

Plants: Ecology, Biology, & Food Source Research

Wildfire, Conservation, and Restoration Ecology Research

Dr. Scott Abella

Associate Professor

School of Life Sciences

Email: scott.abella@unlv.edu

Websites: <https://www.unlv.edu/people/scott-abella>

<https://abellaappliedecologylab.wordpress.com/home/>

Expertise

- Fire ecology
- Restoration ecology
- Ecological conservation practices
- Forest health

We perform fire ecology research that assists local and national wildland fire management efforts in changing environments



UNLV biology students implementing post-fire habitat restoration research

Before-after wildfire in Red Rock Canyon National Conservation Area, just outside Las Vegas. We study fire effects, fuel management, and restoration strategies.



Forest Inventory and Analysis

- **Dr. Brenda J Buck**
- Professor
- Department of Geoscience
- Email: Brenda.Buck@unlv.edu
- Website: <https://unlv-fia.github.io/UNLV-FIA-Group/index.html>



Expertise

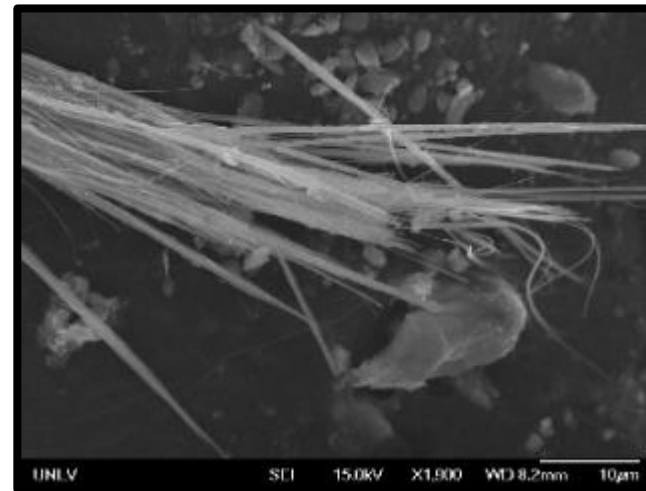
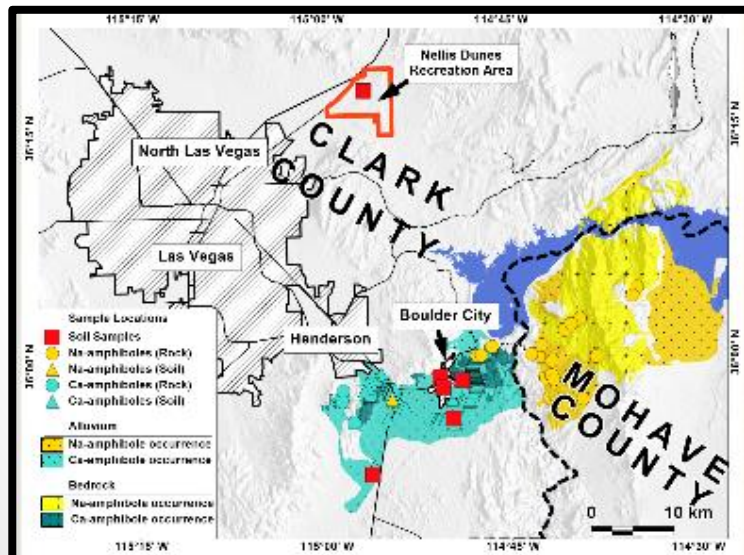
- University partner to USDA-FIA. Area of emphasis is information management research and development to optimize the storage, delivery, and display of forest inventory data.
- The support we provide helps policy makers, land stewards and non-governmental groups base decisions and assessments related to the health, diversity, and productivity of U.S. forests and grasslands on scientifically credible information.

Medical Geology

- **Dr. Brenda J Buck**
- Professor
- Department of Geoscience
- Email: Brenda.Buck@unlv.edu

Expertise

- Expertise: Health effects of mineral dust; Asbestos; Heavy Metals; Soil Science/Geology



Dr. Dale Devitt

Professor

Director - Center for Urban Water Conservation

School of Life Sciences

Phone 702-895-4699

Expertise

Soil Plant Water Relations

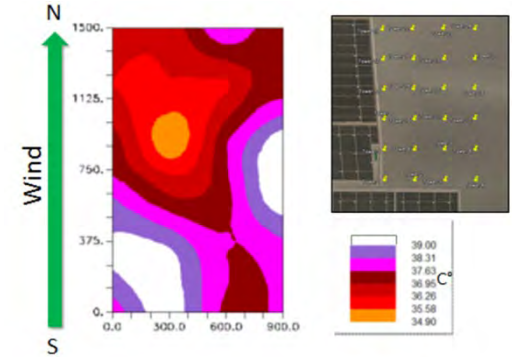
Water Management

Evapotranspiration

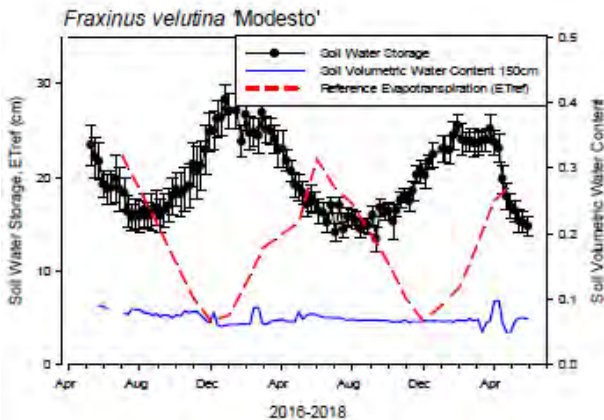
Salinity

Current Research

- Assessing the impact of large scale solar development on desert ecosystems.



- Tree grass water use tradeoffs in urban landscapes



10 acre research facility in North Las Vegas dedicated to conducting applied and basic water related research.



