Exemplar projects and collaborative linkages
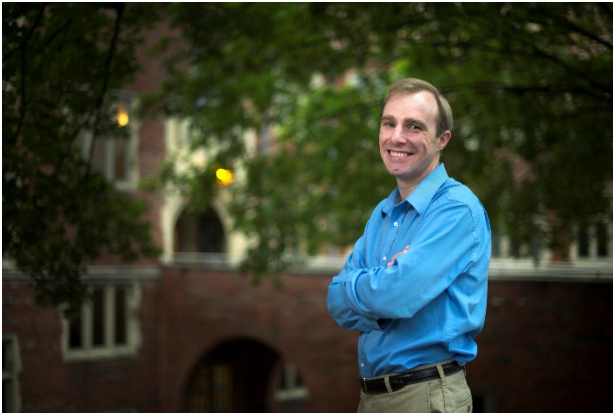
THE UNIVERSITY OF TENNESSEE KNOXVILLE
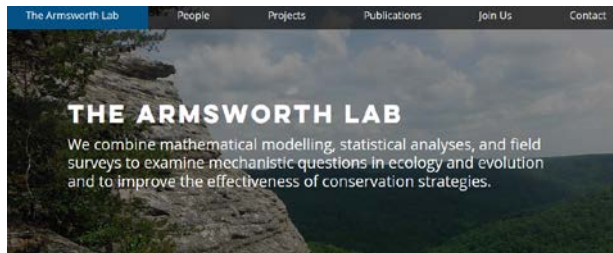
DEPARTMENT OF ECOLOGY & EVOLUTIONARY BIOLOGY

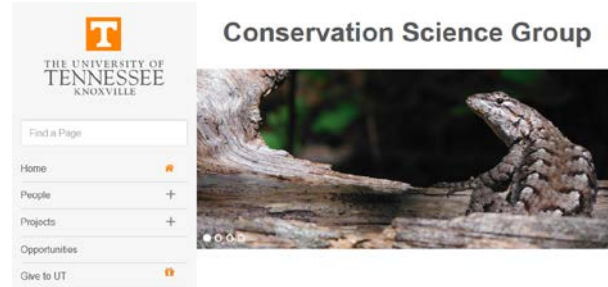# Paul Armsworth

p.armsworth@utk.edu

www.armsworthlab.com

THE ARMSWORTH LAB
We combine mathematical modelling, statistical analyses, and field surveys to examine mechanistic questions in ecology and evolution and to improve the effectiveness of conservation strategies.

consci.utk.edu

www.nimbios.org

secasc.ncsu.edu

Excellent graduate and undergraduate students

Active interdisciplinary groupings on campus (Watersheds, Baker Center, etc.)

New Conservation Fisheries hire in FWF

Cooperative Ecosystem Study Unit

Actionable science in collaboration with partners.

Funders – NSF, NIH, USDA, DoI, DoE, DoD, etc.

Monica (Mona) Papeş mpapes@utk.edu
Assistant professor, EEB
http://monapapes.wixsite.com/biodivmatters
Director, Spatial Analysis Lab, NIMBioS
http://www.nimbios.org/SAL/

Investigates species' distributions using ecological niche modeling, GIS, and remote sensing techniques. Research interests span macroecology, conservation biology, and evolutionary biology. Focus on drivers of biodiversity patters: land use change, climate change, and invasive species.

Spatial Analysis Lab (SAL) at NIMBioS sal@nimbios.org

Capabilities: new data collection; data analysis and visualization; data storage; training and outreach

LiDAR scanner; UAV (drone) with multispectral and hyperspectral sensor

Instrumentation: FARO terrestrial scanner; DJI hexacopter (M600) with visual, multispectral, and hyperspectral sensors; FAA pilot certification

How to work with the Spatial Analysis Lab:

- Current project engagement: enhance your project by working with us on a spatial analysis component
- Grant facilitation: add SAL capabilities to expand the scope and impact of a grant or proposal
- Education and outreach: develop a tutorial or workshop with us that combines your research area with the capabilities of SAL

EEB field station flyover with M600
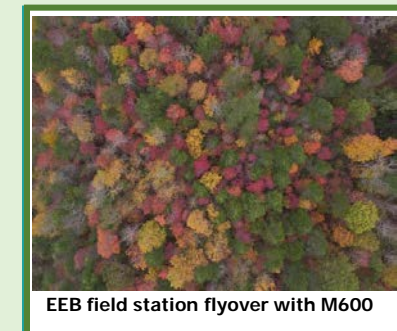
DA Etnier Ichthyological Collection
Dept. EEB, University of Tennessee Knoxville

Current Research

➢ Microplastics: Identifying patterns of microplastic concentration and types in fishes of different functional groups through space and time. Currently restricted to the upper Tennessee River basin, we are using specimens sampled this year and at regular intervals through 1965.

