

## The Future of Wild Trout Management

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As the wrap-up of the plenary session, I was asked to talk about what wild trout management will look like several decades from now. With such a broad topic, it was difficult to narrow down what material to cover. From the beginning, I felt some caveats were needed to establish sideboards. The first is that it appears highly likely that the earth will be at least 1-2°C warmer by the middle of the 21<sup>st</sup> century. So rather than get into specifics here regarding climate change, let us just proceed on the notion that this warming will likely occur, and that wild trout in the future will likely be affected by climate change in meaningful ways (Jonsson and Jonsson 2009; Wenger et al. 2011). My second caveat is that it was hard enough for me to think about what is happening now and what is likely to happen in the future regarding wild trout management in North America, let alone Europe, New Zealand, South America, and other areas of the globe where anglers pursue wild trout. So although this symposium has overseas attendees, herein I focus on North America, though much of the material I cover will hopefully apply to other areas of the globe as well.

Having laid this groundwork, how do you predict what the future of wild trout management will be like? One of my favorite quotes is by Harry Truman, who once said that “The only thing new in the world is the history you don’t know.” Considering only the historical summaries that Bob Gresswell and Bob Carline gave us in their plenary talks, anyone might have some ideas of the general trajectory that we will be following for wild trout management over the next many years. In fact, one could ponder the history of “wild trout management in the future” talks that have been given at past Wild Trout Symposiums. The first was sort of a compilation of concluding statements at Wild Trout I in 1974, given by Willis King, Nathaniel Reed, and Bill Luch. Their general conclusions were that wild trout habitat was being destroyed, that hatchery stocking was ruining wild trout stocks, and that these two things needed to be turned around soon or there would not be any wild trout left to manage.

The next “future of wild trout” talk was given by Lee Wulff at WTII in 1979. His opening line was, “It

is one of the great joys of my life that I have lived long enough to see us turn the corner in trout management and know that we are swinging back upward toward great trout fishing in the future.” What a turnaround in just five years. The major problem he railed against was the need for more restrictive angling regulations, including catch-and-release, which actually was a big issue because this was back in the day when most anglers kept everything that they caught.

There was a gap in “futuring” talks for a while, but at WTV, in 1994, there was an entire session devoted to the subject. By this time, depending on who was speaking, the focus had turned to native trout, protecting quality trout habitat, providing a diversity of angling opportunities, and helping to solve overcrowding and social conflicts on wild trout waters. Remember that the movie “A River Runs Through It” had just come out in 1992.

Fast forward 13 years to WTIIX in 2007 where a few more “future of wild trout” talks were given. One was given by Peter van Gytenbeek, who concluded that in the next twenty years, wild trout management probably would not change much at all.

So there is our history lesson. And like Mr. van Gytenbeek, I do not anticipate that wild trout management in the near future will look that much different than it does right now. I think we can all see some trends that will likely continue for the foreseeable future. One is that we will probably see more catch-and-release regulations on wild trout fisheries. We have already seen catch-and-release waters grow in popularity, and it is hard to imagine that not continuing. As people have recognized for decades, anglers who live farthest from trout fishing waters, in urban environments, are usually the ones who want more restrictive harvest or catch-and-release regulations. In contrast, anglers who live near trout streams in rural areas are usually the ones that still want to harvest wild trout. Since the world is becoming more and more urbanized, and will increasingly do so in the future, there will likely be a continued push for more catch-and-release waters. Organized groups such as Trout Unlimited continually push to expand catch-and-release regulations, and their

voices grow ever louder compared to Joe six-pack who might want to dunk a worm and take a few fish home. So, some level of expansion of catch-and-release waters for wild trout anglers is probably inevitable.

However, we have to continually ask ourselves, now and in the future, whether catch-and-release regulations are really necessary or helpful on any given water to provide quality wild trout fishing, because catch-and-release regulations can be sort of a cop-out by fish managers. In these days, when most anglers voluntarily release their catch, regardless of the angling regulations, will adding more catch-and-release regulations really help to grow substantially more fish, or bigger fish, or both? Is the small amount of harvest that now goes on in wild trout fisheries really having big impacts on the populations? I would assert that in most instances the answer is no.