Response (growth, flower and seed production) of desert perennial shrubs to altered precipitation



Dryland ecology, hydrology and climate dynamics

Dr. Matthew Petrie

Assistant Professor

School of Life Sciences

ph: 702-895-5844

e: matthew.petrie@unlv.edu

Expertise:

Vegetation ecology and near-surface hydrology

Forest regeneration

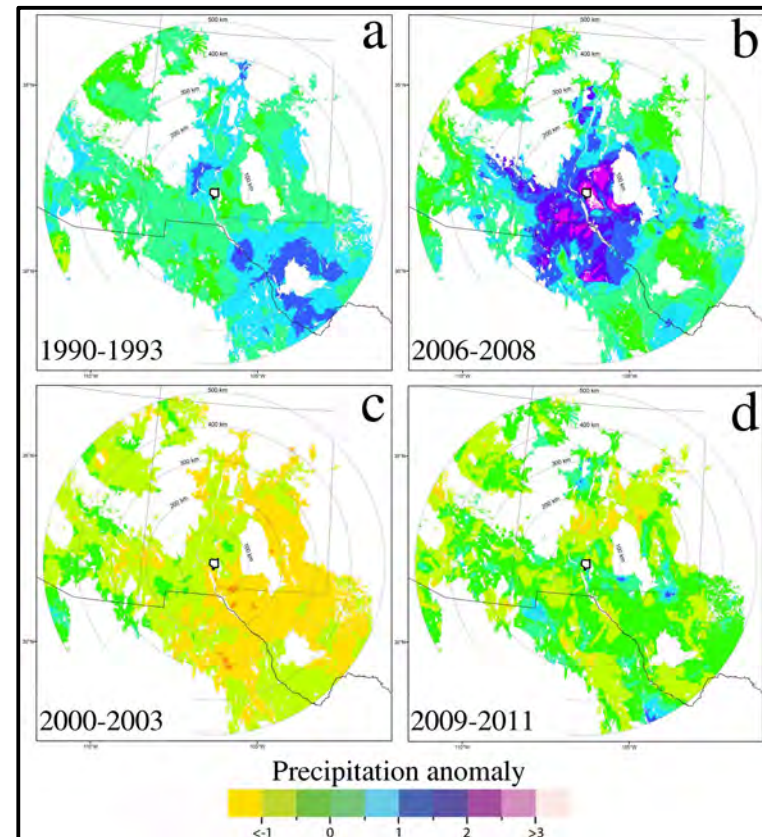
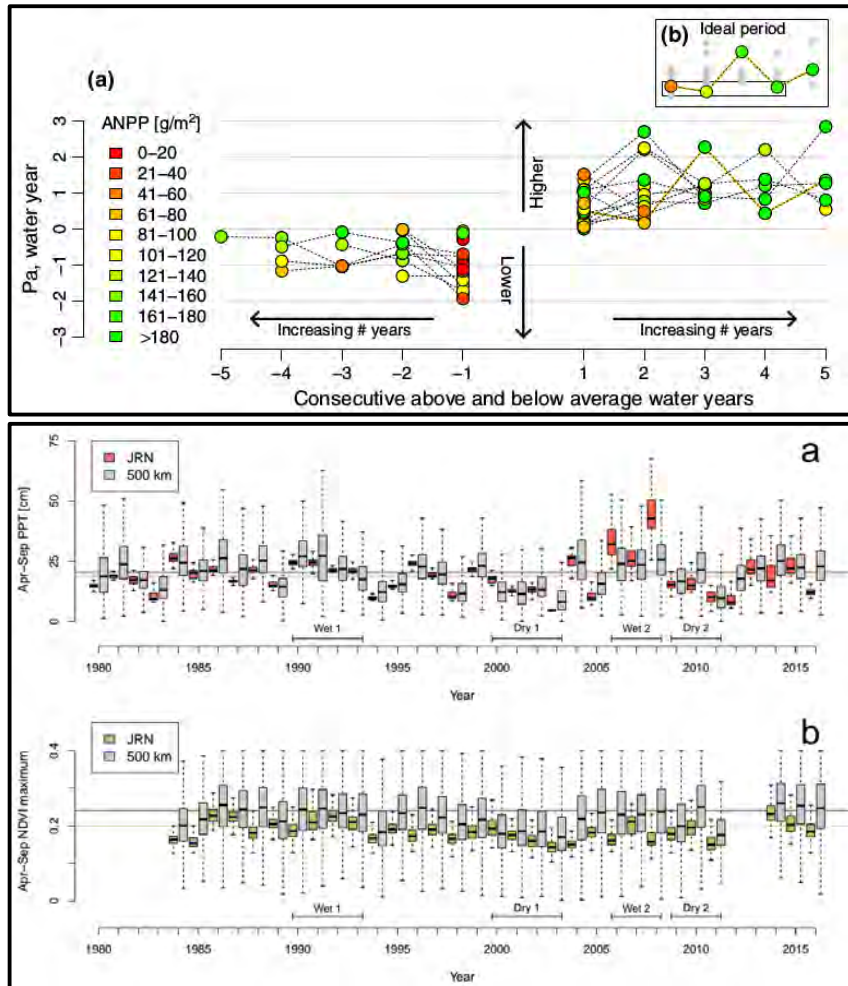
Climate dynamics and climate change forecasting

