Graduate Program at the University of Toledo: Environmental Sciences

Graduate teaching and research fellowships in Biology-Ecology (M.S. and Ph.D.) and Geology (M.S.) are available in the Department of Environmental Sciences (DES) at the University of Toledo. Typical annual (12 month) assistantship stipends are $15,000 (M.S.) and $20,000 (Ph.D.) plus a tuition waiver. In addition, DES has an active NSF GK-12 program that provides a $30,000 annual stipend to several senior graduate students each year for research at the land-lake ecological interface involving local schoolteachers.

Inaugurated in July 2000, our department provides students with exciting opportunities in interdisciplinary research directed by internationally recognized faculty in ecology and geology in collaboration with colleagues in geography, environmental law, engineering and other fields of study.

Information about our entrance requirements, degree programs, course offerings, faculty members, and departmental resources can be found at: http://www.eeescience.utoledo.edu and http://gradschool.utoledo.edu.

DES is an interdisciplinary department with 22 faculty specializing in ecosystems, earth surface processes, and human impacts on the environment. The detailed descriptions for each research lab can be found at: http://www.utoledo.edu/nsm/envsciences/pdfs/research-labs.pdf.

Biology research interests include terrestrial/aquatic ecosystem and landscape ecology, ecosystem sustainability, wetlands, fish ecology, invasive species, agroecology, bioremediation, global change, bioenergy and environmental microbiology. Geology research interests include glacial geology, near surface geophysics, remote sensing/GIS, coastal systems, hydrogeology, and environmental geochemistry and soil sciences. The University of Toledo is an urban university with rapid access to major transportation hubs such as the Detroit Airport, and is a **Carnegie Foundation Doctoral/Research University** and a member of Ohio's State University System. The beautiful main campus is located in an outlying residential area of the city. After its merger in 2006 with the Medical University of Ohio, the university is now the third largest public university in the state.

The university is recognized as a prominent academic center for environmental education and research in Ohio and the Great Lakes region, and was recently named a statewide Center of Excellence in Advanced Renewable Energy and the Environment. The nearby glacial terrains and agricultural/urban ecosystems, interacting with local rivers and Lake Erie's productive fisheries and wetlands, combined with the remarkable diversity of Oak Openings savannas and woodlands make the Greater Toledo area an ideal natural laboratory for studies in ecology, geology, and environmental sciences. We have access to a wide array of field sites and modern research facilities, including the Lake Erie Center on Maumee Bay, the Stranahan Arboretum in Toledo, and the Plant Science Research Center on the main campus.

When applying for admission to the graduate program in DES, international students must take one of two exams with a spoken English component, provided they are available in their area: either (1) the 'iBT' (internet-Based Test) version of the TOEFL (Test of English as a Foreign Language), or (2) the IELTS (International English Language Testing Service) exam. Of the two exams, the TOEFL-iBT is preferred. For the TOEFL, the university considers accepting students with a minimum score of 80 on the internet-based exam, 230 on the computer based exam and 550 on the paper exam. For the IELTS, the minimum score acceptable is 6 (out of a possible 9).

For more information concerning the admission process, please contact Dr. Von Sigler (von.sigler@utoledo.edu), and for information concerning graduate curriculum and advising, please contact Dr. Scott Heckathorn (scott.heckathorn@utoledo.edu). The University of Toledo is an Equal Access, Equal Opportunity, Affirmative Action Employer & Educator. Applications received by March 30 will be given full consideration.

Western Lake Erie Limnology Laboratory: Dr. Thomas Bridgeman

Research in Dr. Bridgeman's laboratory focuses on environmental problems in western Lake Erie including Harmful Algal Blooms (HABs) and episodes of low oxygen (hypoxia) near the lake bottom. Because of its shallow depth, the ecology of western Lake Erie is highly influenced by weather and by nutrient and sediment inputs from the nearby Maumee River. Projects in Dr. Bridgeman's lab usually involve frequent sampling trips on Maumee Bay and the lake in order to characterize and understand the lake's response to changing weather conditions and inflow from the Maumee River.

Current Projects

Lake Erie Algal Source Tracking: In recent years, blooms of the toxic blue-green alga *Microcystis* have become a yearly occurrence during summer months. This project seeks to determine the potential sources of *Microcystis* that provide the "seed" for reoccurring blooms. This project is funded by the US EPA and includes collaborators from U. Toledo (Aquatic Ecology Lab and Engineering), OSU, the National Center for Water Quality Research, and Defiance College.

Remote Sensing of Algal Blooms: This project explores the capability to identify and quantify algal blooms in Maumee Bay using new remote sensing technologies mounted on tethered balloons or small aircraft. The project is funded by the US Army and collaborators include the University of Cincinnati

Bobbing for Benthos: The development of low oxygen (dead) zones in central and western Lake Erie can cause stress for fish that need to dive into the hypoxic layer to forage on the bottom. This project uses a protein marker to measure the physiological stress of environmental hypoxia in yellow perch and their behavioral response. Project funded by Ohio Board of Regents.

Biofuels from Algae: This project explores the potential use of Lake Erie algae to produce biofuels. Project goals are to grow cultures of algal species from Lake Erie and perform experiments that will lead to optimized growth and fuel characteristics.

Some Recent Publications

Rinta-Kanto, J.M., A.J.A. Ouellette, M.R. Twiss, G.L. Boyer, T.B. Bridgeman, and S.W. Wilhelm. 2005. Quantification of toxic *Microcystis* spp. during the 2003 and 2004 blooms in Western Lake Erie. *Environmental Science and Technology* 39, 4198-4205.

Schloesser, D.W., R.G. Stickel, and T.B. Bridgeman. 2005. Potential oxygen demand of sediments from Lake Erie. *Journal of Great Lakes Research.* 31 (Suppl. 2) 272-283.

Bridgeman, T.B., D.W. Schloesser, and A.E. Krause. 2006. Recruitment of *Hexagenia* mayfly nymphs in western Lake Erie linked to environmental variability. *Ecological Applications,* 16:601-611.

Ruberg, S., S. Brandt, R. Muzzi, N. Hawley, T. Bridgeman, G. Leshkevich, and T. Miller. 2007. A wireless real-time coastal observation network. *EOS, Transactions, American Geophysical Union.* 88, 285-286.

