I recently completed the ALS Ice Bucket Challenge. I know many of you did as well because I have seen some of your efforts on Facebook. This has been an incredible thing for funding efforts to support research into causes and treatments for ALS (Amyotrophic Lateral Sclerosis) as well as caring for those suffering with the disease. The latest numbers indicate that funds raised from July 29–August 26 totaled $88.5 million. During that same time period last year, $2.6 million was raised. I suppose this also speaks to the power of peer pressure and social media. OBS has operated under a non-profit model for over ten years now. Our funding comes from donations, member dues, endowments, and indirect costs from various grants we administer. So I find myself wondering what sort of viral campaign could help raise funds for natural history. I am not sure that the OBS Bucket of Snakes Challenge would gain much traction…and I doubt the snakes would appreciate it either. But recent data suggest that natural history, or at least the training of the next generation of natural historians, is suffering. As I have mentioned in this column before, it is quite likely that many, if not most, young biologists are graduating without ever taking an organismal biology course (Tewksbury et al. 2014, BioScience 64:300-310). Tewksbury et al. (2014) point out that the rate at which the number of herbaria and other specimen libraries are added has declined to one or two per year. And while the number of biology Ph.D.s awarded annually has continued to increase, the number graduating with Ph.D.s in a natural history-related field has steadily declined. Further, I recently taught an introductory biology class in which the space devoted to a general survey of the diversity of plants, animals, and fungi totaled approximately 40 pages of the more than 1,000-page text. (The book was chosen by committee.) There are many reasons for this, both within and outside of academia, but whatever the causes, it speaks to funding challenges for basic organismal research. This is an area in which OBS can provide support, but we would like to have the ability to do more. Beyond our current Small Grants Program, which has been very successful, I would like to see OBS provide much larger grants for long-term research into biodiversity, systematics, taxonomy, biogeography, conservation, and other natural history endeavors. I would also like to see OBS be in a position to offer undergraduate scholarships and graduate fellowships for research into these and related areas. Would there be an interest in OBS funding a graduate assistantship or two for a year, or supporting an undergraduate research scholarship for a year? I think there would be interest, but these programs will require additional resources before implementation. I do not think it is beyond our capacity to take a leading role in the rejuvenation of the science of natural history. There are perhaps few groups better positioned to lead in this arena than OBS, with all of our partners in academia, local parks, state and federal agencies, and individuals with a collective reach well beyond what we could accomplish on our own. The OBS Board will be discussing these initiatives more over the coming months and hopefully you will be hearing from us about ways you can be involved and help support our efforts. None of these ideas, of course, are meant to diminish the contributions of biologists that work in theory or process, genetics or cell biology. Quite the opposite; these avenues of research are essential. But
organismal biology is also important and should continue to be an integral part of biology education. As we move to the cutting edge, we should be cautious not to leave the vehicle that got us there behind. In a recent blog post on this topic, Jennifer Frazer made three interesting points about the future of natural history. “(1) Natural History is an important science worthy of respect and research dollars. The scientific method and natural history are not mutually exclusive...(2) Just because biology moved on did not mean that the work of natural history was over...(3) Natural history education—and simply looking, observing, and exploring nature—are the birthright of all children and biologists” (Frazer 2014, Natural History is Dying, and We are All the Losers).

I ask you to ponder the future of natural history and share your thoughts with me (gsmith@ohiobiologicalsurvey.org) on this topic or other items of interest to OBS. You might also want to join the conversation on our Facebook page. We are only as strong as our members and partners, so please, let us hear from you. As always, I greatly appreciate your continued support of OBS!

Greg Smith
Executive Director

“Humanity desperately needs a more extensive and integrated biology—for personal and public health, support of biotechnology, resource management, conservation, and not least, a more complete and wiser understanding of our own species. The wellspring of the new biology is scientific natural history.”


Deep Woods is a 280-acre tract of private property in Hocking County owned by the Blyth family, who has graciously allowed OBS to conduct an All Taxa Biotic Inventory (ATBI) on their land. The area is a model for terrestrial and stream ecosystems in the unglaciated Allegheny Plateau region of southeastern Ohio. Relatively complete surveys exist for algae, bryophytes, lichens, macrofungi, vascular plants, spiders, some beetles, butterflies and larger moths, reptiles, amphibians, birds and mammals. Most taxa have not been exhaustively surveyed, and much remains to be done despite documentation of over 4,700 species. Deep Woods is a valuable research and educational resource, and groups and individuals with an interest in Ohio's flora and fauna are encouraged to visit the site and to contribute to the ATBI.

The Ohio Biological Survey hosts an annual “BioBlitz,” a productive and enjoyable event contributing to the ATBI and to networking among professional scientists and dedicated amateur natural historians. A BioBlitz is an attempt to document as many animal and plant species as possible in a 24-hour period. Biologists and citizens scour the area for samples, and as the weekend progresses a competitive element is often present as participants seek to beat the “record” number of a taxon from past years, or to find species new to the ATBI.

This year’s Deep Woods BioBlitz is scheduled for 3:00 pm Saturday September 20 until 3:00 pm Sunday September 21. Participants may join for all or part of that time. There is limited primitive camping available on-site and other overnight options exist. Participants bring their own food and often there is considerable potluck-style food-sharing.

Anyone with a serious interest in natural history and the outdoors is welcome. It is helpful for us to know who is coming, so to RSVP or for more information, please contact Dave Horn (davehorn43@columbus.rr.com or 614-262-0312).

The record species total for a Deep Woods BioBlitz is 907. Can we top that in 2014?
Baseline Levels of Arsenic in Ohio Soils

Geologic and soil processes are to blame for significant baseline levels of arsenic in soil throughout Ohio, according to a study published recently in the *Journal of Environmental Quality*.

