

Title Assistant Professor
First Name Dave
Middle Name
Last Name Lytle
Institution OSU
Department Zoology

9/6/2007
Permission date



Photo

Email lytle@science.oregonstate.edu

Phone 541-737-1068

Website

<http://www.science.oregonstate.edu/lytlelab/>

Research Fields

- Atmospheric chemistry
- Biogeochemistry
- Carbon Footprint Analysis
- Climatology
- Community & Disaster Planning
- Data Analysis & Statistical Modeling
- Ecology & Ecosystem Management
- Economics
- Energy policy & technology
- Ethics
- Fire
- Forestry & Forest Management
- Geographic Information Systems
- Horticulture
- Human Impacts - economics
- Human Impacts - health
- Human Impacts - policy
- Hydrology
- Impacts - agriculture & horticulture
- Impacts - ecosystems, populations
- Impacts - physical
- Instrumentation
- Mitigation Policy
- Modeling Climate
- Modeling Ecosystems
- Modeling Socioeconomic Processes
- Natural Resource Policy & Planning
- Outreach & Engagement
- Paleoclimatology
- Paleoecology
- Physical Ecology
- Physiological Ecology
- Urban Ecology
- Water Policy & Planning
- Other...

Specific Research Interests

Our lab uses evolutionary ecology to understand how aquatic organisms are shaped by disturbances such as floods, droughts, and dams. Empirically most of our focus is on aquatic insects, but lab members also work on projects involving riparian trees and freshwater fish.

We have ongoing studies in Arizona, Mexico, and the Pacific Northwest. Current projects examine the evolution of flood escape behaviors, island biogeography of desert aquatic insect communities, management of dammed rivers using prescribed flow regimes, and the evolution of body size in aquatic insects.

Projects

Disturbance regimes and life history evolution

Disturbance events such as flood, drought, fire, and disease outbreaks are powerful forces that can shape both the ecology and evolution of organisms. Flash floods are an extreme example of disturbance – in some desert streams flash floods remove over 95% of aquatic insect larvae. The giant water bug *Abedus herberti* has evolved a strategy for escaping flash floods: they sense the rainfall that often precedes floods and use this as a cue to temporarily abandon streams. Using mtDNA sequences, we have identified over 30 distinct populations of *Abedus herberti* across the Madrean Sky Islands of Arizona and Sonora. These populations occupy streams with flood regimes that range from mild (flash floods never occur) to severe (several scouring floods per year). Funded by NSF and based out of the AMNH Southwestern Research Station, Portal, AZ, we're using this as a model system to determine how populations adapt to local flood regimes, and whether enough genetic variation is present for populations to adapt to altered flood regimes due to climate change, dams, and other factors.

Insect identification using pattern recognition technology

Insects are overwhelmingly diverse. While the need to identify insects (for environmental monitoring, agricultural needs, biodiversity surveys) is on the increase, the prohibitive amount of time and expertise required to identify insect samples is the bottleneck that limits data collection. As part of an NSF-funded collaboration among computer scientists, engineers, and entomologists at OSU, we are developing pattern recognition algorithms for computer-aided insect identification. Using stoneflies and soil mites as test cases, we are building a digital image library from known specimens. Statistical algorithms will use this image library to identify new specimens. Rather than replace the need for traditional insect taxonomy, these methods should facilitate the use of insects for ecological monitoring.

Madrean Sky Island aquatic community biogeography

The Madrean Sky Islands Bioregion (MSI) of the southwestern United States and northwestern Mexico contains many fragmented stream habitats, isolated from one another by miles of dry desert. Additionally the area is situated at the biogeographic confluence of the neotropical and temperate regions, and contain a fascinating mix of aquatic insect species from both regions. Aquatic insect diversity is extremely high in these small, fragmented streams. We are examining how habitat size and isolation is related to insect diversity and community composition and also how seasonal and annual variation in flow may help to support high aquatic insect diversity.