Moorhead, D., T. B. Bridgeman and J. Morris. 2008. Changes in Water Quality of Maumee Bay 1928-2003. In M. Munawar and R. Heath (eds.) Checking The Pulse of Lake Erie. *Aquatic Ecosystem Health and Management Society - Ecovision World Monograph Series*. pp 123-158.

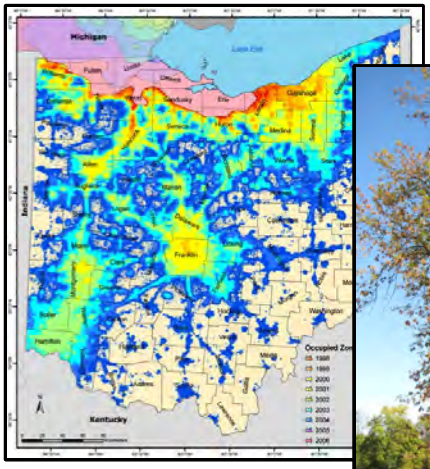
H. Wang, C, Gruden, T. Bridgeman, and J. Chaffin. Detection and Quantification of *Microcystis* Spp. and Microcystin-LR in Western Lake Erie during the Summer of 2007. *Water Science and Technology* (in press)

Applied Spatial Ecology Lab

THE UNIVERSITY OF TOLEDO 1872

Lake Erie Center

The Applied Spatial Ecology Lab, directed by Dr. Jon Bossenbroek, utilizes the theories and concepts of landscape ecology to address applied issues, such as invasive species biology and conservation biology. The investigative approach of this lab is based primarily on predictive and geostatistical modeling and then linking these predictions with field and laboratory studies. Through this approach we are currently undertaking projects on zebra mussels, emerald ash borer, yellow perch in Lake Erie, darters in the Ohio River basin and the phytoremediation of contaminated soils.



Current research projects:

Bioeconomics of invasive species -

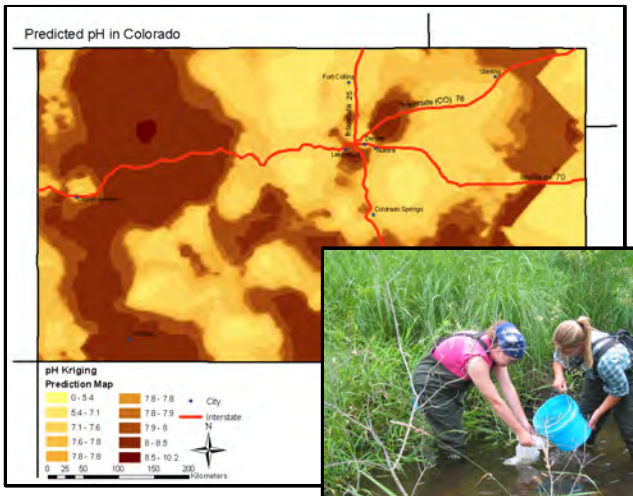
- Predicting the potential habitat and dispersal of zebra and quagga mussels. We examine regional and continental patterns of spread of these species.
- Emerald ash borer. We are working with an economist, landscape ecologist and urban forester to assess the value of slowing the spread of the emerald ash borer.
- Viral Hemorrhagic Septicemia (VHS). What are the potential vectors of spread and habitat of this disease?

Landscape ecology of native fishes:

- Yellow perch in the western basin of Lake Erie. In collaboration with Dr. Chris Mayer, we are examining the relationship between turbidity and the distribution and abundance of young-of-the-year yellow perch.
- Niche partitioning of darter species within riffles throughout the Ohio River basin. We are examining how community patterns of darters shift in different landscape contexts.

Phytoremediation:

- In collaboration with Dr. Daryl Dwyer and Dr. Kevin Czajkowski we are examining how rates of arsenic adsorption to soils change depending on the scale of the experiment from the lab to mesocosms.



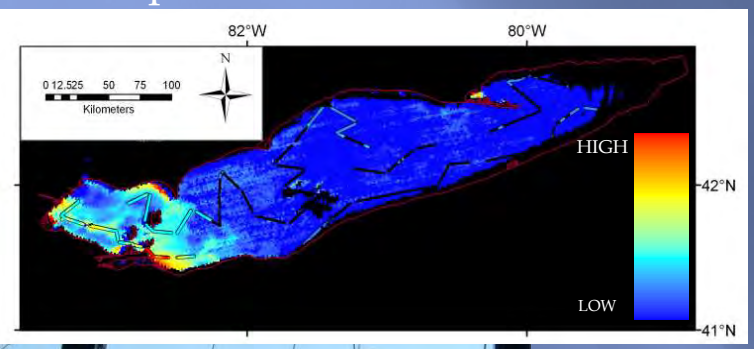
Selected Publications:

- Bossenbroek, J.M., L.E. Johnson, B. Peters and D.M. Lodge. 2007. Forecasting the expansion of zebra mussels in the United States. *Conservation Biology* 21:800-810.
- Bodamer, B. and J.M. Bossenbroek. 2008. Wetlands as barriers: Effects of vegetated waterways on downstream dispersal of zebra mussels (*Dreissena polymorpha*). Freshwater Biology 53:2051–2060.
- Bossenbroek, J.M., D. Finnoff, J. Shogren and T.W. Warziniack. 2009. Advances in ecological and economical analysis of invasive species: dreissenid mussels as a case study. In Bioeconomics of Invasive Species: Integrating Ecology, Economics and Management (eds. Keller, Lodge, Lewis, and Shogren). Oxford University Press.
- Jerde, C. and J.M. Bossenbroek. 2009. Uncertain Invasions: A biological perspective. In Bioeconomics of Invasive Species: Integrating Ecology, Economics and Management (eds. Keller, Lodge, Lewis, and Shogren). Oxford University Press.