Extreme events

Landscape ecology

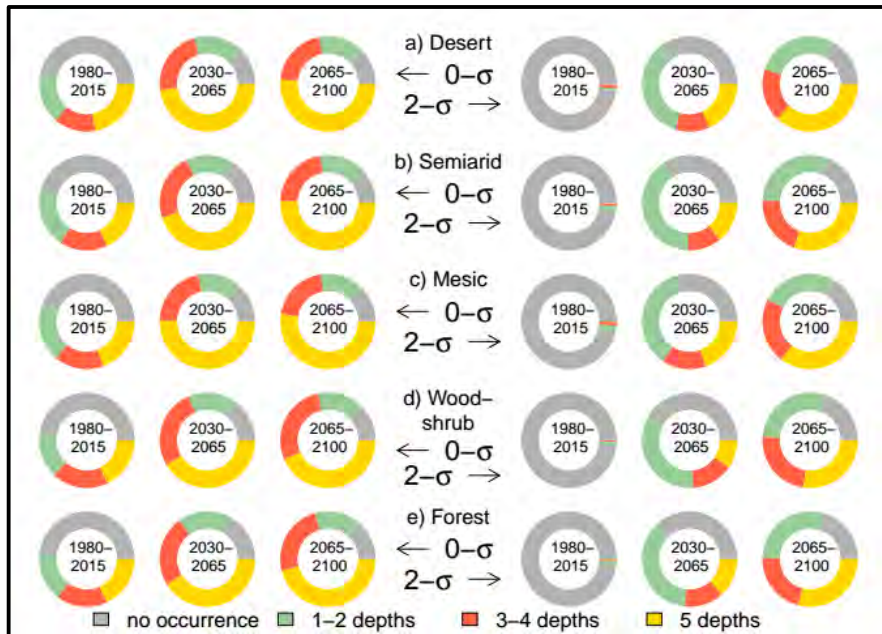
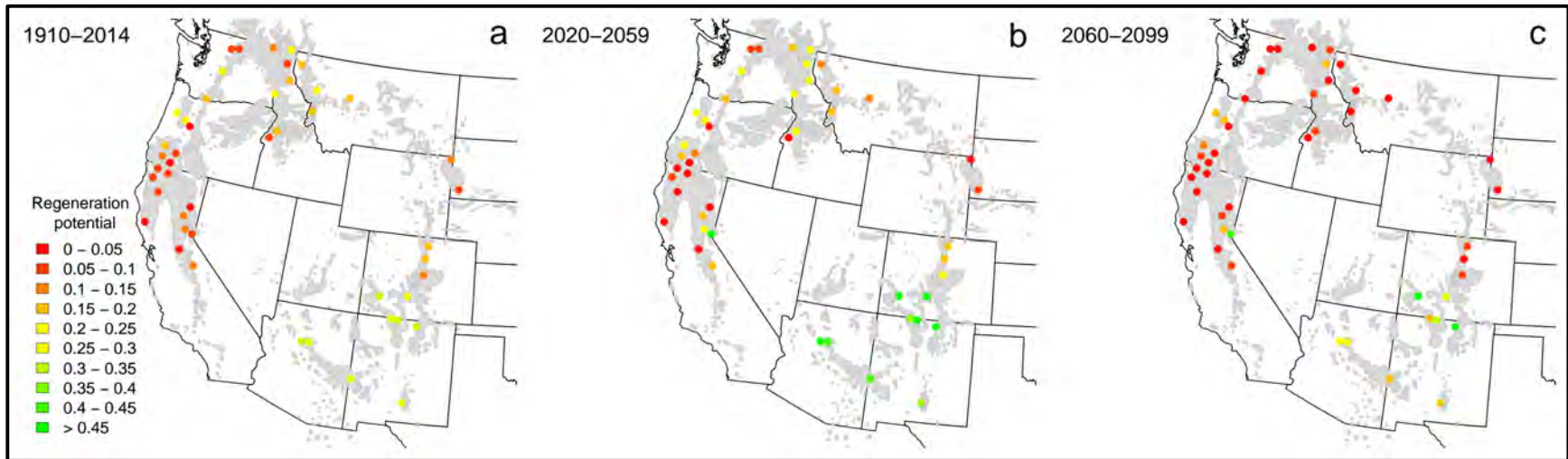
Manipulative field experimentation

Linking extreme climate events and ecological dynamics across space and time



Above: Disentangling locally- and regionally-observed ecological responses to multiyear high and low rainfall periods. Multiyear periods are a key component of understanding climate impacts to arid and semiarid regions. Our research focuses on the physical mechanisms that shape ecological responses, providing a foundation for understanding the effects of local and regional extreme events in a changing climate.

Forecasting climate change impacts



Above: Natural forest regeneration may decline substantially throughout the western US in the 21st century. We study how climate, landscape properties, and the stress tolerance of tree populations will shape the future of western forests.

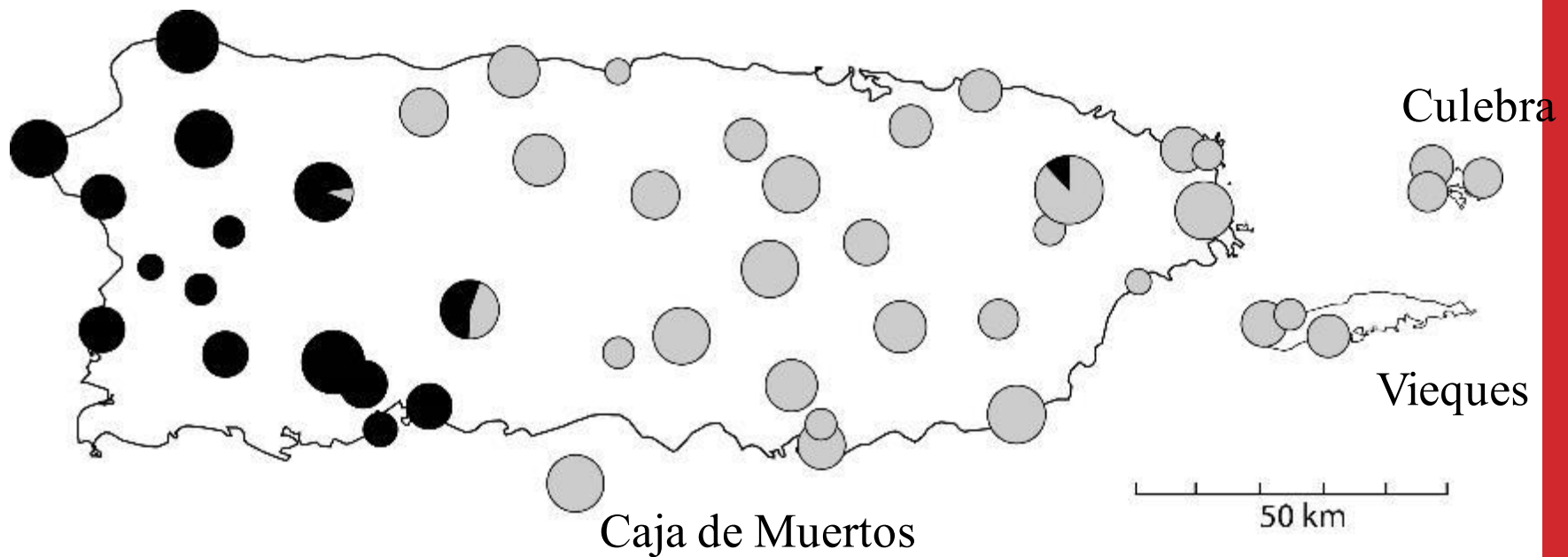
Left: Forecasts for increasing belowground extreme temperature events in a changing climate. We use downscaled climate model projections to forecast the increasing occurrence of moderate (0- σ) and very high (2- σ) extreme temperature events throughout multiple depths in the soil profile for ecosystems of the central and western US.

