Reconnect

One of my favorite class assignments for an adult environmental issues class that I have taught is to ask my students where the resources come from that are the base of their business or place of work. Most of the students in this class are working adults who are taking night classes to complete a degree. Many have been working for years, have families, and are balancing complex lives with the added extra challenges of taking classes. Not an easy task.

The assignment is usually given the first day of class and requires that they research and write a short paper on the source of the key resource(s) upon which their business depends. I find this assignment gets at the heart of so many environmental issues. Plus, it gives me a quick understanding of my students; where they work, what they do for a living, a sense of their environmental awareness, which provides the base of thought provoking and meaningful discussion in the class. More often than not the students come to me in amazement about what they found out; some with sheer surprise at how they and their work are connected to the natural world, some with disbelief about how such a seemingly simple thing is so important, and some with a sense of joy at the understanding they had gained.

Our connection to the world around us is all too often a crafted, contrived, or delusional thing. All human activities depend on natural resources. Our homes, our fuel, our food, and the resources we consume are all based on natural resources upon which our economy also depends. This is the way of the world and nothing can change that even if we wanted to; to live is to consume resources. But with our population working its way to 9 billion, we should at least understand the choices we make and participate in the stewardship of those resources.

Currently here in coastal New Hampshire there are many meaningful ways to reconnect ourselves to our resources and to the world around us. The following organizations can always use new people and energy to help manage and steward our resources. Some of my favorite groups are:

- The Great Bay Stewards: Work to protect the Great Bay and whose Issues Committee is currently developing a program for homeowners to reduce nitrogen input to the Bay. ***www.greatbaystewards.org/***
- The Piscataqua Region Estuaries Partnership: Work to protect and preserve the seacoast's rivers, lakes, marshes and Great Bay for all who live, work and play here. Their Citizen Action Committee is taking off in a big way. ***http://prep.unh.edu/***
- The New Hampshire Coastal Protection Partnership: Works to protect the environment in Great Bay and other critical seacoast habitats. ***www.nhcoast.org***
- The UNH Sea Grant Coastal Research Volunteers: A program that provides training and opportunities to participate in meaningful coastal resource research projects. ***www.seagrant.unh.edu/***
- The New Hampshire Rivers Council: Committed to the conservation and ecologically sound management of New Hampshire's rivers, watersheds and related natural resources. ***www.nhrivers.org/***

Also, nearly every river in coastal NH has a watershed group working to protect and restore their watersheds. I am active in my neighborhood watershed group and we have done great things in the past 15 years.

To get connected to any of the groups you can use the web addresses listed or Google the group's name and you will find the link to the group and their activities. For your local watershed group, Google the name of your favorite river and add watershed to the search phrase. Reconnecting to the world around us and the resources we value and depend upon is rewarding and invigorating. It helps make us better citizens and can insure that our communities grow and thrive in meaningful ways that are based on first-hand knowledge and experience. It can't get much better than that!

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The Real Fountain of Youth?

The horseshoe crab, *Limulus polyphemus*, is center stage at the Great Bay Discovery Center. In late spring and early summer, this gentle yet admittedly bizarre-looking creature becomes part of our spring school program, entertains discovery tank visitors and attracts hundreds of people to the shores of Great Bay to witness its amazing spawning ritual.

We often talk about the fact that the horseshoe crab has been around since the time of the dinosaurs (over 400 million years ago). We share with delighted youngsters the unique adaptations of its armor – a long spiky tail, the pointed edges of its carapace and its funky fly-like compound eyes. Often we marvel with our learners about how this fragile looking animal is one of the few who have outlasted the evolutionary onslaught that has taken out the likes of the *Tyrannosaurus rex*, whorl shark and sea scorpion. After-all, one could simply step on a horseshoe crab and kill it!

What then, is keeping this creature alive? We know from experience that species with very specialized requirements such as the snail kite, a bird-of-prey found in the Everglades, prefers apple snails almost exclusively. Changes in water levels in the Everglades impact the snail populations which negatively impact the kite. Specialized habitats, foods and biological sensitivities may spell disaster for hundreds and thousands of species throughout the planet as time goes on.

Horseshoe crabs, on the other hand, may have just what it takes to survive because of a whole suite of favorable adaptations – ability to withstand extreme changes in salinity, temperatures, predation, habitat change and perhaps the least obvious of all -- its amazing blue blood! The blood of the horseshoe crab has become one of the most important tools in the biomedical industry for determining the presence of bacterial toxins in medicines and implanted devices.

Over fifty years ago it was recognized that some sterile solutions, when injected into humans or rabbits, caused a fever. Scientists quickly discovered that these so-called "injection fevers" were caused by endotoxin left over from bacterial components that remained in the injected solutions after sterilization. Fortunately, it was also found that solutions could be screened by injecting small amounts of the batch into rabbits. If the rabbit exhibited a fever, the solution was deemed contaminated and was rejected.

The rabbit test is still in limited use today but a much more reliable endotoxin test referred to as the Limulus Amebocyte Lysate (LAL) is now done using an extract from the blood cells of the horseshoe crab. In fact, the FDA currently requires the LAL test to be performed on all human and animal injectables as well as medical devices used to deliver these injectables. In addition, many implantable devices and artificial kidneys used for renal dialysis also require an LAL test.

Could it be that the benefits of this blood to humans are also responsible for protecting the horseshoe crab itself from disease? Perhaps all the formidable spikes and unappetizing qualities of the crab have little to do with its success. With our oceans and estuaries literally a soup of bacteria, how does the horseshoe crab constantly threatened with infection survive? Unlike mammals, the horseshoe crab lacks an immune system, but does contain a number of compounds that bind to and inactivate bacteria, fungi and viruses. The components of LAL are part of this primitive "immune" system, not only binding the bacteria, but forming clots that provide wound control by preventing bleeding and forming a physical barrier against additional infection. It is one of those evolutionary miracles that may be the reason it still exists on this planet.

Something has worked for these tenacious creatures. Perhaps instead of drinking from the fountain of youth, or enjoying a glass of good red wine, we should all whip up a horseshoe crab blood smoothie and have at it!

Learn more about how horseshoe crabs keep us safe at a presentation by Dr. Ron Berzofsky, internationally recognized LAL scientist, June 9th 7 p.m. at the Hugh Gregg Coastal Conservation Center, Greenland, NH. See center section for more details.

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