

Oral Abstracts NEPARC Meeting 2018

TITLE: Urbanization Effects on Freshwater Turtle Populations: An Ecological Research as Education Network (EREN) Study

AUTHORS, AFFILIATIONS, AND EMAIL: David R. Bowne, Department of Biology, Elizabethtown College, One Alpha Drive, Elizabethtown, PA 17022, U.S.A.; Mary Beth Kolozsvary*, Department of Environmental Studies and Sciences, Siena College, 515 Loudon Road, Loudonville, NY 12211, U.S.A.

CO-AUTHORS (multiple affiliations): David R. Bowne, Bradley J. Cosentino, Laurel J. Anderson, Christopher P. Bloch, Sandra Cooke, Patrick W. Crumine, Jason Dallas, Alexandra Doran, Jerald J. Dosch, Daniel L. Druckenbrod, Richard D. Durtsche, Daniel Garneau, Kristen Genet, Todd S. Fredericksen, Peter A. Kish, Mary Beth Kolozsvary, Frank T. Kuserk, Erin S. Lindquist, Carol Mankiewicz, James G. March, Timothy J. Muir, K. Greg Murray, Madeline N. Santulli, Frank J. Sicignano, Peter D. Smallwood, Rebecca A. Urban, Kathy Winnett-Murray, and Craig R. Zimmermann.

ABSTRACT: The Ecological Research as Education Network (EREN; www.erenweb.org) was created to carry out high-quality, publishable research, through collaborations across Primarily Undergraduate Institutions (PUIs). EREN is ideally designed to ask ecological questions that can be answered by standardizing protocols allowing students to collect data and compare it across multiple sites. Turtle POP, one of EREN's initial projects, was designed to investigate the effects of landscape characteristics on population structure in freshwater turtles. Landscape-scale alterations that accompany urbanization, such as changes to nesting sites and higher mortality rates due to vehicular collisions and increased predator populations, may particularly affect immature turtles and mature female turtles. We hypothesized that the proportions of adult female and immature turtles in a population will negatively correlate with landscape urbanization. To address this question, we sampled freshwater turtle populations in 11 states across the central and eastern United States. Contrary to expectations, we found a significant positive relationship between proportions of mature female painted turtles (*Chrysemys picta*) and urbanization. We did not detect a relationship between urbanization and proportions of immature turtles. Urbanization may alter the thermal environment of nesting sites such that more females are produced as urbanization increases. Our approach of creating a collaborative network of scientists and students at undergraduate institutions proved valuable in terms of testing our hypothesis over a large spatial scale while also allowing students to gain hands-on experience in conservation science.

TITLE: Headstarting of the Timber Rattlesnake in Massachusetts

AUTHORS, AFFILIATIONS, AND EMAIL: Anne Stengle*, Chemistry Department, Holyoke Community College, Holyoke, MA 01040; astengle@bio.umass.edu; Thomas Tynning, Environmental Sciences, Berkshire Community College, Pittsfield, MA 01201; ttynning@berkshirecc.edu; Paul Sievert, Department of Environmental Conservation, University of Massachusetts, Amherst, MA 01003; psievert@eco.umass.edu.

ABSTRACT: Timber Rattlesnake (*Crotalus horridus*) populations have become increasingly fragmented and isolated during the past 300 years, and probably most pronounced near the northeastern edge of their distribution in Massachusetts. Currently, five populations exist in the state, with only one site large enough to be considered a metapopulation. The state began a small-scale headstarting program in 2011 with the Roger Williams Park Zoo, Providence, RI with the first release in 2012. All neonates were wild caught, although the state is exploring the option of captive breeding in the future. Following releases were done in 2013 and 2014, with future releases planned in the future. Sample sizes were small and the protocol for both the release and husbandry were adjusted with each release. Individuals were released with implanted radiotransmitters. The most recent release was the most successful. Here we will describe how our protocols changed with each release to optimize survivorship, and the results of each release. Headstarting has been widely successful with several turtle species, but there are few reports of its use with snake species, and even fewer that were successful with snake species. These results will guide not only future work with this species in this region, but can be applied to other species in other regions.

