Interim Report: Wood Wide Web

Problem:

The "Wood Wide Web" refers to the underground networks of mycorrhizal fungi that help plants communicate and share resources. These networks allow plants to exchange nutrients, send signals, and even warn each other about potential threats. In regions like New Mexico, where water is scarce and plants are spread out, these networks face some challenges. This year's project is a continuation of last year, which modeled the role of mycorrhizal networks in signal spread in forests, deserts, and prairies. Last year's model found that mycorrhizal networks didn't have a significant impact in deserts or forests, with the low plant density of deserts preventing signal propagation and the high plant density of forests allowing for signal propagation irrespective of mycorrhizal networks. In prairies, however, higher fungal densities improved signal propagation between plants. This year, we're expanding the variables in our model to more accurately mimic prairie ecology. Specifically, we are differentiating between native and non-native grasses, examining the differences in water use and how mycorrhizal densities interact with each. We hope to demonstrate that denser mycorrhizal networks coupled with native grass species are more effective in both retaining limited water supply and propagating signals.

Plan:

Last year we used NetLogo for coding our model. This year we are using Python to expand our simulation of signal spread in prairies to include the effects of native versus non-native grasses and the interaction of grass type with varying densities of mycorrhizal fungi. We are also conducting our own experiment growing native grasses (*Sporobolus airoides*, or alkali sacaton) and non-native grasses (*Cynodon dactylon*, or Bermuda grass) with varying water amounts and mycorrhizal inoculations. We will use the results from this experiment to help determine the difference in water needs of native and non-native grasses and how fungal density interacts with these needs.

Progress:

At this point we are in the middle of our experimental phase. We began with 120 plants - 60 native and 60 non-native. We faced a minor setback from vandalism at our school, but still have 118 plants to work with. These are equally distributed across grass type, water amount (high, medium, low), and fungal inoculation (high, medium, low). We have just started coding our model in Python. We expect our model to show that signal propagation will be most efficient in simulations with native grasses and higher fungal densities, and that these conditions will be especially important in situations where water availability is limited. This will hopefully allow us to propose that prairie restoration with native species and higher densities of fungal inoculations will be more successful, particularly as water becomes scarcer in the southwest.

Expected Results:

We expect the fungal networks in prairies, especially those restored with native plants, to be the most efficient at transmitting signals, thanks to the more favorable conditions. Higher fungal density should improve the spread of signals, help plants retain water, and lead to healthier plant populations. ____ to see if native grasses are more efficient at using water and communicating compared to non-native grasses, which typically need more water to grow.

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