The analysis of 842 soil samples from all corners of Ohio showed that every single sample had concentrations higher than the screening level of concern recommended by the U.S. Environmental Protection Agency. The findings should not alarm the public, say the authors, who note that regulatory levels typically are set far below those thought to be harmful. Rather, the findings pose a real challenge for regulators, who must determine what levels should trigger action when natural arsenic levels everywhere are above suggested screening standards.

The researchers found that the patterns of arsenic in Ohio soils are most closely related to the arsenic content of the underlying bedrock, which was formed approximately 250 to 300 million years ago. Glacial and soil processes have modified the landscape since.

“The distribution of arsenic throughout Ohio appears to be the result of natural patterns,” said first author Erik Venteris of the Department of Energy’s Pacific Northwest National Laboratory, who was with the Division of Geological Survey of the Ohio Department of Natural Resources when the study was done.

Researchers from PNNL, Ohio State University, and the state of Ohio’s Division of Geological Survey did the study, one of the most thorough analyses of arsenic levels to date over a broad area.

**Arsenic and Old Ohio**

Scientists have long known that arsenic levels in Ohio and many other parts of the world are consistently high, even beyond spikes of the element due to smelters, herbicide use, and other human activity.

Arsenic’s reputation as a poison is warranted. High levels can cause cancer, neuromuscular damage, skin diseases, and death. People can be exposed to arsenic found in the soil through drinking water, through the foods they eat, and even through minute amounts of dirt they unknowingly ingest each day. But like many compounds, the element—abundant in Earth’s crust—does little or no measurable harm at very low levels. Deciding at just what level arsenic is harmful, and when regulators should take action to lower levels, is tremendously difficult.

The team set out to get a comprehensive picture of arsenic levels across the state, studying samples from areas with minimal human activity. For example, arsenic has been used for decades as a wood preservative and in pesticides and herbicides, so soil samples near fence posts and orchards were avoided.

The team analyzed samples from soil and stream sediments from across the nearly 45,000 square miles of land that make up Ohio. They included soil samples that the U.S. Geological Survey collected as part of the National Geochemical Survey and from a previous study related to uranium exploration. The analysis included two soil samples each from 348 sites throughout Ohio (one sample taken from 6-12 inches below the surface and another from 12-24 inches deep) and 144 sediment samples from streams.

**Findings**

Overall, arsenic in samples ranged from 2 to 45.6 parts per million by weight, with an average of 9.69 parts per million, compared to the U.S. EPA’s screening standard of 0.39 parts per million. Very few samples had less arsenic than 3 parts per million; samples more than 10 parts per million were very common; and levels of more than 20 parts per million were common for central Ohio.
“When every soil sample has more arsenic than the recommended screening level, it may be time to re-evaluate those regulatory levels and to think about how best to interpret the data,” said co-author Nicholas Basta, professor of Soil and Environmental Chemistry at Ohio State.

Yesterday’s Rocks, Today’s Soil

The study found that bedrock created from about 250 to 425 million years ago, a time when Ohio was positioned near the equator and under warm tropical sea waters for much of the time, is the source of significant levels of arsenic in soils throughout the state.

Some parts of the state had consistently higher levels, including central, western, and northeastern Ohio; areas with lower levels included northwestern and southwestern Ohio.

The authors say that as rocks weathered over time to create the soils, the rocks released arsenic that became part of the soil. They believe that other conditions, such as consistently wet soils, reduced levels of arsenic in some areas of the state, such as northwest Ohio.

“Many processes can break down bedrock, spread the material, and potentially mobilize the arsenic so it leaches out,” said Venteris. “How much arsenic is present in a given location depends on what was originally in the bedrock and how that rock has been altered over time through complex erosion and chemical weathering processes. The result is that arsenic levels vary significantly—but predictably—within a region.”

Influence of Industrial Activity

The team found no correlation between industrial activity and arsenic levels. Soils from some industrial areas in regions with high baseline arsenic levels, such as Columbus, Cleveland and Youngstown, had higher levels, for instance, while soils near other industrial areas like Cincinnati, Dayton, and Toledo in the southwestern or northwestern parts of the state had lower levels.

Levels from soil samples 18 to 24 inches below the surface were on average almost 50 percent higher than levels in the topsoil—more evidence that high levels are due to geological conditions and not human activity, Venteris said.

Basta said the findings could help regulators weigh risks and remediation efforts involving arsenic. That’s frequently a concern when builders create new homes or other structures.

“These findings should be helpful to help evaluate risks properly,” said Basta, a faculty member at Ohio State’s School of Environment and Natural Resources and an expert on rehabilitating urban soils. “Now we have a good scientific understanding of how the levels throughout Ohio came to be.”

In addition to Basta and Venteris, authors of the paper include Jerry Bigham, professor emeritus of environment and natural resources at Ohio State, and Ron Rea, formerly with Ohio’s Division of Geological Survey. The work was supported by the Ohio Department of Natural Resources (Division of Geological Survey) and the U.S. Geological Survey.

Chronic Wasting Disease Not Found for 12th Consecutive Year

The Ohio Department of Natural Resources (ODNR) and the Ohio Department of Agriculture (ODA) announced that testing of Ohio’s deer herd found no evidence of chronic wasting disease (CWD), which is a degenerative brain disease that affects elk, mule deer, and white-tailed deer.

State and federal agriculture and wildlife officials collected tissue samples from 753 deer killed on Ohio’s roads from September 2013 through March 2014. An additional 88 hunter-harvested mature bucks and nine deer displaying symptoms consistent with CWD were tested as well. According to the ODNR Division of Wildlife, all samples were negative for CWD for the 12th consecutive year. Since CWD was first discovered in the late 1960s in the western United States, there has been no evidence that the disease can be transmitted to humans.

