

Riparia

*A Center where science informs policy and practice in
wetlands ecology, landscape hydrology, and watershed management*

This Center is supported by the Department of Geography, the Earth and Environmental Systems Institute, the College of Earth and Mineral Sciences, the Penn State Institutes for Energy and the Environment, and by grants, contracts, and gifts.

“If there is magic on this planet, it is contained in water.” Loren Eiseley

2. Director – Robert P. Brooks, Ph.D., Professor of Geography and Ecology, has led Riparia since it was established in 1993 as the Cooperative Wetlands Center. He will continue to lead the center and selected research projects.

3. Current participants

Associate Director – Denice Heller Wardrop, P.E., Ph.D., Professor of Geography and Ecology; Assistant Director, PSIEE. Dr. Wardrop will continue to serve in this capacity, lead selected research projects, and interface with the broader University community and external stakeholders.

Geospatial Coordinator – Joseph A. Bishop, Ph.D., Research Associate and Instructor in the MGIS Program. Dr. Bishop will continue to be in charge of producing and using geospatial data for Riparia.

Botanist – Sarah (Miller) Chamberlain, M.S., Senior Research Assistant, will continue to lead projects, serve as our botanist and as database coordinator. She is the coordinator for the Mid-Atlantic Wetlands Work Group (MAWWG), an interstate research, outreach, and management organization. This group was just re-funded for additional 3 years by EPA-Region 3.

Other Faculty and Staff – Gian Rocco, Ph.D., Research Associate, Herpetologist, teaches GEOG 313 – Field Geography, each fall semester; Susan Yetter, M.S., Research Assistant, Invertebrate Biologist, Project Coordinator; Mary Easterling, M.S., Project Coordinator; Hannah Ingram, B.S., Research Technician, manages field projects, supports research faculty, staff, and students; 4-6 graduate students.

4. Rationale

As envisioned in the initial proposal, Riparia was a logical enhancement and expansion that better reflect the research, outreach, and instructional breadth and activities of the existing Center (former Cooperative Wetlands Center, established 1993). Within Riparia, natural and social scientists, students, and practitioners study the science, policy, and practice for transition areas between waters and lands in hydrologic, ecologic, geomorphic, and societal contexts. We investigate and communicate concepts regarding the ecological and geophysical processes where water is the driving force. There is broad integration horizontally across spatial scales from plots to landscapes, and equally broad integration vertically from deep aquifers to atmospheric influences on ecosystems. Riparia is broadly conceived to include physical, chemical, and biological fluxes between the atmospheric boundary layer, surface water (streams, wetlands, lakes, coasts), and groundwater (interflow, aquifers). We investigate the spatial and temporal

characteristics of local, regional and global water resources and the impact humans have on these systems. Human activities and attitudes will be integral to – part of, not apart from – these investigations and communications.

Additionally, we want to facilitate interactions not only among participating faculty and staff, but with undergraduate and graduate students from diverse majors, collaborators (e.g., public agencies, universities, research institutions, non-governmental organizations), and sponsors (e.g., agencies, industries, foundations). Personnel in this center lead and encourage interdisciplinary and multi-institutional collaborations. The faculty, staff, and students of Riparia have learned how to lead effectively, large, complex, multi-institutional research projects involving many players outside the University. By involving additional expertise in water resources that is available within EMS and elsewhere within the University, we are linking the historic strengths that Riparia has in coupling wetlands and surface waters within the context of their terrestrial surroundings with stronger connections to subsurface hydrologic fluxes.

With increasing demands for freshwater (e.g., drinking water, agricultural and industrial demands, sustainability of aquatic ecosystems), continued threats to water quality, and growing concerns about climate change, the processes controlling water quantity and quality are of paramount concern. Stream-aquifer interactions, sediment transport in streams, nutrient cycling in aquatic ecosystems, habitat function for water-dependent species, geologic isolation of radioactive waste, and water policy decisions all require an understanding of fluxes of water at multiple spatial and temporal scales from a multidisciplinary point of view. As studies of the fundamental processes controlling fluid flow move forward, we recognize that these processes are complex at all scales, and that physics, chemistry, and biology are tightly coupled, and together impact policy decisions. Consequently, our ability to simultaneously protect and recover water supplies, predict biological responses to climate change, predict contaminant transport, or model flows in situations with limited data remain poor. As regional demands and world population continue to grow, water science will drive and inform issues of critical scientific, technological, and societal importance.

Riparia integrates horizontally across spatial scales from plots (m) to landscapes (km), and vertically from deep aquifers to atmospheric influences on aquatic ecosystems. We maintain existing linkages across multiple departments, colleges, centers, and institutes across campus. By encouraging the involvement of more faculty and students within EMS and across the University, we can address science, engineering, policy, practice, and social science issues concerning water more holistically. Based on discussions with leaders in other units, increasing synergies are not only possible, but desirable. By promoting cooperation and mutually beneficial sharing of limited resources, we expect exchanges and collaborations with other water-related institutes, centers, and laboratories at Penn State to be more frequent and more productive.

Riparia meets the guidelines of the Graduate School and EESI for centers.

