

## The Naturalists Are Dying off

... natural history has earned the pejorative epithet of 'alpha ecology,' and it has often been considered to have little or no potential for generating ideas.

F. C. Evans (1985, *Bulletin of the Ecological Society of America* 66:455-460)

Like probably most of you reading this journal, I do not get out in the field much anymore. It is easy to rationalize the life of armchair ecology (now better called keyboard ecology): field biology is laborious and low-paying. We have too many teaching and committee responsibilities—or too many papers to edit—to afford time in the field. We do not want to be away from our families for so long. Our dissertations are still sitting there on the shelf largely unpublished, so why collect more data? We cannot get big grants to do field work anymore. Computer modeling produces publishable results much quicker, anyway. We can have much more influence and prestige spending our time supervising research projects, writing, speaking, and attending important meetings rather than tromping around in the woods recording data. The mosquitoes, chiggers, and cold wet feet are unbearable. We are getting too old for that stuff.

Every now and then I break free from the office, the computer, the telephone, the piles of manuscripts, and take up an invitation to visit a field site somewhere. I stumble over logs, get ripped by thorns, bitten by horseflies, stuck in mud, sunburned, and bruised. I sweat, groan, spit, curse, and generally have a wonderful time. I fight back tears when I see old, long-forgotten friends—the wildflowers, ferns, trees, salamanders, fungi, and beetles I once knew so well but whose names now elude me as often as not. I begin to wonder what we, as conservation biologists, lose when we spend our time in conference centers rather than mountains, in airplanes instead of canoes, or peering into computer screens instead of down tortoise burrows. What do our students lose when we teach them how to model population viability and analyze remote sensing data, but not how to distinguish the song of the Bay-breasted Warbler from that of the Cape May, the track of the mink from that of the marten, the taste of the birch twig from that of the cherry? Will the next generation of conservation biologists be nothing but a bunch of computer nerds with no firsthand knowledge of natural history? Does it follow that they will therefore have no personal emotional ties to the land?

Conservation biology has made some headway lately in moving from the ivory tower to the "real world" of natural resources management and policy. Slowly but surely, conservation biologists are learning and talking about human population problems, multinational corporations, exotic species, and the Wise Use movement. They are getting involved in reviews and critiques of forest plans, grazing and mining laws, dams, fish hatcheries, and highway projects. They are becoming skeptical of claims of sustainable development and are passing resolutions and signing letters to policy makers about a wide array of issues of true relevance to the future of life on Earth. This increased activism is a good thing. Our sophisticated technological tools can also be good things (though I am ambivalent on this point) to the extent they enable us to make better maps of the patterns of nature and more accurate predictions of the responses of biological elements to potential futures. But I cannot help feeling uneasy in the knowledge that the middle-aged biologists of today may be the last generation to have been exposed to truly wild places and to have been taught serious natural history as part of their professional training. The naturalists are dying off and have few heirs.

Others have sounded the alarm about the decline of systematics and taxonomy in universities and museums worldwide. The problem is serious. Many universities no longer have courses in ichthyology, herpetology, mammalogy, ornithology, taxonomy of vascular plants, bryology, entomology (except, of course, economic entomology), or other courses on the identification, evolutionary relationships, and life histories of organisms. Along with ecology, these were always my favorite courses as a student because they dealt with tangible, living (or once living) things and always included plenty of field trips. Think back to your own collegiate experience. Where did you learn the most and where was learning most fun—in the field courses or in statistics, calculus, and computer sciences? (If you answered the latter group, go subscribe to another journal; just joking, friends.) I am not suggesting that mathematics, statistics, and com-

puter literacy are irrelevant to conservation biology; indeed these days they are almost essential. But they are arguably less central to our discipline than ecological and organismic courses, and today they are thriving and proliferating while field courses are removed from curricula and as taxonomists retiring from universities and museums are not replaced. Even where abundant biology courses remain on campuses, concerns about travel costs and liabilities have virtually eliminated field trips. Without field trips, these subjects are dead and the students who study them risk coming away with little but cold abstractions.

The decline of systematics and taxonomy, the loss of the field trip, and the technological fixation of ecology are symptoms of a bigger problem. That problem, now unfortunately a cliché to some, is our increasing separation from Nature. This is a problem for our species as a whole but it should be especially troubling for conservation biologists. One of our most crucial roles in society is as spokespersons for Nature. Whether or not we play this role as advocates or dispassionate observers is beside my point here. We are asked, albeit not often enough by the political powers that be, for our professional opinions on which conditions will favor the conservation of biodiversity (or some element of it) and which will not. What will we look to for help in answering these difficult questions? Our computer models? Our GIS software? The World Wide Web? Yes, in part. But if we apply these tools in the absence of a firm foundation in field experience, void of the "naturalist's intuition" that is gained only by many years of immersion in raw Nature and through a ceaseless hunger for knowledge about living things, we are sure to go astray. Scientific abstractions and fancy technologies are no substitutes for the wisdom that springs from knowing the world and its creatures in intimate, loving detail. We owe it to ourselves and our students to keep opportunities for acquiring this kind of knowledge alive.

