WSN Naturalist of the Year lecture
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Fifty five years ago, before many of you were born, Edward R. Murrow hosted a radio broadcast that reached millions of Americans and on that show, he had many folks, from the well known to the unknown, read five minute essays about their personal philosophies on life. These people shared the insights and values that shaped their daily actions. These essays were eventually published in 1952 and that year, that book sold more copies than any other book except the Bible. Now, half a century later, the project, called This I Believe was revived and for the past several years, recent essays have been broadcast on National Public Radio and published again although the bible is still the top seller. When Chris Lowe told me I had received this award and would be expected to give a talk, I decided to use it as an opportunity to add my voice and my opinions to that public discussion and in that format. And I decided to use you as my trial audience. I hope, in about 15 minutes, that we are both not sorry. But here goes:

I believe that in order to truly understand natural systems, we need to get out in nature.

This seems obvious to me when I state it like that but I think that there are many forces making the "getting out in nature part" difficult these days and as I continue in my career as an academic ecologist, I realize that it is not an obvious statement to everyone, even other ecologists.

I am older than many of you here, but I am not as old as some of you. My career in ecology has spanned an interesting time, I think a transition time. When I was an undergrad, at U.C. Berkeley in the mid eighties, I studied zoology. Straightup zoology departments are so rare these days that I should explain, we didn't study zoos, but whole animals, mostly in their natural environments. My training was in the ologys- mammalogy, herpetology, ornithology, and ichthyology and I spent a lot of time in those courses in the field, on trips or for class projects or just helping out the TAs. I was encouraged, in fact required, to observe and document organisms, their behaviors, their relationships to the environment and each other. We wrote field notes in spiral notebooks and even drew pictures to illustrate our observations. I also spent a lot of time in the museum. My education there involved learning how to prepare specimens (skin and stuff) for long term archival. I was such a good student back then that for a period of a few years, I never traveled anywhere without a bucket and plastic bags in the back of my truck so that I could pick up road killed animals and take them back to the museum for more practice skinning and stuffing. My own mother can attest to my keen interests in road kill when she cleaned out the family freezer years after I graduated. I spent a few years after college as what I call a 'mercenary research technician' living in tents in places like eastern Washington and Big Bend National Park, working on birds and lizards in marshes and deserts, traveling up to Friday Harbor to help out some grad student

friends working in marine systems and generally exploring a bunch of different communities and ecosystems while thinking about what I wanted to do in grad school. When that time came, I started my PhD at UC Santa Barbara and immediately headed down to St. Croix in the US Virgin Islands where I spent the majority of my time for the next four years snorkeling and diving on coral reefs studying fish recruitment or as my good friend Chris Lowe likes to say "counting dicky fish". I've been underwater pretty much since then on coral reefs and kelp forests occasionally popping to surface to teach fish biology at UCSB.

And I consider my very lucky because I have had the opportunity over the past 20 years or so to help a lot of students and others get out into the field, in this case, the underwater field.

So, I've noticed a few things that have changed over the years since I was in graduate school and I am not talking about the corals or the fishes or the kelp. I'm talking about the changes that I've seen in research and education at the Universities in terms of the incorporation of basic natural history to the ecological sciences.

What I have noticed is an emphasis on the extremes of scale of inquiry in our science and a de-emphasis on the middle parts. Let me explain what I mean by this. These days we have so many sophisticated and really cool technological tools at our disposal and so many of you guys, especially you younger students, you've been raised with technology. These tools are allowing us to look at both very small and very large scales of biological organization. For example, at the smallest scales, we have incredible molecular genetic tools that are more readily available by the day. We can look deeply into the molecular basis of physiology and development. We can even explore nanosytems. And more recently we've started looking really big. Through advances in computing and networks, we have enormous amounts of data at our fingertips, allowing metanalyses and complex modeling exercises. We can access data from satellites onto our desktops in real time. So what do I mean by the middle? To me, the middle levels are where the organisms reside. *Organisms in their environments - the stuff of natural history.* But the thing is, organisms are the fundamental units of ecosystems, communities and populations. And organisms are what embody genetics, development, and physiology. If we ignore the organism and it's relationship to it's environment and to other organisms, we limit the insights that we can make from studies at the lower levels and at the higher levels. But how can we incorporate this kind of knowledge, this natural history into our science? And there is the rub because….

I believe that it is a lot harder for scientists to get out into nature now than it was in the past. And I believe that we need to change that.

I'll mention three potential, but certainly not deal breaking, challenges to incorporating field-based natural history into our science. These are that fieldwork can be time consuming, expensive, and potentially a lot of hard work.

These days there is an incredible pressure on students to perform and perform at very high academic levels. There is incredible pressure on all of us to publish, even my undergraduates are concerned about how many publications they will have when they graduate, and this pressure seems to be increasing each year. So, while I strongly believe that attention to scholarship is important, critical really, I've observed an increasing urgency in students to get to the answers, and big answers at that.

