Interim Report New Mexico Academy of the Media Arts

The Wood-Wide Web's Impact on Plant Health in Arid Areas

Mycelial network, or the "Wood-Wide Web," plays a vital role in facilitating information exchange among plants. This network allows plants to share crucial information. In arid regions, like New Mexico, aridity significantly affects mycelial networks, affecting the efficiency of information transfer. Our project focuses on how these networks impact plant health in arid places, especially in New Mexico.

The Problem:
In forests, there is a significant overlap of root systems between plants and fungi. When trees and other herbaceous growth do not have root systems that overlap, mycelial networks may allow trees to send warning signals to inform each other of threats. (“underground networking”) This process, known as "underground networking," is crucial for the survival of various plant species. In the wild, mycelium can be observed as threadlike strands called hyphae. Hyphae are the “roots” of fungi. Just like a plant’s roots, they break down organic matter into smaller parts to feed fungi and other organisms. Mycelial networks come in a range of sizes, with some types growing to enormous proportions, (“hidden dimension”) such as the largest organism on Earth, a single honey mushroom with a mycelial spread of 4 square miles (“honey mushroom”)!

In more arid environments, wild spaces are more likely to be prairies, and are among the most threatened habitats globally. New Mexico hosts significant prairies in the east and desert grasslands in the south, supporting hundreds of local ecosystems.These prairies are threatened by residential sprawl, energy development, agriculture, and climate change (Nature Conservancy).While prairies may harbor significant fungal populations, protection efforts are crucial to safeguard these essential yet vulnerable landscapes. In dry areas, these fungal networks help plants share information. We want to investigate how arid conditions affect these networks and what it means for plant communication.

Our Model's Focus:
Our modeling platform, NetLogo, simulates how signals travel through fungal networks in different environments like forests, deserts, and prairies. We aim to model how efficiently plants communicate in each environment. Specifically, we are interested in how restoring natural prairies can impact plant growth, water conservation, and climate change mitigation. Our model does not utilize a neural network but relies on NetLogo's capabilities to simulate complex interactions in ecosystems.

Progress So Far:
We have completed the research phase, gaining insights into how the Wood-Wide Web operates in different environments, particularly arid regions. Now, we are transitioning to the coding phase, where we will set up computer models to simulate the communication dynamics in fungal networks.

Expected Results:
We anticipate that signals will spread most efficiently in temperate forests. However, we expect to observe improvements in restored prairies compared to arid deserts like those in New Mexico. Our simulations will provide valuable insights into how restoring natural prairies can benefit plant growth, conservation, water use, and mitigate climate change .

In summary, this report showcases our progress in understanding how the Wood-Wide Web affects plants in dry areas. We are enthusiastic about uncovering new insights through our research and look forward to completing our models, analyzing the results, and contributing to the scientific knowledge of this fascinating natural process.

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