TITLE: Fuels Management and Habitat Restoration Activities Benefit Eastern Hognose Snakes (*Heterodon platirhinos*) and other Snake Species in a Pine Barren

AUTHOR(s), AFFILIATION, ADDRESS, AND EMAIL: Michael E. Akresh*, Department of Environmental Conservation, University of Massachusetts, Amherst, MA 01003; makresh@eco.umass.edu; David I. King, U.S. Forest Service Northern Research Station, Amherst, Massachusetts, 01003; dking@fs.fed.us; Brad C. Timm, Hindsait, Inc.; Robert T. Brooks, U.S. Forest Service Northern Research Station, Amherst, Massachusetts, 01003.

ABSTRACT: Eastern Hognose Snakes (*Heterodon platirhinos*) are a species of conservation concern in the northeast U.S. because of their association with rare and declining habitats such as pine barrens and shrublands. These are disturbance-dependent habitats that currently require management to persist. We studied *Heterodon platirhinos* on a pitch pine-scrub oak barren in western Massachusetts from 2008–2013 to evaluate the effects of habitat restoration and fuels management. We also opportunistically recorded sightings of other snake species occurring in our managed study site. Twelve *Heterodon platirhinos* were radio-tagged during the months of May to October 2008–2010. We examined habitat use versus availability using paired logistic regression analyses in which availability was temporally and spatially explicit in relation to radio-tracked snakes' previous use location and likely movements. *Heterodon platirhinos* significantly avoided closed-canopy forests and power line corridors and instead primarily used heavily thinned pitch pine and scrub oak barrens. Individuals that used some closed-canopy forested habitat had significantly larger home ranges compared to snakes that only used managed early-successional habitat, congruent with ecological theory that home range area increases with decreasing resources. We also observed other snake species extensively using managed areas, including *Coluber constrictor* and *Lampropeltis triangulum*. We calculated a probability of 0.61 for adult

Heterodon platirhinos survival during a 150-day active season (95% CI=0.22–0.85), which is similar to other reports for this species. We conclude that fuels reduction and habitat restoration activities, primarily heavy thinning, are increasing the amount of preferred habitat available for threatened snake species.

TITLE: Operation Kingsnake – the successful coast to coast pursuit and apprehension of reptile poacher’s in the United States

AUTHORS, AFFILIATIONS, AND EMAIL: Corporal K. Michael Lathroum, Maryland Natural Resources Police, Special Operations Section, 1070 East College Parkway, Annapolis, Maryland 21409; Mike.Lathroum@Maryland.gov

Abstract: The illegal collection of reptiles and amphibians for personal profit and notoriety in the herp world is nothing new. Increasingly the poachers are targeting rare and endangered species or color morphs which are locality specific. Their search for these animals is leading them to public lands: State Parks, State Forests, National Parks, Wildlife Management Areas etc. where they illegally collect animals in violation of state laws. The poached reptiles are then frequently transported across state lines and offered for sale in interstate commerce through on-line or through private transactions. I will detail how I became aware of one such violator, my partnership with the U.S. Fish and Wildlife Service and my almost 4 year-long investigation into the illegal collection of Coastal Plains Milksnakes on Maryland’s Eastern shore. My portion of the investigation resulted in my catching the violator on Maryland State Forest property with live reptiles in his possession, his prosecution and sentencing in U.S. District Court for violations of the Lacey Act. A total of (4) reptile poachers were convicted in U.S. District Court for various violations of the Lacey Act. I will also explain how social media and smart phones play a role in modern conservation law enforcement and how researchers can help safeguard our reptile and amphibian resources.

TITLE: The Northeast Wildlife Disease Cooperative: Working With Biologists To Conserve Reptiles And Amphibians In The Region

AUTHOR(S), AFFILIATION, ADDRESS, AND EMAIL: Julie C. Ellis*, Director Northeast Wildlife Disease Cooperative, Cummings School of Veterinary Medicine at Tufts University, 200 Westborough Rd, Grafton, MA 01536; Julie.ellis@tufts.edu; Jenny Dickson, Supervising Wildlife Biologist CT Department of Energy and Environmental Protection, Wildlife Diversity and Outreach Programs, Sessions Woods WMA, P.O. Box 1550, Burlington, CT 06013; Jenny.Dickson@ct.gov

