Stimulated Effects of Climate Change on Fireweed Photosynthesis

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High latitude Arctic regions are experiencing elevated rates of soil nitrogen mineralization due to the influence of climate warming on microbial activity. These changes can drastically alter species distribution patterns and physiology. The tundra changes very slowly and we only recently observed fireweed appearing in experimental plots where it was never seen before in Toolik Field Station (TFS). TFS is one of the largest arctic research sites and is one of 28 Long-Term Ecological Research (LTER) sites in the United States. The reason for this recent appearance is unknown and little is known about the biochemistry of fireweed metabolism in relation to the effects of climate change. I conducted a set of experiments to quantify the effects of fertilizer on fireweed metabolism by measuring CO_2 exchange rates and calculating Rubisco activity using the Farquhar model of photosynthesis. I conducted these experiments every week for a four-week period using a LiCor-6800 portable photosynthesis system. Our results show that fireweed responds to fertilization by increasing the rate of photosynthesis and increasing rubisco activity through the dynamic photosynthetic curves taken from the Licor-6800. A full analysis will allow me to determine the time course of these fertilizer effects and more fully describe the photosynthetic metabolism of this indicator species in relation to climate change.