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Understanding the system is central to mathematical modeling. What better way to do this than by getting your feet wet We describe here a collaboration in which the mathematicians help collect data, the ecologists synthesize more data from model output than they can produce empirically, and the collaboration produces both mathematical approaches and field work that would not happen if ecologists and mathematicians worked alone. Understanding the complicated systems arising in the mathematics of planet Earth requires the contributions of multiple disciplines. Ecologists are skilled at collecting and interpreting data and thinking about the complex systems involved; mathematicians provide a modeling perspective and a different way to understand large data sets. In fact, mathematicians offer additional perspectives that frequently generate new ideas and identify gaps in ecological knowledge. Collaborations such as ours are needed to understand ecological systems. We hope more mathematicians, perhaps inspired by our example, will get their feet wet.

A nonlinear system of two ordinary differential equations is offered and much discussion about how the data was collected, the model was built, and the results are offered in this remarkable view of collaborative efforts. Delays are introduced to make the model more realistic.

Keywords: differential equation, model, system, nonlinear, Cyanobacteria, lake, lake ecosystem, ecosystem, delay, Gloeo, colony, data