Since 2002, the ODNR Division of Wildlife, in conjunction with the ODA Division of Animal Health and the U.S. Department of Agriculture’s Animal and Plant Health Inspection Service, Wildlife and Veterinary Services, has conducted surveillance throughout the state for CWD. While CWD has never been found in Ohio’s deer herd, it had been diagnosed in wild and captive deer, moose, or elk elsewhere in the United States and Canada.

The ODNR Division of Wildlife continues to carefully monitor the health of Ohio’s wild deer herd throughout the year.
A Tribute to Marilyn Ortt

We periodically encounter forces that alter landscapes and human lives. They are formidable, pulling the world in their wake, with an aftermath felt over generations. We call these “forces of nature.”

Marilyn Ortt was a force of nature—a force that made Marietta and the world a better place. We mourn her recent passing.

While many people felt her influence, the breadth of Marilyn’s accomplishments is not easily grasped. While this tribute cannot do full justice to her legacy, possibly in hearing more of it, others will be inspired by what a single, dedicated individual can achieve.

I apologize ahead for failure to recognize important contributions by other people to programs and projects that will be described. Nevertheless, those of us who were involved know that little might have been accomplished without Marilyn’s presence.

Forces of nature are irrepressible, and as we all know, when Marilyn embraced an objective, every available resource was employed and little could waver her resolve. Marilyn did not seem to respond in the normal way to impediments—to the disappointments and frustrations that cause most of us to buckle—it seemed that these only served to strengthen her resolve.

Coming down Route 60 past the hospital, you know when you’ve entered Marietta. A distinct ambiance greets you, a character that would not exist but for Marilyn’s tireless efforts on the City Tree Commission. Serving on the Tree Commission for over three decades, Marilyn introduced modern urban forestry practices and standards, greatly expanded diversity of the urban forest, and made our Commission respected throughout the state.

At some point in their lives, all large urban forest trees need to be inspected, and Marilyn was always there to do it. She knew the distinctive qualities and growth habits of different species, and by memory the maintenance history of many individual trees. While there are sciences for doing both, predicting a tree’s future condition can be as reliable as forecasting next week’s weather. Marilyn had to make hundreds of tough decisions, to prune or remove large city trees, always considering a tight budget, knowing full well who gets blamed when the weather forecast doesn’t pan out.

We may not always appreciate the fruit borne of Marilyn’s nurturing of the urban forest. Our big trees seem always to have been here, but they wouldn’t be had Marilyn not helped select and plant thousands of trees in Marietta and along the entranceways. Whatever were mere saplings 30 years ago are now monuments of the urban forest and have replaced thousands that have been lost. Try envisioning Marietta without these trees. And consider that during severe wind storms in recent years Marietta has generally suffered less tree damage than surrounding areas because of the healthier urban forest.

Also notice on the way to Belpre on Route 7, just past the Solvay overpass, about 120 trees extending for over a mile along the top of the hillside. Marilyn organized planting of these trees as a Community 20/20 project in 2001 to provide some visual remediation of an otherwise austere industrial zone.

Marilyn endeavored to help people recognize the importance of urban trees by organizing Arbor Day Ceremonies. Every year, even if only a few individuals were present, a proclamation was read and an Arbor Day tree was planted.

In 2000, the City Arboretum in Sacred Via Park was established and Marilyn was recognized on the plaque for her contributions to the community. For years, Marilyn helped make the arboretum a showcase for the diversity of native, flowering, and sometimes unusual trees. I doubt there were many locations in Washington County upon which Marilyn had not set foot or eye, and she was an expert on our area’s native and urban plants. She was employed from 1983-1995 (and under contract afterward) by the Ohio Department of Natural Resources, Division of Natural Areas and Preserves, serving as a Plant Community Ecologist and Field Botanist for the Ohio Natural Heritage Program. Her field surveys traversed much of Washington County, recording plant communities and rare and endangered species.

Recognizing her knowledge and ability to accomplish tasks, Marilyn was asked to serve on Boards of many organizations. These included the Nature Conservancy, Rural Action Forest Advisory, Ohio Invasives Plant Council, and the Ohio Biological Survey, from which she was awarded its Naturalist Award (one of the OBS’s two top honors) in 2013.

Anyone who knew Marilyn knew of her relentless battle against invasive plants, such as garlic mustard, Japanese knotweed, and multiflora rose, as well as other damaging, non-native species. What would seem futile to many was not to Marilyn. She wrote extensively about invasive plants while recruiting a battalion of volunteers to help battle their spread. I’m sure the troops, now with ingrained “spot and pull” reflexes, will continue to push the vanguard of extermination in forests, fields, and along the local riverbanks.

Marilyn had great love of our local waterways, their riparian spaces and watersheds. Although a Marietta City Riverbank Conservation Program was developed in 1987, she found it necessary to continuously promote coherent management and protection of its riverbanks. Marilyn recognized the importance of trees to riverbank stability and sought protection of natural a riparian habitat wherever possible. Her concerns were prescient, evidenced by riverbank erosion and occasional collapse along the Muskingum, some requiring significant City investment to stabilize.

Always looking to the future, Marilyn helped Marietta develop and adopt in 2004 the Gilman Street Area Community Transportation Corridor Plan. And again in 2010, Marilyn served on a city ad hoc Riverbank Task Force that addressed riverbank maintenance issues.

The Friends of the Ohio River Islands National Wildlife Refuge is an independent, non-profit organization that encourages participation in and support of the refuge. Marilyn served on the Board of this organization and was recognized for Outstanding Volunteer Service in 2012.

Marilyn had particular concerns for the
Muskingum River, and was a cofounder in 2001 and later President of Friends of Lower Muskingum River. FLMR is a nonprofit watershed protection and Land Trust organization with a mission to restore, protect, and promote the lower Muskingum River and its historic, cultural, recreational, and socioeconomic resources. These goals have been pursued with educational programs, cleanup campaigns, water quality studies, and submission in 2014 of a Watershed Action Plan for maintaining and improving the health of the watershed.

