



National Park Biodiversity

ANALYSIS OF SPECIES IN AMERICA'S NATIONAL PARKS

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species_info.csv

	category	scientific_name	common_names	conservation_status
0	Mammal	Clethrionomys gapperi gapperi	Gapper's Red-Backed Vole	NaN
1	Mammal	Bos bison	American Bison, Bison	NaN
2	Mammal	Bos taurus	Aurochs, Aurochs, Domestic Cattle (Feral), Dom...	NaN
3	Mammal	Ovis aries	Domestic Sheep, Mouflon, Red Sheep, Sheep (Feral)	NaN
4	Mammal	Cervus elaphus	Wapiti Or Elk	NaN
5	Mammal	Odocoileus virginianus	White-Tailed Deer	NaN
6	Mammal	Sus scrofa	Feral Hog, Wild Pig	NaN
7	Mammal	Canis latrans	Coyote	Species of Concern
8	Mammal	Canis lupus	Gray Wolf	Endangered
9	Mammal	Canis rufus	Red Wolf	Endangered

Description of species_info.csv

- ▶ Converted our original CSV into a DataFrame called species.
- ▶ There are 5 columns in the original DataFrame: id, category, scientific_name, common_names, and conservation_status.
- ▶ In an edited version of this DataFrame, there is an additional column called is_protected (*DataFrame below*).

	category	scientific_name	common_names	conservation_status	is_protected
0	Mammal	Clethrionomys gapperi gapperi	Gapper's Red-Backed Vole	No Intervention	False
1	Mammal	Bos bison	American Bison, Bison	No Intervention	False
2	Mammal	Bos taurus	Aurochs, Aurochs, Domestic Cattle (Feral), Dom...	No Intervention	False
3	Mammal	Ovis aries	Domestic Sheep, Mouflon, Red Sheep, Sheep (Feral)	No Intervention	False
4	Mammal	Cervus elaphus	Wapiti Or Elk	No Intervention	False
5	Mammal	Odocoileus virginianus	White-Tailed Deer	No Intervention	False
6	Mammal	Sus scrofa	Feral Hog, Wild Pig	No Intervention	False
7	Mammal	Canis latrans	Coyote	Species of Concern	True
8	Mammal	Canis lupus	Gray Wolf	Endangered	True
9	Mammal	Canis rufus	Red Wolf	Endangered	True

Observations from species_info.csv

- ▶ The majority of the species are not protected (see bar graph at end of presentation).
- ▶ The largest proportions of categories of species that are protected are mammals and birds.
- ▶ How significant are the differences conservation statuses between categories of species?

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

	category	not_protected	protected	percent_protected
0	Amphibian	73	7	0.087500
1	Bird	442	79	0.151631
2	Fish	116	11	0.086614
3	Mammal	176	38	0.177570
4	Nonvascular Plant	328	5	0.015015
5	Reptile	74	5	0.063291
6	Vascular Plant	4424	46	0.010291

Pearson's Chi-Square Test

- ▶ We will use Pearson's Chi-Square Test to determine whether a category of species is more likely to be protected or not.
 - ▶ Categorical data
 - ▶ Comparing differences between rows/categories of species
- ▶ Idea behind this test:
 - ▶ We assume that the row variable, in this case category of species, is independent of the column variable, the protected status.
 - ▶ This means the values in should be proportional to row and column sums.
 - ▶ Used Python's `chi2_contingency` from `scipy.stats`

Results of the Significance Tests

- ▶ There was no significant difference in between birds and mammals protection rates.
- ▶ There was a significant difference between reptiles and mammals protection rates.
- ▶ There was a significant difference between the protection rates of animals and plants.