5. Funding Opportunities

We will continue to build upon past successes, which makes us competitive for a wide breadth of funding opportunities, despite difficult funding situations and scenarios. The federal sources of water resources funding are spread over a number of agencies, implying a diversity of issues and questions, including NSF, DOE, USGS, USEPA, USDA and others. We will not, however, constrain funding applications to federal sources alone. Other sources have been secured in the past, and offer substantial opportunities, including state, foundation, industry, and private funds. Here are some recent examples:

- Riparia faculty, Wardrop and Chamberlain, lead the interstate MAWWG effort, which provides continuing opportunities to compete for funding from USEPA-Region 3, and to collaborate with universities, agencies, and NGOs throughout the region on related projects.
- We are currently involved in several regional wetland science projects, including the first Mid-Atlantic Wetlands Condition Assessment, in collaboration with VIMS.
- Two modest grants, pending through EESI, will provide funding to participate in the inaugural National Wetlands Condition Assessment (40 sites will be sampled in Pennsylvania and Maryland) in summer 2011.
- We are pursuing funding through several USDA options, one following on our recently completed BMPs of Spring Creek project, and a recent regional water quality initiative announcement. This will involve personnel from the College of Agricultural Sciences, USDA (on campus), and SERC.
- Finally, Brooks is co-directing, with Chris Forest, a cross-college proposal to host the Northeast Climate Science Center for USGS, in collaboration with the University of Wisconsin and Virginia Institute of Marine Science, which has the potential to bring significant actual and leveraged resources to EESI and Penn State.

6. Center Needs and Past Expenses

As an established center, Riparia is well-situated with regard to space and equipment. However, discretionary funds are severely limited for a center of Riparia's level of activities. Funds from EMS and Geography sources were renewed for another 3-year period, but at a reduced amount (\$20,000/year). Funding of \$10,000 from EESI would be used primarily for three purposes that enhance center operations:

- Recruitment of high quality graduate students (primarily with "top-up" funds). This was attempted with two students in 2010, but we were unsuccessful; the two students went to University of Wisconsin and University of Melbourne, both prestigious institutions. (\$4,000)
- Travel funds to support trips to conferences and meetings by faculty, staff, and graduate students. In general, these funds are used for national and/or international meetings where papers are presented, or where networking opportunities could prove fruitful, or for personnel that are serving in leadership roles in professional organizations. (\$3,000)
- Support for center activities. These funds are used to supplement various center activities as needed, including support for summer interns, purchase of new software or licenses used for research activities, and filling gaps in funding for current personnel. (\$3,000)

Funds to date have been used to support travel to conferences; for wages for interns/students on collaborative projects; providing connectivity between grants for selected faculty and staff salaries; purchasing equipment, software, and licenses to support on-going projects.

7. Management Structure and Center Operations

Riparia has dedicated physical space managed through the Department of Geography in Walker Building. This space can be used to meet modest expansion needs for Riparia. We anticipate that participating faculty will make their laboratories available to collaborating faculty, staff, and students, and that departments with participating faculty will consider space requests as needed to serve center-related activities (e.g., office space for graduate students, storage space

for field equipment, etc.). Wardrop has worked through PSIEE to arrange co-funding of various instruments to promote ecological research. Operating funds currently available to Riparia through department and college sources will be leveraged for activities of Riparia, including and beyond the requests amounts. Our interactions with other faculty are primarily at the project level, with less need to interact on administrative matters.

8. Accomplishments and activities to date

Recent achievements include the following:

- Brooks named Person-in-Charge of Watersheds & Water Resources Minor, Nov 08
- Wardrop named Assistant Director - Environment, PSIEE, Jan 09
- Formal announcement of Riparia in mid-2009
- Brooks received the University's 2009 Faculty Outreach Award
- James T. Julian, doctoral candidate advised by Brooks, received the University's 2009 Outstanding Graduate Student Award
- In 2009, at the annual meeting of the Society of Wetland Scientists, undergraduate, Brett Dietz (advised by Doctoral Candidate Jessica B. Moon and Associate Director Denice H. Wardrop) was award the Best Student Poster Award, and a masters candidate co-advised between Penn State and Cornell won an Honorable Mention in the same category
- Wardrop was elected Chair of the Science and Technical Advisory Committee for the Chesapeake Bay Program in 2010
- Brooks was appointed to the Louisiana Coastal Area Science Board in 2010 for a 3-year period
- Brooks was awarded a sabbatical leave to work on a book and develop international contacts (Jan-Oct 2010)
- The Robert P. and Rebecca P. Brooks Endowment to support students and the reference wetlands collection of Riparia was established in 2005, and met its initial funding goal in 2010, with assistance from past graduate students and staff, plus the periodic contributions by Brooks.