As nonprofit Land Trust organization, FLMR works to set aside protected natural areas by establishing land conservation easements. A conservation easement allows a landowner to place permanent restrictions on a land tract’s future uses, such as to protect its natural resources. Through Marilyn’s efforts and the generosity of land owners, FLMR set up conservation easements for numerous tracts of land, including Dana Island Preserve, Luke Chute Conservation Area, Fairfield Tract, Devol Run Preserve, and Marietta College’s Barbara A. Beiser Field Station. FLMR acquired in 2001 and then passed to the City of Marietta the easement for the Kroger Wetland. Originally 15 acres and expanded in 2007 to 21 acres, the Kroger Wetland was always a special place for Marilyn. She worked to establish trails, parking spaces, and educational resources on the site. The close proximity made this wetland an educational watershed and opportunity for volunteer projects—bridges erected, trails cleared, trees planted, and bird blinds built.

Kroger Wetland was just one of Marilyn’s greenspace protection projects within Marietta. She also helped in the establishment of Kris–Mar Woods, through which runs a leg of the North Country Trail system. Over the years, she worked with numerous citizens’ groups and city committees, such as the Mayor’s Alternate Transportation Advisory Committee, and helped to promote land protection within Marietta through development of Land Development and Parking Lot Green Space ordinances.

And, of course, Marilyn vigorously promoted recycling in Marietta and Washington County. Long before curbside recycling was part of the city trash hauling contract (a service even now not available in the county), Marietta area residents could drop off recyclables at Marietta Area Recycling Center.

The recycling center was established in 1976 and is the oldest community drop-off volunteer recycling center in the state. Always well-supported by area residents, the recycling center continues to yield high-quality sorted materials. In recent years, around 800 tons of recyclables have been collected annually. The Center received the ODNR Recycle Ohio! Volunteer Recycling Award in April 2002, and the Natural Environment Heritage Award from Ohio’s Hill Country Heritage Area in 2004.

The Washington County Household Hazardous Waste Day was one of Marilyn’s most widely recognized accomplishments. Through her remarkable powers of persuasion, the chemical industry’s Responsible Care Group of Washington County agreed to fund an annual hazardous waste pickup day, beginning in 1991. Members of the RCG organized and supervised the on-site collection, which, with Marilyn’s inspiration, expanded to include tires, car batteries, and fluorescent bulbs. In 1995, a Paint Swap Day was added to give participants the opportunity to also acquire paints or stains no longer needed by other people. This was recycling at its best.

For 20 years, 1991–2010, Marilyn assured that everyone knew that the collection days were coming with posters, fliers, billboards, newspaper ads, and articles. And county residents participated enthusiastically; meticulously collected data showed that, on average, over 1,000 households participated annually. Over the years, tons of solid waste and tens of thousands of gallons of liquids were recovered, and on Paint Swap Day, thousands of gallons of paint were recycled.

Yet, I wonder for how many participants the most memorable part of the HHWD was being greeted every year at the entranceway by Marilyn to be offered fliers, a survey, and a mercury-free thermometer.

Marilyn was certainly not going to let Earth Day go unnoticed, and working with the Earth Day Committee, she helped organize a Marietta City Earth Day Celebration. The effort in planning these events is little appreciated by those attending. It involved not only recruitment of individuals and organizations with displays and activities for people of all ages, but acquisition of city approval for using the Armory grounds, liability insurance coverage, and of course, port-a-johns. This was also a day when Marilyn could help people appreciate practical uses of the “beloved” sweetgum fruit balls.

Possibly Marilyn’s greatest contribution was as an educator. For over 50 years, for young people and for adults, she promoted understanding and sensitivity toward the natural world.

Marilyn was a co-founder of the Marietta City School volunteer Outdoor Education Program in the 1970s, for which she received an NSF grant to train guides. Marilyn and other guides provided half-day nature hikes for both the school system and the 4-H for over 30 years. How many school children and 4-H’ers on these hikes first saw Jack protruding from his pulp, discovered nascent fireflies begin life as a glowworm, and shot each other with projectile jewelweed seeds?

Marilyn contributed many courses to Marietta College’s Institute for Learning in Retirement, and received the Marietta College Community Member Outstanding Education Volunteer Award in 2004 for her work on environmental education. Telesis recognized her as a Telesis Community Leader in 1991.

To better foster awareness of, sensitivity to, and education about our environment, Marilyn cofounded the Marietta Natural History Society (MNHS). Now in its third decade, this organization offers monthly presentations and field trips on diverse topics of local interest, from rattlesnake and mushroom biology to local archeology and the history of our region’s petroleum industry. Even Bigfoot made a (rather fuzzy) appearance. From March 1993 through the present, Marilyn unfailingly planned over 250 monthly events, as well as numerous natural walks, bird watching tours, and night hikes.

Beginning in 1998, a quarterly newsletter was started that presented articles, calendar events, and other information. The Society’s Web page (www.marietta.edu/~biol/mnhs/mnhs.html) houses an archive of all these newsletters, which includes Marilyn’s series on invasive plants and other articles she authored.
In Summer 2002, Marilyn organized publishing by MNHS of *The Natural View of Washington County*, an annual circular distributed through the county. For 13 years, it has provided articles on natural history as well as advertising opportunities for local businesses.

The MNHS has also championed a variety of causes. Members participate in annual winter bird counts and even helped rescue endangered freshwater mussels. With Marilyn’s efforts, the MNHS collaborated with the Ohio River Islands National Wildlife Refuge to develop the “Ohio River’s Wild Side” plaque, dedicated in October 2000 and located along the Ohio River levee. This plaque describes some of the major types of wildlife living in and around the Ohio River.

Marilyn once told me that she tried to be a voice for nature—to communicate for a world that could not speak for itself. The volume of correspondence she provided—the letters, e-mails, and articles—is hard to quantify, but we can get some sense from the approximately 180 “Our Earth” columns written for the local newspaper.