Evolutionary Biology

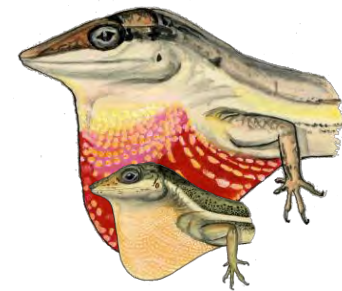
- **Dr. Javier A. Rodríguez**
- Professor of Biological Sciences
- School of Life Sciences
- Email: javier.rodriguez@unlv.edu
- Website: <https://jrodriguez.faculty.unlv.edu/>

Expertise

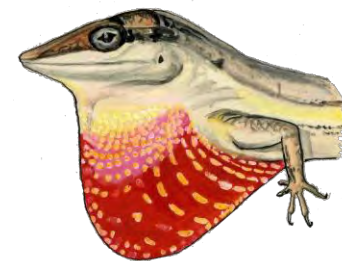
- Evolutionary Biology
- Feeding Ecology
- Genetic Divergence
- Biology of Amphibians and Reptiles



- Hybrids – *A. pulchellus* with *krugi* mtDNA, 85 individuals, 15 localities



- *A. pulchellus* with native mtDNA, 224 individuals, 39 localities



● = ≥ 95% pp support

Mona (n = 10) | *C. m. monensis*

Cayo Diablo (n = 14)

Puerto Rico (n = 5)

Culebra – Ensenada del Cementerio (n = 6)

Tortola I (n = 4)

Culebra – Punta Soldado (n = 2)

St. Thomas (n = 7)

Tortola II (n = 1)

Culebra – Bahía Mosquito (n = 1)

C. inornatus (Puerto Rico)

C. gracilis (Hispaniola)

C. fordii (Hispaniola)

C. striatus (Hispaniola)



C. m. granti

0.02 substitutions
per site

Bayesian tree
1059 bp *Cyt b*
866 bp *ND4*

Computational biology and the physiology of plants

Dr. Paul J Schulte

Associate Professor,
School of Life Sciences
Email: paul.Schulte@unlv.edu

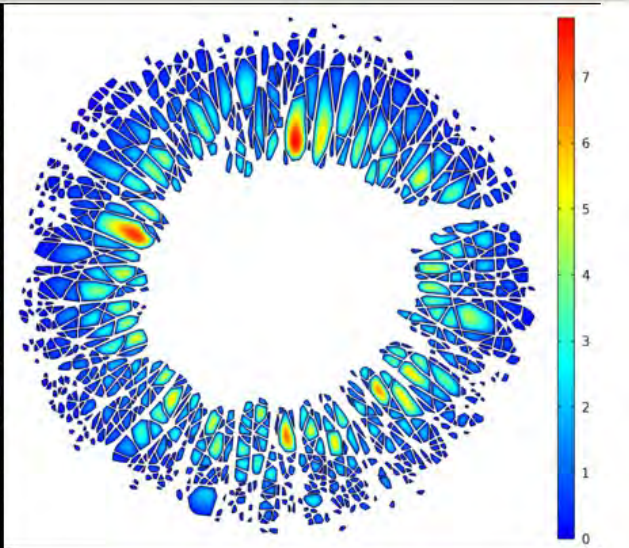
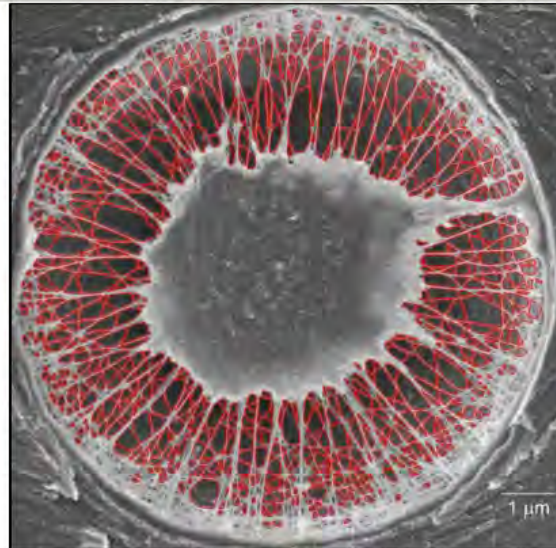
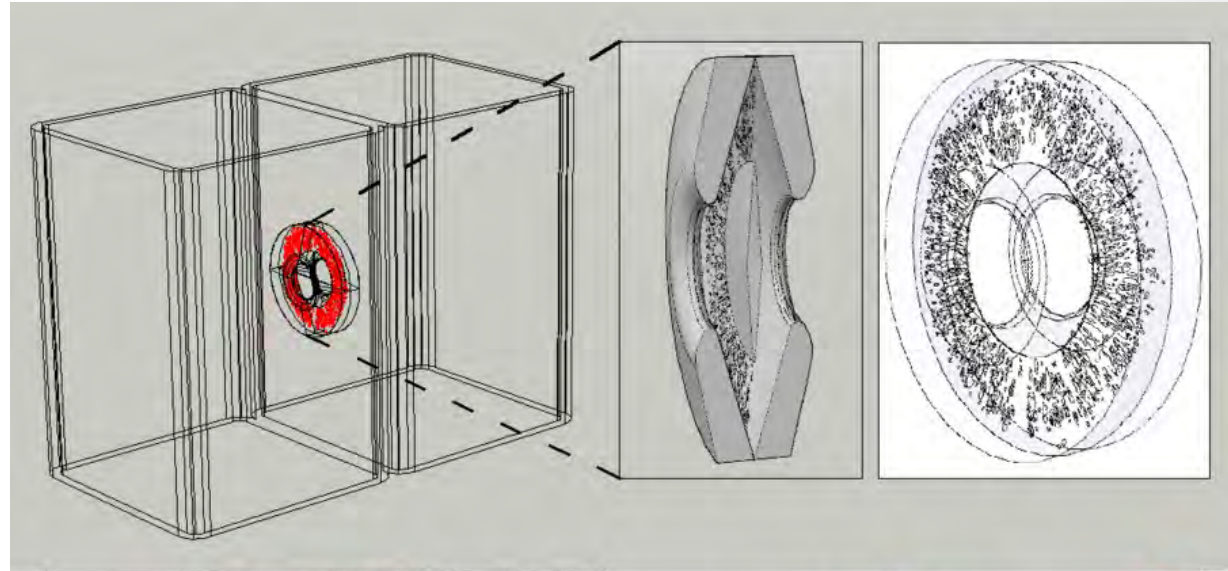
Expertise

- Plant water relations and transport processes
- Computational fluid dynamics
- Anatomy of transport tissues in plants

