The Department of Ecology and Evolutionary Biology Spring 2018 Seminar Series

The genetics of local adaptation, community assembly, interaction networks, and stability help develop solutions to mitigate global change

While Darwin's "entangled bank" metaphor for the evolution, complexity and interconnectedness of communities emerged in 1859, it has taken community and ecosystem ecologists nearly 150 years to begin quantifying the genetic underpinnings of their disciplines. With habitat destruction, invasive species, climate change, and other global change challenges it is now more important than ever that we quantify the extent of local adaptation and the genetics-based principles that drive community assembly and ecosystem processes. Using model foundation tree species that support a diverse community including many T&E species, our research group has used replicated common gardens in different environments, studies in the wild, and molecular genetics to identify candidate genes of functional traits. These combined studies have allowed us to quantify the genetic basis of community assembly, network structure, diversity and stability. While some of these community metrics were once thought to be unknowable "emergent" properties, we've found that they can be quantified as heritable plant traits and that very different communities from microbes to vertebrates are connected by the underlying genetics of these trees. We are now using genetics-based restoration projects at a Superfund site and on highly degraded rivers where 98% of the biomass is exotic to test and improve: 1. the concepts of assisted gene flow and migration, 2. the use of coevolved species complexes in sympatric plantings, 3. genetics approaches to declining water tables, invasive species, nurse plant associations, and drought adapted mycorrhizal mutualists, and 4. to develop realistic guidelines for land managers. While the use of local stock in restoration under "normal" conditions is best, the "new normal" brought about by global change may force land managers to deploy genetics-based strategies. We need to get very good at genetics-based restoration by having the methods to mitigate the worst, and hope that we don't have to deploy on a global scale. Field trials embedded in lands to be restored such as the Southwest Experimental Garden Array (http://www.sega.nau.edu) provide the infrastructure to test the fundamental principles of community assembly and to develop genetics-based solutions to global change.

Join us in welcoming
Dr. Tom Whitham
Northen Arizona University

Friday, April 13, 2018
SERF 307 - 3:30 PM
Reception 3:00 PM
in Dabney 575