Competition between Woody & Herbaceous Plants

Questions

1. Refer to your model of soil moisture for prairies. Which kinds of plants, woody plants or herbaceous plants (grasses and forbs), will do better under drought conditions? Why?

2. Climate models make complex predictions about the link between rising temperatures and changes in precipitation. In some places like the Arctic, rising global temperatures will likely increase precipitation. Places like Northern Africa will probably receive less precipitation. In other places, like the Midwest including Missouri, climate change is NOT predicted to change the amount of precipitation; however, it probably will change the frequency and intensity of precipitation events. That is, the same overall amount of precipitation will probably fall, but it will come in stronger storms separated by longer periods without rain. If this prediction for precipitation in Missouri is correct, which kinds of plants, woody plants or herbaceous plants (grasses and forbs), will likely do better? Why?

3. We are not sure about how climate change may be affecting Tucker Prairie; this is why Dr. Holdo is actively conducting research. Research, conducted in other natural areas, helps to inform what we think is likely taking place. Read the abstract of the article by Kulmatsi & Bard (on the back of this handout; the full article from *Nature Climate Change* is available online: [http://restem4.wix.com/learning-resources](http://restem4.wix.com/learning-resources)). Explain the main findings from this study.

Global circulation models and empirical evidence suggest that precipitation events are likely to become more extreme across much of the globe. As most plant roots are in shallow soils, small but pervasive changes in precipitation intensity could be expected to cause large-scale shifts in plant growth, yet experimental tests of the effects of precipitation intensity are lacking. Here we show that, without changing the total amount of precipitation, small experimental increases in precipitation intensity can push soil water deeper into the soil, increase aboveground woody plant growth and decrease aboveground grass growth in a savannah system. These responses seemed to reflect the ability of woody plants to increase their rooting depths and competitively suppress grass growth. In many parts of the world, woody plant abundance has multiplied in the past 50–100 years, causing changes in fire, forage value, biodiversity and carbon cycling. Factors such as fire, grazing and atmospheric CO2 concentrations have become dominant explanations for this woody encroachment and semi-arid structure in general. Our results suggest that niche partitioning is also an important factor in tree–grass coexistence and that the woody plant encroachment observed over the past century may continue in the future should precipitation intensity increase.