ABSTRACT: The Northeast Wildlife Disease Cooperative (NWDC) provides diagnostic services, expertise, training, and research support to state and federal agencies that manage wildlife populations in the Northeast. Participating veterinary diagnostic laboratories located throughout the region serve NWDC members, which include the wildlife agencies of eight states and the U.S. Fish and Wildlife Service (Northeast Region). Through the cooperative structure of the NWDC, multiple institutions contribute

their respective skills and knowledge, and agencies pool their resources to fund a cost-effective and efficient means of detecting, diagnosing and responding to wildlife disease events. The main objective of the NWDC is to serve the agencies that manage and conserve wildlife species in the region. NWDC staff and biologists from member agencies have formed a working group to discuss disease issues pertaining to captive herpetofauna, including animals in rehabilitation, pet trade, and head start programs. The goal of the group is to develop evidence-based recommendations for maintaining captive animals to prevent the spread of infectious disease to free-living wild herpetofauna. As such, we are working to draft regional recommendations that would include decision trees for when to release an animal, biosecurity protocols that are evidence-based and feasible, and disease surveillance guidelines for pre- and post-release of animals. The goal of this presentation is to coordinate the work that NWDC is doing with the efforts by NEPARC working groups and members.

TITLE: Monitoring with Microbes: Predicting Amphibian Disease Susceptibility Using Lab-Based Microbial Challenge Assays

AUTHOR, AFFILIATION, ADDRESS, AND EMAIL: Ariel Kruger*, Department of Ecology, Evolution, and Natural Resources, Rutgers University, 14 College Farm Road, New Brunswick NJ 08901; ariel.kruger@rutgers.edu

ABSTRACT: Determining where and when to focus conservation efforts for at-risk species is an ongoing challenge for researchers. Implementing appropriate conservation efforts is especially important for amphibians that are threatened by the chytrid fungus, a virulent pathogen that infects amphibian skin. In the amphibian-chytrid fungus system, studying the antifungal microorganisms on amphibian skin has provided important insights to differences in chytrid susceptibility among populations. As such, identifying anti-chytrid microbes has been a promising avenue of conservation research. Here, I propose that researchers document the microorganisms present on disease-prone amphibians across space and time prior to disease invasion to predict which species, populations, or individuals are most susceptible to disease and thus deserve targeted conservation efforts.

Using conventional microbiology techniques, I tested amphibian skin-associated bacteria for anti-chytrid activity using a lab-based microbial challenge assay. In this assay, chytrid is grown in the presence of bacterial supernatant to determine which bacteria have the ability to inhibit its growth. Using these assays, I found differences in the frequency of anti-chytrid bacteria on *Lithobates clamitans* across sites in New Jersey. By understanding the antifungal abilities of microorganisms present on amphibian skin using these assays, researchers can predict which populations might be most affected by chytrid prior to disease invasion. Furthermore, having a baseline understanding of amphibian skin microbes prior to disease emergence is necessary to distinguish pre- and post-disease dynamics and to know when infected populations have fully recovered.

TITLE: Evaluating Volunteer-Collected Environmental DNA Samples To Detect The Amphibian Pathogens *Batrachochytrium Dendrobatidis* And *Ranavirus*

AUTHORS, AFFILIATION, ADDRESS, AND EMAIL: James T. Julian*, Division of Mathematics and Natural Science, Penn State University-Altoona College, Altoona, PA 16601; jtj2@psu.edu; Gavin W. Glenney, Northeast Fishery Center, U.S. Fish and Wildlife Service, Lamar, PA 16848; gavin_glenney@fws.gov; Christopher B. Rees, Northeast Fishery Center, U.S. Fish and Wildlife Service, Lamar, PA 16848; christopher_rees@fws.gov;

ABSTRACT: When mortality events occur at amphibian breeding ponds, it can prove difficult to confirm pathogens as the proximal cause because dead animals are quickly consumed by conspecifics or they decompose before investigators can collect the tissue samples needed for diagnostic testing. However, the collection of environmental DNA (eDNA) from the water column of infected ponds has been shown to detect these pathogens. We trained volunteers from five conservation organizations to collect eDNA samples from a series of ponds whose larval amphibian community had a history of *Batrachochytrium dendrobatidis* and/or *Ranavirus* infections. Volunteers were given low-cost sampling kits to filter pond water and preserve eDNA on filter paper, with the principal investigators (PI) using similar kits to make independent eDNA collections within 48 hours of volunteer collections. This resulted in 38-paired comparisons of volunteer and PI-collected eDNA samples, allowing us to evaluate how consistently these two groups were able to detect amphibian pathogens. Separate collections of eDNA were made in May, June, and July for each of 21 ponds to determine temporal variation in pathogen presence/abundance. We will present the results of this study, and discuss the effectiveness of using our volunteer-sampling protocols as a means of establishing rapid response disease diagnostic teams in an area

