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PCB 4043C Lab

Lab 4: Annotated References for Terrestrial Report

Citation Reference 1:

Day, Frank P and Schroeder, Rachel E. 2013. The effects of 11 yr of CO2 enrichment on roots in a Florida scrub-oak ecosystem. New Phytologist. 3:778-787

The general topic of this paper is to inform the audience on the effects on how elevated CO2 on the Florida scrub-oak ecosystem will increase fine root biomass and leaf biomass. The researches were able to increase CO2 levels using an open-top chamber. Once they did this, they measured the CO2 level in the fine root biomass of the shrub-oak using soil core samples and ground- penetrating radars. This article states the hypothesis that there will and increase in fine root biomass and leaf biomass if CO2 levels are elevated in the shrub-oak ecosystem. The researchers concluded that total root biomass was greater in elevated plots but there was no noticeable difference on the surface. The fine root biomass did increase with the increase of CO2 as well as leaf biomass. This would be true for a fire disturbance but not for a hurricane disturbance. A hurricane disturbance can increase CO2 but the disturbance would cause leaf biomass to decrease. There was also a finding that fine roots do have a CO2 capacity and will not continue to respond noticeably once they reach their limits. The researchers settled that fires have a great effect on fine root biomass and leaf biomass, which in turn has a large effect on CO2 exchange.

I note that this article relates to the goals of the upcoming Terrestrial Lab Report because this article explains how hurricane and fire disturbance increase fine root biomass and leaf biomass in a shrub-oak ecosystem. When fine root biomass and leaf biomass increase, the levels of CO2 exchange increase as well. Shrub-oak ecosystems are very prominent in Florida and can be found in every National Park. Even though we will not be doing our experiments in this particular eco-system, the same principle applies. If the landscape we were testing had more biomass than another area, we will find that the area with more biomass will have a higher CO2 exchange rate. I’m positive that when we conduct our experiment we will find very similar results. We will find that that increased root biomass and leaf biomass will increase CO2 exchanges in an area.

Citation Reference 2:

Hungate, Bruce A. and Dijkstra, Paul. 2013. Cumulative response of ecosystem carbon and nitrogen stocks to chronic CO2 exposure in a subtropical oak woodland. New Phytologist. 3: 753-766

In this peer reviewed article the authors mention that rising atmospheric CO2 could alter the carbon and nitrogen content of ecosystems. These effects have not been accurately studied since there are many variables to that effect the results. The subtropical woodlands were examined for carbon and nitrogen budgets after a certain amount of exposure to elevated CO2. Open-top chambers were used to manipulate CO2 after plant development in the aftermath of a brush fire. They also measured carbon, nitrogen and tracer N-15 in ecosystem throughout the area. They observed that elevated CO2 increased plant carbon and at the same time increase plant nitrogen. The researchers also observed elevated CO2 increased soil microbial activity. After recovering multiple samples of a long term N-15 tracer, the findings indicated that CO2 exposure increased nitrogen losses and altered nitrogen distribution. The researchers hypothesized that the increase of plant carbon accrual was attended by higher soil microbial activity and increase carbon loss from the soil. They ultimately concluded that findings contest the treatment of terrestrial ecosystems reactions to elevated CO2 in models, because of how there was no noticeable carbon increase with elevated soil microbial activity. Current models depict that elevated CO2 in an ecosystem describes that carbon balance is both enhanced plant regrowth and photosynthesis with decay as a first-order response.

This article relates to the goals of the upcoming Terrestrial Lab report because it mentions how increased CO2 effects aspects of the soil. With increased CO2 we can find an increase of carbon production and also nitrogen production in soil. An elevated CO2 increases soil microbial activity, which in turn increases overall CO2 exchange. The findings proved different than what a current biogeochemical model would predict, so it will be interesting to find out our own conclusions when we complete the experiment. I hope that we will find that elevated CO2 will cause increase soil microbial activity as well as carbon inputs, since that is what is being taught in class. I do believe we will observe that increase soil microbial activity will increase CO2 exchange and carbon inputs, but I am not entirely sure this will be resulted.