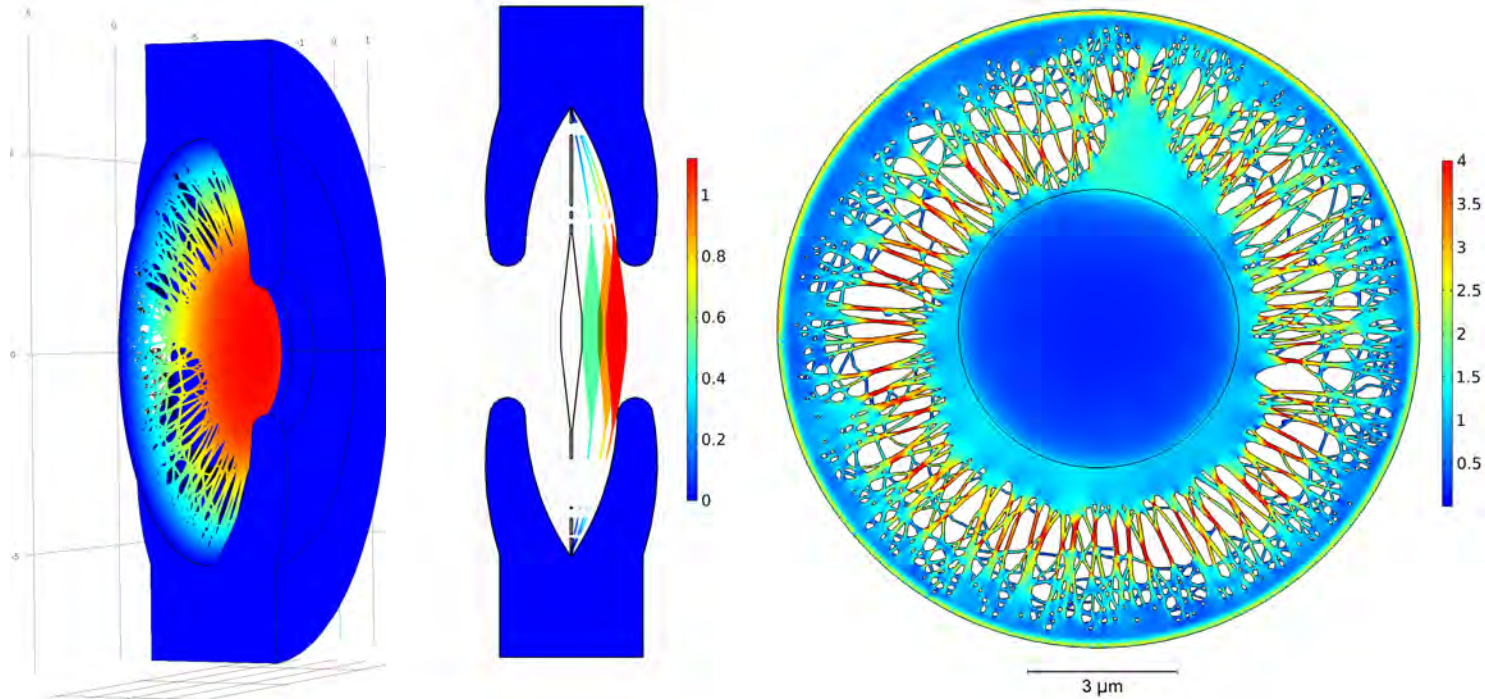
Fluid dynamics of flow between cells

Computer models and mathematical approaches to studying transport processes can help us understand the roles that these structures play in the flow of water from roots to the leaves of tall trees.

These images show work based on a computational fluid dynamics approach to flow through pits in conifer tracheids.



Biomechanics of valves in plant cells



Water flows along the xylem in conifer trees from cell-to-cell through small openings called pits. The pits in many species contain structures that appear to act as valves that prevent air from spreading and blocking the transport system. The above figures show results from solid mechanics modeling of the pressures that are required to deflect the valve and seal the pit.

Speciation in Trees

Dr. Elizabeth A. Stacy

Associate Professor of Biology

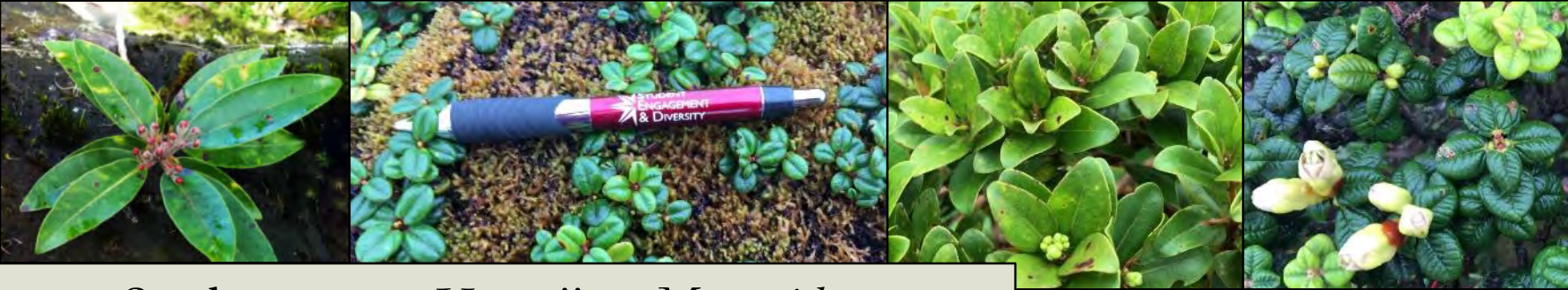
School of Life Sciences

702.895.4461

elizabeth.stacy@unlv.edu

Expertise

- **Local Adaptation & Population Divergence**
- **Evolution of Reproductive Isolating Barriers**
- **Phylogeography & Phylogenomics**
- **Population Genomics**
- **Hawaiian Evolutionary Biology**



