ENDANGERED SPECIES ANALYSIS

COMMISSIONED BY THE NATIONAL PARK SERVICE

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TABLE OF CONTENTS

DATA OVERVIEW

- The following information is known about each species catalogued by the National Park Service:
  - Category
    - 5 Animal Categories: Amphibian, Bird, Fish, Mammal, Reptile
    - 2 Plant Categories: Nonvascular Plant, Vascular Plant
  - Scientific Name
  - Common Names
  - Conservation Status:
    - Species of Concern: declining or appear to be in need of conservation
    - Threatened: vulnerable to endangerment in the near future
    - Endangered: seriously at risk of extinction
    - In Recovery: formerly Endangered, but currently neither in danger of extinction throughout all or a significant portion of its range

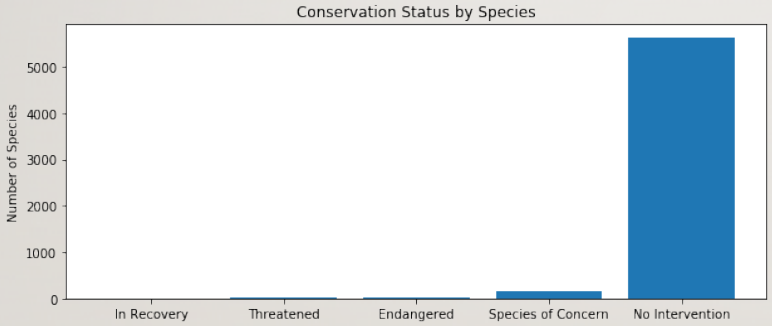
DATA OVERVIEW

5,824 species have been catalogued by the National Park Service across 7 categories

Category	Number of Species
Animal Species:	
Amphibian	80
Bird	521
Fish	127
Mammal	214
Reptile	79
Total Animal Species	**1,021**
Plant Species:	
Nonvascular Plant	333
Vascular Plant	4,470
Total Plant Species	**4,803**
Total Species	**5,824**

SPECIES CATEGORY ANALYSIS FOR CONSERVATION

96.7% of known species require
"No Intervention" for conservation measures.



Category	Not Protected	Protected	% Protected
Animal Species:			
Amphibian	73	7	8.8%
Bird	442	79	15.2%
Fish	116	11	8.7%
Mammal	176	38	17.8%
Reptile	74	5	6.3%
Total Animal Species	**881**	**140**	**13.7%**
Plant Species:			
Nonvascular Plant	328	5	1.5%
Vascular Plant	4,424	46	1.0%
Total Plant Species	**4,752**	**51**	**1.1%**
Total	**5,633**	**191**	**3.3%**

Are certain types of species more likely to be endangered?

SPECIES CATEGORY ANALYSIS FOR CONSERVATION

Species v. Species Test Results

Test 1: Mammal (17.8%) vs. Bird (15.2%)

- Is there a significant difference between the number of protected species categorized as Mammal vs. those categorized as Bird?
- **NO**, using the chi square test, the pvalue = 0.4459017030471 97 indicating that there is not a significant difference between these 2 species categories.

Test 2: Mammal (17.8%) vs. Reptile (6.3%)

- Is there a significant difference between the number of protected species categorized as Mammal vs. those categorized as Reptile?
- **YES,** using the chi square test, the pvalue = 0.023384652148715 47 indicating that there is a significant difference between these 2 species categories.

ENDANGERED SPECIES RECOMMENDATIONS

- 3.3% of known species require conservation measures.
  - 13.7% Animal species require conservation measures
  - 1.1% Plant species require conservation measures
- Recommendations based upon species categories determined to be most at risk:
  - While Mammals appear to be at higher risk than Birds, there is no significant difference and equal conservation measures should be taken for each category.
  - Mammals appear to be and are at a higher risk than Reptiles, and conservation measures should first be applied to Mammals.

DISEASE STUDY SAMPLE SIZE

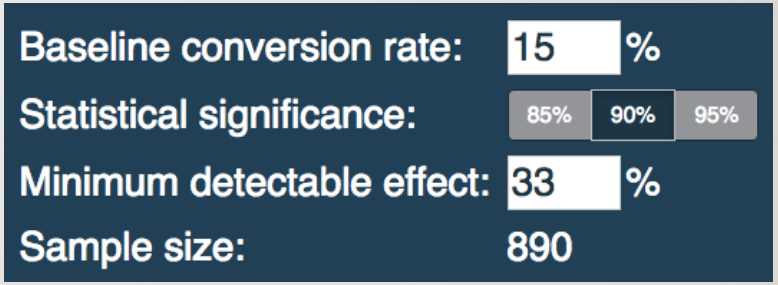
- Certain conservation efforts for Mammals focus on disease control.
- 3 Mammal species are "Sheep", and 2 of the 3 species are classified as Protected.
- Scientist have determined 15% of sheep at Bryce National Park have foot and mouth disease.
- Park rangers at Yellowstone National Park have been running a program to reduce the rate of foot and mouth disease at that park.

Is the Foot and Mouth Disease Program working?