Jonathan Bossenbroek, Department of Environmental Sciences/Lake Erie Center, University of Toledo, Toledo, OH 43606
Phone: 419-530-8376, Fax: 419-530-8399, Email: Jonathan.Bossenbroek@utoledo.edu

ENVIRONMENTAL REMOTE SENSING LAB

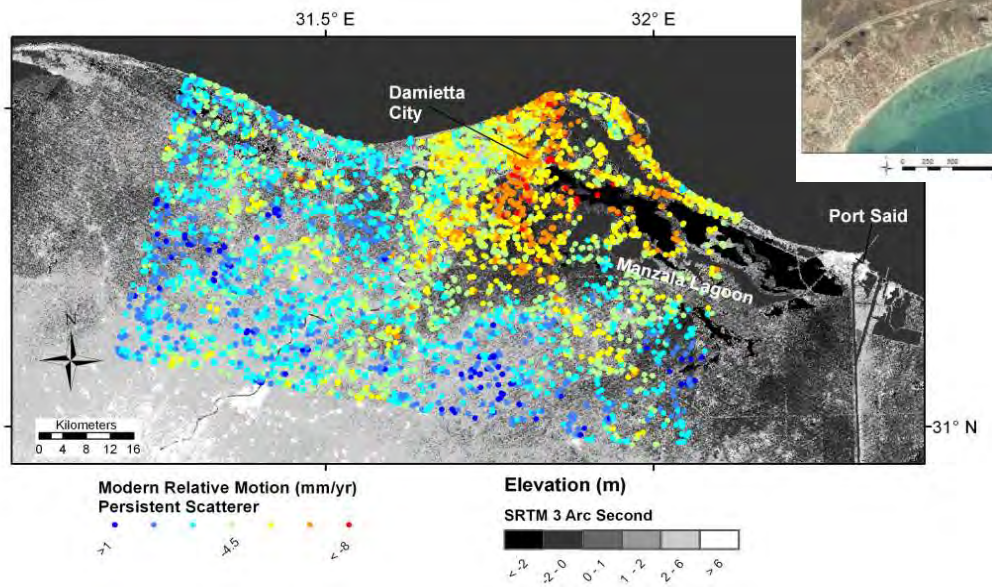
Research at the Environmental Remote Sensing Lab @UT is based on investigations of water resources, and human-environment interactions. Satellite monitoring tools are used in combination with more traditional geologic, geochemical, and geophysical approaches. These techniques are integrated using Geographic Information System (GIS) techniques.



Recent and ongoing projects include :

- Mapping potentially toxic algal blooms on the Laurentian Great Lakes
- Measuring subsidence in the Nile Delta using radar satellites
- Determining climate inputs for Nile River flow volumes
- Identifying renewable groundwater resources in the middle east
- Studying dune migration in Cape Cod National Seashore
- Modeling land use effects on

2001 Air Photo composite



Contact info:

Dr. Richard Becker

richard.becker@utoledo.edu

(419) 530 4571

Landscape Ecology & Ecosystem Science (LEES) Lab

The LEES Lab, directed by Dr. Jiquan Chen at the University of Toledo, was established to conduct scientific research and education on carbon & water cycle, biological diversity, microclimate, ecosystem responses to climate change, fire and other natural disturbances in managed landscapes, pattern-process relationship at various spatial and temporal scales, biomass production and biofuel energy, sustainable management based on sound field experiments, state-of-the-art of technology, modeling, and remote sensing products. LEES is also the headquarters of UT's CESU Team, the Landscape Ecology Working Party of the IUFRO (8.01.02), US-China Carbon Consortium (USCCC), and UT's NEON Team. LEES has been supported by NSF, LULCC/NASA, GLBRC/DOE, MDC, JFSP, USDA Forest Service, OBOR, and others for its research.

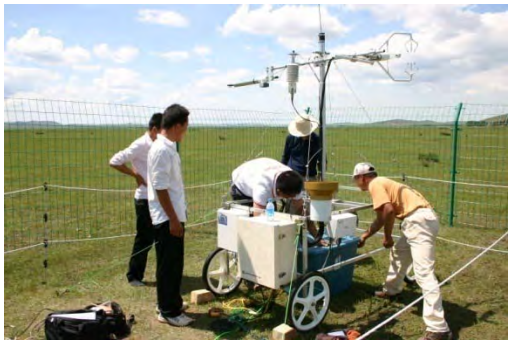
The LEES Lab collaborates with many leading institutions worldwide (e.g., Michigan State University, USDA Forest Service , Fudan University, Chinese Academy of Sciences, Mongolian Academy of Sciences, University of Bari) and hosts frequent visits of scholars and students worldwide

Major Research Projects:

Great Lakes Bioenergy Center (GLBRC)
sing the cluster of 7 eddy-covariance flux towers established *at* the experimental biofuel systems established at the Kellogg Biological Station (KBS), *we team up with other researchers* to develop a first-hand capability and field database to explore the underlying mechanisms for ecosystem-level biofuel production and soil carbon sequestration at multiple temporal scales.

Northern Eurasian Earth Science Partnership Initiative (NEESPI)
Within NEESPI, LEES Lab focuses on examining the land-use, climate change, socioeconomic shift on natural and human ecosystems on the Mongolia Plateau. We analyze current and historic changes of land cover and land use, shifts in biome boundaries and changes in carbon, water and energy balances, and their importance to ecosystem function across the plateau.

Missouri Ozark Forest Ecosystem Project (MOFEP)
As a MOFEP partner, the LEES Lab aims at developing scientifically sound methods to estimate carbon credits for Ozark landscapes. Key questions are: How much carbon do Ozark forests sequester? How will climate change or alternative management scenarios affect carbon stocks? Predictions from our long-term investigations will help legislators evaluate Missouri's position in the context of national and international carbon trading. This will influence future management plans for the Ozark Forests, and is likely to influence the economic development of private and public sectors in MO.



Selected Publications (200+):

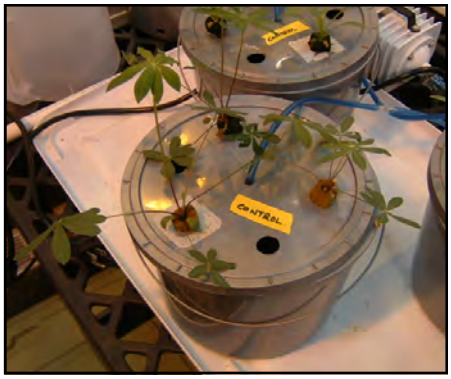
- Lu, N, B Wilske, J Ni, R John, & J Chen. 2009 Characteristics of climate change in Inner Mongolia over the past 50 years. *Environmental Research Letters* (in press).
- Noormets, AM Gavazzi, SMcNulty, G Sun, JC Domec, J King, & J Chen. 2009. Resilience of carbon fluxes to drought in a coastal plain loblolly pine forest. *Global Change Biology* (in press)
- Concilio, A, J Chen, S Ma, & M North. 2009. Precipitation drives interannual variation in soil respiration in an experimental forest. *Climatic Change* 92: 109-122.
- Lafortezza,R, J Chen, G Sanesi, & TR Crow (eds). 2008. Patterns and Processes in Forest Landscapes. Springer-Verlag, 425pp.
- Li, L, J Chen, JL DeForest, R Jensen, DL Moorhead, & R Henderson. 2007. Effects of timber harvest on carbon pools in Ozark forests. *Canadian Journal of Forest Research* 37: 2337-2348.