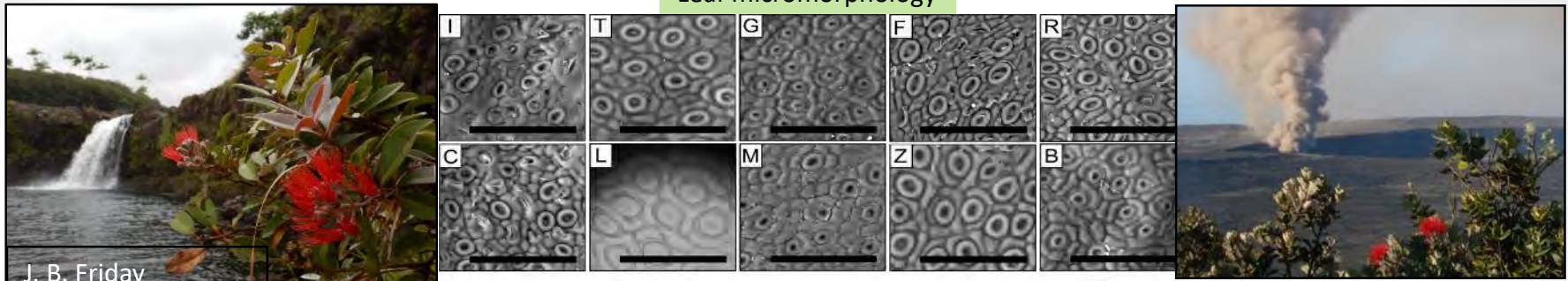
Study system: Hawaiian *Metrosideros*

2.5-to-3.9-million-year-old incipient adaptive radiation of woody taxa that dominates Hawaiian forests



Local Adaptation & Population Divergence

Leaf micromorphology

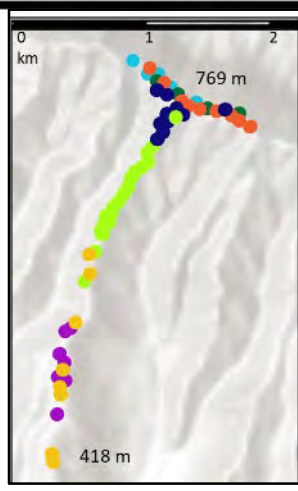
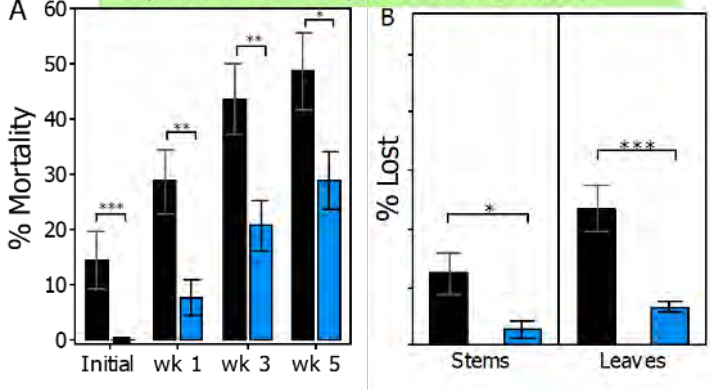


J. B. Friday

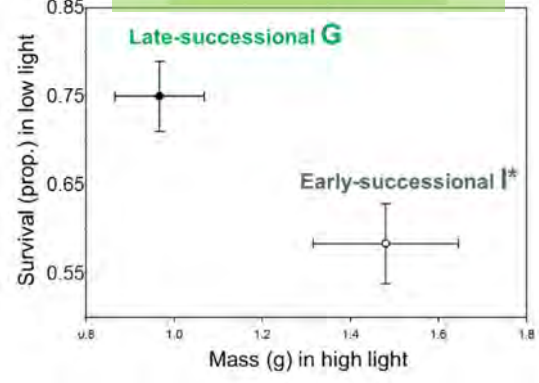
Lower elevation

Higher elevation

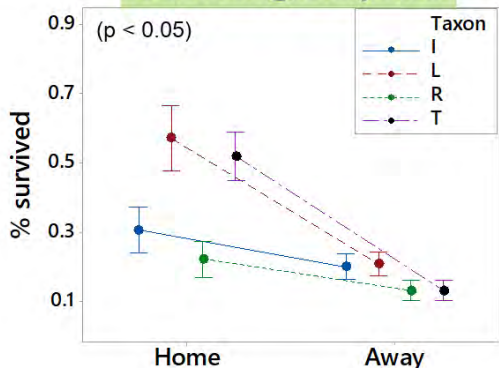
Response to 1-hour exposure to 2 m/s current



