

## **Are Michigan soils protecting waterways from phosphorus pollution?**

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**Project description:** Interested in how deep soils can potentially act a natural “filter” to protect water quality? So are we! Phosphorus (P) is a limiting nutrient in cropping systems and is an important fertilizer in food production, however it is also a limiting nutrient in most freshwaters, which in excess can cause harmful algal blooms. Our lab has demonstrated that P tends to fall out of solution (precipitate out) with calcium carbonate in high pH surface waters. A new study demonstrated that calcium carbonate precipitation acts like a P trap in calcium carbonate-rich soils below agricultural lands. This is a newly described process and we would like to see if it is also happening at the W.K. Kellogg Biological Station (KBS) where we also have calcium carbonate-rich soils starting at about 1.5 m below the surface. If it is occurring, then perhaps there are ways to take more advantage of it to inhibit P pollution in the Great Lakes Basin.

**This summer we will work with a student to develop an independent project analyzing three meter deep soil cores** from a row crop system (with active P fertilization), an abandoned ag field (no P fertilization for at least 25 years), and a primary forest site (never P fertilized). We expect to find different patterns in the profile of soil P with depth across these sites with different land use histories (and P additions). In the soil, P binds to different soil fractions (types of soil particles) with varying strengths. We will carry out a series of chemical extractions on different depth segments of the cores to measure the P bound to soil calcium. The P measurements from the core’s depth segments will together create a P profile for each core. We will also measure calcium and carbonate content. If the 1.5 m deep calcium carbonate-rich soils are trapping P, we expect the calcium-bound P in the soil to increase with soil calcium carbonate. The findings from this study will help us see whether or not the soil is “trapping” P pollution before it reaches groundwater and surface water.

**Fellowship details:** The student will also participate in collecting and analyzing samples from field experiments we are conducting, helping our lab’s other REU’s as needed, as well as other research going on in the Hamilton lab. This research-intensive fellowship will take place at KBS from May 23-August 5, 2016 (11 weeks). The student will work on average 40 hours a week. The ideal candidate will have already taken a college-level introductory chemistry course and lab, be enthusiastic about learning and research, be able to think and work independently, and be open to providing and receiving constructive feedback. We hope to continue working with the student after the summer experience to publish a paper on their findings. We are excited about mentoring an undergraduate student this summer and about this phosphorus project. Feel free to email Bonnie at [mcgillbo@msu.edu](mailto:mcgillbo@msu.edu) with questions. She can also put you in touch with her 2015 summer undergraduate student who can tell you what it’s like to work with us and live at KBS.