HEATHER A. BECHTOLD

Cary Institute of Ecosystem Studies
2801 Sharon Turnpike; PO Box AB
Millbrook NY 12545-0129
Telephone: (845) 677-5343 x235 FAX: (845) 677-5976
E-mail: bechtoldh @ caryinstitute.org

Education:

Ph.D., Idaho State University, Pocatello, Idaho.	Ecology	2010
M.S., Idaho State University, Pocatello, Idaho	Ecology	2005
B.A., University of Colorado, Boulder, Colorado	Biology/Ecology	2000

Professional Positions:

2010-present Postdoctoral Research Associate, Cary Institute of Ecosystem Studies
2005-2010 Research Assistant, Stream Ecology Center, Idaho State University
2003-2005 Research Assistant, Department of Biological Sciences, Idaho State University
2000-2003 Research Technician, Mountain Research Station, University of Colorado

Selected Professional Honors:

2010 NSF funded Eco-Das (DIALOG I-VII) Symposia Participant, Hawaii
2010 North American Benthological Society Endowment Recipient
2009 Doctoral Arts Fellowship for Education, ISU $11,700
2009 NSF Doctoral Dissertation Improvement Grant $15,000

Research Interests and Activities:

1. **Evaluating the influence of riparian forest structure on stream ecosystems across the northern forest.** Northeastern US forest structure has been modified due to historic clearings, but since that time the forests have matured. Currently, it is not known how forest structure influences stream nutrient cycling and metabolism. In addition, there are predictions that global climate change and pest invasions are likely to change the structure of northeastern forests. Our objective is to characterize nutrient cycling and metabolism across a range of forest ages, including old growth and secondary growth forests to provide a foundation for exploring future forest changes. We predict that changes in stream function are potentially linked to differences in light availability when forest structure is altered and these changes may have consequences for stream ecosystem processes (metabolism and uptake) and the carbon sources fueling stream foodwebs.

2. **Spatially explicit measures of incoming solar radiation using Rhodamine WT.** Incoming solar radiation is an important driver of aquatic ecosystem processes such as gross primary production and photo-degradation of organic matter. However, methods to estimate the rates of incoming solar radiation are currently limited. Typically, light meters are used to measure incoming solar radiation but are expensive and focus on a single area within a reach. In this study, we tested if Rhodamine WT (RWT), a photo-degrading fluorescent dye, could provide spatially explicit measures of light throughout a stream reach. We attached vials with known concentrations of RWT to the stream bed and exposed them to natural light and dark conditions to develop photo-decay rates when exposed to known incoming radiation. Vials that were attached within the stream had

average decay rates of 0.145 per mol photons m^{-2}. After 48 hours, RWT decay rates were 93% slower in the dark compared to exposure to solar radiation over 8 days (range: 0 – 377,890 mol photons m^{-2}). We conclude that RWT may be useful as an economical integrative measure of incoming solar radiation with the ability to rapidly measure fluorescence from an array of rhodamine deployments. This method provides the capacity to develop a detailed and spatially explicit measure of light availability for limited additional cost or time.

3. **Chronic exposure to pharmaceutical compounds suppresses in-situ algal growth, microbial respiration and invertebrate production**. Pharmaceutical and personal care products (PPCPs) are ubiquitous in aquatic systems. The toxicology of many PPCPs is known, but questions remain regarding their effects on aquatic ecosystem function. We measured the in-situ response of developing biofilms to chronic levels of exposure to six common pharmaceutical compounds (caffeine, cimetidine, ciprofloxacin, diphenhydramine, metformin, and ranitidine). We hypothesized that chronic exposure to these compounds would suppress algal and microbial growth. In Winter 2009, Spring 2010, and Fall 2010, we deployed pharmaceutical diffusing substrates (similar in design to nutrient diffusing substrates) for 18 days in small, rural streams in New York and Indiana (Spring only). Both streams received input from wastewater treatment facilities. Across sites and seasons, chlorophyll-a was suppressed by an average of 32% relative to controls by some of the pharmaceutical compounds. A similar pattern occurred for microbial respiration, which was reduced by an average of 60%. This experiment demonstrates that some PPCPs may influence important aspects of carbon cycling in streams and their influence on ecosystem processes warrants further investigation.

