GEG 3114, Section A01
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Lab 4
Arctic plant species richness

In this experiment, data was analysed from a large scale study (Gonzalez, 2000), which included biotic and abiotic information from many sampling locations across the arctic. This experiment used an Exploratory Data Analysis (EDA) to compare the species richnesses at sampling locations to the geographic parameters present. This experiment also analysed the distribution of these species across sampling locations, and looked at how prevalent species were.

From the analysis, it could be seen that species richness was affected differently by different environmental parameters. When compared to pH, as seen in Figure 1, species richness could be seen to be higher near neutral pH, with a slight preference for basic soils. Species richness could also be seen to be highly variable near neutral pH, and less variable but lower in acidic soils. When species richness was compared to soil nutrients, little correlation could be seen across a range of concentrations P, K, C, and N. This could be due to the fact that arctic species are adapted to exist in conditions with low nutrients, and where local biomass may be affected by limiting nutrients, species richness is not. Little correlations could also be seen when species richness was compared to moisture levels, and species richness could be seen to be high even in areas of low moisture. This could be due to species being highly adapted to exist in the very dry tundra biome, but could also be due to sampling variation temporally, since the moisture levels in an environment change dependent on seasonality and weather. Lastly, as seen in Table 1, species richness could be seen to undergo a small gradual decrease with increasing latitude in each subzone. In zones with more sample sites and more data, there was more variability, but on average the means underwent mild decrease towards the north. This could be due to conditions becoming too harsh, and the growing season becoming too short for species to prevail, or could be due to sampling error if the species present are harder to find. Table 1 shows the means, but also the variation, range, and dataset size, to display these trends.

The number of quadrats in which a given species was found varied. This distribution can be seen in Figure 2 and Table 2. The most common species was found across 65 of the sample sites, *Salix arctica Pall. s. Lat.* This species is one of the most northerly existing species and has many adaptations that allow it to exist across a variety of landscapes and conditions. For example, it remains very close to the ground in order to stay sheltered. One of the least common species was *Pyrola grandiflora Radius*, occurring in only one quadrat. This species could be more specialised to exist in a unique environment, or may not be able to persist further north. Because 23% of species were only found within one quadrat, I would consider species only found in one quadrat to be rare in the context of this study, and given that the samples were an accurate representation of the overall species population.

References:

Gonzalez, G., W.A. Gould, & M.K. Reynolds. 2000. Report, Northern Ecosystem Analysis and Mapping Laboratory, Fairbanks, AK.

Table 1: Species richness data across different arctic subzones.

	Subzone 1	Subzone 2	Subzone 3	Subzone 4	Subzone 5
Mean	12.56	11.33	13.04	12.63	10.11
Standard Deviation	4.33	6.75	3.78	3.09	4.83
Min	5	0	6	8	3
Max	18	30	21	19	17
Count	9	51	28	19	9

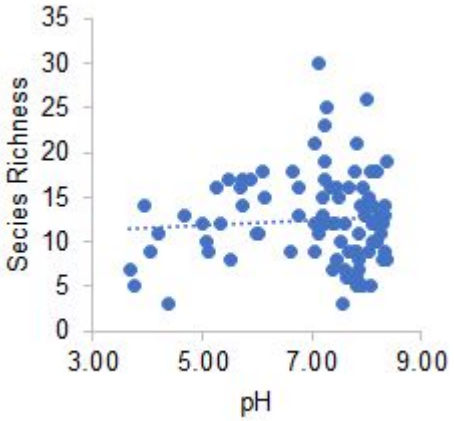

Figure 1: Species richness across soil pH for tundra quadrats.

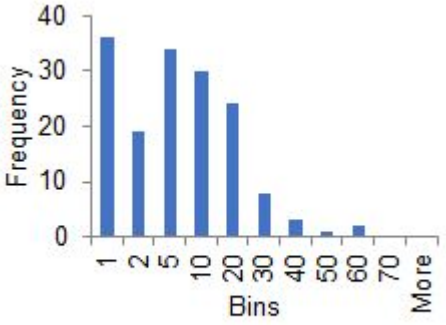

Figure 2: The distribution and different prevalence of species throughout the sampling sites.

Table 2: The number of sample sites in which species were found, as depicted in Figure 2.

Bins	Frequency
1	36
2	19
5	34
10	30
20	24
30	8
40	3
50	1
60	2
70	0
More	0