



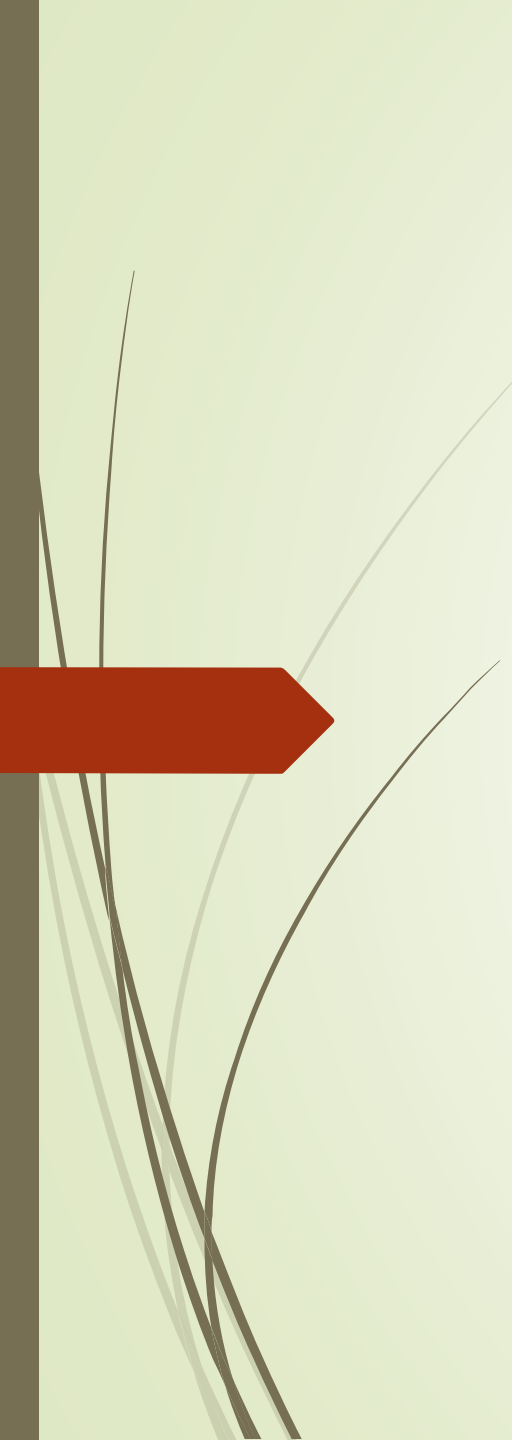
Conservation Statuses of Endangered Species

Data Analysis for National Park Service



BIODIVERSITY CAPSTONE PROJECT - **INVESTIGATING PROTECTED SPECIES**

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- Results
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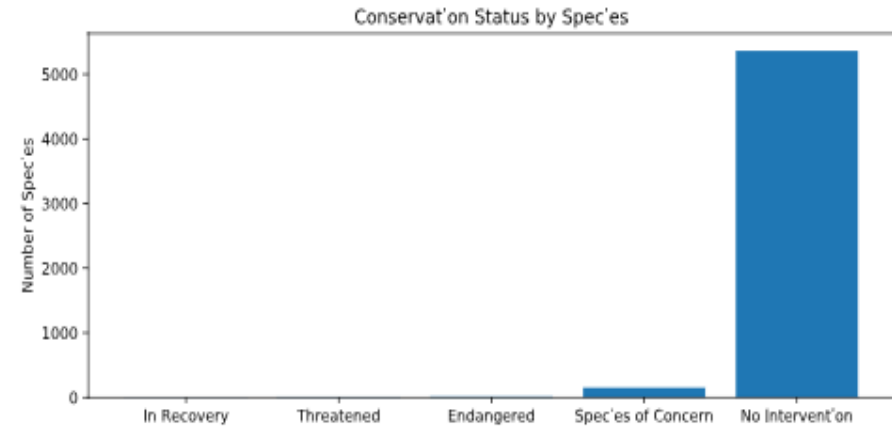
The National Parks Service would like to know what is the conservation statuses of endangered species and to investigate if there are any patterns or themes to the types of species that become endangered.

The data received had different species that are within the National Parks, which included:

- ❖ The scientific name of each species
- ❖ The common names of each species
- ❖ The species conservation status

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

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Data Spread

Looking at this bar graph you can see that the spread of the data shows quite a difference between the 'No Interference' and the rest of the endangered list for the National Parks Service. This means that most of the animals within the National Parks Services are living well.

** An additional graph would be beneficial to see what levels are on the endangered list that exclude the 'No Interference' section.

Section 1:


Are certain types of species more likely to be endangered?

Here to the right, you can see the categories of the types of animals and plant life that has been recorded, which also shows what percentage of protection each category has.