There are many superlatives that could be used to describe Marilyn as a person. A recognition she received in 1985 conveyed some of the best, noting that she was “inspired, cheerful, witty, patient, courteous, sensible, instructive, gracious, helpful, wise, conscientious, wonderful, questing, communicative, virtuous, humane, loyal, nature-loving, generous, observant, capable, punctual, reputable, distinguished, responsible, knowledgeable, courageous, informative, intelligent, imaginative, beautiful [and] mostly veracious.”

Marilyn was our benevolent force of nature. Her words and actions made the world a better and smarter place to live. We will miss her presence dearly, but I know that like the many trees she planted, what she gave us will continue to grow.

–Steven R. Spilatro, Ph.D.
Department of Biology and Environmental Science
Marietta College

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**Invasive Species of the Ordovician Period**

New Ohio University research suggests that the rise of an early phase of the Appalachian Mountains and cooling oceans allowed invasive species to upset the North American ecosystem 450 million years ago. The study, published recently in the journal *PLOS ONE*, took a closer look at a dramatic ecological shift captured in the fossil record during the Ordovician period. Ohio University scientists argue that major geological developments triggered evolutionary changes in the ancient seas, which were dominated by organisms such as brachiopods, corals, trilobites, and crinoids.

During this period, North America was part of an ancient continent called Laurentia that sat near the equator and had a tropical climate. Shifting of the Earth’s tectonic plates gave rise to the Taconic Mountains, which were forerunners of the Appalachian Mountains. The geological shift left a depression behind the mountain range, flooding the area with cool water from the surrounding deep ocean.

Scientists knew that there was a massive influx of invasive species into this ocean basin during this time period, but didn’t know where the invaders came from or how they got a foothold in the ecosystem, said Alycia Stigall, an Ohio University associate professor of geological sciences who co-authored the paper with former Ohio University graduate student David Wright, now a doctoral student at Ohio State University.

“The rocks of this time record a major oceanographic shift, pulse of mountain building, and a change in evolutionary dynamics coincident with each other,” Stigall said. “We are interested in examining the interactions between these factors.”

Using the fossils of 53 species of brachiopods that dominated the Laurentian ecosystem, Stigall and Wright created several phylogenies, or trees of reconstructed evolutionary relationships, to examine how individual speciation events occurred.

The invaders that proliferated during this time period were species within the groups of animals that inhabited...
Laurentia, Stigall explained. Within the brachiopods, corals, and cephalopods, for example, some species are invasive and some are not. As the geological changes slowly played out over the course of a million years, two patterns of survival emerged, the scientists report.

During the early stage of mountain building and ocean cooling, the native organisms became geographically divided, slowly evolving into different species suited for these niche habitats. This process, called vicariance, is the typical method by which new species originate on Earth, Stigall said.

As the geological changes progressed, however, species from other regions of the continent began to directly invade habitats, a process called dispersal. Although biodiversity may initially increase, this process decreases biodiversity in the long term, Stigall explained, because it allows a few aggressive species to populate many sites quickly, dominating those ecosystems.

This is the second time that Stigall and her team have found this pattern of speciation in the geological record. A study published in 2010 on the invasive species that prompted a mass extinction during the Devonian period about 375 million years ago also discovered a shift from vicariance to dispersal that contributed to a decline in biodiversity, Stigall noted.

It’s a pattern that’s happening during our modern biodiversity crisis as well, she said. “Only one out of 10 invaders truly become invasive species. Understanding the process can help determine where to put conservation resources,” she said.

The study was funded by a National Science Foundation grant awarded to Stigall, as well as support from the Yale Peabody Museum, Cincinnati Dry Dredgers and Ohio University's Department of Geological Sciences and Ohio Center for Ecology and Evolutionary Studies to Wright.

The PLOS ONE paper is available online: http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0068353.

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**Black Bear Sightings Increase in Southeast Ohio**

Last year, approximately 74 different black bears were confirmed in the Buckeye State according to the Ohio Department of Natural Resources (ODNR) Division of Wildlife. While the population of Ohio's largest mammal may not exactly increase in 2014, sightings of black bears are expected to rise in the summer months. June and July are peak months for bear movement.

“Dispersal of subadult male bears occurs annually, typically a result of being driven off by their mother as she prepares for the breeding season,” explains Jim Hill, wildlife management supervisor for southeast Ohio. “Young females have smaller ranges and seldom venture as far as males to establish territories.”

If a bear is sighted, individuals should contact the Division of Wildlife District Office (740-589-9930) to report the sighting, and then leave the bear alone. Every year, some bear reports in Ohio are associated with nuisance situations. When people remove potential food sources, conflicts with bears often diminish. Moving bird feeders higher, removing uneaten pet food, keeping trash inside until pick-up day, and cleaning up after grilling out all help to deter bears from frequenting an area and becoming nuisances.

During 2013, a total of 158 reported sightings of black bears occurred in 35 Ohio counties. Most sightings occurred in northeast and southeast Ohio. “Confirmed” sightings are defined by verified reports, which could mean tracks, scat, or pictures that provide proof of bear activity.

Efforts to monitor black bears in Ohio are supported by the Endangered Species and Wildlife Diversity Fund, which receives donations through the sale of Ohio Wildlife Legacy Stamps, the state income tax checkoff program, and the purchase of cardinal license plates. More information is available at wildohio.com.

The black bear is listed as an endangered species in Ohio and protected by state law.
Some Ohio Butterflies Threatened by Rising Temperatures

Heat of climate change, roads and buildings likely to harm several species

The combined heat from climate change and urbanization is likely to reduce the number of eastern swallowtails and other native butterflies in Ohio and promote the spread of invasive relatives, a new study led by a Case Western Reserve University researcher shows. Among 20 species monitored by the Ohio Lepidopterists society, eight showed significant delays in important early lifecycle events when the two factors were combined—a surprising response that may render the eight unfit for parts of the state where they now thrive.

