EXAMINING OUR NATIONAL PARKS: ENDANGERED SPECIES AND PREVENTION OF DISEASE

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SPECIES WITHIN OUR NATIONAL PARKS

- National Park Services provides the following data for different species within our National Parks:
  - 7 different Categories of Animals (Mammal, Bird, Reptile, Amphibian, Fish, Vascular Plan, and Non-Vascular Plant)
  - Scientific Name & Common Name of each species
    - 5541 different species within our National Parks
- Species conservation status (Endangered, In Recovery, Of Concern, Threatened)
  - Some animals do not have a conservation status reported (Null)

CONSERVATION COUNTS

Conservation Status	Unique Count of Species based on Scientific Name
Endangered	15
In Recovery	4
No Intervention (Null)	5363
Of Concern	151
Threatened	10

Conservation Status by Species
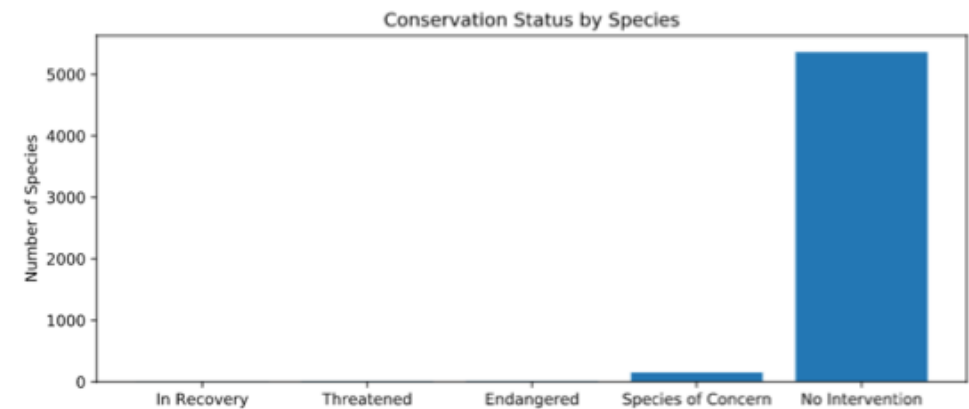
PROTECTED SPECIES BY CATEGORY

Category	No Intervention	Protected	Percent Protected
Amphibian	72	7	0.088608
Bird	413	75	0.153689
Fish	115	11	0.087302
Mammal	146	30	0.170455
Non-Vascular Plant	328	5	0.015015
Reptile	73	5	0.064103
Vascular Plant	4216	46	0.010793

- Mammals are move protected (~0.17) therefore most likely to be endangered
- Vascular Plants are least protected (~0.010) therefore least likely to be endangered

ARE CERTAIN SPECIES MORE LIKELY TO BE ENDANGERED? CHI-SQUARED TEST

- Chi-Squared Test determines independence or dependence between two different datasets

- Chi2_Contingency test of a data frame (ex: species within our National Parks) determines if there is a significant difference between two datasets

  - pval (p-value) < 0.05 there is a significant difference and the null hypothesis will be rejected

- **Null Hypothesis**: Difference in protection between two species is due to chance

CERTAIN SPECIES **ARE** MORE LIKELY TO BE ENDANGERED!

Accept Null Hypothesis:

- Mammal vs. Bird (~0.688) Not Significant

- Fish vs. Amphibian (~0.824) Not Significant

- Vascular Plants vs. Non-Vascular Plants (~0.662) Not Significant

- Reptiles vs. Amphibians (~0.781) Not Significant

Difference between species is a result of chance.

Reject Null Hypothesis:

- Reptile vs. Mammal (~0.038) Significant

- Mammal vs. Vascular Plants (1.44 x 10^-55) Significant

- Reptile vs. Vascular Plants (~0.0001) Significant

- Mammal vs. Non-Vascular Plants (1.48 x 10^-10) Significant

- Reptile vs. Non-Vascular Plants (~0.033) Significant

These species are more likely to be endangered than others.

RECOMMENDATION

- Initial analysis showed there was a slight difference in the percentages of protected animals that fell within a specific species. (Slide 4)

- To investigate further, a null hypothesis was constructed to state that the difference between these species was a result of chance.

- Based on the results of our Chi-Squared test,, it was determined that certain types of species are more likely to be endangered than others. (Slide 6)

- Focus conservation efforts on Reptiles, Mammals, Vascular and Non-Vascular Plants. This will provide the greatest enhancement to the National Parks ecosystem.

	Reptile	Mammal	Vascular Plants	Non-Vascular Plants	p-value	Results
Reptile vs. Mammal	0.064	0.17			0.038	Significant
Mammal vs. Vascular Plants		0.17	0.011		1.44×10^{-55}	Significant
Reptile vs. Vascular Plants	0.064		0.011		0.0001	Significant
Mammal vs. Non-Vascular Plants		0.17		0.015	1.48×10^{-10}	Significant
Reptiles vs. Non-Vascular Plant	0.064			0.015	0.033	Significant

SUBSET OF SPECIES DATA FROM NATIONAL PARK SERVICES:

Narrowed dataset to species = 'sheep' and category = 'mammal' summed across different National Parks

	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
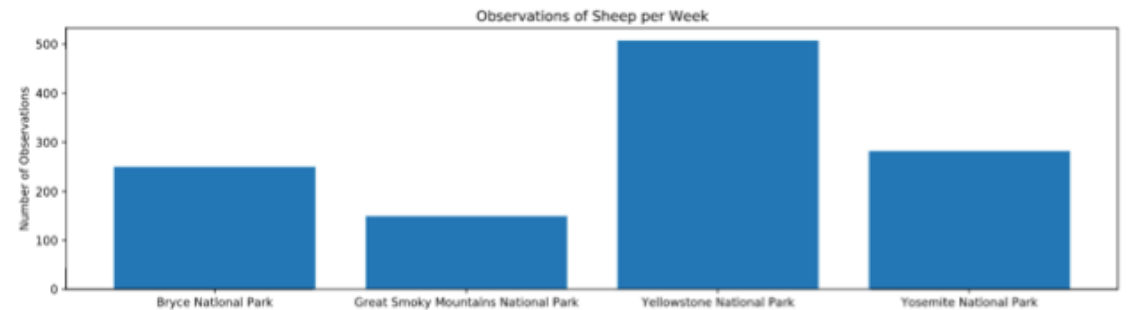
SUCCESS IN REDUCING FOOT & MOUTH DISEASE IN SHEEP

- In order to determine whether the program instituted by the Park Rangers is working, an acceptable sample size must be determined to ensure results are significant. To determine sample size, three variables are required:

  - Baseline Conversion Rate

  - Minimum Detectable Effect

  - Statistical Significance

- Last year, 15% of sheep at Bryce National Park have foot and mouth disease. This is our Baseline Conversion Rate.

- A minimum level of Statistical Significance is determined to be 90%.

- Calculation of the Minimum Detectable Effect is the percentage of change that would need to be seen between the variant. Park Rangers want to detect reductions of at least 5 percentage points.

  - MDE = 100 * (Reduction of 5% / Baseline 15%)

  - MDE = 100 * (5 / 15.0)

  - MDE = 870

TIME REQUIREMENT FOR STUDY

Yellowstone National Park:

- Typically 507 sheep are observed per week.

- Since 810 sheep need to be observed, scientists would need to spend 2 weeks at Yellowstone National Park.

Bryce National Park:

- Typically 250 sheep are observed per week.

- Since 810 sheep need to be observed, scientists would need to spend 4 weeks at Bryce National Park.