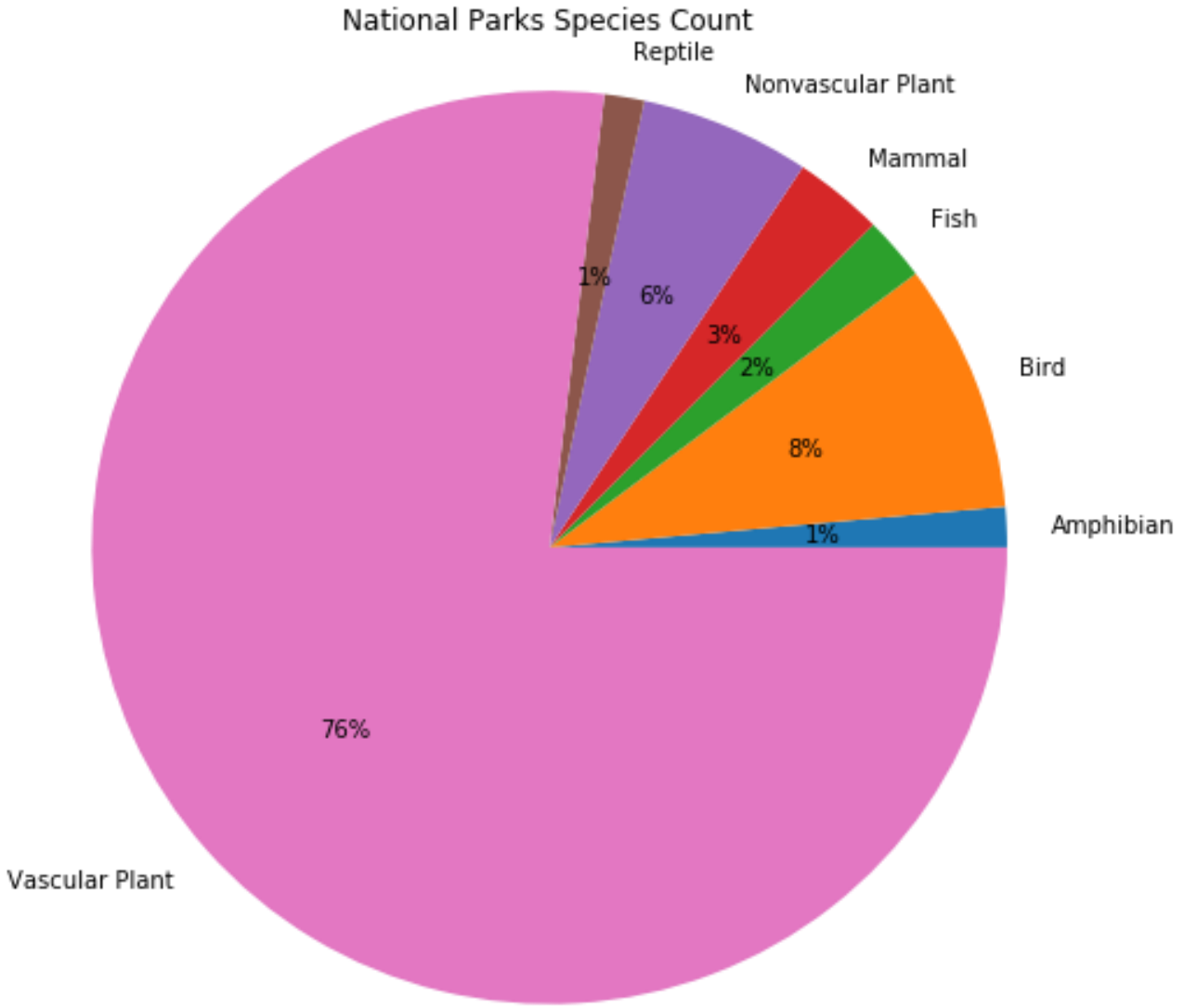
An analysis of species and their conservation status at National Parks

