Phosphorus Cycling in Metropolitan Phoenix

Abstract

Phosphorus (P), an essential element for life, is becoming increasingly scarce, and its global management presents a serious challenge. As urban environments dominate the landscape, we need to elucidate how P cycles in urban ecosystems to better understand how cities contribute to—and provide opportunities to solve—problems of P management. The goal of my research was to increase our understanding of urban P cycling in the context of urban resource management through analysis of existing ecological and socio-economic data supplemented with expert interviews in order to facilitate a transition to sustainable P management. Study objectives were to: I) Quantify and map P stocks and flows in the Phoenix metropolitan area and analyze the drivers of spatial distribution and dynamics of P flows; II) examine changes in P-flow dynamics in the urban-agricultural interface (UAI), and the drivers of those changes, between 1978 and 2008; III) compare the UAI’s average annual P budget to the global agricultural P budget; and IV) explore opportunities for more sustainable P management in Phoenix. Results showed that Phoenix is a sink for P, and that agriculture plays a primary role in the dynamics of P cycling. Internal P-dynamics in the UAI shifted over the 30-year study period, with alfalfa replacing cotton as the main locus of agricultural P cycling. Results also suggest that the extent of P recycling in Phoenix is proportionally larger than comparable estimates available at the global scale due to the biophysical characteristics of the region and the proximity of various land-uses. Uncertainty remains about the effectiveness of current recycling strategies and about best-management strategies for the future because we do not have sufficient data to use as basis for evaluation and decision-making. By working in collaboration with practitioners, researchers can overcome some of these data limitations to develop a deeper understanding of the complexities of P dynamics and the range of options available to sustainably manage P. There is also need to better connect P
management with that for other resources, notably water and other nutrients, in order to sustainably manage cities.

Friday April 29, 2011
1:00 p.m.
Wrigley Hall, Room 481

Faculty, students, and the general public are invited.

Supervisory Committee:
Dr. Dan Childers (co-chair)
Dr. Rimjhim Aggarwal (co-chair)
Dr. Charles Redman (member)