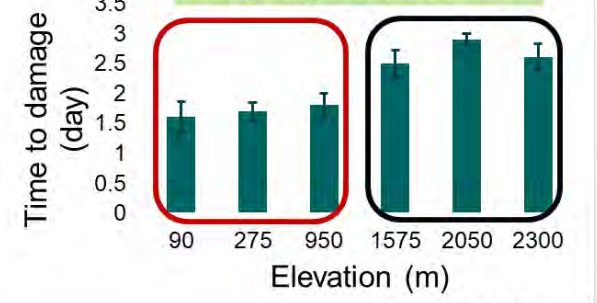
Response to light vs. shade



Survival @ 3.5 years



Daily exposure to 43C

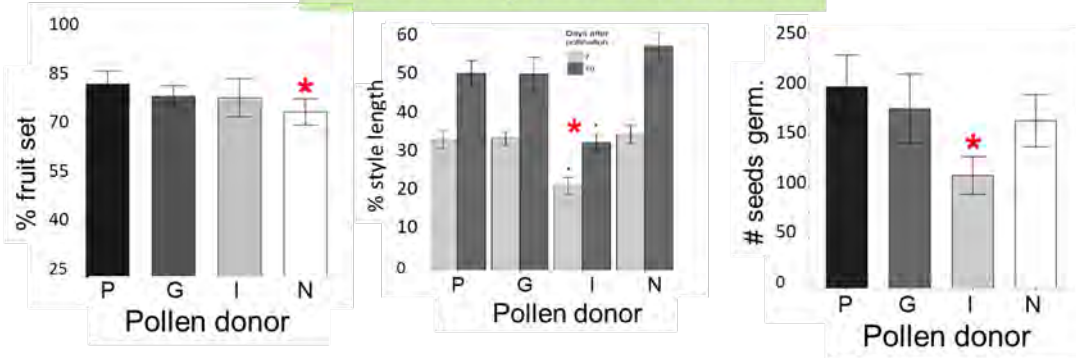


W=330, $p=0.03$

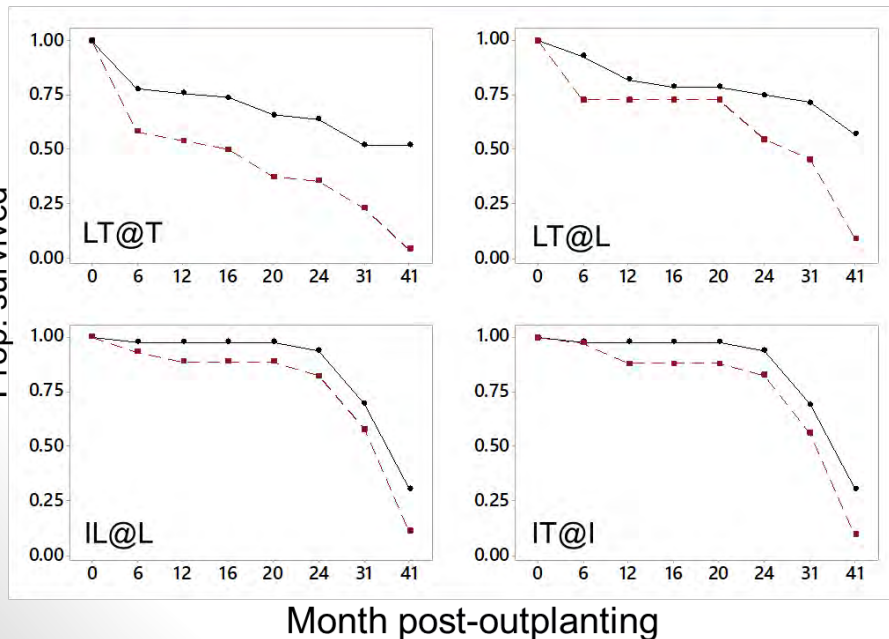


Evolution of Reproductive Isolating Barriers

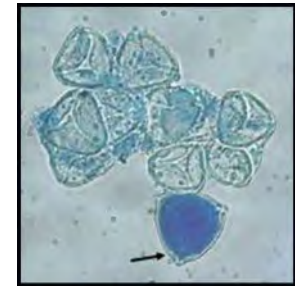
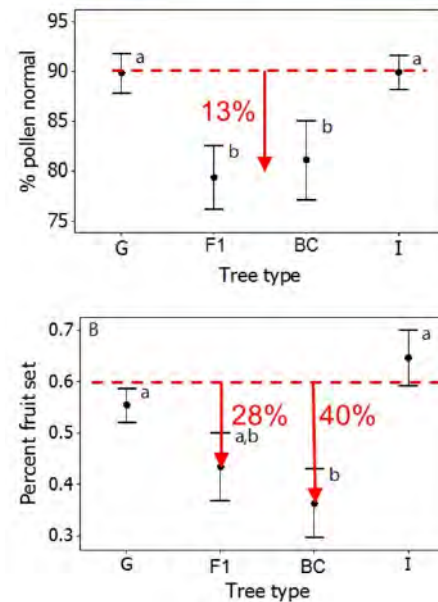
Cross-fertility between varieties



F1 inviability in maternal environment



↓ F1 & backcross fertility

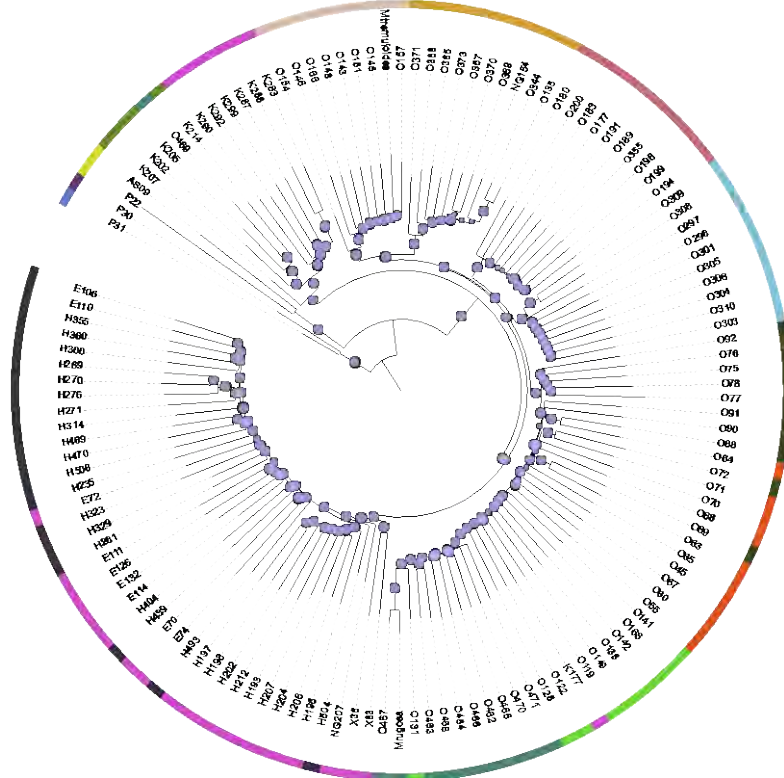
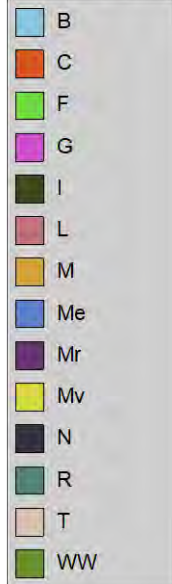


Phylogeography & Phylogenomics

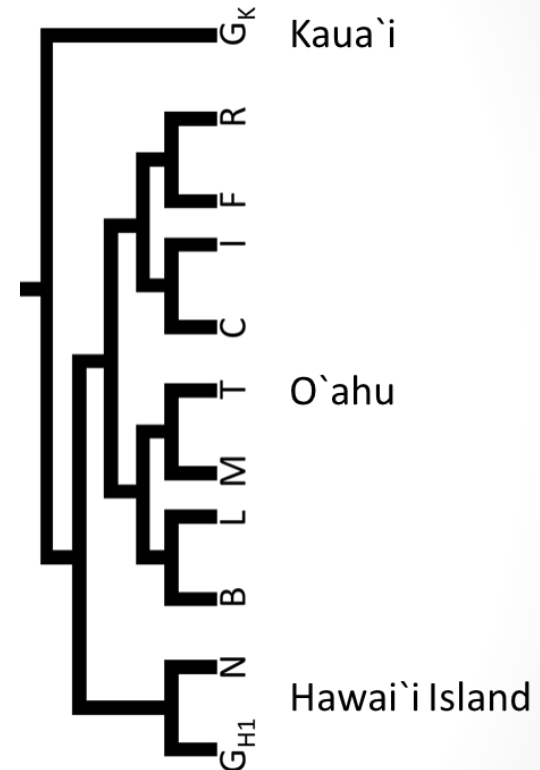
Phylogenomic analysis of 14 taxa (8.5 million genome-wide SNPs)

