PROJECT SUMMARY

The Missouri Transect: Climate, Plants and Community

The Missouri Transect is a five-year effort to build infrastructure, knowledge, and collaborations in research and education across Missouri. The research and education activities are focused on understanding, modeling, and predicting 1) short- and long-term trends in temperature and water availability; 2) the impact of these trends on the productivity of native flora and agricultural crops; and 3) how different stakeholder communities are likely to respond to a changing climate. We have assembled interdisciplinary teams who will focus on specific areas of research and education and interact collaboratively to build the research platform across the state.

Intellectual Merit

High-resolution data will be the basis for integrated and interdisciplinary climate and hydrology research. The data will drive our ability to predict/model climate-scale trends that impact plant productivity in different ecosystems across temporal scales. Anticipated outcomes include 1) enhanced microclimate monitoring by radar and expanded surface networks; 2) maps of playa productivity and nitrogen cycling capability under different precipitation and land-use scenarios; 3) improved seasonal-scale precipitation outlook methods; and 4) forecast indices for anomalous conditions (e.g., droughts) that will lend insights into climate change simulations.

Phenomics technologies, algorithms, and analytics will be the basis for integrated and interdisciplinary plant science research. The data will enable us to associate genotypes and phenotypes with environmental variation. The research will address both above- and below-ground plant physiology and will span multiple scales of imaging and remote sensing, from individual leaves to whole fields. The high-resolution, high-throughput phenotype and genotype data will be integrated with climate data to model and ultimately understand the impact of changing environments on plant productivity. Outcomes include 1) identification of genes that confer drought tolerance; 2) new imaging and remote-sensing technologies to understand plant phenotypes in response to environmental variation; 3) algorithms and software for improved automated image processing, feature extraction and plant phenotype identification and; 4) analytical platforms for associating phenotypes with genotypes and environments and modeling plant productivity in varying environments.

Community-based research efforts will address how Missouri communities can manage for resilience under a changing climate. The research will inform our understanding of the effects of climate change on Missouri citizens by considering how various stakeholders make decisions in response to changing water availability and vegetation.

Broader Impacts

The outcomes from the research and education efforts of the Missouri Transect will benefit the competitiveness of the state and impact the lives of its residents. Activities will be integrated by developing learning tools and opportunities that inform individuals of all ages about climate change and its predicted effects on agriculture and the natural environment. Public education programs will give students, teachers, and citizens a better understanding of how a changing environment affects plants and society, and their ability to adapt to climate change. Educational programs will share information about 1) how scientists study climate change; 2) how they search for new plant drought/stress tolerance traits; and 3) how scientists extract valuable information from very large datasets. In addition, the Missouri Transect will incorporate a diverse population of individuals and organizations throughout all aspects of the project. Special emphasis will be placed on increasing the proficiency and interest of underrepresented groups and women in STEM. The workforce development plan is focused on undergraduate and graduate training, bioinformatics training for individuals with physical disabilities, and job creation. The project specifically targets people with physical disabilities as an untapped resource for filling high-skilled bioinformatics jobs. Investments also will be made in the hiring of new faculty across the partner institutions. Project leaders have assembled a team of partners and collaborators with broad expertise, experience, and capabilities in research, education, diversity, outreach, and commercialization to ensure broader impacts are achieved.