Conserving Species

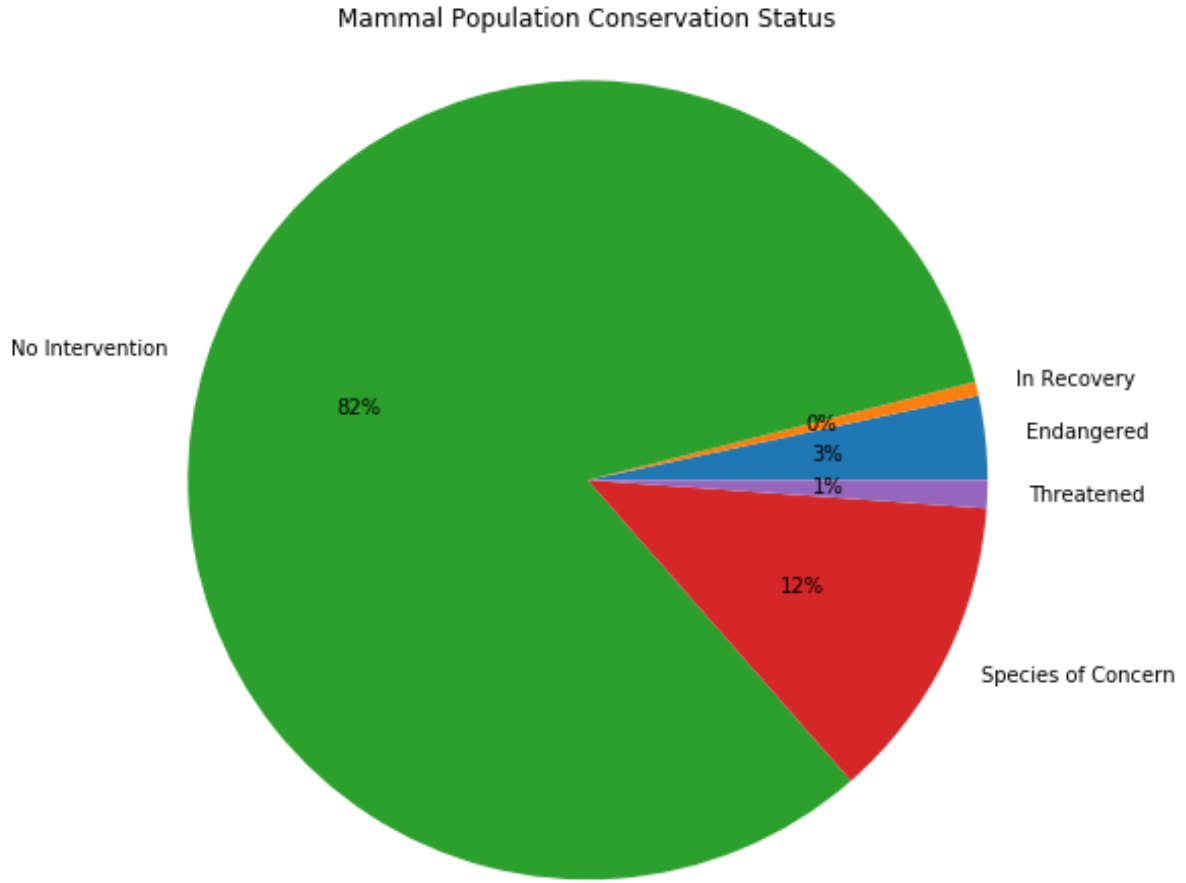
National Parks Species

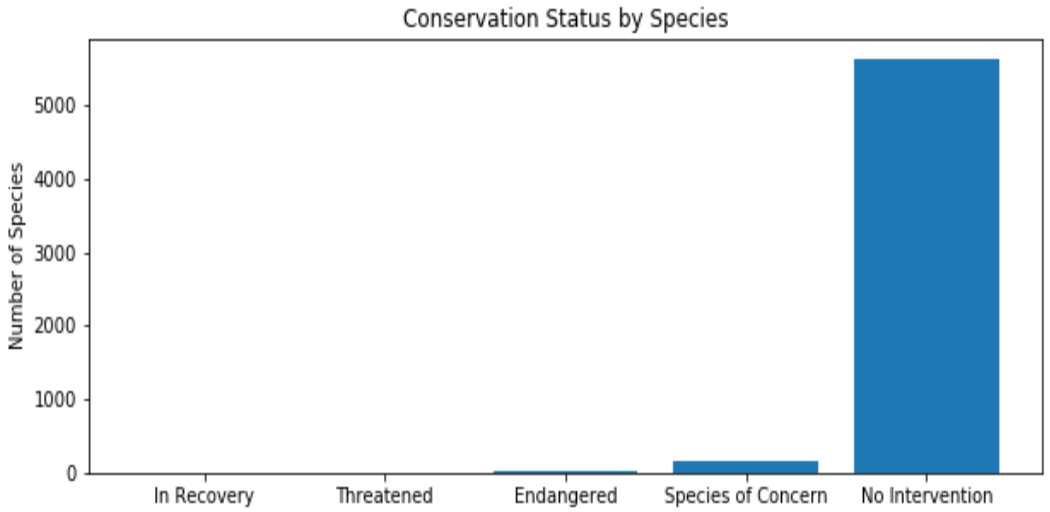
- Our species data showed us information on the species type, scientific name, common name, and conservation status
  - Species types include,
    - Birds
    - Mammals
    - Reptiles
    - Amphibians
    - Fish
    - Plants, vascular and non-vascular
  - There are 5,541 unique species that roam, fly, or grow in our National Parks.
  - The most abundant species is plants with 4,262 species of vascular plants and 333 species of non-vascular plants
  - Birds and mammals are the next in order with 488 and 176 species, respectively
  - Leaving the amphibians, fish, and reptiles with 79, 125, and 78 species, respectively