Landscape Ecology & Ecosystem Science (LEES), Department of Environmental Sciences (DES), University of Toledo , Toledo, OH 43606-3390
Lab Phone: 419-530-2246 ; Fax: 419-530-4421 ; Web: http://research.eeescience.utoledo.edu/lees/index.htm

Environmental Remediation and Restoration Laboratory (ERRL)

Our mission is to investigate ecological and environmental principles to develop sustainable technologies that can be used to remediate human-induced environmental contamination and restore native habitat at ecologically degraded sites.

The Environmental Remediation and Restoration Laboratory at the University of Toledo is under the direction of Dr. Daryl Dwyer, Associate Professor of Ecology. Research objectives of the lab encompass modeling and understanding the interactions of soil, water, and plants and restoring converted or degraded sites to native habitat with sustainable design as a remediation goal. Current and past funding has come from United States Department of Agriculture, Natural Resources Conservation Service, Ohio Department of Natural Resources, Lake Erie Protection Fund, and Toledo Metropolitan Area Council of Governments.



Current Projects include:

- The modeling and design of treatment wetlands to remove chemical contaminants, such as arsenic and other heavy metals, from water and soil
- The design of alternative landfill covers that rely on evapotranspiration to control leachate formation in older landfills such as those that are prevalent in Northwest Ohio
- The characterization of hydrodynamic, meteorlogical, and watershed variables in the fate and transport of bacterial and viral pathogens at the public swimming beaches of Maumee Bay for the development of a passive biological treatment system

Our Facilities include:

- The newly constructed Environmental Remediation and Restoration Experimental Park (ERREP) at the Stranahan Arboretum, which includes 12 cylindrical, stainless steel lysimeters and 6 dividable wetland mesocosms available by request
- Soil and microbial laboratory facilities at the Lake Erie Center, within close proximity to agricultural study sites and remedial investigation sites
- Laboratory and office space at the University of Toledo main campus, with instrument collaboration and greenhouse space from the local USDA laboratory and other university researchers

FOR MORE INFORMATION, PLEASE CONTACT DR. DARYL DWYER

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Toledo, OH 43606

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Fax: 419-530-4421 or 419-530-8399
E-mail: daryl.dwyer@utoledo.edu
www.utoledo.edu/as/lec/research/errl

Glacial Lake and Sediment Science Lab

THE UNIVERSITY OF TOLEDO 1872

Our goal is to reconstruct proglacial lakes, understand the origin of glacial landscapes, the deglaciation history of the Great Lakes, and the chronology of Great Lake coastal sand dunes and lake level variability

GLASS Lab

Dr. Timothy Fisher

rm BOL 3094, 419-530-7760, -2883
timothy.fisher@utoledo.edu

blow-outs & parabolic dunes northern SA, Canada

coring a bog, Michigan

lake coring, Michigan

Recent Graduates:

Melinda Campbell M.S. (2009): Surficial geology mapping of the dune-dominated Whitehouse 7.5' Quadrangle.

Mario Castaneda M.S. (2009): The Origin and Dynamics of Coastal Processes at Sand Point, Pictured Rocks National Lakeshore, MI.

Brittany Fussell M.S. (2007): Late Wisconsinan history and molluscan paleoecology of Stony and Silver Lakes, Oceana County, MI, USA.

Mathew Weller B.S. (2007): Feasibility Study of Mapping Continuous Strandlines Across the Southeast Lake Agassiz Basin.

Henry Loope (2006): Deglacial chronology and glacial stratigraphy of the western Thunder Bay Lowland, Northwest Ontario, Canada.

drained glacial lake with stranded icebergs, Iceland

Recent Funding:

NSF, USGS, EDMAP, Comer Science & Education Foundation

Field & Laboratory Equipment:

25' pontoon boat, zodiac boat, 4x4 truck, vibracorer, Livingstone piston corer with hydaulic assist, GPR & other geophysics equipment (seismic, resistivity), dissecting scope with camera, magnetic susceptibility meter, laser grain size machine.

Recent Publications:

Hansen, E.C., Fisher, T.G., Arbogast, A.F., Bateman, M., 2009. Geomorphic History of Low Perched, Transgressive Dune Complexes Along The Southeastern Shore of Lake Michigan. J. Aeolian Research, in press.

Weller, M.B. and Fisher, T.G., 2009 Feasibility Study of Mapping Continuous Strandlines Along the Southeast Lake Agassiz Basin, Journal of Maps, v2009, 165-165.

Lowell, T.V., Fisher, T.G., Hajdas, I., Glover, K. *Loope, H.M. *Henry, T. 2009. Radiocarbon Deglaciation Chronology of the Thunder Bay, Ontario Area and Implications for Ice Sheet Retreat Patterns. Quat. Sci. Rev. 28: 1597-1607.

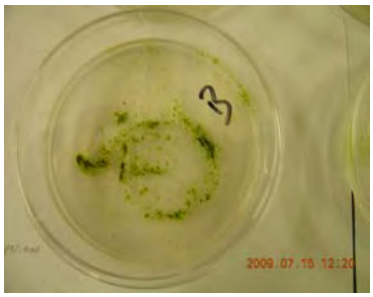
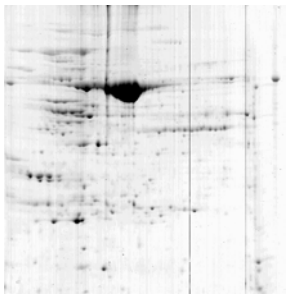
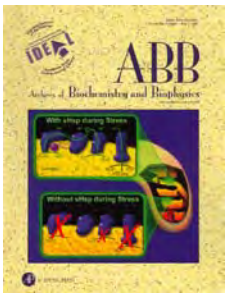
Fisher, T.G., Waterson, N., Hajdas, I. Lowell, T.V. 2009. Deglaciation Ages and Meltwater Routing in the Fort McMur ray Region, northeastern Alberta and northwestern Saskatchewan, Canada. Quat. Sci. Rev. 28: 1608-1624.