Tree scale: 0.1

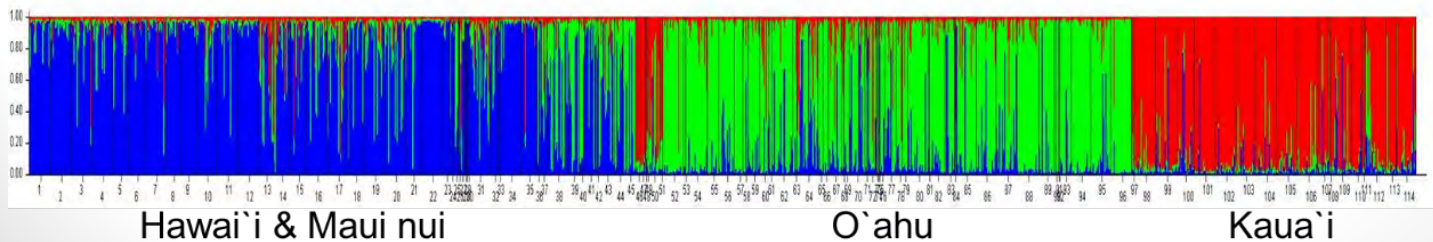
Dataset_legend



Phylogenetic analysis of 11 taxa (8.5 million genome-wide SNPs)

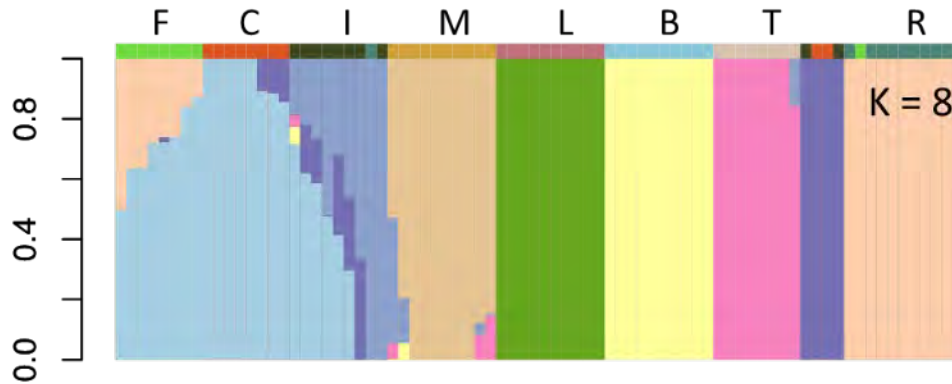


STRUCTURE analysis of 35 populations (9 nuclear SSR loci)

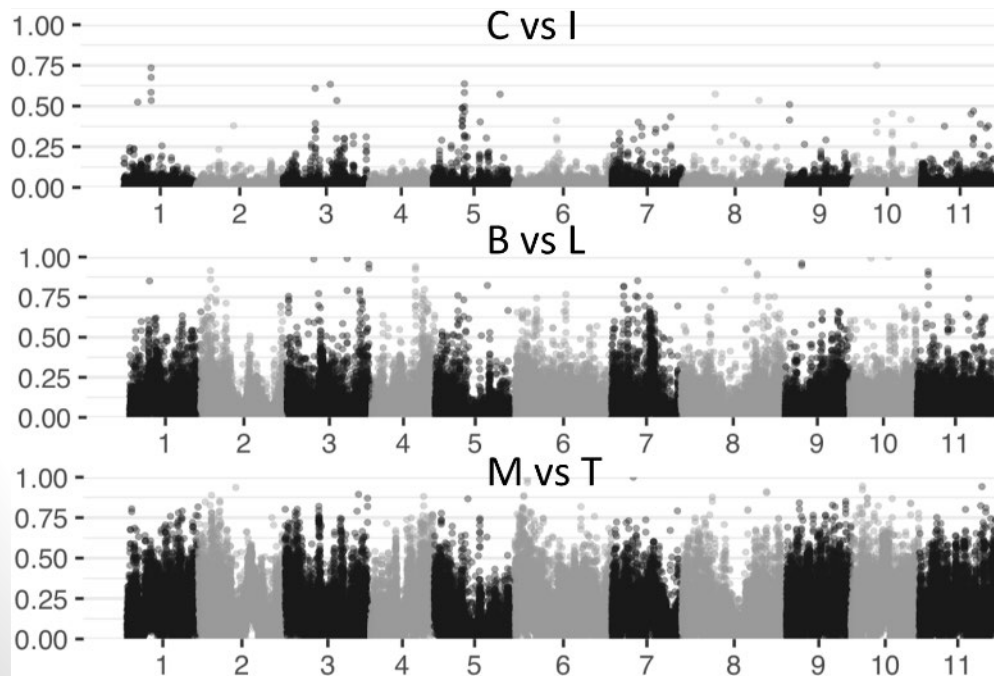


Population Genomics

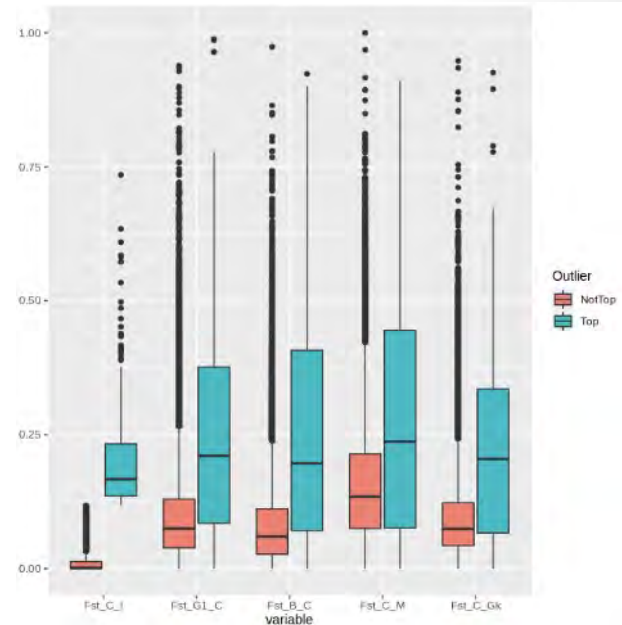
STRUCTURE analysis (8.5 million SNPs)



F_{ST} analysis to detect genomic islands of divergence



Selection analysis



Divergence time estimation