The **Chi-square test** is intended to **test** how likely it is that an observed distribution is due to chance.

Therefore, we can conclude that certain types of species *are* more likely to be endangered than others.

	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



The significant p-value Chi-test results from the National Park Services data are here on the right.

In comparing the percentages of protected Non-Vascular Plants and Vascular Plants to aquatic type species: Amphibians, Fish and Reptiles show that these species are more likely to be endangered. This is indicated by their less than 1% significance.

When comparing mammals to aquatic type species (Fish and Birds) show 5% significance. Mammal and Reptiles show less than 1% significance.

Chi-test Results:

- Non-Vascular Plant / Amphibian (0.001)
- Non-Vascular Plant / Fish (0.0004)
- Non-Vascular Plant / Reptile (0.03)
- Vascular Plant / Reptile (0.0001)

- Mammal / Reptiles (0.038)
- Mammal / Fish (0.05)
- Bird / Reptile (0.05)



What do the test results mean?

Let's look at what Non-Vascular and Vascular Plants are to have a better understanding as to why these values are significant.



Non-Vascular

- Non-vascular plants do not retain water for long period of time or deliver water to other parts of the plant body. Consequently, water is absorbed directly from its surrounding area or nearby water source [1].
- Examples: mosses, liverworts, and hornworts

Vascular Plants

- Vascular plants are more structurally and functionally complex. The tissues are organized into specialized organs called roots, stems, and leaves. Different combinations of tissues make up the organs of a vascular plant [2].
- Examples: ferns and flowering plants

Non-Vascular grow in the Riparian Zone

- Non-Vascular plants grow within the **Riparian zone** which is a part of the land that transitions between water and land. This area is particularly sensitive to environmental effects because it is the first to experience any kind of toxicity from land or water that are then absorbed through Non-Vascular plants [3].
- Amphibians, fish and reptiles are among the wild life who live within these areas and eat its vegetation.

Chi-test Results:

Non-Vascular Plant / Amphibian (0.001)

Non-Vascular Plant / Fish (0.0004)

Non-Vascular Plant / Reptile (0.03)

Vascular Plant / Reptile (0.0001)

Results

The evidence that the sensitivity to environmental threats is higher in amphibians than in mammals has been generally linked to the observation that amphibians are characterized by a rather permeable skin and exchange gas, water, and electrolyte with the environment.

Amphibians spend the first two parts of their life cycle in aquatic and terrestrial environments and face threats present in both habitats []. This kind of environment is prone to **bioaccumulation**.

Mammals mostly live on land however are significantly affected because of the consumption of Fish and Reptile through **Biomagnification**.

Chi-test Results:

- Non-Vascular Plant / Amphibian (0.001)
- Non-Vascular Plant / Fish (0.0004)
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Bioaccumulation to Biomagnification

- **Bioaccumulation** is when toxic chemical accumulate within the tissue of a particular organism [4].
- **Biomagnification** is when there is an increased concentration of a toxic chemical the higher the animal is on the food chain [4].
- Good thing humans do not generally eat Reptiles and possibly a reason for other mammals.

Chi-test Results:

- Mammal / Reptiles (0.038)
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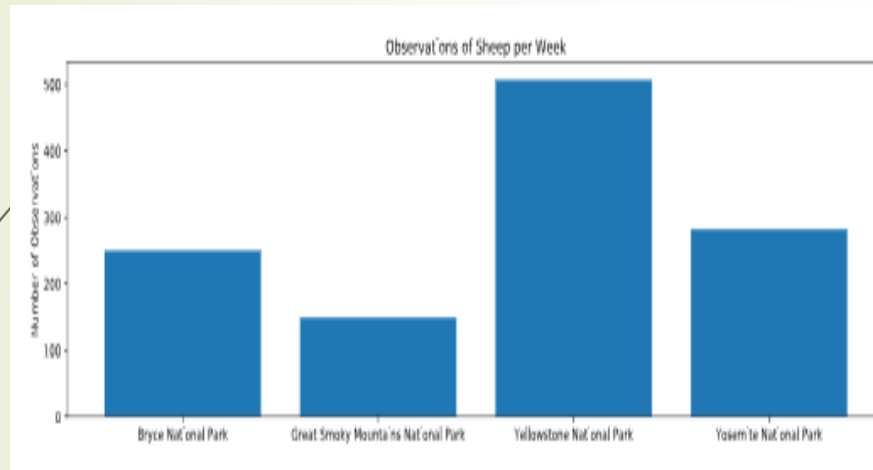


Section 2:

Foot and Mouth Reduction Effort

- ▶ Park Rangers at Yellowstone National Park have been running a program to reduce the rate of foot and mouth disease at that park. The scientists want to test whether or not this program is working. They want to be able to detect reductions of at least 5 percentage points
- ▶ The only information that the scientists currently have is that last year it was recorded that 15% of sheep at Bryce National Park have foot and mouth disease

	scientific_name	park_name	observations	category	common_names	conservation_status	is_protected	is_sheep
0	Ovis canadensis	Yellowstone National Park	219	Mammal	Bighorn Sheep, Bighorn Sheep	Species of Concern	True	True
1	Ovis canadensis	Bryce National Park	109	Mammal	Bighorn Sheep, Bighorn Sheep	Species of Concern	True	True
2	Ovis canadensis	Yosemite National Park	117	Mammal	Bighorn Sheep, Bighorn Sheep	Species of Concern	True	True
3	Ovis canadensis	Great Smoky Mountains National Park	48	Mammal	Bighorn Sheep, Bighorn Sheep	Species of Concern	True	True
4	Ovis canadensis sierrae	Yellowstone National Park	67	Mammal	Sierra Nevada Bighorn Sheep	Endangered	True	True



	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

Data Spread

Here is the selection of all the different breeds of sheep from all the National Parks and can be seen in the graph.

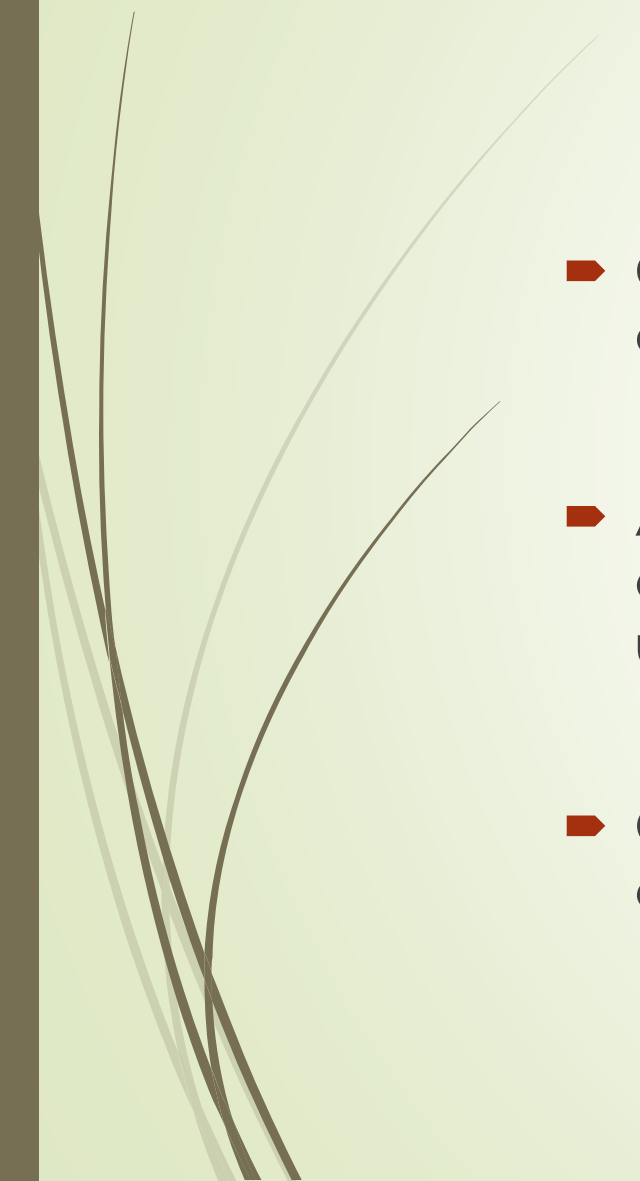


Determining Sample Size

- ▶ The number of sheep that need to be observed is **870 sheep** in the park to make sure their foot and mouth are **90% significant**.
- ▶ The observation data found that this would take approximately **one week** of observing in Yellowstone to see that many sheep, or approximately two weeks in Bryce to see that many sheep.



Future Recommendations

- Create a meridian zones map for targeted area analysis for water and soil testing for aquatic life.
 - An additional bar graph could be made to see only the endangered species list which would provide a better understanding of the levels of species who need attention.
 - Create a map to show where sheep are seen using a geo-coordinate tracking.
- 



References

- 1. Non-Vascular: <https://www.cliffsnotes.com/study-guides/biology/biology/plants-diversity-and-reproduction/nonvascular-plants-defined>
- 2. Vascular: <https://www.cliffsnotes.com/study-guides/biology/biology/vascular-plants-structure-and-function/vascular-plants>
- 3. Riparian Zone: <http://allaboutwatersheds.org/library/kyw-poster-files-and-links/riparian-zone>
- 4. Bioaccumulation & Biomagnification: <https://w3.marietta.edu/~biol/102/2bioma95.html>