PLANT ECOLOGICAL PHYSIOLOGY & BIOCHEMISTRY LABORATORY

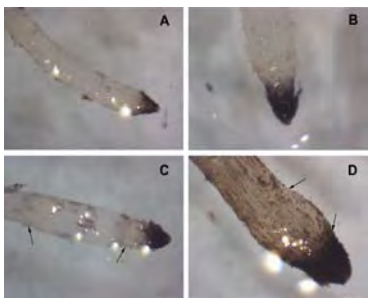
Dr. Scott Heckathorn
Associate Professor, Dept. of Environmental Sciences, University of Toledo
Email: Scott.heckathorn@utoledo.edu; phone: 419-530-4328

My research interests are in plant, and more recently algal, ecological physiology and biochemistry, stress physiology and stress proteins (especially heat-shock proteins, or HSPs), photosynthesis and respiration, and nutrient relations. Most of our lab's current and recent research is focused on:

(1) effects of global environmental change (CO_2, nitrogen, mean temperature, drought) on tolerance and adaptation of plants to acute heat stress (especially photosynthesis and HSPs, root function, and plant productivity) [funding: U.S. National Science Foundation];
(2) patterns, functional consequences, and causes of natural variation in protection of metabolism by small HSPs [funding: U.S. National Science Foundation];
(3) identifying and developing protein biomarkers for early detection of nutrient deficiency and toxicity in plants [funding: U.S. Dept. of Agriculture, USDA];
(4) investigating effects of abiotic factors on algal physiology as a means to understand causes of algal blooms in the Great Lakes [funding: NOAA SeaGrant & Ohio Lake Erie Commission];
(5) investigating the potential use of freshwater algae from the Great Lakes in biofuel production [funding: USDA & U.S. Air Force via CIFT].





Aquatic Ecology Laboratory: Dr. Christine Mayer

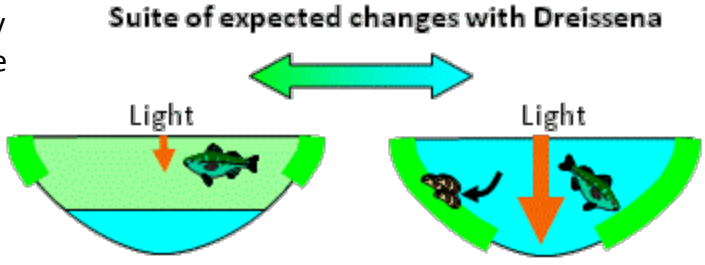
Research in Dr. Christine Mayer's laboratory focuses on aquatic ecology, including: fish and invertebrate ecology, organism-habitat modification (ecosystem engineering), and introduced species effects. Researchers in this lab conduct experiments , field surveys, and long-term data analysis to investigate large scale patterns in nature and to understand underlying ecological mechanisms. An emphasis is placed on training students to become independent scientists.

Current Projects

Effects of turbidity on yellow perch feeding ecology: Turbidity can be comprised primarily of sediment or phytoplankton. This project aims to understand the effects of different types and quantities of turbidity on fish foraging using experiments and spatial modeling. Funded by the Great Lakes Fishery Commission in collaboration with Bossenbroek Lab.

Effects of Bay Shore power plant on ecosystem function in Maumee Bay: We will assess the power plant's potential effect on larval fish exiting the Maumee River and algal blooms which may be intensified by warm water discharge. We will also address questions of basic ecosystem function in this highly sensitive and human-impacted area. Funded by NOAA Sea Grant.

Effects of *Dreissena* on lake ecology: This is an ongoing research theme in the lab. *Dreissena* modify both water column and bottom habitat and therefore affect organisms across trophic levels. Individual projects address ecological interactions with fish, invertebrates and benthic algae. *Dreissena* have strong localized effects on invertebrates including mayfly larvae and possibly on algae such as *Lyngbya*. Funding provided by NOAA Sea Grant and the Lake Erie Protection Fund.



Some Recent Publications

- Cecala, R.K., Mayer, C.M., Mills, E.L. and Schulz, K.L. 2008 Increased benthic algal primary production in response to zebra mussel (*Dreissena polymorpha*) invasion in Oneida Lake. Journal of Integrated Plant Biology 50:1452-1466.
- Zhu B., Mayer C.M., Rudstam L.G., Mills E.L., Ritchie M.E. 2008. Experimental examination of light and phosphorus effects on submerged macrophytes: implications for ecosystem changes in North American lakes. Aquatic Botany 88: 358-362.
- Lohner R. N., Sigler W.V., Mayer C.M., and Balogh C. 2007. A comparison of the benthic microbial community within and surrounding *Dreissena* clusters in lakes. Microbial Ecology 54:469-477.
- Qin, P Mayer C.M., Schulz K.L., Ji X. and Ritchie M. 2007. Ecological stoichiometry in benthic food webs: light and nutrients effects on periphyton food quantity and quality in lakes. Limnology and Oceanography. 52: 1728-1734.
- Zhu B., Fitzgerald D.G., Hoskins S.B., Rudstam L.G., Mayer C.M., and Mills E.L. 2007. Quantification of response of submerged aquatic vegetation to historical changes in water clarity in two bays of Lake Ontario. Journal of Great Lakes Research 33:122-135.
- Zhu B., Fitzgerald D.M., Mayer C.M., Rudstam L.G., and Mills E.L. 2006 Alteration of ecosystem function by zebra mussels in Oneida Lake, NY: impacts on submerged macrophytes. Ecosystems 9:1-12.

Wetlands Ecology
Department of Environmental Sciences
The University of Toledo

Wetlands ecology studies the relationships between organisms and their wetland environment. It has grown from a basic science to an applied discipline, increasingly called on to help solve environmental problems. As a result, wetlands ecology combines a traditional biology with engineering, hydrology, geology, environmental chemistry and other disciplines. Students in the wetlands program, directed by Dr. Hans Gottgens, use this approach in their research projects. The lab is currently pursuing three research directions:

Pulse Stability in Wetlands

Succession in aquatic systems is often controlled by periodic perturbations, such as fluctuating water levels, drought, fire, grazing or tides. These perturbations remove organic matter and liberate nutrients. As such, they help maintain these ecosystems at an intermediate stage in their successional development. Water managers, however, generally aim to eliminate these disturbances, because they interfere with the use of aquatic habitat for water supply, navigation, recreation and aquaculture. Students test hypotheses relative to the long-term impact of eliminating or altering such a pattern of pulsed stability in lakes and wetlands.