Recommendations

- ▶ Clearly there are significantly higher protection rates for animals and plants.
- ▶ How to lower protection rates:
 - ▶ Seek increased protections for the current habitats of protected species.
 - ▶ Introduce programs to increase the abundance of food available to protected species.
 - ▶ Introduce protected species to areas where their prey is overpopulated and disrupting the ecosystem.
 - ▶ Create programs to reintroduce protected species into former habitats with oversight.
 - ▶ Reduce pesticide use around the habitats of protected species.
 - ▶ Increase fines and penalties for those who harm protected species and their habitats.

observations.csv

- ▶ Loaded observations.csv into a DataFrame called observations.
- ▶ Observations has four columns:
 - ▶ Id
 - ▶ scientific_name
 - ▶ park_name
 - ▶ observations

	scientific_name	park_name	observations
0	Vicia benghalensis	Great Smoky Mountains National Park	68
1	Neovison vison	Great Smoky Mountains National Park	77
2	Prunus subcordata	Yosemite National Park	138
3	Abutilon theophrasti	Bryce National Park	84
4	Githopsis specularioides	Great Smoky Mountains National Park	85

Sheep Observations

Partial sheep observations DataFrame

	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
5	Ovis canadensis sierrae	Yosemite National Park	39	Mammal	Sierra Nevada Bighorn Sheep	Endangered	True	True