Butterflies serve as important indicator species for how the broader ecosystem might be impacted, the researchers say. They are pursuing further studies to learn whether the negative impacts on multiple species add up to cause disruptions to the environment.

Other studies have shown that butterflies respond to higher temperatures due either to climate change or turning farmland and forests into asphalt and concrete by first appearing and reaching peak numbers earlier in the year.

“But when you combine the effects, it sort of throws a wrench in how you predict species’ responses,” said Sarah Diamond, an assistant professor of biology at Case Western Reserve and lead author of the study, now online in the journal Ecology at http://www.esajournals.org/doi/abs/10.1890/13-1848.1.

The findings may be useful to predict effects of environmental changes over the next decades and develop response strategies, and can likely be applied worldwide.

Diamond worked with Heather Cayton, Tyson Wepprich, Clinton Jenkins, Rob Dunn, and Nick Haddad of the department of biological sciences at North Carolina State University; and Leslie Ries, of the biology department at the University of Maryland.

The Study

Researchers analyzed 13 years of butterfly monitoring records by lepidopterists society volunteers at 83 locations statewide. The monitoring sites include locations in parks and preserves throughout Ohio. Nearly 230 Society monitors recorded species numbers from the first week of April through the first week of November. Their data was compared with temperature records.

Temperatures were taken from the nearest National Oceanic and Atmospheric Administration meteorological stations, which avoid the warming effects of urbanization. Sites in southern Ohio ranged 2 to 3 degrees Celsius warmer than northern sites on a given day. That difference reflects the amount of warming climate change models predict for the Midwest later this century, enabling the researchers to see how the change may alter butterfly lifecycles.

The lepidopterists’ records showed that butterflies generally emerged up to three weeks earlier and reached peak numbers sooner in southern Ohio than mid- and northern Ohio.

Biologists believe that advancing butterfly lifecycle events a couple of weeks enables them to take advantage of earlier flowering induced by warmer temperatures. The bigger payoff is that a species may add another generation in a year, increasing its population and ability to compete.

Urban Heat Tips Pattern

To estimate the heat from urbanization, researchers calculated the percent of impervious surface within 1 kilometer of each monitoring site, using the National Land Cover Database. Research by others shows the percentage of impervious surface is correlated with specific increases in surface and air temperatures. When this heat was added to the already warmer temperatures in greater Cincinnati and Dayton, seven species delayed their initial appearances. Three of them, plus one other species, delayed their peak numbers.

“Butterflies need warmth from the environment to develop,” Ries said. “As their environment gets warmer, they have more and more energy, but at extremes, it’s too hot and they die.

“Before it becomes lethal, too much heat can slow growth,” she said. “That’s why we see the delay.”

The delays may leave a species with fewer resources to feed and lay eggs or may expose them to greater risk of predation, resulting in a smaller next generation. Such a scenario may lead to loss of local populations.

The eastern tiger swallowtail, pearl crescent, and red admiral, all noted for their beauty, are among the eight species that delay and are more likely to suffer in the future in Ohio. Invasives, such as the cabbage white and European skipper, are more likely to thrive. These species are called “weedy,” meaning they can feed and lay eggs on a wide variety of plants. They were largely unaffected by the combined heat.

The researchers studied Ohio butterflies after Ries found the state has the most intensive monitoring records in the United States. While many other states are monitoring butterfly populations, most volunteers only go out about 7 times a year. Ohio volunteers go out 15 to 30 times per year. “That really helps us track shifts in timing, something that is more difficult to do with less intensive protocols” Ries said.

“If our data can be used for some enlightenment, we’re happy to have it used,” said Jerry Weidman, who chairs the society committee in charge of monitoring. Volunteers generate the records. They choose a section of trail and record the species and numbers they see within 7.5 feet of either side, Weidman explained. They monitor weekly from the beginning to end of the main butterfly flight season.

“One lab could never do something of this scope,” Diamond said. “Citizen scientists can help us do things on a scale never thought possible.”

The researchers believe their findings are applicable nationally and globally. Patterns of temperatures varying geographically and over time under climate change, coupled with gradients of rural to urban habitats, are widespread.

Diamond and colleagues are now setting up growth chambers to study butterfly physiology in the lab. They will simulate environmental conditions, including climate change and urbanization, to see what temperatures or other factors trigger changes in growth and behavior, and when. From that, they hope to develop predictions to help conserve each species.
New Horned Dinosaur Reveals Unique Wing-Shaped Headgear

Scientists have named a new species of horned dinosaur (ceratopsian) based on fossils collected from Montana in the United States and Alberta, Canada. *Mercuriceratops* (mer-cure-E-sare-ah-tops) *gemini* was approximately 6 meters (20 feet) long and weighed more than 2 tons. It lived about 77 million years ago during the Late Cretaceous Period. Research describing the new species is published online in the journal *Naturwissenschaften*.

*Mercuriceratops* means “Mercury horned-face,” referring to the wing-like ornamentation on its head that resembles the wings on the helmet of the Roman god, Mercury. The name “gemini” refers to the almost identical twin specimens found in north central Montana and the UNESCO World Heritage Site, Dinosaur Provincial Park, in Alberta, Canada. *Mercuriceratops* had a parrot-like beak and probably had two long brow horns above its eyes. It was a plant-eating dinosaur.

“*Mercuriceratops* took a unique evolutionary path that shaped the large frill on the back of its skull into protruding wings like the decorative fins on classic 1950s cars. It definitively would have stood out from the herd during the Late Cretaceous,” said lead author Dr. Michael Ryan, curator of vertebrate paleontology at The Cleveland Museum of Natural History. “Horned dinosaurs in North America used their elaborate skull ornamentation to identify each other and to attract mates—not just for protection from predators. The wing-like protrusions on the sides of its frill may have offered male *Mercuriceratops* a competitive advantage in attracting mates.”