TITLE: Impacts of Cannibalism on an All-Female Lineage of Salamanders

AUTHORS, AFFILIATION, ADDRESS, AND EMAIL: Dennis Murray, Department of Biology, Trent University, Peterborough, ON, K9HJ 0G2; dennismurray@trentu.ca; Jasper S. Leavitt*, Department of Environmental and Life Sciences, Trent University, Peterborough, ON, K9HJ 0G2; jasperleavitt@trentu.ca; Thomas J. Hossie, Department of Biology, Trent University, Peterborough, ON, K9HJ 0G2; thossie@trentu.ca

ABSTRACT: In ambystomatids, relatedness impacts the likelihood of a larva cannibalizing another, with siblings being much less likely to attack each other than unrelated individuals. Within these salamanders is the “unisexual complex”, an all-female lineage that steals sperm from male *Ambystoma* to have offspring. Notably, they often don't incorporate the male DNA, thereby producing clones of themselves. My work with these animals looks at cannibalism from two perspectives: choosing when to cannibalize and overcoming being partially eaten. To do this, we first tested whether clonal lineages would cannibalize each other at rates more like siblings or non-siblings by monitoring aggression rates over the course of two months. After that, we monitored regeneration rates of unisexuals to a pure, bisexual lineage, *Ambystoma laterale*, at multiple temperatures spanning their thermal range. We found that unisexuals overall were more aggressive than *A. laterale*, regardless of kinship, with higher rates of full

cannibalism events and sub-lethal aggression. We also found that unisexuales were larger in both mass and length than *A. laterale*, but they did not regenerate tails faster. They did, however, regrow tails faster at warmer temperatures than ones they were locally adapted to. These results indicate that clonality in the unisexual lineage does not confer a significant benefit to salamanders when they are larvae, and that they are potentially less cold-adapted than their primary sperm donors in the northeast.

TITLE: Do Land Use Changes Buffer The Evolutionary Responses Of A Terrestrial Salamander To Climate Change?

AUTHORS, AFFILIATIONS, AND EMAIL: Annette Evans^{*}, Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, Connecticut, 06269 USA; annette.evans@uconn.edu; Elizabeth Jockusch Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, Connecticut, 06269 USA; Elizabeth.jockusch@uconn.edu, Mark C. Urban; Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, Connecticut, 06269 USA; mark.urban@uconn.edu; Brenna Forester; Department of Biology, Colorado State University, Fort Collins, Colorado 80523, USA; Brenna.Forester@colostate.edu; Caitlin Fisher-Reid, Department of Biological Sciences, Bridgewater State University, Bridgewater, Massachusetts, 02325 USA; MFISHERREID@BRIDGEW.EDU; Brad Cosentino, Department of Biology, Hobart and William Smith Colleges, Geneva, New York, 14456 USA; COSENTINO@hws.edu

ABSTRACT: A myriad of biotic and abiotic factors can act simultaneously to amplify or dampen the selective pressures imposed by climate change and the ecological responses of species. Given this multifaceted nature of selection, we need to understand how the joint operation of multiple major disturbances, like land use change and climate, interact in their effect on population evolutionary responses. Terrestrial amphibians, such as plethodontid salamanders, are expected to be particularly sensitive to multiple environmental stressors given their limited dispersal capabilities and need to maintain cool, moist skin for respiration. Previous research on the response to environmental stressors by the polymorphic salamander *Plethodon cinereus* suggests that both cool climates and forest cover are associated with higher frequencies of striped color morphs at broad spatial scales. However, at the regional New England scale, recent population resurveys reveal no changes in morph frequencies over the past 40 years despite substantial changes in climate. One potential explanation is that changes in forest cover over the same period have buffered populations from the impacts of climate change. We used structural equation models (SEMs) to examine if land use and climate change affect the evolution of *P. cinereus* color polymorphisms in New England by comparing historical and resurvey data. Our results shed light on the importance of simultaneously examining multiple environmental stressors when evaluating and predicting species evolutionary responses to climate change.