I was stimulated to write this editorial by reading the marvelous collection of writings by Archie Carr, *A Naturalist in Florida* (see review by Richard Franz in *Conservation Biology* 9:971-972). Throughout my life, my mentors were mostly field naturalists. Among the first was my grandfather, John Burlin Johnson, then considered the dean of American metallurgy and a skilled amateur dendrologist who taught me how to identify trees and let me look through his microscope at the cross-sections of stems he had prepared for many of the tree species of Ohio. Then there were Edith Blincoe and a host of other instructors who taught summer courses on birds, reptiles and amphibians, insects, wildflowers, fossils, and other topics for young children through the Dayton Museum of Natural History. Then came Paul Knoop, director of the Aullwood Audubon Center, who could tell you virtually everything there is to know about the plants and animals of that place, not just

names, mind you, but life histories, evolutionary relationships, and folk uses. There were many other naturalist mentors over the years. I never knew Archie Carr well, but I was fortunate to take the Community Ecology course at the University of Florida the very last time he helped teach it. Archie had formally retired some years before, and Peter Feinsinger (himself a fine naturalist) was giving the lectures in this course. But Archie still led the field trips with all the enthusiasm, knowledge, and humor for which he was long known. Whatever natural communities we visited, Archie knew virtually every inhabitant and treated them as friends. But where are the young Edith Blincoes, Paul Knoops, and Archie Carrs today? Who will be the field-wise mentors for another generation of ecologists and conservation biologists? Will the memoirs of future biologists contain the vibrant descriptions of childhoods spent crawling through swamps and grabbing snakes that we find in E. O. Wilson's *Naturalist*? Somehow I do not think that stories of boyhoods and girlhoods spent playing Nintendo and watching Teenage Mutant Ninja Turtles will be nearly so enthralling.

Without a solid grounding in field experience, conservation biology is hollow. Without years of bug-bitten trudging through hollows and bogs, how can a biologist be expected to be able to separate biological truth from computer fabrication? Yes, the sometimes counterintuitive results of experiments, equations, and simulations have led to some of the greatest advancements in scientific understanding, but a scientist who lacks familiarity with Nature will have difficulty interpreting any kind of results realistically. We have no shortage of fabulous models and supercomputers; what we lack in many cases are good field data to plug into the models. Furthermore, how can the biologist who lacks a long-term, emotional investment in wild places be trusted to exercise sound judgment in making recommendations for conservation? Will he or she be properly conservative and, in the face of uncertainty, risk erring on the side of protecting too much? Empathy for living things comes from many years of observing them in their natural environments, which is why field biologists have always been among the most adamant defenders of wild Nature. Some would call this experience-based conservatism emotional and biased; I would call it prudent and precautionary.

I call on all biologists—ecologists, evolutionary biologists, botanists, zoologists, population geneticists, taxonomists, systematists, and others—to join together in resisting the trend toward indoor biology. Nothing will destroy the science and mission of conservation biology faster than a generation or two of biologists raised on dead facts and technology and lacking direct, personal experience with Nature. In private conversation virtually every biologist I speak with is seriously concerned about the death of natural history. We are outraged, but our voices are diffuse. So far only the systematists and

taxonomists have gone public about their fears, and they risk being seen as self-serving because their jobs are so often on the line these days. This fight is too important to go it alone as separate subdisciplines. Here are some things we can do together to resist this trend.

First, university departments in basic and applied natural sciences (zoology, botany, forestry, fisheries, range management, wildlife, geology, etc.) should band together to request of deans and presidents that ecological and organismic courses be reinstated in curricula and that frequent field trips be part of these courses. Departments and professors should encourage and require their students to take field courses and include abundant field work in their graduate research projects.

Second, faculty and students can donate time to local school districts, parks departments, and other public agencies to help them develop or improve educational programs in local natural history and ecology. Pete Feinsinger, while at the University of Florida, led just such an effort with the help of graduate students from several departments. Programs should include discussion of local conservation issues in light of the principles of conservation biology. Consider leading field trips to local sites that are of high value for conservation or at risk of degradation. Make conservation biology locally relevant and perhaps the public will show more understanding and support for our science.

Third, professional societies in the biological sciences should band together and issue joint statements on the value of field experience in education at all levels. The societies could also evaluate and accredit university curricula in conservation biology, environmental studies, or other interdisciplinary subjects partly on the basis of how many required and optional courses include field trips, how much time students spend in the field, and how experienced the faculty are in field work.

Fourth, applicants for jobs related to conservation biology should be evaluated not only in terms of GPA, publication record, employment experience, and academic references, but also in terms of their field knowl-

edge. Job interviews could include specimen identification quizzes and questions about life histories, phylogeny, and biogeography. One of my most enjoyable job interviews, for the Ohio Department of Natural Resources, included a long slide show of flora and fauna native to the state, which I was expected to identify to species. Some might think this kind of evaluation anachronistic or perhaps appropriate for interpretive naturalists but not for modern scientists. But conservation biology is fundamentally about real organisms in real environments. If an applicant has not taken the time to learn something about natural history, perhaps he or she has little real interest or aptitude for this field.

Fifth, we can spend more time in the field ourselves. Perhaps, especially if you do not have a funded research project involving field work, you need to make the effort to explore the natural areas in the bioregion where you live and learn something about what organisms live there and how they interact. Do the same for areas where you travel regularly. We cannot leave field knowledge to the backpackers and hikers, the birdwatchers and native plant enthusiasts. There are too few of them and most do not have the scientific training or the communication and teaching skills and opportunities we have. But they and the public at large will not long be blind to the hollowness within us when we spew out models, maps, formulas, and proposals that lack any connection to the real world.

Finally, we must ensure that plenty of natural areas remain, not only in wilderness regions but also in humanized landscapes. Ignorance of natural history grows in direct proportion to the scarcity of natural areas in convenient proximity to where people live. Prospects for the future are not cheery, but we will be better prepared to face the foes of conservation with fresh air in our lungs, mud on our boots, and the determination that comes from knowing that our kin—all living things—are depending on us.

**Reed F. Noss**

