BIOL121 Ecology Worksheet - Stipia
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The questions in this worksheet were adapted from old final exam questions given in BIOL121. Please note that there is not space provided on the worksheet to answer questions, you can answer on a separate page.

1. *Stipa neomexicana* is a grass that occurs in grasslands of Arizona at altitudes of ~1000 to 2000 m above sea level. This grass reproduces only by seed but individual plants can live for many years (they are perennial). These grasslands are relatively dry environments. Small hills are present in these grasslands. *S. neomexicana* is most abundant on the tops of the hills in areas with overall low grass abundance. The sides of the hills and the depressions between hills are dominated by other grass species and have higher grass abundance.

    The soils on the tops of the hills are very dry. The sides of the hills have more moisture. The bottoms of the hills have the highest moisture.

    The table below shows the % ground cover (a measure of plant density) and the aboveground dry biomass (a measure of plant productivity) for *S. neomexicana* and other grass species.

	Top of the Hill	Side of the Hill	Bottom of the Hill
% Ground Cover			
S. neomexicana	20.5%	8.5%	3.0%
Other Grasses	12.0%	35.5%	47.5%
Aboveground dry biomass (g/m^2) ± 95% confidence interval (a measure of variation)			
S. neomexicana	139.2 ± 15.7	75.8 ± 10.2	0.8 ± 1.1
Other Grasses	16.2 ± 7.4	111 ± 18.0	281.9 ± 27.1

    a. Based on the data in the table, describe in your own words the trends in % ground cover and aboveground dry biomass for *S. neomexicana* and other grasses.

    Dr. Jessica Gurevitch performed experiments to understand what factors contribute to the local distribution of *S. neomexicana* in these environments. She hypothesized that *S. neomexicana* was competitively excluded from the sides and bottoms of hills by other grasses. The alternative hypothesis was that the fundamental niche of *S. neomexicana* was the dry environments found on hilltops.

    Six types of plots were established. Plots were established at three locations on hills: top of the hill, side of the hill and bottom of the hill. For each location, two treatment plots were established: (1) sites that were undisturbed and contained both *S. neomexicana* and other

grass species that were present prior to the beginning of the experiment and (2) sites where grasses other than *Stipa* were removed. The aboveground biomass of *S. neomexicana* and other grasses was measured by cutting the aboveground parts of the plants, drying them and weighing them.

b. What is the name of the experimental treatment for sites that were undisturbed and contained both *S. neomexicana* and other grass species. (**1 mark**)
    - note: I did not talk about controls in my classes

c. If the fundamental niche of *S. neomexicana* is the dry environment found on hilltops, create a figure showing the expected biomass of *S. neomexicana* in the six plots. You can use Figures 1 and 2 as a guide for figure style. (**3 marks**)

The data for aboveground biomass for *S. neomexicana* and other grasses is shown in the figures below.

Fig. 1 Biomass of *Stipa* and other grass species .	Fig 2. Biomass of *Stipa* at a site where other grass species have been removed.
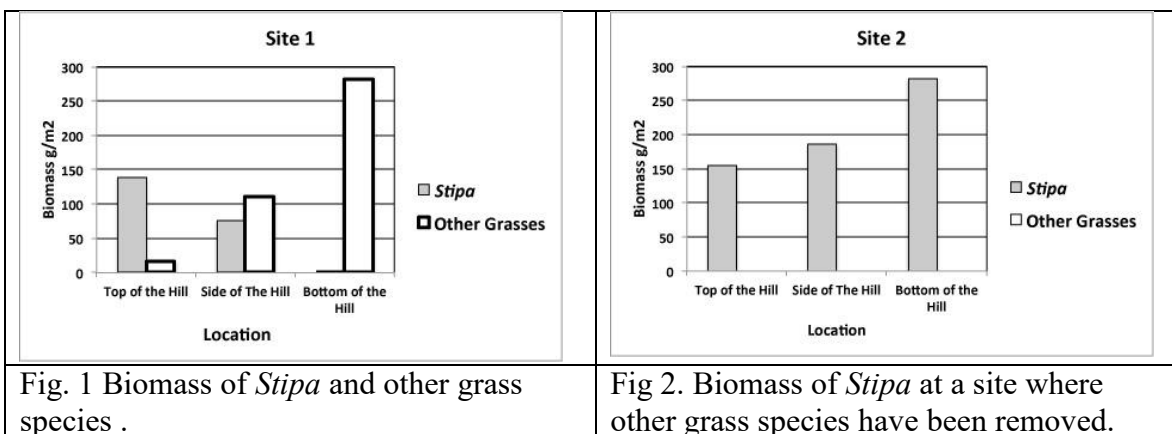
d. Based on the figures, briefly describe the trends in the biomass of *Stipa* in Site 1 and Site 2. Include relevant values in your description.

e. Given the information from the study, what is the fundamental niche of the *Stipa*? Briefly explain your reasoning.

f. Given the results of this experiment, what can you conclude about the factor(s) that affect the distribution of *S. neomexicana*? Your answer should be clear, logical and legible. It is recommended that you use the "claim, evidence and reasoning" model.

g. Imagine an additional experiment where the biomass of other grasses was measured on hills where *Stipa* has been removed. The biomass of the other grasses at each of the three locations on these hills was not different from hills where *Stipa* was present. What factor most likely affects the growth of other grasses on the tops of hills? Briefly justify your answer.

h. Climate change is expected to result in greater variability in rainfall, more severe and frequent droughts. Briefly describe how you might expect the distribution of *S. neomexicana* and other grasses to change and justify your reasoning.