For example, at least once every year a beginning graduate student will come to me for advice on what data to gather in the field and how to do it. One student, came to me a few years ago, she was about to head off her first field trip as a grad student. She had a great set of questions in a very cool area of ecology and was headed of to an amazing coral reef. However, at the time she had very little experience on coral reefs in general and even less studying fishes. She came to me armed with a draft data sheet with a list of variables to measure, not knowing yet what the important ones would be but with the wild eyed look common in first year graduate students and when I suggested that she go out and snorkel around for some time and not actually take data and simply observe, maybe even for that whole first field trip, she looked like I had suggested she drop out of the PhD program and get a job pulling shots of espresso at Starbucks. Our ensuing discussion made it clear that swimming around on a reef learning about the system, although conceptually logical, would just take too much time. That is an extreme example but not an isolated one. I believe that in a rush to answers you may very well miss the critical pieces and it is OK to just look for a while. Gaining a true understanding of complex natural systems requires patience and keen observation over time.

The second potential challenge is that field work can be expensive and funding can be hard to get, especially if you are suggesting building in the time to snorkel around a coral reef for a while just to learn about the system! I think we need to ask ourselves: why is it that funding for basic natural history studies, even when incorporated in multi-disciplinary approaches, is lagging behind that for more technological or theoretical work? even when the theoretical models are crying out for more empirical field based data with which to test predictions? Are we partially to blame for this by a subtle but pervasive attitude, especially in academia, that 'natural history' is in some way inferior to more mechanistic or 'hard' or 'real' science? I don't have the answer to those questions but in the true spirit of the This I Believe project: I'll put them out there in hopes of starting a productive discourse.

The third challenge is the perception that fieldwork is really 'hard'. And while it can be hard at times I don't actually believe that is a valid reason for not getting to know one's system and the organisms in it. All science can be hard, whether you are in the lab, in front of a computer or out on a boat.

The other night I was talking to a colleague of mine who mentioned that she had some field work coming up in Alaska, and, because I never really lost the personality of a 'the mercenary technician' no matter how old I get, I said that I would love to go up there, I know it's a really beautiful place and she looked at me and said you know,

the work is highly repetitive, and there was this unspoken implication that it might be boring to someone like me. And I thought for a second and said to her, well, you know, that really characterizes my whole career, highly repetitive activities in really beautiful places. So, I said goodbye and we walked our separate ways and thought about it some more and I thought well, actually, the actions, the techniques I use are definitely repetitive, I can't even tell you how many transects and quadrats that I have run in my life, but it's really never repetitive, every time I go visit a field site over and over and over, be it a coral reef or a kelp forest, it's different in some way. The animals themselves, their distributions, their behaviors are different, often in very subtle ways. Each time I go out in the field, I get a different insight, or more insight and a better understanding of what I am seeing or what I am trying to figure out about the communities and the ecosystem. And I can bring that insight back with me and use it to develop the next set of questions, and to interpret the data. And, I believe, there is just no way I could do that if I didn't go out there and put my head underwater.

So I'm what Dr. Reed Noss described in paper in the Journal of Conservation Biology as a "middle aged biologist of today" and he went on to say that mine might be the "last generation to be have been taught serious natural history as part of their training". While I very much want to believe that that is not true, I am fearful that without a concerted effort on our parts he may be right. I feel lucky to have trained in those –ologies and to now be at a University that has maintained the commitment to these organismal, systematics and taxonomy courses. This type of coursework as well as field trips and field-based labs are disappearing from our educational systems. But I believe that we can do something about this. In fact, I believe that each of you, by being here, by mentoring others, by sharing your knowledge, and by breaking down any stereotypes of what a Natural Historian is and does, we can ensure that my generation of scientists is not the last one to be inspired the amazing breadth of diversity and the power of being in nature, that attracted many of us to this field in the first place.

I'd like to conclude with one final observation that I have made over the past 20 years or so, and one that gives me huge hope for the future. And that is the increasing acceptance, especially in academia, of focusing questions on applied issues such as conservation, and the management of wildlife and fisheries.

Yet conservation relies on solid understanding of the natural history of the targets. How do we protect something if we don't know where it is? How can we design rational conservation measures for any species if we don't understand its relationship to the species around it? And importantly, when we incorporate natural history into our studies, we are placing ourselves in nature. Perhaps without even knowing it, we are creating emotional ties to the other nonhuman organisms and the environment. It's this connectedness, this relationship, that will ultimately serve society when we face, like we are facing so often now, big environmental challenges.

Aldo Leopold, who was maybe the most influential conservation thinker of the 20th century, gave a speech at the Univ. of Missouri and he objected to the way science "relegated natural history to the dusty backroom at time when society needs it most". That speech was given in 1938, almost 70 years ago and I believe that if Aldo Leopold felt we needed natural history in our science to solve societal problems back then, boy, do we really need it now.