Human impacts on Rivers and Streams

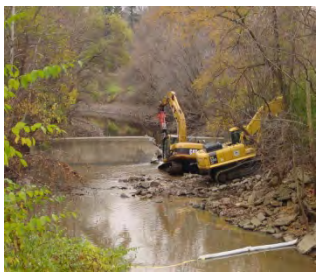
Rivers and streams are among the most impacted ecosystems. They are used as conveyors of pollutants and have been dredged, dammed, ditched or diked. The majority of 1st and 2nd order streams, making up a stunning 75% of the total length of U.S. streams and rivers, have communities that no longer resemble their natural condition. Moreover, they have lost their ability to provide us with 'free' ecosystem services such as water quality protection and flood control. Students research stream management methods that incorporate environmental considerations, including dam removal to restore fish migration and ditch maintenance to promote conservation.

Paleolimnological Approaches to Restoration

To understand the response of lakes, rivers and wetlands to anthropogenic actions requires long-term records of environmental data. Because such historical data are usually absent, stratigraphic analysis of sedimentary records and the mechanisms that can modify those records (i.e., paleolimnology) may be used. The lab has published paleo-limnological research on lake and wetland responses to water-level manipulations, development in the watershed, loading of agricultural non-point pollution, dam failures, and long-term contamination with toxics.

Current Projects

- Design of a wetland treatment system for arsenic. Evaluation of the fern *Azolla caroliniana* to phytofiltrate arsenic from contaminated water *(graduate research Alex Duncan - sponsor USDA)*
- Incorporating ecological principles into stream management. The effect of channel heterogeneity on fish communities in agricultural streams in the Sandusky drainage, Ohio *(graduate research Justin Selden - sponsor U.S. EPA)*
- Impact of habitat variables on the distribution of unionid mussels, with emphasis on the rayed bean (*Villosa fabalis*) *(graduate research Jeff Grabarkiewicz - sponsor Lake Erie Protection Fund)*
- Agricultural streams in Ohio as spawning habitat by native fishes: Impact of habitat heterogeneity (graduate research Nate Tessler - *sponsor U.S. EPA)*
- A multiscale analysis of *Etheostoma* darter habitat in the Ohio River Basin *(graduate research Todd Crail – co-directed)*
- Effect of a low-head dam removal on the fish community in a Great Lakes tributary *(group project – sponsor Ohio EPA)*
- Inquiry masters program advancing content for teachers (IMPACT): Providing in-service to high school science teachers in Toledo public schools *(sponsor U.S. Department of Education)*



Selected Publications

- Evans, J.E. and J.F. Gottgens. 2007. Contaminant stratigraphy of the Ballville Reservoir, Sandusky River, NW Ohio: Implications for dam removal. *Journal of Great Lakes Research* 33(2): 182-193
- Gottgens, J.F. and J.E. Evans. 2007. Dam removals and river channel changes in Ohio: Implications for Lake Erie sediment budgets and water quality. *Journal of Great Lakes Research* 33(2): 87-89
- Roberts, S.J., J.F. Gottgens, A. L. Spongberg, J.E. Evans, and N.S. Levine. 2007. Assessing removal of low-head dams: An example from the Ottawa River, Ohio. *Environmental Management* 39(1): 113-124
- Fortney, R.H., M. Benedict, J.F. Gottgens, T. Walters, and B. Leady. 2004. Aquatic macrophyte communities along inundation gradients in two ecologically-distinct regions of the Brazilian Pantanal. *Wetlands Ecology and Management*. 12(6): 575-585
- Leady, B.S. and J.F. Gottgens. 2001. Mercury accumulation in sediment cores and along food chains in two regions of the Brazilian Pantanal. *Wetlands Ecology and Management* 9(4): 349-361
- Gottgens, J.F., J.E. Perry, R.H. Fortney, J. Meyer, M. Benedict, amd B.E. Rood. 2001. The Paraguay-Paraná Hidrovia: Protecting the Pantanal with lessons from the past. *BioScience* 51(4): 301-308

Dr. Hans Gottgens, Department of Environmental Sciences, MS 604 University of Toledo , Toledo, OH 43606
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The ANTS Lab

Over 50% of land area is in agriculture and understanding ecological processes within and conservation potential of different agricultural habitats is a key towards meeting conservation goals. We are also facing undoubted global change defined broadly as changes brought about by climate, land use, and invasive species. Incorporating both the relevance of the agricultural matrix and the economic, social, and cultural needs of communities living in agricultural landscapes, including at the edges of protected areas, are critical for promoting sustainability. Projects in the ANTS lab (Agroecology and NeoTropical Studies), directed by Dr. Stacy Philpott, span broad areas of both theoretical and applied ecology, all with the common goal of understanding fundamental ecological processes and protecting biodiversity and natural resources while contributing to sustainable communities.

Research Interests

Our current research focuses on four areas: 1) insect community ecology, 2) ecosystem services, 3) urban ecology, and 4) interactions between agriculture, conservation, and livelihoods. Our research activities include strong field components in agroecosystems and natural systems as they pertain to landscape-level questions, primarily in tropical regions and in urban landscapes. We are a diverse group including both international and undergraduate researchers, and have weekly lab meetings to discuss research ideas and current literature. We have strong collaborations with the U. of Michigan, and El Colegio de la Frontera Sur in Chiapas, Mexico.

Recent Publications

Moorhead L, Philpott SM, Bichier P. (in press) Epiphyte biodiversity in the coffee agricultural matrix: Canopy stratification and distance to forest fragments. *Conserv. Biol.*

Philpott SM, et al. (2009) Functional traits and ecosystem services: Bird predation on arthropods in tropical agroecosystems. *Ecol. Appl.* 19: 1858-186712.

