Conceptual framework illustrates ways in which terrestrial microbiome function impacts water quality

Walter Dodds, Jim Bever, Sharon Billings, Chuck Rice

Justin Brisendine installs aquatic water quality sensors on McDiffit Creek, Kansas to assess biological and physical conditions in the stream that could influence aquatic microbiomes.

Lydia Zeglin and Pamela Sullivan collect samples and measurements from a soil pit at Konza Prairie.

A team of scientists laid out a conceptual framework describing the functions of, and interconnections between, the terrestrial and aquatic microbiomes. This work illustrates how the degradation of components of the terrestrial microbiome could lead to increased vulnerability to algal blooms in downstream reservoirs.

Microbiomes of plants, soil and water play important roles in terrestrial and aquatic ecosystems. Understanding the interconnections of these functions can aid management to increase terrestrial productivity while maintaining water quality.We have a broad understanding that agricultural production and other intensive land-uses has severely deleterious impacts on downstream water quality. However, what has been less appreciated is the ways and extent to which the terrestrial and aquatic microbiomes mediate the impact of anthropogenic land-use. Characterizing the terrestrial and aquatic microbiomes and their interconnections can facilitate management strategies that maximize productive uses of terrestrial systems while minimizing downstream effects on water quality.

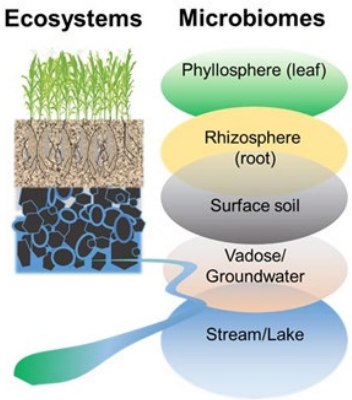

Fig. Overlapping and interacting habitats of microbiomes of aquatic, plants and soils.

With support from the NSF EPSCoR program, a multi-university, interdisciplinary team of scientists have developed a conceptual framework and illustrative models of the potential interdependence of terrestrial and aquatic microbiome functions. We have identified, for example, that degradation of arbuscular mycorrhizal fungi, a critical component of the plant microbiome that facilitates phosphorous uptake, can lead to increased blooms of toxic algae in downstream reservoirs. This work has recently been accepted for publication in the journal BioScience.

Bringing Compassion to Science Education: Mentoring the New Generation of Native Scientists

Jay T. Johnson and Cody Marshall

2019 Haskell Environmental Research Studies Program (HERS) Students

In addressing the decline in Native American student completion of graduate degrees, particularly in STEM fields, Prof. Johnson and Mr. Marshall presented on their incorporation of compassion into the Haskell Environmental Research Studies Program curriculum.

Bringing compassion into STEM curriculum provides both students and faculty with a foundation for equitable interactions and increases the likelihood that underrepresented minority students will pursue graduate education.

In collaboration with the Facilitating Indigenous Research, Science, and Technology Research Coordination Network grant through NSF's Arctic Social Science Program, Prof. Johnson was prompted by Dr. Ed Galindo to consider methods for incorporating compassion into the curriculum of the Haskell Environmental Research Studies program. Prof. Johnson adapted a set of dialogue agreements used by FIRST RCN co-PI, the First Alaskans Institute for their workshops and meetings. The adapted agreements were then utilized to bring compassion and self-care into the interactions between student interns and staff members during the HERS 2019 summer program.

In addition to bringing compassion into the HERS program curriculum, Prof Johnson and Mr. Marshall have also integrated Traditional Ecological Knowledge and place-based education as core curriculum in order create a positive learning environment for Native American students, aimed at empowering interns to be both community and science leaders.

Supporting Distance Learning in Kansas Elementary Schools during the COVID19 Pandemic

Peggy Schultz and Terra Lubin

The Kansas Ecology for Elementary Students (KEES) program developed short video clips in both English and Spanish to highlight the ecology and the natural history of Eastern Kansas in the spring.

These videos support Next Generation Science Standards, strengthen critical thinking skills and provide teachers, parents and students with an accessible educational resource to enhance the distance learning experience. Plus, they introduce elementary students to the amazing research being done by EPSCoR MAPS researchers and scientists at the University of Kansas.

During the academic school year, the Kansas Ecology for Elementary Students Program travels to elementary schools in Lawrence and Topeka, KS to provide 3rd-grade students with opportunities to conduct small group hands-on experiments in order to learn about Kansas ecology. By design, the program is engaging, brings in resources that public schools don't have access to and provides learning opportunities that students normally would not be able to experience. Teachers have commented that students can hardly wait for the 'science people' to visit and always ask when they will come again.

Because schools began distance learning in late March due to the Kansas COVID-19 response, the Kansas Ecology for Elementary Students (KEES) program was unable to continue to visit classrooms and teach ecology lessons in person. In order to address the students' disappointment and the teachers and parents need to have resources to support their online curriculum, educational videos discussing topics related to the cancelled KEES lessons were created. Links to the videos can be found on the epscoroutreach@ku.edu and on the new Kansas NSF EPSCoR website, nsfepscor@ku.edu.