

Biodiversity for the National Parks

Presented by Doug Short
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Analysis of species.csv

The species.csv data file includes 5824 entries with four columns: type of flora or fauna (category), scientific name, common name & conservation status.

Since we are trying to understand the various species statuses, we have graphed the relative numbers of species within each category (see graph 'Conservation status by Species').

Interestingly, only a small portion of the listed species' statuses are in danger of extinction ('threatened', 'endangered', 'species of concern') however, this could be misleading as the complex structure of biomes could be affected by the removal of one or a few species.

Endangered Species of Significance

Although loss of any species is a possible threat to biodiversity, what we are observing at the current time is significant reduction of mammals compared to the other species.

Category	Not Protected	Protected	Percent Protected
Amphibian	72	7	8.8%
Bird	413	75	15.4%
Fish	115	11	8.7%
Mammal	146	30	17.0%
Non-Vascular Plant	328	5	1.5%
Reptile	73	5	6.4%
Vascular Plant	4216	46	1.1%

Endangered Species of Significance (Continued)

We compare the various categories of flora/fauna to each other by using a chi-squared test for significance. A chi-squared test is used to determine whether there is a significant difference between the expected frequencies and the observed frequencies in one or more categories (Wikipedia). For instance, mammals do not have a significant difference from birds ($pval=0.68$), but do have significant difference versus reptiles ($pval=0.03$). What does this mean to us? Even though mammals have more protected species (17.0%) than birds (15.4%), the two categories are not significantly different - they have the essentially the same number of protected species statistically (or the difference is the result of chance). After comparing all categories against each other, what we can say without doing so is that mammals and birds are suffering the most.

Suggestions & Recommendations

Why does biodiversity matter? “Different species fulfill important functions within the ecosystem. For example, they may be photosynthesizers, decomposers, herbivores, carnivores or pollinators. In ecosystems that have many species that can fulfill a given function, the ecosystem is more resilient. In other words, it is able to respond to disturbances such as disease or fire without collapsing. This apparent redundancy is a very effective insurance, for if one species succumbs to a disease, its “function” in the ecosystem is taken over by another species. Ecosystems with limited diversity, including monocultures (areas entirely dominated by a single species, as in most agricultural crops), are much more prone to disease than diverse natural systems.” (sustainablefootprint.com). Because of this, we should take note of the findings of our study. As identified previously, several mammal and bird species are under the danger of extinction. Removal of those species could dramatically affect ecosystems (Tilman, 1999). As such, our suggestions include understanding why these species specifically are under threat and identifying methods to reduce said threats. Analysis of one intervention follows...

Tilman, D (1999) Global environmental impacts of agricultural expansion: The need for sustainable and efficient practices. PNAS May 25, 1999. 96 (11) 5995-6000; <https://doi.org/10.1073/pnas.96.11.5995>

<http://sustainablefootprint.org/extra-information/why-is-biodiversity-important-to-ecosystems-and-people/>

Effectiveness of HMD Intervention in National Parks

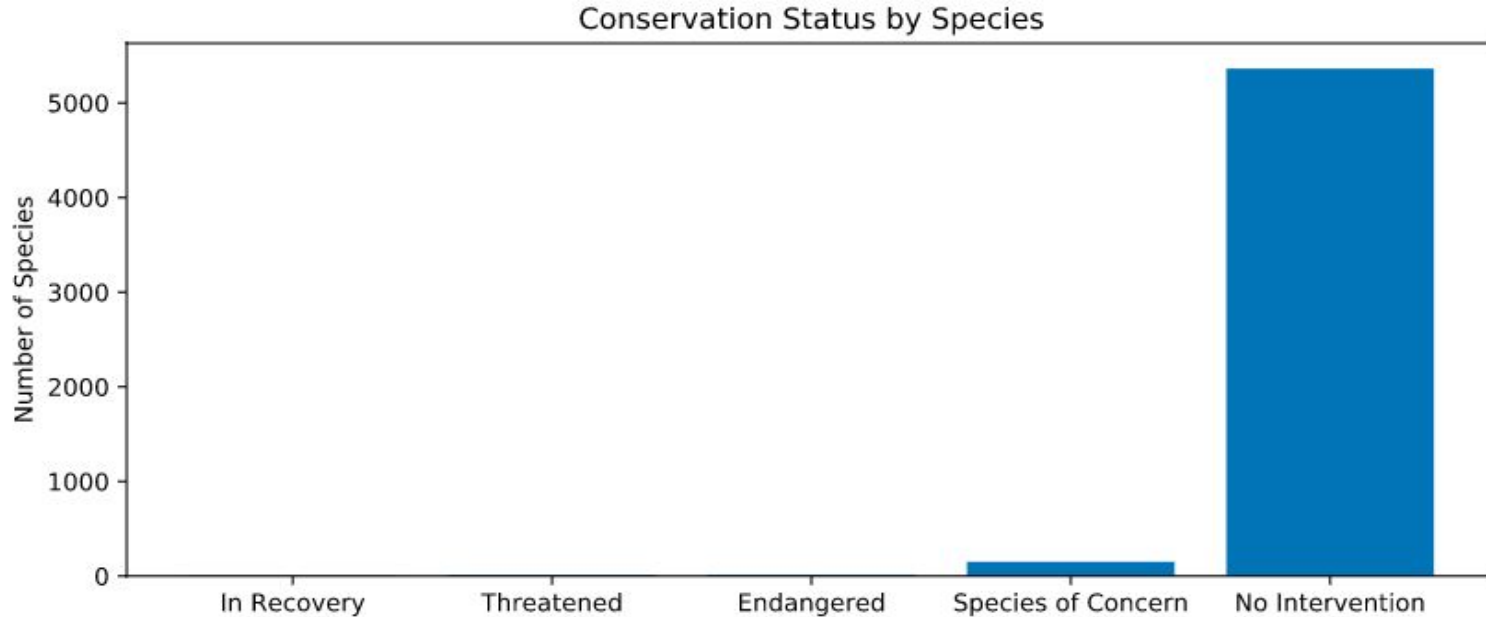
To understand the effectiveness of the intervention program to reduce hood and mouth disease (HMD) currently running in the four national parks, we must determine the sample size and length of testing.