TITLE: Genomic Methods Reveal Distinct Structure & Connectivity of the threatened Long-tail Salamander (*Eurycea longicauda*) Across Pond & Stream Landscapes

AUTHORS, AFFILIATIONS, AND EMAIL: Neha G. Savant*, The Nature Conservancy, 200 Pottersville Rd. Chester, NJ 07930; neha.savant@tnc.org ; Matthew I. Palmer, Department of Ecology, Evolution & Environmental Biology, Columbia University, 1200 Amsterdam Ave., New York, NY 10027; mp2434@columbia.edu

ABSTRACT: Understanding population genetic structure and connectivity of imperiled species across different habitats is vital not only to understand their natural history, but also to inform management strategies. In New Jersey, the threatened long-tail salamander, *Eurycea longicauda*, lives and breeds in a variety of habitats including Piedmont stream-dominated landscapes and Ridge & Valley pond-dominated landscapes. Using genomic methods, we investigated the genetic structure of *E. longicauda*, across these two contrasting landscapes at three scales: among regions, within regions and within habitat. We collected 94 samples near ponds and 161 samples near streams and used ddRADseq to identify thousands of genomic markers. We found population density was higher along pond margins than along streams where salamanders were found in aggregations of fewer individuals. At the largest scale, among regions, population genetic structure mirrored geography while within regions, populations from the Ridge & Valley pond landscape displayed stronger genetic structure than populations within the Piedmont stream landscape. At the smallest scale, within habitats, we see populations within a stream have much less structure than populations within a pond complex at a similar extent indicating that individuals within a stream could be a single putative population. Studies on *E. longicauda* population connectivity in New Jersey are especially timely as a natural gas pipeline is proposed to be built across many Piedmont streams surveyed in this study. Results from this study will bring managers closer to understanding how to best manage impacts from this disturbance and conserve this state threatened species.

TITLE: Amphibian Road Closures: Lessons Learned from a Pilot Season of “Big Night Detours” in Keene, NH

AUTHORS, AFFILIATIONS, AND EMAIL: Brett Amy Thelen*, Science Director, Harris Center for Conservation Education, 83 King’s Highway, Hancock, NH, 03449; thelen@harriscenter.org Duncan Watson, Assistant Public Works Director, City of Keene, 350 Marlboro Street, Keene, NH, 03431; dwatson@ci.keene.nh.us

ABSTRACT: Amphibian road mortality is a considerable conservation issue, particularly during the highly-synchronized annual migrations undertaken by vernal pool-breeding species on the first warm, rainy nights of spring (“Big Nights”). Observed mortality rates along even low-traffic rural roads may be high enough to lead to localized extirpation of pool-breeding amphibians, and long-term impacts of roads on amphibian population dynamics can be severe. To reduce localized amphibian road mortality, the Harris Center for Conservation Education – a non-profit organization based in southwest New Hampshire – coordinates an annual “Salamander Crossing Brigade” program, in which trained volunteers move migrating amphibians across roads by hand during periods of

peak traffic. In 2018, following ten years of crossing brigade efforts at North Lincoln Street in Keene, New Hampshire, the City of Keene agreed to close the road to vehicle traffic on Big Nights. City staff worked with the Harris Center to determine when to close the road, though the unpredictability of spring weather presented a challenge, particularly when paired with the logistics of implementing and communicating a same-day road detour. In the project's inaugural year, the road was closed four times, facilitating the safe passage of at least 1,850 individual amphibians. Smaller migrations also occurred on three nights when the road was open to vehicles. In addition, the road closures generated widespread public interest – resulting in well over 100 visitors to the crossing site, many without flashlights or raingear – highlighting the project's educational value, as well as the need for a robust communications plan.