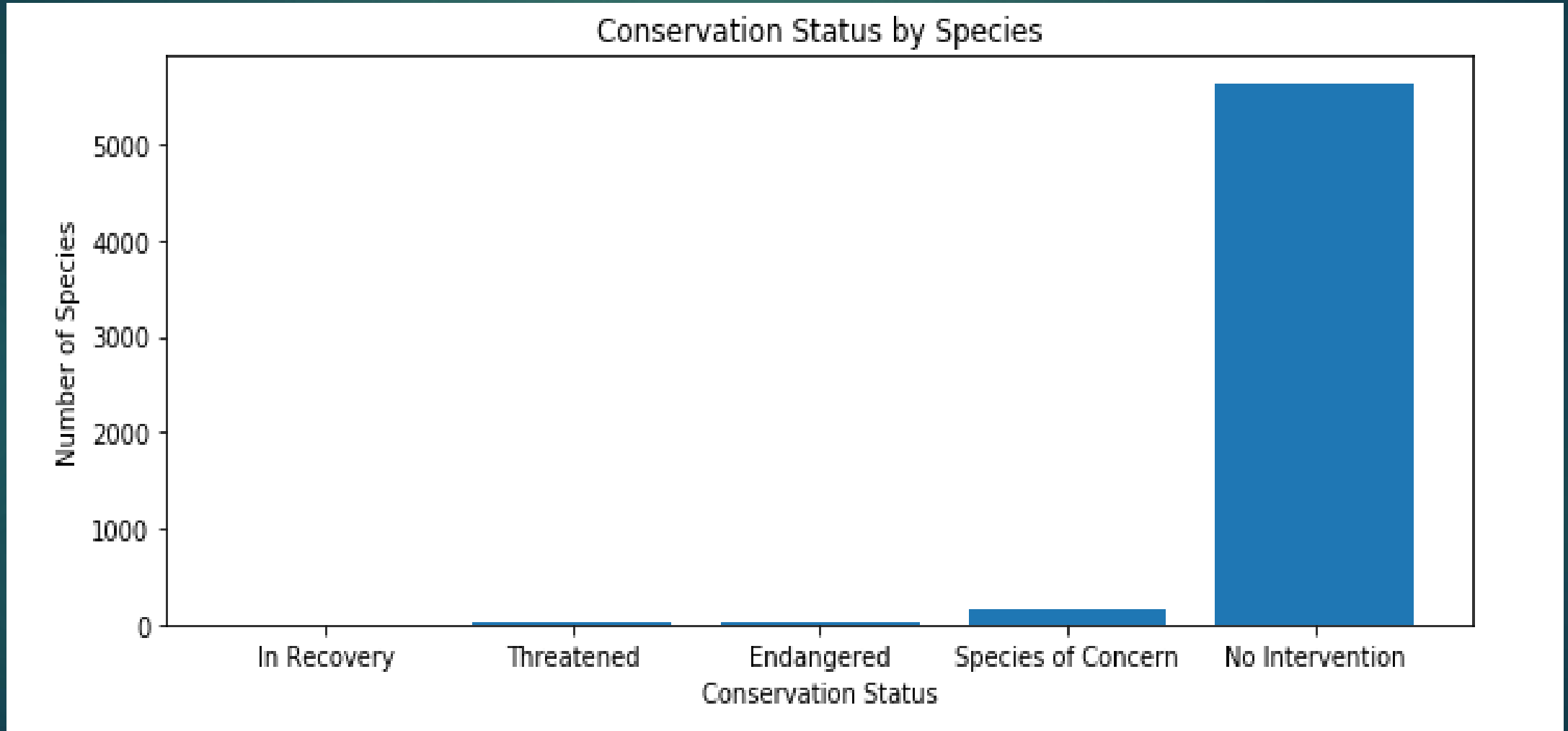
Sheep Observations by National Park

	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

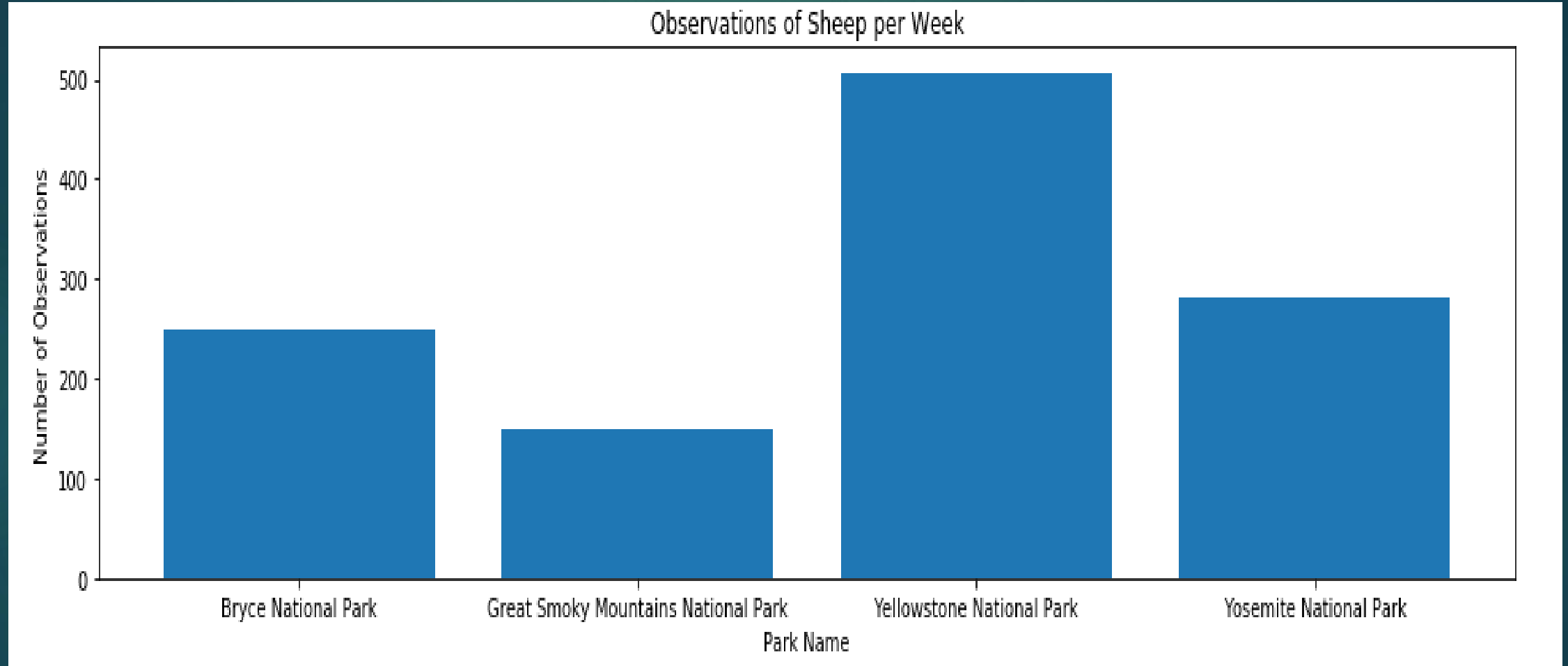
Foot and Mouth Disease Study

- ▶ 15% of sheep in Bryce National Park have foot and mouth disease.
- ▶ Yellowstone trial program
- ▶ Wish to see reduction to 10% diseased rate
- ▶ Determine sample size for a default level of significance of 90%
- ▶ Appropriate sample size for the study would be 510 sheep observations
- ▶ Based on last week's observations, it should take a week to complete the study at Yellowstone National Park and two weeks to complete the study at Bryce National Park.

Conservation Status by Species Graph



Observations of Sheep per Week graph





Questions?