Previous estimates of infection rate suggest 15% of sheep have HMD and is used as the baseline along with a 90% level of significance and minimum detectable effect of 33.3%. These give us a sample size of 870.

Based on the observation rate, we can calculate the length of time it would take to complete the study.

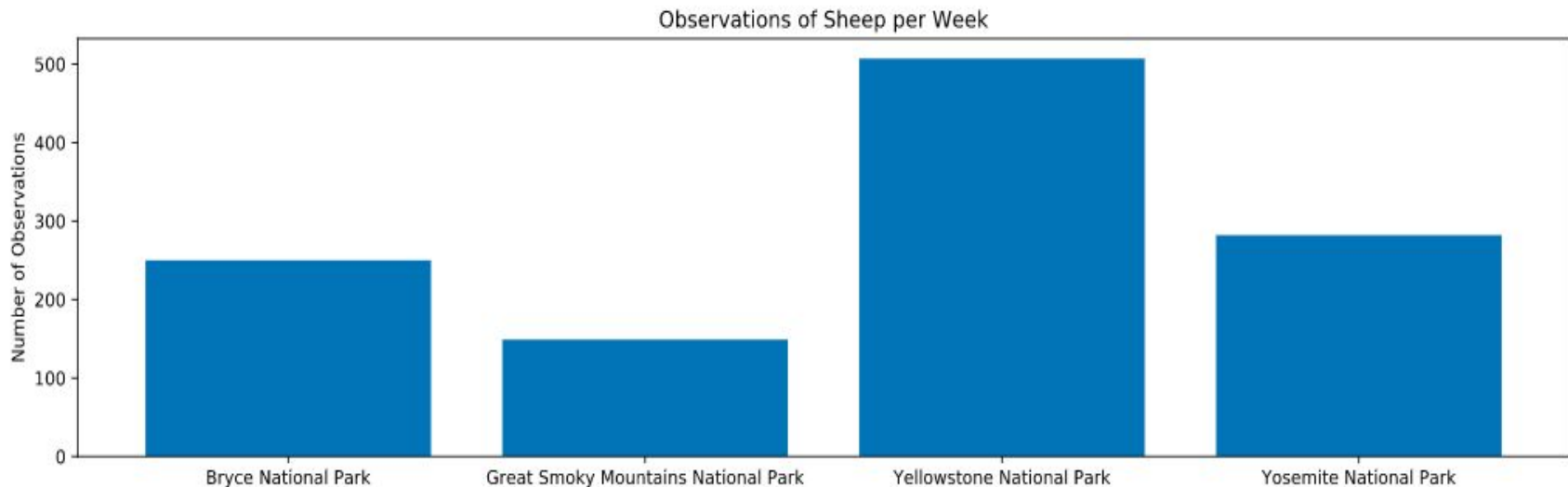
National Park Name	Observations/Week	Length of Study (Weeks)
Bryce	250	3.5
Great Smoky Mountains	149	5.8
Yellowstone	507	1.7
Yosemite	282	3.1

Conservation Status by Species



This graph shows the relative number of species in each of the listed categories. Because the 'No Intervention' column is so large the first three are not visible although there are some species in each of them.

Observations of Sheep per Week



This graph shows how many sheep observations are recorded per week within each of the National Parks.