Philpott SM, et al. (2008) Biodiversity loss in Latin American coffee landscapes: reviewing evidence on ants, birds, and trees. *Conserv. Biol.* 22: 1093-1105

Philpott SM, Lin BB, Jha S, Brines SA. (2008) A multi-scale assessment of hurricane impacts based on land-use and topographic features. *AGEE* 128: 12-20

Vandermeer, J, Perfecto, I, Philpott SM. (2008) Clusters of ant colonies and robust criticality in a tropical agroecosystem. *Nature* 451: 457-460

Philpott SM, Foster PF. (2005) Nest-site limitation in coffee agroecosystems: artificial nests promote maintenance of arboreal ant diversity. *Ecol. Appl.* 15: 1478–1485

Philpott SM, Dietsch T. (2003) Coffee and conservation: a global context and farmer involvement. *Conserv. Biol.* 17:1844-1846

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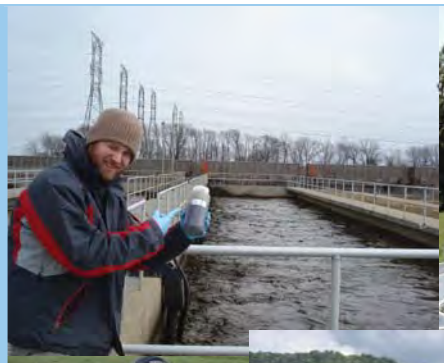
GEOCHEMICAL and ENVIRONMENTAL SOIL SCIENCE LABORATORY

DEPARTMENT OF ENVIRONMENTAL SCIENCES
UNIVERSITY OF TOLEDO




Anthropogenic influences on soils, sediments, water resources and biota have continued to be major topics of research around the world, and in our laboratory. The GESS lab strives to supplement current and develop new investigative approaches to geochemical and environmental questions. Our facilities and cross disciplinary approach allow for a mixture of laboratory and field experimentation on classic and emerging compounds and materials of interest. Students learn a variety of analytical techniques and have access to instrumentation not commonly found in other Environmental Science departments.

During a typical week you could be in field gear on Monday and Tuesday, a laboratory coat on Wednesday and Thursday, and at your desk analyzing your data on Friday.

Recent Projects

- Sorption and degradation of Pharmaceutical and Personal Care Pruducts in soils and biosolids
- Uptake of organic contaminants in aquatic and terrestrial plant species
- Occurrence and characterization of polycyclic aromatic hydrocarbons in marina sediments
- Characterization of heavy metals on contaminated sites
- Chemical evaluation of degradation of "green" materials

Laboratory Capability

- Liquid chromatography tandem mass spectrometry (LC-MS/MS)
- Gas chromatography mass spectrometry (GC-MS)
- Accelerated solvent, solid phase and soxhlet extraction
- Various components needed for sorption, degradation and transport studies
- Access to CHN and DOM analyzers, ICP-OES and ICP-MS

Field Capability

- Greenhouse space
- Field lysimeters and wetland macrocosm cells
- Waders, samplers and various other equipment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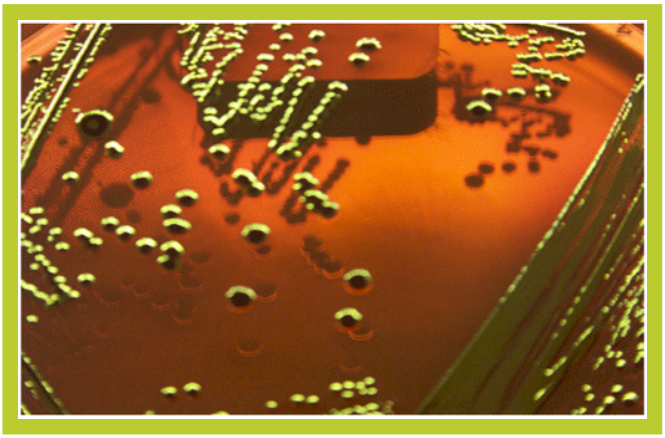
GEOCHEMICAL AND ENVIRONMENTAL SOIL SCIENCE RESEARCH LABORATORY · Est 1994

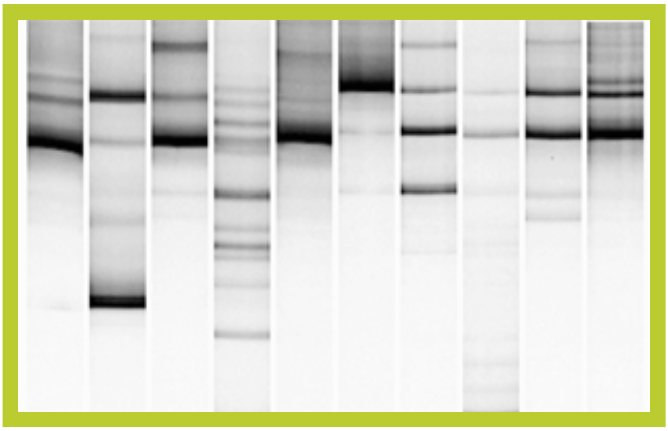
Laboratory for Environmental Pathogens Research

Von Sigler, Ph.D.

University of Toledo Department of Environmental Sciences



Colonies of *Escherichia coli* (*E. coli*) growing on nutrient agar. *E. coli* is an indicator of bacteria contamination in natural waters and our current projects aim to identify *E. coli* sources in the environment.



These genetic fingerprints reveal contamination of surfaces by Staphylococci in the University of Toledo Medical Center. The Staphylococci are bacteria that can cause human disease and our efforts aim to characterize this contamination.

Our Laboratory

The Laboratory for Environmental Pathogens Research is dedicated to revealing the sources and behavior of bacteria and viruses that cause disease. We address important public health issues by identifying where pathogens live, how they survive and how they move through the natural environment. Understanding these concepts will allow us to prevent the transmission of pathogens and the diseases they cause.

Our Research

Our research projects focus on several important public health issues, including:

- Identifying the sources of bacteria (e.g. *Escherichia coli)* that pollute natural waters.
- Assessing the prevalence of bacteria contamination in the hospital environment.
- Determining the fate, impact and transport of pathogens associated with agricultural management.

Our Methods

We are constantly attempting to improve the methods used to study environmental pathogens. Researchers in the Laboratory for Environmental Pathogens Research become familiar with traditional microbiological techniques, as well as state-of-the-art genetic methods, including genetic fingerprinting and computerized image analysis.

Our People

Our laboratory personnel include undergraduate assistants and Honors students, as well as graduate students, including Masters and Doctoral students. We also offer internship opportunities that satisfy the requirements of the Department of Environmental Sciences as well as other departments on campus.

For more information contact:

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THE UNIVERSITY OF TOLEDO 1872

Lake Erie Center

Dr. Carol Stepien sizing up the walleye run at the Maumee River.

