Capstone Option 2: Biodiversity for the National Parks

By: Johnathan Moore

Completion Date: 3/25/2018

Completed Code in the Learning Environment

https://www.youtube.com/redirect?event=video_description&v=GK_vRtHJZu4&redir_token=RYyORhQ66vVXNMIAsR1G-OTDhsB8MTUyMjEwMTc4NkAxNTIyMDE1Mzg2&q=http%3A%2F%2Fed.ted.com%2Flessons%2Fwhy-is-biodiversity-so-important-kim-preshoff

Datafile: species_info.csv

- Datafile description:
  - ❑ File is split into 4 columns
    - i. **category** = type of animal
      - a) amphibian, bird, fish, mammal, nonvascular plant, reptile, and vascular plant
    - ii. **scientific_name** = specific animal name
      - a) 5541 unique species
    - iii. **common_names** = colloquial name
      - a) Can have more than one
    - iv. **conservation_status** = current status on endangered species listing
      - a) Endangered, In Recovery, No Intervention, Species of Concern, Threatened

Datafile: species_info.csv - Analysis

- Protections
  - **i. Most animals are unprotected (96.7%)**
    - **a. 5363 out of 5541 in the data sheet are unprotected**
  - **ii. <u>Mammals and birds</u> are more protected per capita than other categories in the dataset**
    - a) Either mammals/birds are more prone to extinction **<u>or</u>** they are easier to measure than the other categories, with the exception of birds.

Category	Not Protected	Protected	Percent Protected
Amphibian	72	7	8.9%
Bird	413	75	15.4%
Fish	115	11	8.7%
Mammal	146	30	17.0%
Nonvascular Plant	328	5	1.5%
Reptile	73	5	6.4%
Vascular Plant	4216	46	1.1%

0.27% of animal endangered

Only 0.07% of animals are in recovery

Mammals most endangered

Plants are in general less protected

Conservation Status	Total Animals
Endangered	15
In Recovery	4
No Intervention	5363
Species of Concern	151
Threatened	10

Datafile: species_info.csv – Analysis Cont.

I. **Mammals and birds are statistically and significantly more endangered than the other categories of animal**
    a) The chi2 pval for mammals and birds is **0.687** which is to say there is no evidence of a difference between the two in terms of endangerment
    b) The chi2 pval for birds to amphibians (the next two closest categories) is **0.0384** while the pval for mammals and reptiles is **0.0384** as well
        a) Since amphibians are the closest category to birds or mammals, it reasons that they would be a good proxy for the significance of other species endangerment compared to birds/mammals
        b) This means that the other categories are <u>significantly less endangered than birds OR mammals</u>

Conservation Recommendations

I. **Mammals and birds should be the focus of conservation efforts as they are the most susceptible to endangerment**
II. **Additional work should be performed to determine classification systems for endangerment and the threshold at which classiciation occurs**
    - **It is unclear from the current dataset if there is a clear designation of this cutoff**
    - **There is no indication of the category prevalence in nature which could also play into determination of endangerment**
        1. **E.g. a healthy population of rhino might be 4,000 while a healthy population of eastern whitetail might be 4,000,000**
III. **Plant conservation, for the most part, can be considered less critical than most animals**
IV. **Fewer animals are in recovery than endangered or threatened, meaning more efforts and resources need to be focused on those groups**

Foot and Mouth in Sheep

I. **Sheep were analyzed in particular to evaluate how commonly they were observed in 4 national parks – left table**
II. **The incidence rate of foot and mouth in sheep was determined to be 15% in previous years' study**
III. **The national park service has indicated that it wishes to be able to confidently determine reductions in the disease as low as 5%**

National Park	Weekly Sheep Observations
Bryce National Park	250
Great Smoky Mountains National Park	149
Yellowstone National Park	507
Yosemite National Park	282

Foot and Mouth in Sheep Cont.

I. **In order to observe the 5% reduction, the minimum detectable effect would be 0.33 (33%)**
II. **Assuming a statistical significance of 90% and a minimum detectable effect of 33%, the population sample size would need to be 870 individuals**
III. **In order to reach this observation, each national park would require a different timeframe of study based on previously known observations**

Notes:

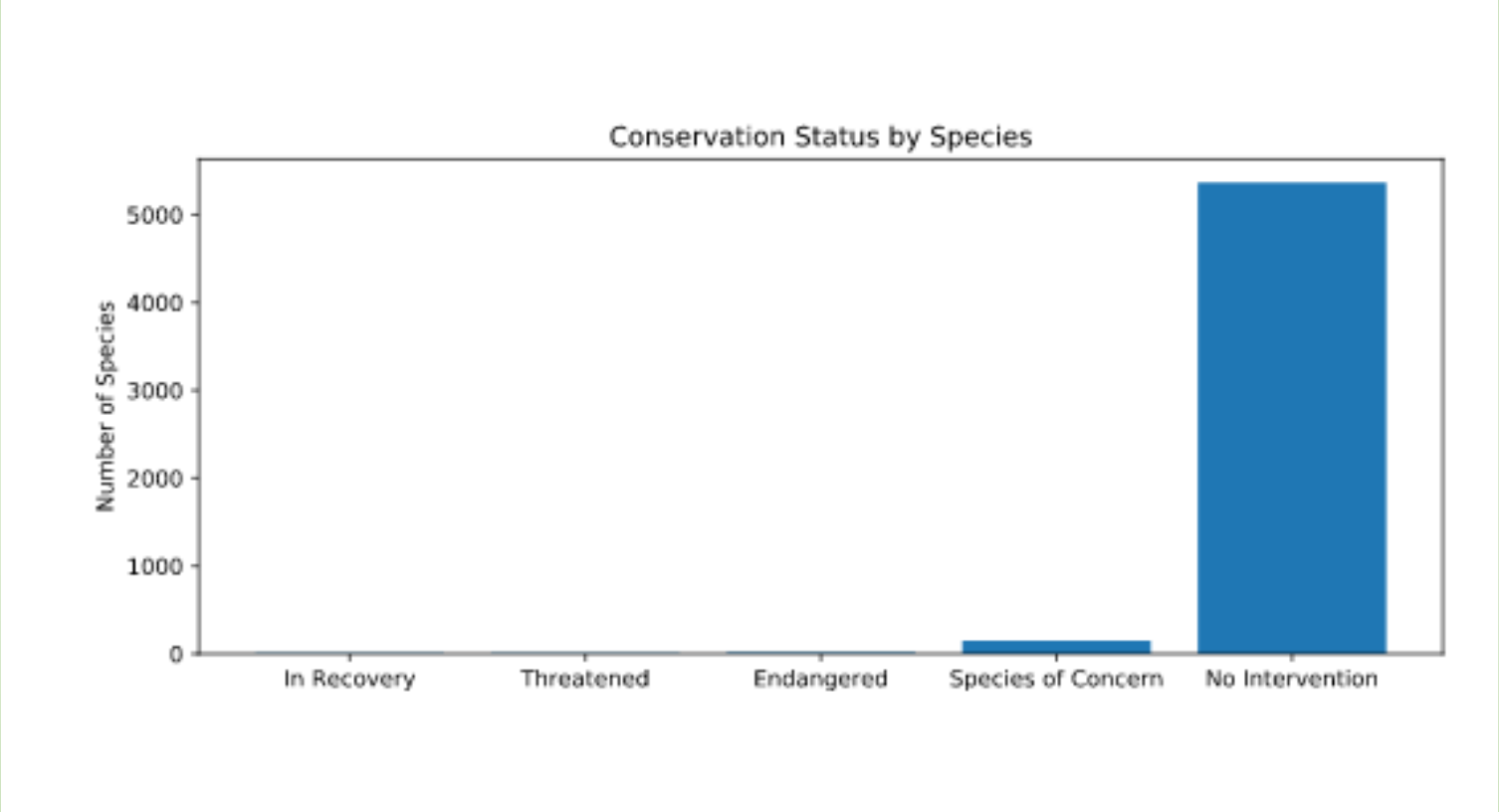
1. **It is possible that Yellowstone would be a good proxy for the other parks and may be the most time efficient first step**
2. **This doesn't account for the susceptibility of certain species of sheep to the disease**
3. **This doesn't take into account conservation efforts, staffing efforts for observation, or total sheep population size**

National Park	Weeks of Observation	Days of Observation
Bryce National Park	3.48	25
Great Smoky Mountains National Park	5.84	41
Yellowstone National Park	1.72	12
Yosemite National Park	3.09	22

Conclusions

I. **In order to best direct resources, conservation managers at the national parks should focus on mammals and birds as other species are statistically doing better in terms of endangerment**
II. **Vascular and Non-Vascular plants are the least protected species and thus should take significantly less resources from the mission**
III. **In order to effectively monitor the reductions in foot and mouth within the sheep populations, at least 870 individuals must be analyzed to make a statistically significant prediction of successful reduction as low as 5%**

Graph – Step 5, Conservation Status by Species



Graph – Step 13, Observations of Sheep per Week