Research and Scholarship. Research projects and scholarly activities continue to be the focus of Riparia. Faculty, staff, and students continue to lead interdisciplinary, multi-institutional projects, compete successfully for extramural funds, publish in journals and other outlets, make presentations at regional, national, and international conferences. Recent evidence of our success and leadership in Research and Scholarship includes:

- During the past 3 academic years, 6 graduate students successfully completed their degrees.
- Papers and presentations continue at a respectable rate, including publication in a diversity of journals, and attendance at a variety of regional, national, and international conferences.
- Awarding of new extramural funding was slightly less than average in 2010, while Brooks was on a 9-month sabbatical leave, but shows signs of increasing again in 2011.
- We have increased our inclusion of undergraduate interns in research projects, with 3-9 hired/year, depending on needs.
- Brooks and Wardrop were approved by Springer to write and publish a book on Mid-Atlantic Freshwater Wetlands, for the Ecological Studies Series; publication in late 2011.

- As we do in most years, several members of Riparia presented papers or posters at the Society of Wetlands Scientists annual meeting, this year held in Salt Lake City, Utah. The list of papers presented is shown here because it shows the breadth of topics and range of co-authors included in our work:

Brooks, Robert P., K. Havens, H. Ingram, D. Wardrop, C. Hershner, and R. Poeske. 2010. Toward a Mid-Atlantic Regional Wetlands Condition Assessment. Society of Wetland Scientists 30th Annual Meeting, 27 June – 2 July 2010, Salt Lake City, Utah (abstract only)

Miller, S., and H. Ingram. 2010. Developing coefficients of conservatism to advance Floristic Quality Assessment in the Mid-Atlantic Region. Society of Wetland Scientists 30th Annual Meeting, 27 June – 2 July 2010, Salt Lake City, Utah (abstract only)

Moon, J. B., and D.H. Wardrop. 2010. Soil habitat complexity in headwater riparian wetlands and their links to microbial and plant communities. Society of Wetland Scientists 30th Annual Meeting, 27 June – 2 July 2010, Salt Lake City, Utah (abstract only)

Tyrna, A., R. P. Brooks, and D. H. Wardrop. 2010. Quantifying ecosystem services for water quality: the case of the Upper Juniata Watershed. Society of Wetland Scientists 30th Annual Meeting, 27 June – 2 July 2010, Salt Lake City, Utah (poster only)

Wardrop, D.H., A.K. Glasmeier, and J.K. Peterson. 2010. Betting the farm: Assessing ecosystem services and socioeconomic benefits through conservation practices in the Appalachian Region. Society of Wetland Scientists 30th Annual Meeting, 27 June – 2 July 2010, Salt Lake City, Utah (abstract only)

Outreach and Service. Riparia has an outstanding reputation in the mission of Outreach and Service. Whenever possible, we respond to requests for information and assistance. These include requests from the University students and faculty, the University's Office of the Physical Plant, federal and state agencies, non-governmental organizations, consulting firms, industries, schools, and citizens. Much of our effort has depended upon volunteerism, with a modest amount of discretionary resources used to encourage and support these activities. As water quantity and quality issues continue to come to the forefront, scientists, policy-makers and citizens will demand more refined knowledge about these essential systems, and Riparia will be able to respond to those inquiries. Recent evidence of our commitment and achievement in Outreach comes in many forms:

- Denice H. Wardrop, P.E., Ph.D. is serving as Chair of the Science and Technical Advisory Committee for the Chesapeake Bay Program
- Dr. Wardrop continues as Co-Director of the Mid-Atlantic Wetlands Work Group
- Joseph A. Bishop, Ph.D., Geospatial Coordinator for the CWC, serves on the Board of The ClearWater Conservancy, and is on the Science Advisory Board of the Amazon Center for Environmental Education and Research (ACEER)
- Susan Yetter, Gian Rocco, Ph.D. and other staff of Riparia continue to organize and deliver programs each year for EMEX, GEMS, the Farm Show in Harrisburg, and Ag Progress Days

- Brooks has served on the Millbrook Marsh Nature Center Advisory Committee since its inception in 1997
- Brooks completed 16 years of service as a member (and chair) of a local municipal planning commission
- Brooks is serving a 3-year stint as a member of the Louisiana Coastal Area Science Board, focusing on restoration issues.

Instruction. The faculty and staff of Riparia both participate in and coordinate several water-related and ecological graduate and undergraduate programs:

- Geography, B.S., M.S., & Ph.D. programs (Robert P. Brooks teaches GEOG 10 – Physical Geography, GEOG 550 - Wetlands, & EMSC 100S – Freshman Seminar)
- EMS Minor in Watersheds and Water Resources (Robert P. Brooks, Professor in charge)
- Bishop has developed and is teaching GEOG 587 – Conservation GIS for the online MGIS Program, twice per year
- Drs. Bishop and Wardrop offer GEOG 497 Explorations Across the Americas, an experiential learning course taking students to Peru to learn about and conduct research on various environmental and cultural issues
- Rocco teaches GEOG 313 – Field Geography each fall semester.
- Sarah Miller, Riparia botanist, periodically teaches plant identification courses to agency personnel and consultants
- Brooks is serving his third term as Internship Coordinator in Geography
- Brooks serves on the MGIS Advisory Board for this World Campus degree program

In addition, Riparia promotes graduate and undergraduate research, symposia, field experiences and internships, by arranging teaching and advising by participating faculty and staff.

9. Support Letters (Shortle, Wardrop, Miller)