

Making Waves Episode 44

Freshwater Field Trips

[intro clip]

Hello, my name is Susan Washko, and welcome to Making Waves, brought to you by the Society for Freshwater Science.

Natural scientists focus their research outdoors, and so their training often occurs outdoors. Since the early 1900s, scientists-in-training have been brought outdoors by their instructors to experience the systems they study in a hands-on, personal manner, engaging all their senses and gaining an appreciation for nature.

However, contemporary college classes are becoming increasingly large and are often taught online, making field trips unfeasible. Virtual field trips, like computer programs and virtual reality simulations, have risen to be the solution for classes such as these, but the learning value of virtual field trips has not matched that of traditional field trips. Since traditional field trips are better for learning, I wanted to chat with some freshwater scientists that lead field trips to listen to their thoughts on why field trips should happen for classes where they are feasible.

I had the privilege of interviewing three college-level educators about their freshwater field trips:

- Dr. Howard Whiteman, Professor of Biological Sciences at Murray State University
- Dr. Sarah Whorley, Assistant Professor of Biology at Daemen College (and former member of the SFS Student Resources Committee)
- Dr. Kate Boersma, Assistant Professor of Biology at the University of San Diego

1) What classes do you teach that involve field trips, and where do you take your students?

Howard: I teach vertebrate natural history, I teach advanced ecology, and conservation biology. And I take my students to a variety of habitats throughout the western Kentucky region including cypress swamps, ponds, a lot of terrestrial forest sorts of things, and the reservoirs that are near Murray State University.

Sarah: I was able to teach Limnology for the first time this fall. Even though most of my students are pre-professionals, I wanted them to experience all the aquatic habitats we were going to learn about. So we had two trips onto Lake Erie to conduct a depth profile, we went to a stream in the southern tier to conduct a stream profile, and lastly we went to a protected wetland to walk around and take notes on the different types of wetland habitats and defining characteristics. I'm also part of the team that teaches our intro bio labs. All of our lab exercises are experimental inquiry-driven labs. For the last lab of the semester, we take all the students out to a local park, where they can choose from various habitats what to assess the biodiversity of. I always take the stream group, where they get in the creek with nets and collect macroinvertebrates, and sometimes the occasional fish. Again, most of these students are pre-professional, so getting wet

and muddy in a creek is the last thing they ever expected to be doing as first-year students. It's always a crowd-pleaser.

Kate: So I'm one of the lucky ones who teaches at a primarily undergraduate institution, a private school, a private Catholic school to be specific, and so our large classes are only about 40 students. So that gives me a lot of freedom to take students into the field for a variety of assignments in a bunch of different contexts. I mostly teach upper division courses, which gives me additional freedom. This last year I taught an amazing class called 'The Ecological Communities of San Diego County' in which each week we went on a field trip to a different ecosystem in one of the most biodiverse counties in the nation. I also take students to the field for my ecology class, for my projects classes, and of course for my research laboratory where students are doing research for credits since it's an undergraduate research program. And so we go to the field all the time for that too.

2) What sorts of concepts are best taught in the field?

Howard: Well, you know, we're ecologists, so I feel like all ecological topics are best taught in the field. There are some things where the theory or the mechanics or the mechanistic nature of it is best taught in a laboratory setting, but most of the things we're talking about are interactions with nature and I think many of these concepts really come alive when we bring students out into the field.

Sarah: I think that standard sampling techniques are best taught in the field. Sure, I can teach limnology showing them depth profile after depth profile, but it really doesn't hit them just how much work every one of those figures is. All data comes from somewhere, and it's an important experience learning just how much work collecting that data can be. I also think being in the field is an important experience for measuring concepts that can't be purposefully measured. For example, our first trip out to Lake Erie was a windy day. We're out on the boats doing our depth profiles when I noticed that the wind had created langmere waves or windrow waves. We had just gone over these in lecture, so I yelled excitedly to the students to look at them and [delete] they were really excited to see them as well and started pointing and talking amongst themselves excitedly. Our boat drivers who were normally fishing tour guides were very perplexed by this and suddenly found themselves with eight limnology students trying to explain windrows and circulation cylinders all at the same time. It was great. Another accidental learning experience also comes from Lake Erie. We took plankton samples back to the lab to measure biodiversity at various depths. For days, looking through samples, students would excitedly call me over to their microscope to look at something, wondering what organism they found, and I'd sadly reply that it's just a plastic fishing line. I think we found more plastic than actual organisms, and it was really eye-opening and depressing for my students to see that much tiny plastic in so few samples. It became a sad running gag for every other field trip to point at some large organism like a tree or a fish and ask if it was plastic, or to ask what the DO of the plastic water was. But the next time I run limnology, I'm definitely doing a microplastics lab.

3) Why is it important for students to have firsthand experiences with aquatic ecosystems?

