

Project Elements. Title: New GK-12: Using the STEM Dimensions of Bioenergy Sustainability to Bring Leading-edge Graduate Research to K-12 Learning Settings.

Institution: Michigan State University (MSU).

PI: Thomas Getty, Professor, Zoology and the W.K. Kellogg Biological Station (KBS).

Co-PI(s): Katherine Gross, University Distinguished Professor, Plant Biology, Director of KBS.

G. Philip Robertson, University Distinguished Professor, Crop & Soil Sciences and KBS.

Charles W. Anderson, Professor, Teacher Education, Division of Science & Mathematics Education.

Jennifer Lau, Assistant Professor, Plant Biology and KBS.

Faculty Associates: Jeffrey Conner, Plant Biology; Bruce Dale, Chemical Engineering & Materials Science; Stephen Hamilton, Zoology; Christopher Klausmeier, Plant Biology; Jay Lennon, Microbiology & Molecular Genetics; Douglas Landis, Entomology; Elena Litchman, Zoology; Gary Mittelbach, Zoology; Douglas Schemske, Plant Biology; Sieglinde Snapp, Crop & Soil Sciences; Kurt Thelen, Crop & Soil Sciences; Santiago Utsumi, Animal Science.

Graduate fellows per year: 8 fellows. **K-12 teachers per year:** 8 mentors plus ~80 partner teachers.

K-12 classes served per year: 8 mentor classes (~8hrs/wk); ~80 partner classes (~2 hrs/wk).

Schools and School District Partners: 8-16 schools in the 11 KBS K-12 Partner districts.

Target audience: Primarily high school and middle school science classes. **Setting:** Rural.

NSF-supported STEM disciplines: Ecological Biology, Ecosystem Science, Population & Evolutionary Processes, Behavioral Systems, Systematic Biology & Biodiversity Inventories, Plant Genome Research, Genes & Genome Systems, Economic, Decision & Management Sciences.

Project Summary

Intellectual Merit: In our proposed new project, graduate students in MSU's Ecology, Evolutionary Biology & Behavior (EEBB) and Environmental Science & Public Policy (ESPP) programs who are engaged in STEM research at the W.K. Kellogg Biological Station (KBS) will partner with the new DOE Great Lakes Bioenergy Research Center (GLBRC) Sustainability Research Group, our NSF Long-Term Ecological Research (LTER) project on the ecology of agricultural landscapes, the KBS K-12 Partnership for Science Literacy and MSU's Center for Research on College Science Teaching and Learning (CRCSTL), to create a new GK-12 project with an intellectual focus on the ecological dimensions of bioenergy sustainability. This theme and project are central to the mission of KBS and are relevant to the research of all of our core faculty and their grad students. Proposed activities include establishing schoolyard science research plots in K-12 Partner districts, and at KBS, that mimic aspects of GLBRC research plots and serve as the foundation for a collaborative schoolyard science network that will enable our fellows to integrate their scientific research practice and findings into K-12 STEM education.

This project will help our fellows learn how to collaborate across disciplines, place their research in its broader societal and global contexts, integrate their research and teaching, and communicate their research to professional, K-12 and public audiences. All of our fellows will be able to use their own research to develop projects and lessons that help their K-12 partners address specific Michigan Grade Level Content Expectations in Biology, Chemistry, Physics, Earth Sciences, and Mathematics.

Broader Impacts: Our current fellow candidate pool is ~53% female and ~12% ethnic minority; in the earlier 3-year Track I GK-12 at MSU, 65% of the fellows were female and 12% minority. The Director of KBS (coPI Gross) is leading initiatives to increase participation by under-represented groups, including building research and educational collaborations with faculty and students at Puerto Rico-Mayaguez, Jackson State, Maryland-Eastern Shore, Florida A&T, and North Carolina A&T universities. We are active participants in the MSU AGEP project and the ESA SEEDS program: *Strategies for Ecology Education, Diversity and Sustainability*. These efforts are opening pathways and increasing minority applications to STEM graduate programs at MSU. We will use funding from this GK-12 grant, generous supplemental support from MSU and contributions from endowments and private foundations to further develop these partnerships and enhance pathways to degrees and careers in the STEM disciplines. Other broader impacts on teaching, training, scientific infrastructure and society are enumerated in the project description.