

A decorative graphic on the left side of the slide consisting of two overlapping parallelograms. The front one is blue and the back one is a light green. They are positioned diagonally, with the blue one partially covering the green one.

Biodiversity for the National Parks

A presentation by Jason Nelson



Analysis of species_info.csv

What species are present?

- The species_info.csv contains details about a range of animals: their scientific name, common name, category, and conservation status.
- There are 5824 entries, but some are duplicated. The number of unique entries (determined by unique scientific names) is 5542.
- The categories of species recorded are Mammal, Bird, Reptile, Amphibian, Fish, and both Vascular and Nonvascular plants.
- More specifically, these are the breakdowns of how many of each category of animal are present:

○ Amphibians	79
○ Bird	488
○ Fish	126
○ Mammal	176
○ Nonvascular Plant	333
○ Reptile	78
○ Vascular Plant	4262



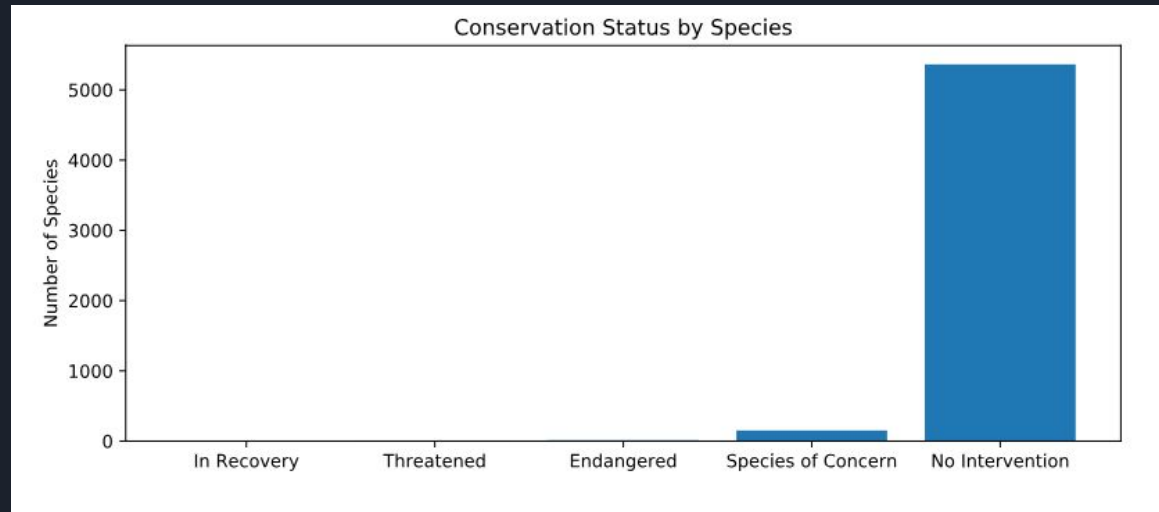
Analysis of species_info.csv

What is the status of the species?

- The conservation statuses used are Species of Concern, Endangered, Threatened, and In Recovery.
 - Many entries have a NaN entry for their conservation status. This presentation gives these species the label “No Intervention”
 - Technically, these species with undefined status’s could either be nowhere near extinction, or extinct. For the purpose of conservation efforts, we take no action either way.

Analysis of species_info.csv

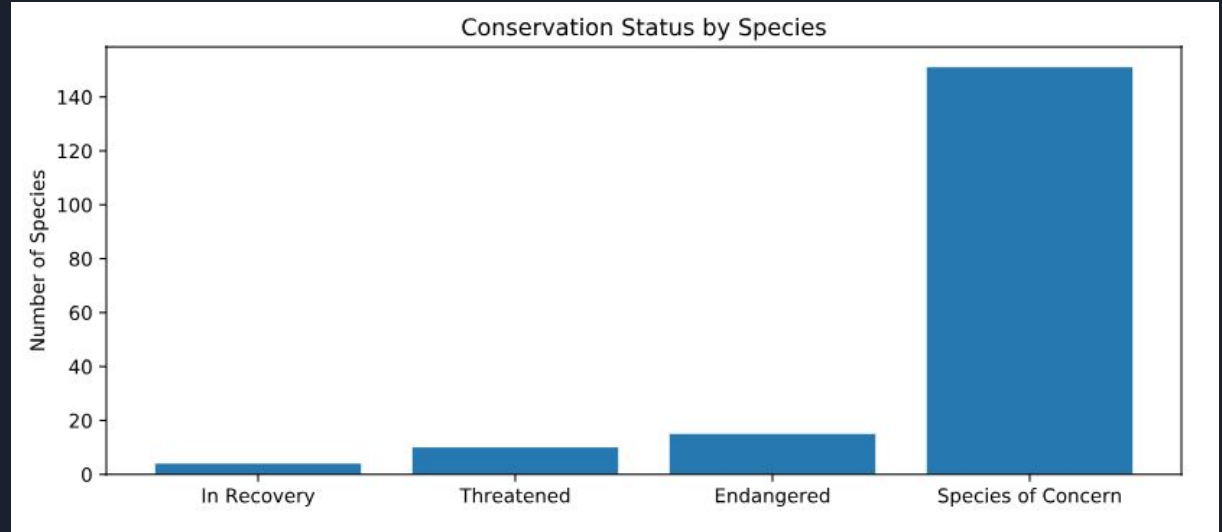
Summary of species status amounts p1



Analysis of species_info.csv

Summary of species status amounts p2

Sums of species per
conservation status, ignoring
“No Intervention” species
(zoomed in):





Significance calculations

Who's going extinct?