4. **The antihistamine cimetidine alters invertebrate growth and production in artificial streams.** Although a diversity of pharmaceutical compounds have been detected in surface waters, their effects on stream ecosystem function are not currently understood. Concentrations of cimetidine, a widely used antihistamine, have comprehensively increased in streams and rivers. Invertebrates may be affected by exposure to cimetidine because they use histamines to regulate olfactory and stomatogastric function. Primary producers, such as algal biofilms, may also be affected by cimetidine which may alter metabolism and ultimately secondary production. We conducted a long-term (83d) artificial stream experiment to measure the chronic effects of cimetidine on benthic biofilm, a basal resource and stream invertebrates. We exposed two common invertebrates, *Gammarus fasciatus* and *Psephenus herricki*, and separately, biofilm to concentrations of cimetidine similar to what is found in U.S.A. surface waters (0.07 µg L^{-1} to 70.0 µg L^{-1}). We found no consistent effect of cimetidine on biofilm biomass (chlorophyll *a*) or metabolism (gross primary production, respiration). Growth and production of reproducing *G. fasciatus* growth was reduced across all cimetidine treatments compared to the control. In addition, there were no surviving individuals of the smallest size class at lower doses of cimetidine suggesting that cimetidine may either more strongly affect invertebrates that are younger or may suppress adult reproduction. We also found higher concentrations of cimetidine significantly reduce survivorship of *P. herricki*. Although trace amounts of cimetidine appear to have less of an effect on primary producers, our observations indicate there are indirect negative effects on invertebrate growth and reproduction.

Selected Publications:

In review

Bechtold, H.A., R.S. Inouye, M.J. Germino. Response of dominant native and exotic grasses to nitrogen addition and sagebrush removal.

Rosi-Marshall, E.J., D. Kincaid, **H.A. Bechtold,** T.V. Royer. *In situ* exposure to pharmaceutical compounds suppresses algal growth and microbial respiration in streams.

Hoppe, P., E.J. Rosi-Marshall**, H.A. Bechtold.** The antihistamine cimetidine alters stream invertebrate growth and production in artificial streams.

Bechtold, H.A., C.V. Baxter, A.M. Marcarelli, R.S. Inouye. Relationships between biofilm and stream ecosystem nutrient dynamics in a semi-arid watershed.

Previous Publications:

Hopkins, J.M., Marcarelli, A.M., **Bechtold, H.A.,** 2011. Ecosystem structure and function are complementary measures of water quality in a polluted, spring-influenced river. *Water, Air, and Soil Pollution.* DOI 10.1007/s11270-010-0432-y

Marcarelli, A.M., **Bechtold, H.A**., Rugenski, A.T., Inouye, R.S., 2009. Nutrient limitation of biofilm biomass and metabolism in the Upper Snake River basin, southeast Idaho, USA. *Hydrobiologia 620: 63-76.*

Suding, K.N., Ashton, I.W., **Bechtold, H.A**., Bowman, W.D., Mobley, M.L., Winkleman, R., 2008. Plant and microbe contribution to community resilience in a directionally changing environment. *Ecological Monographs 78: 313-329.*

Rugenski, A.T., Marcarelli, A.M., **Bechtold, H.A.,** Inouye, R.S., 2008. Effects of temperature and concentration on nutrient release rates from nutrient diffusing substrates. *Journal of the North American Benthological Society 27: 52-57.*

Bechtold, H.A., Inouye, R.S., 2007. Distribution of carbon and nitrogen in sagebrush steppe after six years of nitrogen addition and shrub removal. *Journal of Arid Environments 71: 122-132.*

Suding, K.N., Miller, A.E., **Bechtold, H.A**., Bowman, W.D., 2006. The consequence of species loss on ecosystem nitrogen cycling depends on community compensation. *Oecologia 149:141-149.*

Bechtold, H. A., Forbis, T. A., Bowman, W.D, Diggle, P.K. 2002. Lack of reproductive plasticity in alpine Saxifraga rhomboidea Greene (Saxifragaceae). *Nordic Journal of Botany 22:316-368.*