➢ Species Delimitation and Evolution: Using morphological and genetic data to delimit 4 species of darter (Percidae) and identify how nick-point (waterfall) migration influences isolation among fish species and populations in the upper Tennessee River basin

Highlights

➢ 48,000+ Lots
➢ 460,000+ Specimens
➢ 3000+ Paratypes of 100+ species
➢ 8000+ Tissue biopsies
➢ Nearly all georeferenced
➢ Online: https://tennfish.utk.edu/

History

The DAE Ichthyology Collection is the largest fish collection in Tennessee and represents over 60 years of work by Dr. David Etnier and many collaborators. In terms of total species it ranks in the top 20 among North American Fish collections. Holdings are mostly North American freshwater fishes with good representation of North Pacific, North Atlantic, and Gulf of Mexico saltwater fishes. The collection contains specimens and data from, and is used by private, academic, and government institutions, such as Tennessee Valley Authority.

Benjamin P Keck, Curator, bkeck@utk.edu

Jennifer Brummett, Collections Manager, jparris@utk.edu

Tennessee Water Resources Research Center (TNWRRC)

- *Within the* University of Tennessee – Knoxville Institute of a Secure and Sustainability Environment

- **John S. Schwartz, PhD, PE,** Professor and Water Center Director; Dept. Civil & Environ. Engineering
- **Tim Gangaware,** Water Center Assistant Director

The **TNWRRC** is the state representation to the **National Institute of Water Resources (NIWR)**, associated with §104 of the Water Resources Act with funding from the **US Geological Survey**.

54 NIWR institutes/centers in the US + territories and partnered among 8 regions.

The **TNWRRC** mission is to be the primary link among water resource experts in academia, government, and the private sector across the state of Tennessee - engaged in the promotion of research, education, and community outreach.

➢ Provides for competitive grants awarded annually through the TNWWRC under the **104b Program**. Grants focused on state research needs.
➢ Supports collaboration among the USGS and regional university institutions and promote funded research through the **104g Program**.

Web site link: http://tnwrrc.tennessee.edu/

Selected Current Activities:

- Support Trainings for Tennessee Dept. of Environment and Conservation including EPSC and stormwater management practices, Hydrological Determination Certification, and Stream Quantification Tool.

- Development of an Urban Waters Report Card with state MS4 (Stormwater) communities.

- Assist TN Dept. of Agriculture with generation of 319 Watershed Plans and restoration activities.

Water Risk of US Bulk Power System Assets: Current and Future

High Level Summary

Project Description

This project aims to improve the reliability and resilience of the power sector by enabling utilities to evaluate impacts and risks associated with water resources. We will create an analysis platform that can provide environmental and economic benefits by aiding short-term operational and long-term investment decisions.

Value Proposition

- ✓ Water shortage, temperature, flood, and regulatory burdens can affect reliable and economic operation of the power sector.
- ✓ There is no standardized, consistent mechanism for utilities to evaluate water-related impacts and risks of current grid assets and future investments.
- ✓ This project builds on prior successful GMLC, NSF, and EPRI work to create a national-scale analysis platform enabling utilities to evaluate water-related impacts and risks of their existing or new grid assets.
- ✓ This project will perform unique model linkages across existing tools to provide insights that can improve near-term and long-term decision-making and increase grid reliability.

Project Objectives

- ✓ Create a national-scale water risk analysis platform for existing and future assets
- ✓ Address impacts and risks related to water shortage, water temperature, flooding, and discharge limits
- ✓ Leverage state-of-the-art advancements in hydrology, and power system modeling
- ✓ Improve grid reliability and asset investments

Team Partners

- Lead-Jordan Macknick, NREL
- NREL: Ariel Miara, Stuart Cohen, Jon Weers
- SNL: Vince Tidwell
- NETL: Tim Skone, John Brewer
- ORNL: Henriette Jager, Brennan Smith
- Utility Partner – Nalini Rao, EPRI, TVA
- Other partner-C Vorosmaty, City University of New York
- Unfunded partners: WECC, ERCOT, NYISO, MISO, PJM
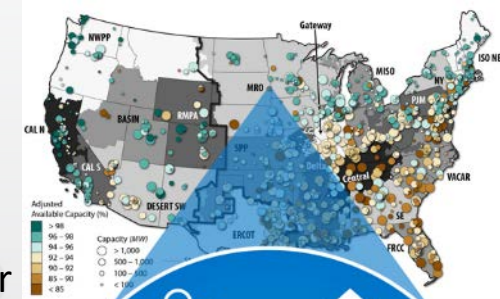
At-risk species management   Aquatic invasive species

Biodiversity discovery