“The butterfly-shaped frill, or neck shield, of *Mercuriceratops* is unlike anything we have seen before,” said co-author Dr. David Evans, curator of vertebrate paleontology at the Royal Ontario Museum. “*Mercuriceratops* shows that evolution gave rise to much greater variation in horned dinosaur headgear than we had previously suspected.”

The new dinosaur is described from skull fragments from two individuals collected from the Judith River Formation of Montana and the Dinosaur Park Formation of Alberta. The Montana specimen was originally collected on private land and acquired by the Royal Ontario Museum. The Alberta specimen was collected by Susan Owen-Kagen, a preparator in Dr. Philip Currie’s lab at the University of Alberta. “Susan showed me her specimen during one of my trips to Alberta,” said Ryan. “I instantly recognized it as being from the same type of dinosaur that the Royal Ontario Museum had from Montana.”

The Alberta specimen confirmed that the fossil from Montana was not a pathological specimen, nor had it somehow been distorted during the process of fossilization,” said Dr. Philip Currie, professor and Canada research chair in dinosaur paleobiology at the University of Alberta. “The two fossils—squamosal bones from the side of the frill—have all the features you would expect, just presented in a unique shape.”

“This discovery of a previously unknown species in relatively well-studied rocks underscores that we still have many more new species of dinosaurs to left to find,” said co-author Dr. Mark Loewen, research associate at the Natural History Museum of Utah.

This dinosaur is just the latest in a series of new finds being made by Ryan and Evans as part of their Southern Alberta Dinosaur Project, which is designed to fill in gaps in our knowledge of Late Cretaceous dinosaurs and study their evolution. This project focuses on the paleontology of some of oldest dinosaur-bearing rocks in Alberta and the neighboring rocks of northern Montana that are of the same age.
Depending on habitat availability, the endangered Indiana bat may be able to use its social connections to survive a certain amount of roost destruction, according to research by scientists at Virginia Tech and The Ohio State University.

Alexander Silvis of Lynchburg, Ohio, and Andrew Kniowski of Boones Mill, Virginia, both doctoral students in Virginia Tech's College of Natural Resources and Environment, made findings from Ohio State field studies highly visual by applying graphic and spatial approaches to the data.

"Social dynamics are important to bat roosting behavior," said Silvis, who is studying fish and wildlife conservation. "And now, looking at results of a study of roosting and foraging activity in a new light, we have evidence that Indiana bats make social contacts during foraging."

"An improved understanding of Indiana bat social structure and roosting behavior could greatly benefit efforts to minimize impacts of human land use on the species and provide insight into habitat management efforts," said Associate Professor W. Mark Ford of Virginia Tech's Department of Fish and Wildlife Conservation, who leads the Virginia Cooperative Fish and Wildlife Research Unit and advises both Silvis and Kniowski.

Silvis, Kniowski, and Ford, along with Stanley D. Gehrt, associate professor and wildlife extension specialist at The Ohio State University, co-authored an article on their research that appears in the May 9, 2014, issue of PLOS ONE.

Indiana bats form maternity colonies in summer beneath the bark of live trees or standing dead trees known as snags. The Ohio State researchers, which included Kniowski, then a master's student advised by Gehrt at Ohio State, conducted their study in Pickaway County, Ohio, which is dominated by cropland with only 9 percent woodland.

They captured and radio-tagged bats from maternity colonies in 2009 and 2010, tracked their activity to determine foraging areas and roosts, and counted bats as they exited roosts. They captured 23 Indiana bats in 2009, of which 14 were adult females and the rest juveniles. They captured 26 bats in 2010, 20 of which were adult females.

Tracking the radio-tagged bats to roosts, they observed that the female bats didn't always return to the same roost. Applying their new approach to the data, "We were able to map a network of connections between the roosts," said Kniowski, who is in the interdisciplinary geospatial and environmental analysis program at Virginia Tech and works out of the Department of Fish and Wildlife Conservation.

A comparison of the 2009 and 2010 network maps revealed a dispersed roost area in 2009 and a dense network in 2010, with only the most central roosts reused in the second year. The roost area for the entire colony was more than 6.5 square miles in 2009 and less than a square mile in 2010, whereas the foraging area was about 14 square miles both years.

Some flexibility is to be expected in terms of roosting, given the transitory nature of snags, the researchers note in the article. "Roost conditions are very fleeting," said Silvis, who also did his master's research at Ohio State under Gehrt.

But the substantial dispersion of the roosts in 2009 could have been dangerous for the bats. The researchers simulated the removal of roosts to determine the robustness of the colony. Removal of only 5 percent of roosts in 2009 would have resulted in fragmentation of the network, whereas it would have required removal of half of the roosts to fragment the tightly knit network of 2010.

The researchers suggested in the article that they may have witnessed colony behavior changes associated with roost deterioration. In 2009, the colony may have been scattered, seeking a suitable primary roost, following abandonment of a primary roost the previous year. Then in 2010, the colony concentrated roosting activity in the proximity of the new, most suitable roost.

"There is evidence that the colony was using a different primary roost two years prior to our study," they wrote. "In areas with greater amounts of forest or roosting resources, bats may not need to disperse as far in search of new roosts allowing a more stable roosting area."

"We happened to catch the bats at a time when a tree probably became 'ideal,'" said Kniowski.

"Indiana bats do not select the most stable environment for their roosts," said Silvis, "which makes it all the more critical that we understand their social dynamics and how to manage the conditions of their habitats."

The team also observed greater foraging area overlap than expected, "which does not necessarily equate to association, and further may be an artifact of the location of the highest quality foraging habitat," they cautiously noted. "However, a high level of overlap should be positively related to the potential for association."