River management using prescribed flow regimes

Bill Williams River, Arizona

Selected Recent Publications

2007. Finn, D. S., M. Blouin, D. A. Lytle. Population genetic structure reveals terrestrial affinities for a headwater stream insect. *Freshwater Biology*. DOI: 10.1111/j.1365-2427.2006.01647.x.
2007. Bogan, M. T. and D. A. Lytle. Seasonal flow variation allows 'time-sharing' by disparate aquatic insect communities in montane desert streams. *Freshwater Biology* 52: 290-304.
2007. Lytle, D.A., & N. J. White. Rainfall cues and flash-flood escape in desert stream insects. *Journal of Insect Behavior* 20:413-423.
2007. Hall, S. R., M. A. Leibold, D. A. Lytle, V. Smith. Grazers, producer stoichiometry, and the light: nutrient hypothesis revisited. *Ecology* 88(5): 1142-1152.
2007. Larios, E., H. Deng, W. Zhang, M. Sarpola, J. Yuen, R. Paasch, A. Moldenke, D. A. Lytle, S. R. Correa, E. Mortensen, L. Shapiro, T. Dietterich. Automated insect identification through concatenated histograms of local appearance features: feature vector generation and region detection for deformable objects. *Machine Vision and Applications*. DOI 10.1007/s00138-007-0086-y.
2007. E. N. Mortensen, E. L. Delgado, H. Deng, D. Lytle, A. Moldenke, R. Paasch, L. Shapiro, P. Wu, W. Zhang, T. G. Dietterich. Pattern Recognition for Ecological Science and Environmental Monitoring: An Initial Report. pp.189-206 in N. MacLeod (Ed.) *Automated Taxon Identification in Systematics: Theory, Approaches and Applications*. CRC Press, Boca Raton.
2007. Larios, E., H. Deng, W. Zhang, M. Sarpola, J. Yuen, R. Paasch, A. Moldenke, D. A. Lytle, S. R. Correa, E. Mortensen, L. Shapiro, T. Dietterich. Automated insect identification through concatenated histograms of local appearance features. *IEEE Workshop on Applications of Computer Vision*. DOI 10.1109/WACV.2007.13.
2006. Hall, S. R., M. A. Leibold, D. A. Lytle, V. Smith. Inedible producers in stoichiometrically-explicit food webs: inter-trophic competition and controls on food quality for grazers. *American Naturalist* 167 (5): 626-635.
2005. Hall, S. R., V. Smith, D. A. Lytle, M. A. Leibold. Constraints on primary producer N:P stoichiometry along N:P supply ratio gradients. *Ecology* 86(7): 1894-1904.
2004. Lytle, D. A. and N. L. Poff. Adaptation to natural flow regimes. *Trends in Ecology and Evolution* 19 (2): 94-100. Assembles known examples of plants and animals that have evolved life history, behavioral, or morphological traits for surviving flood or drought, and discusses what these adaptations mean for stream and river conservation.
2004. Lytle, D. A. and D. M. Merritt. Hydrologic regimes and riparian forests: a structured population model for cottonwood. *Ecology* 85(9): 2493-2503. Describes a modeling approach that can be used to understand how different cycles of flood and drought affect long-term population dynamics of cottonwood forests.
2004. Lytle, D. A. and R. L. Smith. Exaptation and flash flood escape in the giant water bugs. *Journal of Insect Behavior* 17(2): 169-178. Describes how flood escape behavior was coopted from an ancient (>150 m.y. old) migratory behavior.
2004. Hall, S. R., V. H. Smith, D. A. Lytle, and M. A. Leibold. Stoichiometry and planktonic grazer composition over gradients of light, nutrients, and predation risk. *Ecology* 85(8): 2291-2301. Results of a mesocosm experiment that explores species sorting of zooplankton communities across ecological conditions (light, nutrients, predators) observed in natural ponds.

Professional Activities