Great Lakes Genetics Laboratory at the Lake Erie Center, Department of Environmental Sciences

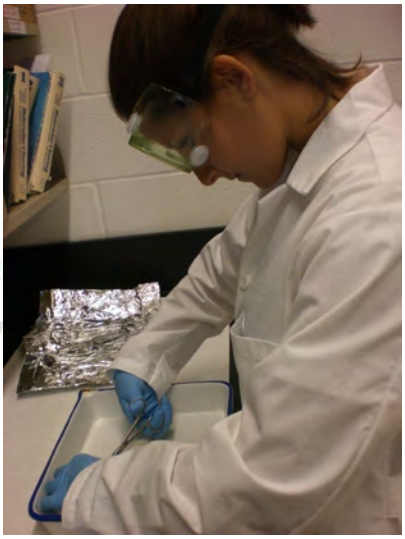
The Great Lakes Genetics Laboratory (GLGL) at the Lake Erie Center, directed by Dr. Carol Stepien, focuses on:

1. Evaluating the systematic and evolutionary relationships, population genetics, and biogeographic structure of fishes.
2. Understanding the vector pathways, population dynamics, evolutionary relationships, and genetic time course of nonindigenous species invasions.
3. Interpreting gene flow patterns and differentiation of fishes as influenced by dams, habitat changes, and other anthropogenic factors.
4. Developing rapid genetic tests for discerning fish disease, in conjunction with the laboratory of Dr. James Willey of the Health Science Campus.

For all of these problems, we work closely with federal and state agency fishery and conservation managers, who partner with us and often serve on graduate student committees. Our laboratory emphasizes tiered mentorship and our graduate students first-author many publications, obtain grants and scholarships, win best-paper awards, and are recognized as top environmental professional students nationally and internationally. We are funded by the NSF, USEPA, USDA, NOAA Sea Grant, and others.

Our graduate students gain:

1. Personalized tiered mentorship, laboratory and field experiences.
2. Hands-on training in the latest data analysis, genetic methodology, and molecular ecology approaches to thesis and dissertation work.
3. International experiences, such as our field work in Poland, Russia, Ukraine, and soon in Australia.
4. Experience and training at museum and university partners (such as 2009 Ph.D. graduate student Matthew Neilson's research work at the Russian Academy of Sciences in St. Petersburg, sponsored by NSF Deepfin, and Ph.D. student Amanda Haponski's summer 2009 work at the U.S. National Museum, Smithsonian Institution in Washington D.C., sponsored by NSF Deepfin and the Smithsonian).
5. Opportunity to become an NSF Gk-12 fellow through "Graduate Fellows in High School STEM: An environmental science learning community at the Land-Lake Ecosystem Interface", for which Dr. Stepien is the lead P.I. (stipend=$30,000/year, plus full tuition, general fees and medical insurance).
6. Work in a beautiful lake-front laboratory with the newest equipment and long-standing collaborations with federal and state agency researchers.
7. Postdoctoral and job placement assistance. Three of our graduate students have been Sea Grant Knauss Fellows. Graduates from our laboratory have gone on to employment in federal research agencies, university professorships, and the biotech industry, etc.
8. Publication experience in top ranked scientific journals.
9. Training to win best paper awards (Lindsey Pierce won 2 awards in year 1 of her Ph.D. work!).
10. Experience in writing grants and winning scholarships and awards (our students have won grant awards from NSF, Sigma Xi, NOAA Sea Grant, IAGLR, etc.).



GLGL Ph.D. sutdent Lindsey Pierce collects tissue samples from fish infected with Viral Hemorrhagic Septicemia.

GLGL Ph.D. student Jhonatan Sepulveda Villet, and REU undergraduate students electrofish in Lake Erie.

Selected 2009 Publications with our GLGL graduate students(*):

Stepien, C.A., D.J. Murphy, R.N. Lohner, O.J. Sepulveda-Villet*, and A.E. Haponski*. 2009. Signatures of vicariance, postglacial dispersal, and spawning philopatry: Population genetics and biogeography of the walleye *Sander vitreus*. Molecular Ecology, 18: 3411–3428.

Haponski, A.E.*, T.L. Bollin, M.A. Jedicka, and C.A. Stepien. 2009. Landscape genetic patterns of the rainbow darter: A watershed analysis of mitochondrial DNA sequences and nuclear microsatellites. Journal of Fish Biology. In Press.

Sepulveda-Villet, O.J.*, A.M. Ford*, J.D. Williams, and C.A. Stepien. 2009. Population genetic diversity and phylogeographic divergence patterns of the yellow perch (*Perca flavescens*). Journal of Great Lakes Research, 35: 107-119.

Neilson, M.E.* and C.A. Stepien. 2009. Escape from the Ponto-Caspian: Evolution and biogeography of an endemic goby species flock. Molecular Phylogenetics and Evolution, 52: 84–102.

Neilson, M.E.* and C.A. Stepien. 2009. Evolution and phylogeography of the tubenose goby genus *Proterorhinus* (Gobiidae: Teleostei): Evidence for new cryptic species. Biological Journal of the Linnean Society, 96: 664-684.

Brown, J.E.* and C.A. Stepien. 2009. Invasion genetics of the round goby: Tracing Eurasian source populations to the New World. Molecular Ecology, 18: 64-79.

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Great Lakes Genetics Laboratory
Lake Erie Center • University of Toledo

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Department of Environmental Sciences

The Ecosystem and Soil Ecology Laboratory, directed by Dr. Michael Weintraub, is dedicated to developing a mechanistic understanding of critical soil processes, to gain insight into how terrestrial ecosystems function, and to predict how they will respond to disturbances.

Research Interests

- Climate change, nitrogen deposition, and other disturbances alter important ecosystem properties, such as soil nutrient availability and decomposition.
- In many cases, however, we do not understand the mechanisms underlying important processes well enough to predict the effects of disturbances.
- The ESE Lab's goal is to improve our understanding of the controls on soil nutrient dynamics and decomposition by linking the ecology of soil microorganisms, which control these processes, to ecosystem function.

Current Research Projects

- Climate change and the changing seasonality of tundra nutrient cycling
- Microbial interactions with plant litter chemistry during decomposition
- Below-ground effects of invasive plants
- The biogeochemical importance of extra-cellular enzymes on plant roots
- Microbial controls on soil nitrogen mineralization

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Decomposition


Nutrient Cycling


Global Change


Plant-Soil Interactions