Below is a breakdown of each category of species, how many of them are protected, and how many are not protected. Percentage of amount protected is also provided

<u>Category</u>	<u>not_protected</u>	<u>protected</u>	<u>percent_protected</u>
Amphibian	72	7	8.8608%
Bird	413	75	15.3689%
Fish	115	11	8.7302%
Mammal	146	30	17.0455%
Nonvascular Plant	328	5	1.5015%
Reptile	73	5	6.4103%
Vascular Plant	4216	46	1.0793%



Significance calculations

Are these proportions significant?

At first glance, it seems like Mammals are slightly more at risk for extinction than Birds. Chi-squared tests were used to compare the category's protected status for significance.

Null hypothesis: the differences in categories' protected status is insignificant. P-Value to test for significance: 5% (0.05)

P-values for the tests are provided below:

<u>Categories compared</u>	<u>Chi-squared pval</u>	<u>Significantly different?</u>
Bird & Mammal	.6876	No
Mammal & Amphibian	.1275	No
Mammal & Reptile	.0383	Yes
Amphibian & Reptiles	.7814	No
Amphibian & Bird	.1759	No
Reptile & Non-vascular plant	.0336	Yes



Recommended actions

Where to focus conservation efforts

1. Birds and Mammals are equally affected by the environment as it pertains to causing or alleviating protected status. As they have the highest percentages of species in protected status, they should both take priority. Moreover, this means improvements to save one of these categories of species should equally benefit the other category.
2. Mammals and reptiles are not significantly similar in their protected status. That is, attempts to improve the protected status of mammals is not predicted to change the ratio of the protected status reptilians.
3. However, reptiles, birds, and mammals have some significant protected status relationship with amphibians. It's possible that providing conservation efforts to improve the protection status of amphibians would have the side effect of benefitting nearly all other groups.
4. The protected status of plant life has no significant relationship to the protected status of non-plant life.



Closer look: Foot and Mouth Disease in Sheep

Are we making progress?

Context: Conservation efforts have been made to at the Yellowstone National Park to reduce the amount of foot and mouth diseases in sheep. We now need to sample the populace to track the effectiveness of these efforts.

Baseline: 15% of sheep at the Bryce National Park have had foot and mouth diseases

Desired improvement: at least 5% decrease, so a new rate of 10%

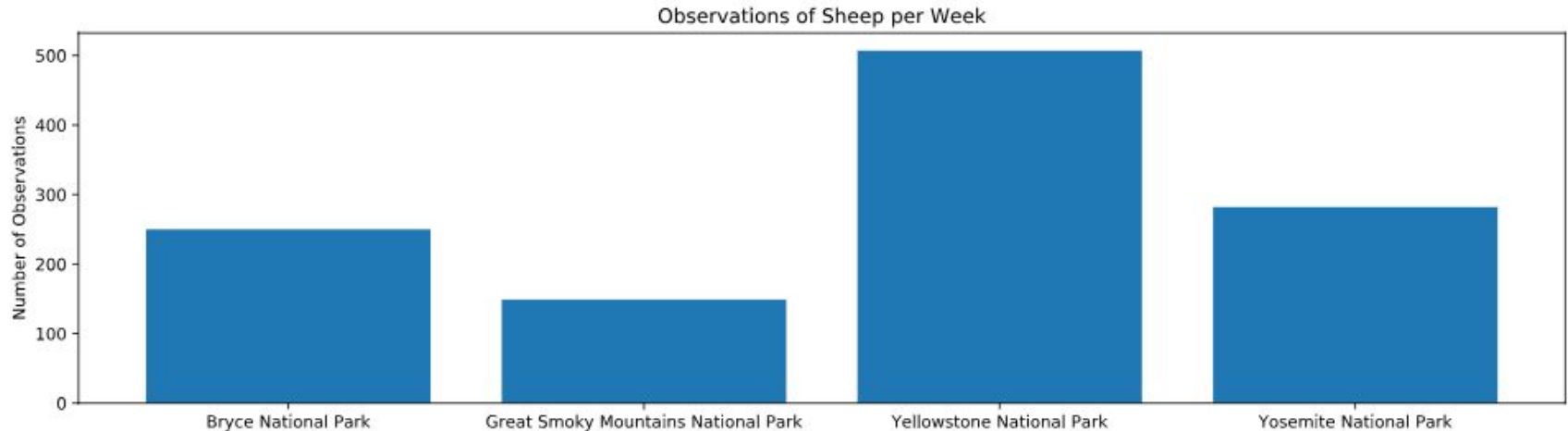
Minimum detectable effect (MDE): $(100 * |(10-15)|) / 15 = 33.33\%$

Samples needed to gain 90% confident answer: **870**

Closer look: Foot and Mouth Disease in Sheep

How long will the sampling take? p1

From cross referencing species_info.csv with observations.csv:





Closer look: Foot and Mouth Disease in Sheep

How long will the sampling take? p2

In summation:

At a rate of ~500 observances of sheep at Yellowstone per week, it will take a little less than 2 weeks to gain a confident poll of the foot and mouth disease status of the sheep.

Provided the rate of sheep foot and mouth disease at Bryce National Park (15%) held true for Yellowstone, then we know we're making sufficient impact if 87 or fewer sheep in our 870 samples have the disease.

If anywhere between 88 and 131 sheep have the disease after our samples, then this will prove that our methods are not working well enough.