National Parks Species Count
Reptile
Nonvascular Plant
Mammal
Fish
Bird
Amphibian
Vascular Plant
1%
6%
3%
2%
8%
1%
76%

Conservation Status of Park Species

- Mammals are our most notable attractions and can signal the overall health of our animal populations in our parks.
- We found that 17 % of our mammal population is listed under a protected status (30 out of 176 mammals)
  - Of that seventeen percent we see that eight are listed as Endangered or Threatened.
    - What is concerning here is that four are large animals, with three being apex predators and important to the overall health of our national parks. The other being a bighorn sheep (Sierra Nevada) which signals that there may be something happening to their specific environment that is impacting their health.
  - Of the species list as being of concern we found that a majority were species of bats
  - There's also cause for concern here as we see bighorn sheep, not specific to the Sierra Nevada's, as well as smaller animals from the Sierra Mountain area.


Mammal Population Conservation Status
No Intervention
82%
In Recovery
0%
Endangered
3%
Threatened
1%
Species of Concern
12%



Conservation Status Analysis

Overall Conservation Status

- A look at the total population of species shows 180 total species that are listed as protected
  - Species of concern is the status with the most animals, these species and their habitats will need to be monitored and their relationships to threatened or endangered species investigated
- A vast majority of species, 5,363, are in the clear and require no intervention or monitoring

Conservation Status Analysis

Conservation Status	Count of Species
Endangered	15
In Recovery	4
No Intervention	5,363
Species of Concern	151
Threatened	10

- You can see that a majority of species are listed as not protected (No Intervention)
- However, the small number of Endangered and Threatened species can actually tell you a lot about the overall health of the park.

Species	Not Protected	Protected	Percentage Protected
Amphibian	72	7	0.088608
Bird	413	75	0.153689
Fish	115	11	0.087302
Mammal	146	30	0.170455
Nonvascular Plant	328	5	0.015015
Reptile	73	5	0.064103
Vascular Plant	4216	46	0.010793

- While the overall number of protected animals is “low,” the high percentages for Mammals and Birds can signal serious issues for parks at large
- At first glance it appears that some species are indeed more susceptible to being endangered. We’ll prove this via statistical significance tests in the following slides.

Conservation Status Analysis

Using data from the previous slides, we can run a Chi Squared test to see if certain animals are more likely to be protected.

- Our first comparison is between mammals and birds, both of which have the highest percentage of being protected.
- Before testing we assume a null hypothesis that birds are no likelier to be endangered than mammals
- We run a chi squared test because we are comparing two, or more, sets of categorical data
    - First we created a contingency table to run through Python's built-in chi square test function
        - contingency = [[146, 30], [413, 75]]
    - Then we ran this table through Python's built-in function
        - chi2, pval, dof, expected = chi2_contingency(contingency)
        - A p-value of 0.687594809666 was returned, which means we cannot reject the null hypothesis and accept that birds are no more likely to be protected than mammals.
- Does this also apply to other species in the dataset?

Conservation Status Analysis

Reptile vs. Mammals

- Running the following in Python…
  - contingency2 = [[73, 5], [146, 30]]
  - chi2, pval, dof, expected = chi2_contingency(contingency2)
- Returns a p-value of 0.0383555902297
- We can reject the null hypothesis that reptiles are no more likely to be endangered than mammals. In fact, it appears that reptiles are less likely to be endangered than mammals.

Fish vs. Birds

- Running the following in Python…
  - contingency3 = [[413, 75], [115, 11]]
  - chi2, pval, dof, expected = chi2_contingency(contingency3)
- Returns a p-value of 0. 0766819956906
- While we can't reject the null hypothesis that fish are no more likely to be endangered than birds. We can note that the p-value was close enough to the threshold for significance and that the bird population should be monitored closely.

