Full-Contact Ecology

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Several years ago, a student in my class, also a starter on our high school's football team, sprained his ankle while running from a hornet's nest while conducting biodiversity research. When his perplexed coach asked how he had hurt himself, the student's response was that he was taking full-contact ecology. We know that only by urging them to become hunter-gatherers of information, knowledge, and skills will students connect their work to a broader community, and create enduring understanding.

Aldo Leopold writes that "There are two spiritual dangers in not owning a farm. One is the danger of supposing breakfast comes from the grocery, and the other that heat comes from the furnace." When I ask my students to sketch an insect, I find that students not only have difficulty locating where they need to place appendages on insects, but also where all that sustains us as humans comes from. It has become an abstraction for all too many of my students. The word "ecology" comes from the Greek word "oikos" – the study of our house. Full-contact ecology provides a way of establishing the context for study of "our house"—our culture, our society, and our children's future.

I teach conservation biology at Souhegan High School (SHS) in Amherst, New Hampshire. I am also an adjunct biodiversity researcher for the Smithsonian Institution's Monitoring and Assessment of Biodiversity (SIMAB) program. In 1996, I developed a program, HabitatNet for my SHS students as well as other students and teachers around the globe. HabitatNet directly involves students and teachers with conducting authentic biodiversity research while learning science as science is done.

Using the SIMAB permanent biodiversity research protocols, my high school students have been collecting biological research data at field sites in New Hampshire, Central America, the Caribbean Islands, and Mexico for the past eight years. The overall goals of HabitatNet are (1) to develop conservation biological literacy in high school students by giving them an opportunity to learn field methods and applications while collecting and interpreting biological diversity data, and (2) to establish baseline biological diversity data at our HabitatNet field sites. Thus far, over five hundred high school students have been involved with this project. They write annual field reports for the Smithsonian Institution in Washington, D.C., various conservation agencies throughout the Caribbean, and El Edén Ecological Reserve located in Quintana Roo, Mexico. Field reports include 20 m x 20 m forest quadrant tree maps; vegetation analysis (tree species frequency, dominance values, and density statistics); and invertebrate and vertebrate species lists. Additionally, concurrent student research projects complement the basic biodiversity data that is collected using the SIMAB protocols. These research projects are designed by students and conducted by them in the field. Their focus of research is on an aspect of anthropogenic or

"natural" disturbance regimes as they pertain to biological diversity.

The fact that our students and I had ten years of data recently earned us the opportunity to travel to EL Eden to share our work with university and PhD candidates as we began our assessment of hurricane Wilma's damage to our biodiversity plot. Traditionally, principal investigators for the National Science Foundation are college professors and their graduate students.

Our ongoing relationship with the Conservation Biology Center at the University of California / Riverside (UC/R) included an earlier collaboration on a joint publication of a text (*The Lowland Maya Area; Three Millennia At The Human-Wildland Interface*, Haywort Press, 2004). UC/R's research has centered on how recently disturbed forests of the Yucatan recover from anthropogenic disturbances while our SHS HabitatNet research has focused on the long view of forest successional patterns. Our 10 year research has indicated that even "mature forests" show past disturbance regimes and selective forestry practices by early through mid- 20th Century Mayan people.

Souhegan Seniors Nate Langille and Julia Day accompanied me on this trip. They had first traveled to El Eden as part of a Global Use Symposium of 80 students from Saba, India, Germany, Mexico, Italy, Spain, and several states. Souhegan's students served as teachers for the field work, as they had been trained in field protocols. Students developed the Youth Accord on Biodiversity for the United Nations.

In December 2005, Nate and Julia served as graduate students, along with Ph.D candidates from the University of California, Riverside. Our task was to record the destruction of hurricane Wilma, the strongest hurricane ever recorded. Its 140 mph winds had swirled over the Yucatan for 36 hours in October. Trudging through waist-high water, wielding machetes to clear a path, we studied the changes we observed. We measured the height of the snapped trees, the number of trees felled, the size of the trees, and the species that had withstood the violent winds.

Julia noticed the effects of changes in the density of the canopy. "With all the leaves stripped from the trees, we observed vast changes in light that would definitely affect species' growth. We wondered what plant species would adapt and/or recover from the change in canopy density."

Nate observed a significant change in wildlife behavior following the storm. "When we were first in the Yucatan, we saw very little wildlife. The canopy hid their presence. With the land exposed to the elements, the animals were willing to gather for food. Their behavior changed; they seemed to seek us out. I was fascinated by their rapid adaptability to changed circumstances."

What impressed me watching my students work with college professors and graduate students is that we were all teachers with distinct skill sets to share. My students were functioning as scientists at a field research site—their tests were designed by their environment. We all shared expert status. I became Nate and Julia's students on our last days in the field. They knew that a friend with dwarfism would accompany the next student group to El Edén Reserve; as we cleared trails and cleared paths, they urged me to do a better job so that the student would be able to participate fully in the field experience.

Julia and Nate serve as exemplary witnesses to the value of authentic learning. Julia realizes fully that "the most minute event affects individuals on a global scale." Nate vehemently states that "you can't not want to make a difference when you *(continued on page 18)*

teenagers fighting to belong, fighting for their way of life, and fighting for their community. Angela wrote, "The hurricane has affected my life in many ways. Far as school goes, it's hard to focus knowing there is a lot going on around me." Angela continued to lament about missing her school and the activities in which she had participated. She continued, "Don't get me wrong, learning did come first, but there were times when we enjoyed being a high school student."

The teenagers from New Orleans are looking for a place to feel safe and secure. I had my school to help me through the disaster of my childhood, but these kids do not have that place – everything has been taken from them. The curriculum has to take a backseat in the classroom while teachers and administrators work to provide a community for the kids from New Orleans. Maslow's hierarchy of needs proposes that until we can fulfill the physiological, safety, love/belonging, and esteem related needs of our students, the students will never reach self-actualization.

With the tragedy of the tornado, my teachers already knew me and knew ways to help me. We must make a conscious effort to get to know our new students so that we can learn how to serve them better. A friend recently informed me that this is difficult at the high school level because we are more concerned or passionate about our content. I think we need to make a call for action to become passionate about the children in front of us and less about covering our content. How can we leave no child behind when we have no idea who the child is?

Naima, a bright and cheerful teenager, is able to see the silver lining in this terrible event, but also relates her frustration and yearning for family. She writes, "I like Houston and my school because the teachers teach. I could stay in Houston because there are many opportunities here…but everything is far away. My friends are so far away, and my family is all over the world." Teachers, remember you are part of their family now. Show them with love and care. Teaching and learning will naturally follow. ■

Maslow, A. H. (1943). A Theory of Human Motivation. *Psychological Review, 50, 370-396.*

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see the profound effect on a single system in such a short time."

Perhaps what we need to observe as educators in this new millennium is not how we "teach students," but instead how we may enable students "to learn." If we want our students to have enduring knowledge and skills in which they are mindful of the natural world, then we need to involve our students in the process of science. Individual choices and decisions regarding the environment are not restricted to those students who pursue a career in the sciences. This must become an imperative for those of us who "teach science."

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You can learn more about HabitatNet at www.sprise.com/shs/habitatnet/default.htm

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