Category	Scientific Name	Common Names	Conservation Status
Mammal	Ovis aries	Domestic Sheep, Mouflon, Red Sheep, Sheep (Feral)	No Intervention
Mammal	**Ovis canadensis**	**Bighorn Sheep, Bighorn Sheep**	**Species of Concern**
Mammal	**Ovis canadensis sierrae**	**Sierra Nevada Bighorn Sheep**	**Endangered**

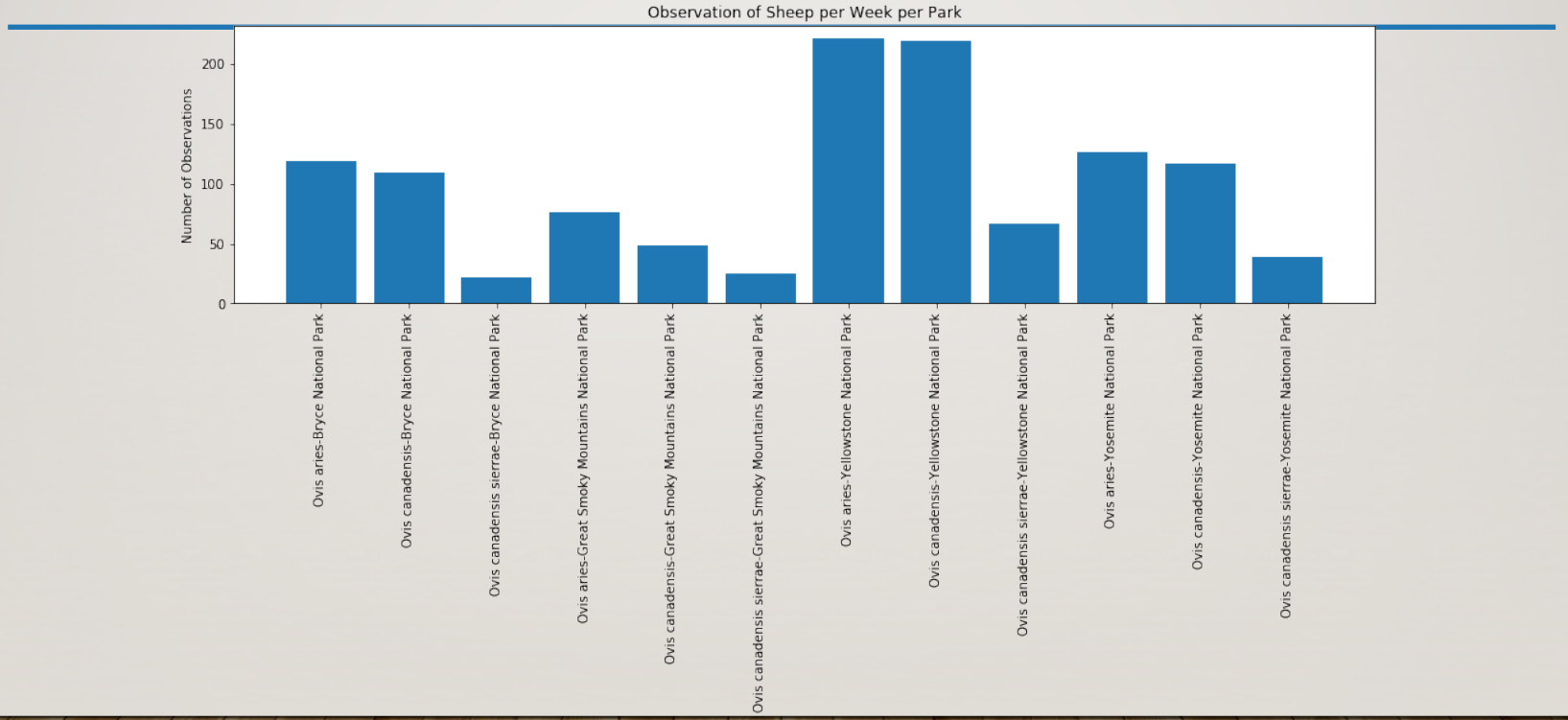
DISEASE STUDY SAMPLE SIZE

How many sheep need to be observed to determine with 90% confidence that 5% change in sheep with the disease has occurred?



Sample Size = 890 sheep

DISEASE STUDY SAMPLE SIZE



DISEASE STUDY SAMPLE SIZE

Scientific Name	Park Name	# of Observations		Park Name	# of Observations
Ovis aries	Bryce National Park	119		Yellowstone National Park	221
Ovis canadensis	Bryce National Park	109		Yellowstone National Park	219
Ovis canadensis sierrae	Bryce National Park	22		Yellowstone National Park	67
	Sheep/Week	**250**		**Sheep/Week**	**507**
	Weeks to Observe	**3.56**		**Weeks to Observe**	**1.76**

Based upon sheep observed in the respective Parks, to observe 890 sheep:

- In Bryce National Park, sheep need to be observed for 25 days (3 weeks, 4 days).
- In Yellowstone National Park, sheep need to be observed for 13 days (1 week, 6 days).