Anglers, and even biologists, are often under the impression that if wild trout populations were left alone, mortality in the population would be extremely low, and you would have larger trout and more of them in every run, riffle and pool in the stream. In reality, in most instances, about half of each age class is lost each year to natural causes. What results is that, even in unexploited trout populations with good fish growth and in a relatively remote setting, you generally get very few trout larger than 16 inches – no matter how productive the water is. So in many instances, you can have some fish harvested by anglers, or lost to natural mortality, but either way, a lot of wild trout this year are not going to be around next year.

Of course, each species of trout has a different capacity to withstand angler harvest. Brook Trout *Salvelinus fontinalis*, for example, which mature early in life, have a short lifespan, and are highly fecund for their size, can in some areas withstand exceptionally high levels of harvest without having hardly any measurable impact on the population. About 10 years ago I evaluated a Brook Trout eradication effort, and found that total annual mortality in the population was already 92% before the removal began, so all the eradication effort did was substitute eradication mortality for what used to be natural mortality, and total mortality did not change at all. Sometimes harvest actually improves Brook Trout fisheries by reducing their overabundance and improving growth and size of the catch by anglers. In contrast, Cutthroat Trout *Oncorhynchus clarkii*, because they are easy to catch, tend to be quite susceptible to overharvest by anglers,

and there are lots of examples of overexploitation in Cutthroat Trout populations (e.g., Mallet 2013).

A debate that may gain momentum in the relatively near future is whether innovations in bait hooks may reduce the historical incompatibility between bait fishing for trout and catch-and-release angling. Circle hook use in marine fisheries usually reduces deep hooking and, consequently, hooking mortality. These hooks appear to also work well in stream settings for wild trout (Sullivan et al. 2013; High and Meyer 2014), and there will actually be a talk here on this topic Friday morning. Whether it ever becomes common to allow bait fishing in catch-and-release trout waters as long as you use circle hooks remains to be seen. That seems unlikely because in reality, there is little demand these days to harvest trout or to use bait to fish for wild trout in streams. In reservoirs or community ponds, harvest and bait fishing by trout anglers is still very popular, but usually these types of waters do not support wild trout to begin with, so those people wanting to harvest trout are already focusing their time and energy on waters that are usually supported by hatchery trout, and they have pretty much lost interest in fishing for wild trout in streams, because so often they cannot keep fish anyway.

A debate that is gaining momentum in Europe is whether catch-and-release angling should be allowed at all. Animal rights activists argue that it is inhumane to catch and release a fish because angling causes pain and stress in fish. Their argument is that you should either not be allowed to angle at all, or you should at least be required to keep what you catch and stop fishing when you reach your limit. In other words, “catch-and-release is bad”. I am sure if we asked the fish whether they would rather be caught and kept or caught and released, they would prefer the latter, but regardless of the fish’s sentiment, the fish welfare argument has not resonated with people in North America like it apparently has in Europe, and we should all cross our fingers that it does not resonate more strongly any time soon.

If there is less desire to harvest wild trout, then presumably there will be even less need to stock hatchery trout in streams, since the main reason for stocking hatchery trout is to allow harvest opportunities. But in reality, this change has already taken place in many areas. In fact, in many states there is now only a small fraction of stream reaches

stocked with hatchery fish as there once was 30-40 years ago. Anyone who is still concerned with genetic introgression between wild native trout and hatchery trout can stock sterile fish and eliminate that concern, and many states and provinces do that, including the agency I work for (Kozfkay et al. 2006). I think that hatchery trout get an unsubstantiated bad rap among wild trout enthusiasts; in my opinion we should look at them as a useful tool for wild trout management, because they can divert harvest-oriented anglers away from wild trout waters and onto waters that do not support wild trout but can support harvest opportunities on hatchery-stocked fish.

Will barbless regulations be expanded in the future? Are they needed now? This is an issue that many anglers and biologists are very passionate about. For wild trout, the overwhelming evidence in the literature suggests that you can release fish quicker with barbless hooks, and they may cause less severe injuries, but they appear to have no impact on fish survival. What they do appear to impact, according to a recently published study, is angler landing success, especially for novice anglers (Bloom 2013). It is usually the experienced anglers who are the ones pushing for barbless hook regulations, probably because using barbless hooks does not reduce their landing success very much. The people who see the big drop-off in landing success with barbless hooks are the inexperienced anglers, the ones we always say we are so concerned about in trying to recruit them to the sport of angling, to be another voice (or voter) that supports wild trout conservation. So it seems to me that we are shooting ourselves in the foot by requiring novice anglers who want to fish in catch-and-release waters to use terminal tackle that does not improve survival of released fish but does reduce the number of fish they are likely to have the satisfaction of landing.