Conservation Recommendations

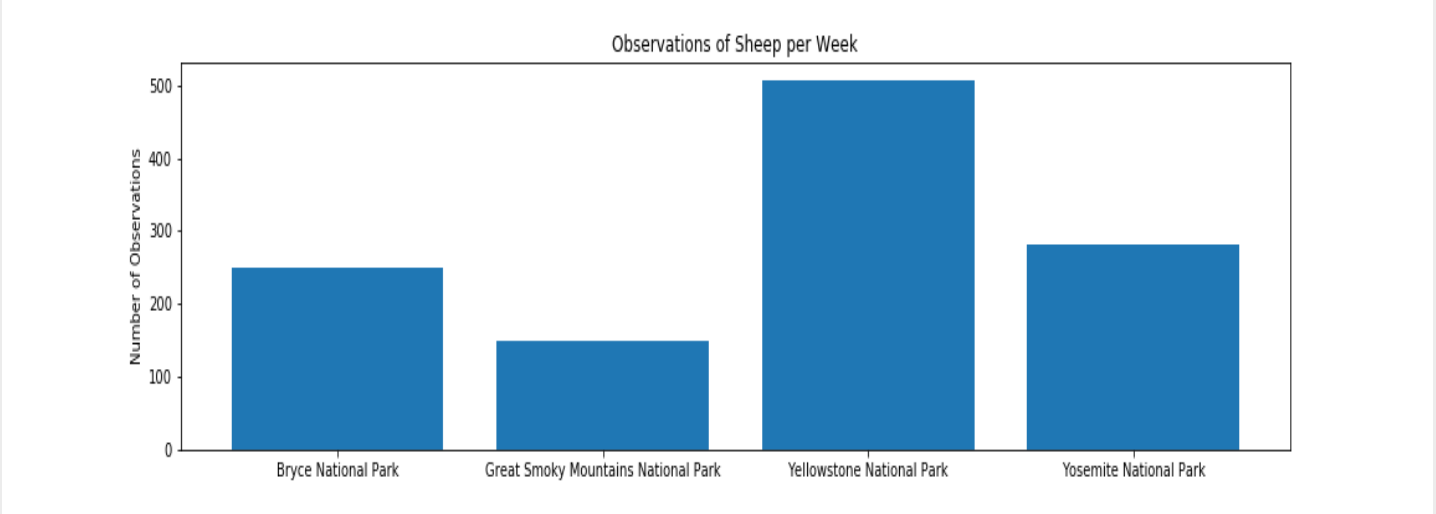
- While the overall number of protected species is not high, we should monitor the endangered species because of their role in the greater ecosystem of the parks.
- Mammals, birds to a lesser degree, are more susceptible to being endangered than other species. The threat to apex predators should be remedied via importing wolf packs and/or bears.
    - Yellowstone National Park suffered a tremendous amount of damage to both flora and fauna from the lack of apex predators like wolves and bears. A lack of apex predators allows the proliferation of herbivorous fauna that can negatively affect the many plant species that exist in our nation's parks. Remember that plants are the majority of the species that exist in the dataset.
- Some of the fish can be restocked and there should be teams to monitor conditions that could be affecting those populations
- The California Condor, should also be monitored and replenished, if possible. Condors provide essential services in their preferred environments.

Conservation Recommendations

- We want to be sure that this isn't being exacerbated by loss of habitat from environmental events like drought, wildfires, or from having a hot-steaming, orange pile for a President who appoints Earth-hating imbeciles to cabinet positions directly impacting the environment and public lands upon which our species rely to survive.
  - Some of the threatened populations could be a result of loss of habitat and it's possible that with minimum intervention on our part, the populations will rebound. A wildfire, or petroleum mining, would inevitably destroy habitat for many of the species that are under protection, such as birds, bats, owls, beavers, rabbits, and badgers.
  - Species of concern, specifically their relationship to species that are endangered or threatened, should be investigated. Some species prey or rely exclusively on other species so a lack of one will lead to population drops in another.

Case Study: Sheep – Foot and Mouth Disease

- First we isolated the sheep entries from the species database and filtered for mammals; ‘sheep’ is also used to name plants. Then we merged this with observation data from our conservationists.
- Knowing how many of each sheep were observed at each park, we can use this to calculate a sample size to use for future studies.



Case Study: Sheep – Foot and Mouth Disease

- Park officials have been running a program to reduce foot and mouth disease at Yellowstone. Knowing that approximately 15% of sheep at Bryce National Park have the disease, the scientist's want to know with confidence that Yellowstone is at 10%.
- Mostly, park officials want to know how long a potential study will take.
- To confidently detect a reduction rate of 5 percentage points we need to have a reliable sample size. We calculate this by plugging in the following numbers into the sample size calculator at Optimizely,
    - Baseline Conversion Rate: 15%
    - Significance: 90%
    - Minimum Detectable Effect: 33.3%
    - Sample Size: 510
- Combine this with a weekly observation count and we can calculate that a study in Bryce National Park would take approximately 2 weeks to complete and Yellowstone would only take 1 week to complete a study.

Questions?

Review

- Overall, population levels appear to be healthy in our national parks
- There are some concerns with regards to mammals, specifically the threat to apex predators
- Mammals, to a lesser extent birds, are more likely to endangered than other species
  - It’s important to note that aside from plants, these are the next two highest population counts as well
- We should investigate how environmental impacts may be affecting the conservation status of our species