TITLE: Urban Wood Frog Movement and Habitat Selection in Maine, USA

Authors: Kristine Hoffmann*, Department of Wildlife, Fisheries, and Conservation Biology, University of Maine, Orono, ME, 04469, Kris.e.hoffmann@gmail.com; Thomas Hastings, Department of Wildlife, Fisheries, and Conservation Biology, University of Maine, Orono, ME, 04469, tphastings1s@semo.edu; Malcolm L. Hunter, Department of Wildlife, Fisheries, and Conservation Biology, University of Maine, Orono, ME, 04469, mhunter@maine.edu; Aram J. K. Calhoun, Department of Wildlife, Fisheries, and Conservation Biology, University of Maine, Orono, ME, 04469, calhoun@maine.edu; and Mitchell Jones, Department of Wildlife, Fisheries, and Conservation Biology, University of Maine, Orono, ME, 04469, jonemi02@gmail.com

ABSTRACT: The complex life cycle of *Lithobates sylvaticus* (Wood Frogs) in undisturbed forests includes migrations to vernal pools to breed, to summer home ranges in forested wetland, and to upland hibernacula, however their habitat use and movements in developed landscapes are poorly understood. We radio tracked frogs at three urban pools to quantify migration and habitat selection on a coarse scale by locating frogs daily, and at one site on a fine scale by locating frogs hourly during post-breeding migration. Frogs made shorter migrations than those documented in natural landscapes or did not migrate, presumably due to the limited availability of suitable habitat. Frogs summered in forested wetlands, along forested ditches with intermittent streams, and in shrubs. Observed frogs did not make fall migrations but hibernated in the forest adjacent to the summer habitat on a slightly elevated bank. At the fine scale we observed frogs migrating at nights across open lawns and settling under cover (shrubs, garden plants, grass, etc.) when the rain ended or as dawn approached. Sources of mortality included lawn mowers, swimming pools, and predation. Our results indicate that some *L. sylvaticus* populations limit their migratory behavior to persist in areas with limited habitat and that diurnal refuges are important for migration through altered landscapes.

TITLE: Salamanders in Space: An Experimental Manipulation of Artificial Cover Objects

AUTHOR(s), AFFILIATION, ADDRESS, AND EMAIL: Jill Fleming*, Northeast Amphibian Research and Monitoring Initiative; USGS Patuxent Wildlife Research

Center; Turners Falls, MA 01376; jefleming@usgs.gov; Evan H Campbell Grant, Northeast Amphibian Research and Monitoring Initiative, USGS Patuxent Wildlife Research Center, Turners Falls, MA 01376; ehgrant@usgs.gov; Chris Sutherland, Department of Environmental Conservation, University of Massachusetts, Amherst, MA 01003; csutherland@umass.edu;

ABSTRACT:

Amphibian conservation efforts suffer from a lack of long-term population data which limits the efficacy of management actions. However, this data deficiency can be compensated for by monitoring species across their range. SPARCnet (Salamander Population and Adaptation Research Collaboration Network) is a network of scientists using artificial cover object (ACO) arrays and mark-recapture techniques to investigate the population ecology of the red-backed salamander (*Plethodon cinereus*) across their entire range. Though ACOs are a reliable tool for encountering terrestrial salamanders, they are subject to bias as they introduce suitable habitat to the study area, potentially acting as an attractant. ACO arrays are sampled on multiple occasions and the resulting capture data, which are inherently spatial, allows for the estimation of true density using spatial capture-recapture (SCR). In order to understand whether the spatial design of ACO arrays induce bias in population estimates via biological or physical phenomena (i.e., territoriality or habitat availability, respectively), we have installed three geographically separated replicates of five array designs differing in sampling area and ACO density in Wendell State Forest (Wendell, MA). We found that in using SCR analysis, a spatially explicit method for estimating population parameters, density estimated of red-backed salamanders are not influenced by ACO array design. These results support the use of ACOs for terrestrial salamander monitoring, and further demonstrate the value of SCR for analyzing spatially explicit capture data.

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(Macalester College), Daniel L. Druckenbrod (Rider University), Richard D. Durtsche (Northern Kentucky University), Daniel Garneau (State University of New York Plattsburgh), Kristen Genet (Anoka-Ramsey Community College), Todd S. Fredericksen (Ferrum College), Peter A. Kish (Moravian Academy), Mary Beth Kolozsvary (Siena College), Frank T. Kuserk (Moravian College), Erin S. Lindquist (Meredith College), Carol Mankiewicz (Beloit College), James G. March (Washington & Jefferson College), Timothy J. Muir (Augustana College), K. Greg Murray (Hope College), Madeline N. Santulli (Siena College), Frank J. Sicignano (Siena College), Peter D. Smallwood (University of Richmond), Rebecca A. Urban (Lebanon Valley College), Kathy Winnett-Murray (Hope College), and Craig R. Zimmermann (Rogers State University).

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