

Project Abstract

Title of proposal: Changes in biodiversity under elevated CO₂

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The burning of fossil fuels continues to elevate atmospheric carbon dioxide. As well as contributing to global warming, elevated carbon dioxide can have direct effects on plant and animal communities. Because we have installed ambient and elevated CO₂ open-top chambers over a natural scrub-oak forest in Florida, we can examine these effects. Our experiment provides the only opportunity to examine how plant and animal diversity changes when CO₂ is increased.

This research will be carried out at Kennedy Space Center, Florida CO₂ will be elevated in eight open-top chambers in a scrub-oak forest at Kennedy Space Center, Florida. Normal levels of CO₂ will be maintained inside eight other open-top chambers. Diversity of plants, insect herbivores, insect natural enemies and litter dwellers will be compared between ambient and elevated CO₂.

This proposal has four main goals. The first is to quantify changes in plant diversity under elevated CO₂ using whole chamber counts of total plants, chamber transects and litter fall traps. The second goal is to quantify changes in insect herbivore diversity of leaf miners, leaf chewers, gall makers, sap suckers, acorn feeders and other insect herbivores by means of counts on green foliage. The third goal is to quantify changes in insect predator and parasitoid diversity at the third trophic level including parasitoids of leaf miners, aphids and gall makers and predatory spiders. Spiders will be counted on both the foliage, by counting web builders, and on the ground, by using pitfall traps for cursorial species. The fourth goal is to document changes in insect detritivore communities and ground dwelling species by using both pitfall traps and litter bags.

Previous experiments at Cape Kennedy Space Center, Florida, revealed that higher atmospheric CO₂ concentration increases plant growth in some plant species more than others. This suggests that elevated CO₂ can directly impact plant diversity while indirectly impacting insect diversity via changes in plant diversity, foliage quality and, for litter feeders, increased litter fall.

Our project is directly relevant to the Regional Center's RFP on page 8: "What are the effects of environmental change associated with energy production on interactions between plants, insects, and plant diseases? We expect to determine if elevated CO₂ changes the biodiversity of natural systems. Our deliverables will include publishes papers in top flight journals, such as Global change Biology, which will detail the results of our work.