282

National Park Sheep Sightings (Last 7 Days)



Foot and Mouth Study Results

Foot and Mouth Study: Efficacy of Efforts to Stop the Spread

Background

- Yellowstone Park Rangers have been conducting a program to reduce foot and mouth disease in sheep species
- Scientists want to calculate sample size values to detect a disease reduction of at least 5% with a confidence interval of 90%
- The only information available is that 15% of sheep were recorded to have foot and mouth disease at Bryce National Park

Results

- In order to see if a 5% drop in the occurrence of foot and mouth is significant at Yellowstone, Rangers would have to observe at least 870 sheep
- Based on observations from the past 7 days, it would take just under 2 weeks to achieve this in Yellowstone

Conclusions

- Birds and Mammals are at highest risk of endangerment, whereas Plants are currently the safest species
- Data indicative of potential associations, such as the similarity in Amphibian and Fish conservation statuses, should be considered in future observational study designs
- Additional observational information such as animal and human interactions or prey/predator relationships would enable more targeted conservation efforts
- Only 3 species of mammal sheep were observed in National Parks, each of a different protection status
- 870 sheep would need to be observed over the course of 2 weeks at Yellowstone in order to have confidence in a 5% drop in the occurrence of Foot and Mouth disease