STEPS Phoenix TBL Phosphorus Project

Andrea Amavisca, Dr. Rebecca Muenich, Dr. Clinton Williams

Project Summary

The **Science and Technologies for Phosphorus Sustainability** Project Theme 3 aims to use phosphorus (P) inventories and site-specific data to quantify **P fluxes** and use **P isotope data** to validate P flow diagrams and simulation models

Background

- **Food production systems** rely on **P fertilizers** mostly mined outside of the US from non-renewable sources
- Only 20% of input P is incorporated into human diet, resulting in **"lost" P**
- **P accumulates** in soil and water systems, causing **eutrophication** (excess nutrients in a body of water), **algal blooms**, and **dead zones**
- Existing data collection efforts by the Central Arizona-Phoenix Long-Term Ecological Research (CAP-LTER) center
- Substance flow analyses are helpful to understand where P is stored and how it moves through a system, but they may not provide enough information about the **driving factors for P stocks and flows**

Methods

- 40 representative soil samples to examine legacy P in the Phoenix TBL
  - 20 locations, a mix of **legacy ag and now urban** sites, likely **never ag and now urban** sites, and **always open desert** sites
  - 2 samples from each site (0-6 in and 6-12 in)
- Water sampling at Indian Bend Wash to understand P flux and use of isotopic P in models
  - Identifying **how P transforms** between drinking water intake and wastewater outputs
  - Identifying **major sources of P in Tempe Town Lake** during dry weather
  - Using filters and a pump
- Analyses will be run at the ASU METALS lab and at the University of Florida lab

Outcomes

"The STEPS vision is to facilitate a 25% reduction in human dependence on mined phosphates and a 25% reduction in losses of point and non-point sources of phosphorus to soils and water resources within 25 years"

- Accurately quantify P fluxes
- Compile data and develop high-resolution (spatial and temporal) models for the specific geographical sites or Triple-Bottom-Line Scenarios (TBLs)

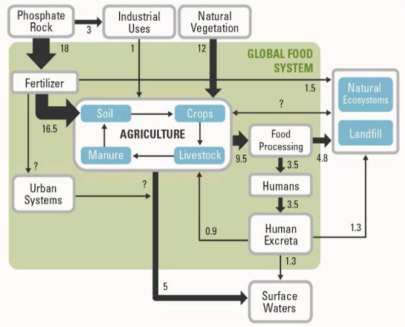

Fig. 1. Global phosphorus flow diagram, inspired by Cordell and White (2014).[3] Numbers alongside flow arrows represent million metric tons of phosphorus per year.

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