

Remaining Symposium Questions for Thomas Quinn

1. Any comment on how Aldo Leopold's thinking about the "land ethic" applies to your long view on salmon ecology and conservation?

This is a great, thought-provoking question. To start with, I found a convenient quotation from Aldo Leopold's "A Sand County Almanac" to get started, and I attribute the quote to the convenience of a website on the Land Ethic by the Aldo Leopold Foundation.

<https://www.aldoleopold.org/post/understanding-land-ethic/>

"There is as yet no ethic dealing with man's relation to land and to the animals and plants which grow upon it. The land-relation is still strictly economic, entailing privileges but not obligations..."

I think it is fair to say that for many, the waters have similarly been seen as a source of food, drinking water, transportation, and other uses, mixed with the inconvenience of flooding and risk of drowning, etc. This utilitarian view was the predominant one of settlers from elsewhere, and I fully appreciate the fact that indigenous peoples here and in other countries had much more nuanced and deeper connections with the natural world compared to colonists. Jim Lichtowich has written extensively about the need to change our perspective on salmon (and other things) from a production-industrial one to one more like those of the Native Americans. His 1999 book, *Salmon Without Rivers* (Island Press) goes into this in much more detail and with much more authority than I can here.

Personally, I came to the west coast from New York City, which one might regard as a poor place to get in touch with nature. However, thanks to my parents, I had the opportunity to spend summers in the Adirondack Mountains of northern New York, and was more attuned to natural history than might have been the case. Coming to Seattle, and especially the chance to visit and work in Bristol Bay for many years gave me much greater appreciation for the specific places, and also the importance of place-based knowledge. I cannot, of course, compare what little I know to the knowledge of local people, but at least I am getting a small glimpse of it. For readers interested in this idea, Bernd Heinrich's book, *The Homing Instinct* is wonderful. He is an exceptional writer, and explores many aspects of how we know where we are, where we are from, and so forth. This includes animals and humans.

2. We are finding increasing levels of paralytic shellfish toxins in salmon. Might occurrence of harmful algal blooms be important to Alaska salmon populations?

This is a great question too, but I confess I have to punt on it, as I have no real expertise in harmful algal blooms (HABs). When I think of this topic I think of Vera Trainer, who works for NOAA in Seattle. A quick web check confirmed this and there are presentations by her that seem to be available online, so I would look into them and contact her. Sorry about that!

3. Do you think the hatcheries are producing too many pink salmon? Do you think the ocean is at carrying capacity?

Hatchery production is now an integral part of the management, ecology, and evolution of salmon and trout (and other fishes too, of course). Depending on the species and area, hatcheries may be overwhelmingly dominant, important but not dominant, a bit player, or negligible. The ocean is a big pasture, but not infinitely so. There is good evidence that increasing numbers of salmon (including, but not limited to pink salmon) can result in decreased growth rates, mostly within but also between species, and also some evidence of decreased survival rates. The problem, as I see it, is that the benefits and costs are not shared equally. Hypothetically, in one region people may be willing to put up with some reduction in average size of salmon in order to get a lot more of them. However, people elsewhere may not get any benefit from the numbers but only see smaller fish in their area. This is, of course, oversimplified. However, it is very clear that while salmon in general have become more abundant in northerly areas, pink salmon have become especially so. How many is too many? Not easy to say. Regardless, increased hatchery production comes at a cost to nearby wild populations through fishing pressure and straying. To return to the first question that was posed to me (i.e., the land ethic as applied to salmon), do we see the ocean as just a pasture on which to stock as many salmon as it will hold, and rivers as just places to produce as many little salmon as possible, or something holistic whose long-term well-being is our responsibility.

4. The Bristol Bay watersheds harbor northern pike, but why are these systems still so productive for salmon? Could large predatory fish such as huge northern pike be controlling/predating on smaller pike and other salmon fry predators?

Yes, northern pike are indeed native to parts of Alaska, including the Bristol Bay areas where I have worked, but do not seem to be ecologically dominant. I think in large part, at least in the lakes with which I am most familiar, this results from the size and shape of the lakes. Iliamna Lake, for example, has some weedy bays and coves of the sort favored for reproduction and foraging by pike but much of the shoreline is rocky, wave-swept, and not ideal for them, and most of the lake's area is open water where they cannot function at all. Smaller lakes like Aleknagik and Nerka, in the Wood River system, are still mostly open water where the juvenile sockeye salmon can feed in comparative safety, from pike at least. I have not studied in the lakes where pike are causing problems in Alaska but I gather that they are smaller and perhaps have higher proportions of suitable habitat for pike to breed and forage. Having said this, it is certainly true that pike eat smaller pike, so some cannibalism occurs. However, they are also remarkably flexible and even in the absence of fish as prey (other than their own species) they can get by on insects and other invertebrates, so even if they drive salmon and trout numbers down, the pike may persist.