Howard: I think it's important for them to have these firsthand experiences because that's where nature's actually occurring. And although many of our students spend time outdoors and maybe they even fish or they interact in some sort of recreational sense in our reservoirs or our lakes, many of them don't understand how those things operate. And it's only by getting them out in the field and getting their hands dirty and making them understand through our laboratories, our field experiences that nature is actually doing something out there and there are patterns that we can see, we can observe, we can understand. And we can use that to help us manage and plan for the future. All those things come together I think and not only help them become better students and better citizens but also allow them to impart that upon other people that they might interact with the next time they're out fishing or water skiing or whatever they're doing. So I think it's critical for them to have those firsthand experiences, and the more they can have the better off we'll all be.

Sarah: Aquatic ecosystems are inherently mysterious. Everything is underwater where we can't breathe, often can't open our eyes, and it's usually pretty cold. It's all hidden. Just the experience of teaching people how to pull back that curtain and observe what's in the water, not only biologically, but chemically and physically as well, is often a really eye-opening experience. But beyond that, I probably have my students spend more time just looking—taking pictures, taking selfies, and listening, than doing actual science. Most of my students, from freshmen to seniors, are pre-health professionals, very few of them will become ecologists. So more than anything else, I just want them to experience the world around them, enjoy what they can observe, and marvel that there's so much more they've yet to learn. My limnology students were great about wanting to be open to new experiences. After our stream sampling, I lamented that we were pretty close to Letchworth State Park, also known as the Grand Canyon of the East. And completely unprompted they all said, "You talk about that place all the time, let's go see it!" So, we hijacked the campus van and took it on a completely unprompted trip to Letchworth Park. We went and we looked at the shale layers exposed by the Genesee River, we talked about sediment transport over the big three falls, and we looked at all the tributaries and talked about stream order. Most importantly, these students got to go visit a natural treasure in their backyard that they had never been to. Most of these kids had grown up in western New York, but they had never been to Letchworth. We weren't more than an hour from campus, but this was a completely unknown experience to them. So field classes are really important because they show students it's ok to go out and explore, and field classes are really best for doing this for students.

Kate: So I think that anyone who works in education understands that students learn in a variety of ways. Some really excel at the start of classic academic testing and reading, the digital learners. And then there are the rest of us who benefit from other types of information input, visual or kinesthetic or whatever. And the great thing about field courses is that we can engage all those different kinds of learners. And so whenever possible, I think it's important to take students outside. I have students working in my research lab for example right now who are C students in my ecology class, but they are exceling in a fieldwork environment, and that's one of the reasons I got into fieldwork at the beginning, this engagement factor, the capacity to work with students, to really take advantage of students' strengths in a context that's not often prioritized in academia. And the great thing is that once these students get their degrees, once they make it through academia, there are many jobs that do prize the skills that are associated with field work. And so I think that field courses are taking students into the field for field

experiences can sort of work around those inherent limitations in how we assess students through our traditional course approaches of lecture and exams.

Other ways to get students to the field:

Susan: Ok so this podcast episode kind of came from this class that I was taking called Technology in Teaching, and I really wanted to talk about field trips and why they're so important (probably because I love them so much). We talked so much about online learning in that class, and I was really hoping to find a way to make field trips available to online students. Luckily, Dr. Kate Boersma had some really, really wonderful comments that connect to that, and I want to share them here. So this is what Kate had to say about other ways to get students into the field.

Kate: I'd like to challenge the assumption that field trips are unfeasible or untenable in online or large classes. So I acknowledge that I'm one of the lucky ones, so are my students, my school is very expensive, and not everyone has access to these kinds of resources where we can go into the field, where we can have these real world experiences that we field ecologists consider so valuable. So for example I have a friend who teaches aquatic ecology in the E campus program, the online program at Oregon State University. And he has come up with these really innovative ideas for how to get students into the field. He has hundreds of students in each class, and they come from all around the world. So he has a term project in which students identify a local waterway, they go out, take water samples, do habitat mapping, riparian vegetation assessment, and maybe that's in Singapore with an urban stream, maybe that's in Montana in some natural, untouched reference condition waterway, but all of these students go out to their local watersheds and collect samples make observations, and then come back and talk about them as a group. And so then are you not only encouraging students to get outside, providing them guidance of course in the online classroom environment before they do so, but then you're able to bring all of those independent field experiences together and have everyone reflect on similarities and differences across cultures. So I also have managed to get students into the field in my lecture-only classes using platforms such as iNaturalist, or the phenology database, in which students are required to go out and log a certain number of hours, observe a certain number of organisms in the field with specific guidelines for the types of observations they're supposed to be making. So while this is limited and definitely not as beneficial as having an instructor physically in the field instructing in real time with students, I think that for students who aren't able to experience those, there are other alternatives. So I think we just need to think creatively about how we are providing these experiences to our students and not see limitations as limitations.

Susan: So I just love that, I'm so inspired. I agree that the college education community needs to take this challenge head-on and assign projects that work around the limitations of large class sizes and online platforms to give students the most worthwhile experience possible. As the college education system continues to change into the future, I'm sure freshwater scientists will look past limitations and whenever possible, take students out to the field. Thanks so much for listening, this has been Making Waves. I'm Susan Washko. Have a great day!

[outro clip]