Program: Tropical Forest Resilience and the Role of Nutrients
Speaker: Annette Trierweiler, PhD
Introduced by: Marty Meisenheimer
Attendance: 110
Guests: Mark Albrecht, Grace Conyers, John Finke, Janet Harris, Jason Myers, Rich Peine, Matthew Sabens, Nancy Scott, Janice Hicks Slaughter
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Dr. Trierweiler is a biogeochemist who is based at Notre Dame and works with the Environmental Change Initiative investigating tropical forest growth and nutrition. She is also the daughter of longtime Scientech Club and Foundation member Teresa Trierweiler, and she said Scientech and Eagle Creek Park were two significant influences on her eventual career path.

Many environmental scientists' primary interest is carbon. Our speaker stated that fossil fuel use and industry are major generators of atmospheric CO_2. On the other hand, there are both land and ocean "sinks" that remove CO_2 from the atmosphere. There is considerable disagreement about how effective these carbon sinks will be in the future. Tropical forests are large carbon sinks, and their diminution would lead to CO_2 levels rising even more rapidly than the current alarming increase.

Increased atmospheric CO_2 fortunately increases the carbon sink, but plant nutrient limits may decrease the carbon sink response to CO_2 and slow the recovery of biomass after land use change. Tropical soils tend to be nutrient poor due to their loss of geologically derived nutrients. Clay and iron-rich soils bind important nutrients such as phosphorus and molybdenum, and these limitations may significantly limit the biomass response to increased CO_2.

Nitrogen fixation is an important process whereby atmospheric N_2 is converted to ammonia (NH_3) and related compounds by microbes that produce nitrogenase enzymes. Ammonia is then used by the plants to create a variety of essential organic compounds. Without adequate ammonia, the biomass needed to sequester atmospheric CO_2 will not thrive.

Phosphorus and molybdenum are important elements necessary for plant growth, as is sunlight needed for photosynthesis. Dr. Trierweiler and her colleagues have shown that higher levels of phosphorus and molybdenum increase biomass growth and nitrogen fixation, especially at higher levels of atmospheric CO_2. Lack of these nutrients may significantly impair the biomass response to elevated atmospheric CO_2. Other complicated factors, such as soil microbe decomposition, contribute to this complex story.

Further expensive and complicated research will be needed to determine how best to maintain and hopefully enlarge the land-based carbon sink, of which tropical forests are an important part. Better methods for recovering abandoned nonproductive agricultural lands could result from the practical application of this basic research.

Dr. Annette Trierweiler