They optimistically suggest, that in cases of roost loss, "foraging area overlap supports the idea that social connections could be re-established during foraging bouts."

"The study highlights a level of complexity in both roost and roosting area use that has not been previously described and raises questions about the resiliency of Indiana bats to roost loss," said Ford.

"Identifying the similarities and differences in colony structure across an array of geographic locations and habitat configurations would provide insight into the biological and ecological factors influencing colony behavior," Ford continued. "However, reductions in population size due to white-nose syndrome, a disease that has significantly impacted the Indiana bat and other bat species, probably preclude such opportunities, making the social dynamics revealed by Kniowski, Silvis, and Gehrt all the more profound."
A recent study in *Physiological and Biochemical Zoology* shows that Eastern bluebirds in Ohio differ in a variety of ways from their relatives in Bermuda. Island plants and animals are often different from their mainland relatives. In general, the lack of top predators and large herbivores on isolated oceanic islands influences traits of island organisms. Consider, for example, the dodo: this island-dwelling, flightless bird was so fearless that it was hunted to extinction by humans within 200 years of first contact. Human interaction is just one threat to conservation. Differences in the threats posed by pathogens and parasites may also be important for conservation of today’s extinction-prone island populations.

Eastern bluebirds (*Sialia sialis*) are familiar to many people living in the eastern United States, and also to residents and tourists in Bermuda, an archipelago with a total area of about 54 square kilometers that lies in the North Atlantic about 1,100 km off the East Coast of the United States. Although the current outlook for the bluebirds in the U.S. is good, their Bermuda relatives have been designated as threatened and vulnerable.

Comparisons of island and continental bird populations can offer new insights to people interested in conserving island birds. We compared island (Bermuda) and continental (Ohio, U.S.) populations of the Eastern bluebird, studying these birds from egg to adult. We investigated how nestlings and adults differed in growth, size and shape, immune function, numbers of eggs and nestlings that pairs produce, and how frequently parents deliver food to their young. We also attempted to identify differences between continental and island birds that, either individually or as part of a broader phenomenon, might intensify the risks of decline typically associated with small and geographically isolated populations, such as the Bermuda bluebirds.

Our study showed that bluebirds in Bermuda differed in a variety of ways from bluebirds in Ohio. For example, adults in Bermuda were lighter weight and had longer wings than the Ohio birds. These differences contrast with the usual changes associated with small animals living on isolated islands. Parents fed their nestlings at equal rates throughout the season in both locations. However, island nestlings grew more slowly and, as the breeding season progressed, more chicks died in their nests in Bermuda, though no similar seasonal pattern was observed in Ohio. Overall, our results suggest that the Bermuda bluebirds may be adjusted to certain aspects of the island environment but not to others.

Efforts to conserve Bermuda bluebirds may be improved by focusing on the intraseasonal patterns in nestling mortality and, more generally, the survival rates of birds of all ages. Furthermore, conservation planners in Bermuda may benefit by considering the consequences of (1) introduced mammalian and avian predators and competitors and their removal and (2) human-driven changes in populations of the insects that bluebirds eat and feed their chicks. These factors may not only affect survival and mortality rates but may also shape bluebird physiology and reproduction. Ultimately, our study highlights the value of considering the match between an organism, its environment, and its evolutionary history on a population-specific scale. Without this context, identifying detrimental trends is a more challenging proposition.

The Herbert Osborn Award

**Purpose:** The Ohio Biological Survey, in honor of its founder, established the Herbert Osborn Award to recognize noteworthy accomplishments and service in the field of biology as pertaining to the objectives of the Ohio Biological Survey. The Award is presented on an annual basis, and was initiated in 1991.

**Qualifications:** Recipients of the Herbert Osborn Award will be individuals who have made an exceptional contribution through consistent research publications to the advancement of knowledge concerning the occurrence, distribution, taxonomy, and/or ecology of the flora and fauna of Ohio. The intent of the Award is to recognize relevant accomplishments and service over a period of years.

OBS Naturalist Award

**Purpose:** The Ohio Biological Survey wishes to honor those individuals who have made significant contributions to our understanding and conservation of the natural heritage of Ohio.

**Qualifications:** An individual selected to receive the Ohio Biological Survey Naturalist Award will have worked energetically to acquire or disseminate knowledge, conserve natural areas, and/or foster our understanding of the fauna and flora of Ohio. The awardee will be an active contributor over a period of years in pursuit of the activities concerning the natural heritage of Ohio.

Small Grants

OBS offers small grant programs to support work that occurs partially or wholly in Ohio, and that promotes the Survey’s objectives. The Survey offers this support to individual members and institutional/corporate members from monies derived from a portion of dues income. Applicants for individual small grants must be current individual members of the Survey or employees/members of the institution or corporation that is a Survey member. Proposals should be received on or before February 1 of each granting year.

You can find more information, including an application form, at [www.ohiobiologicalsurvey.org/projects/](http://www.ohiobiologicalsurvey.org/projects/).

### Ohio Biological Survey - Individual Membership

The Ohio Biological Survey, an inter-institutional agency dedicated to the natural history and conservation of Ohio’s flora and fauna, has opened its membership to individuals. Individual members are entitled to a 20% discount on all Survey publications, will receive the Survey’s newsletter, *BioOhio*, can participate in hosted or co-hosted workshops, field trips, or lecture series, and are eligible to apply for research monies through the Survey’s Small Grant Program. All dues money will be returned to these benefits.

**Dues schedule:** Students and Retired Members: **$15**/year; Regular Members: **$25**/year; Lifetime Regular Membership: **$500**; and Lifetime Retired Membership (60 or older): **$100**. If you are interested in becoming a member, please send your name, address, and dues to Ohio Biological Survey, P.O. Box 21370, Columbus, OH 43221-0370.