There has been a surge of interest in the last decade or two in preserving and protecting native trout, and that will probably continue for the foreseeable future. In the not-so-distant past, wild trout meant just that. In fact, at Wild Trout I, there was not a single talk about native trout. Rather, nearly every talk was just about wild trout, or about wild vs. hatchery trout. These days, more anglers are interested in catching not just wild trout, but wild native trout. Yet despite this relative surge of interest in native trout, the vast majority of anglers these days still do not really care what wild trout they are catching, as long as they

are wild. Native does not matter to them. In fact, your average angler does not even know which species are native and which are not. For example, in western North America many anglers use the name “German brown trout” to describe the fish they are catching without it dawning on them that that is where Brown Trout *Salmo trutta* are native, not North America. So we as fish managers must be cautious in not outpacing the public’s interest in native trout. I circle around to public interest again at the end of the paper.

Even though there will probably be less angler harvest of wild trout in the future, there will be even more pressure on wild trout resources due simply to an expanding human population. It is estimated that the human population in North America and the rest of the globe will stabilize by about the year 2050, so the heavy impact that human population growth has on natural resources may soon stabilize in many areas. However, wild trout in North America are currently doing best where human population size is under-seeded, such as Alaska and the Rocky Mountains (from northern Canada to Colorado). This is not a coincidence. Pressures on natural resources tend to be lower in these areas because there are fewer people, so areas like this tend to serve as reservoirs of biodiversity. Unfortunately for wild trout, the human population in these under-seeded, lighter populated areas will not stabilize by 2050, but instead will likely continue to grow through the end of the century as people flock to these areas to get their own slice of elbow-room (Lackey 2001). With climate warming already expected to further restrict wild trout populations in the future, the continued increase in the human population size in these reservoirs of biodiversity may exacerbate climate-related declines in wild trout populations.

Robert Lackey is a Professor of Fisheries at Oregon State University who (with colleagues) predicts that four core drivers will constrain salmon recovery in the Pacific Northwest through the 21<sup>st</sup> century (Lackey et al. 2006), and I would argue that these same drivers will also constrain wild trout management across the continent. They are (1) the economy, (2) the increasing scarcity of and competition for natural resources, (3) the increasing human population in the region, and (4) individual and collective lifestyle choices and priorities. This last driver - lifestyle choices and priorities - I will cover later, but the other three are pretty self-explanatory.

If the economy tanks, people are going to be less concerned about conserving wild trout and more concerned about putting their children through college or being able to afford health care coverage. These other two drivers kind of go together, because the more out-of-control human population growth is, the more pressure there tends to be on the remaining natural resources in the area, especially water.

Stream habitat in the 19<sup>th</sup> and early 20<sup>th</sup> century was annihilated in many areas of North America primarily because of poor mining, logging, and grazing practices, and this was one of the two major themes of Wild Trout I: to stop the destruction of stream habitat. It has taken a long time for streams to recover, in some areas they are still recovering, and in still others they may never recover. But reasonably strict environmental laws have now been in place for many decades in America and Canada, and adequate habitat for wild trout is now relatively common across the continent. I am not suggesting that everything has been restored, and I think we all recognize that we need wood to build houses, coal and gas to produce electricity, and phosphorus to fertilize crops and gardens, so there will continue to be more resource extraction in the future, and thus more stream habitat degradation. But I think it is reasonable to state that in many areas of North America, stream habitat is better now than it used to be. Thus, do not get your hopes up that we will see substantial improvements in stream habitat across North America in the future.

Another change we can obviously expect to see is in the world of technology, but I think we are getting so used to that type of change that it really is not a change at all. Computer technology that once filled a room now fits in the palm of your hand, and soon will fit on the head of a pin. Technological advances in PIT-tags, radio tags, eDNA, SNPs, and genetic engineering (to name just a few) will continue to skyrocket into the future. What this means is that the amount of fisheries data we are able to collect will someday stagger the mind. The key will be not letting the quantity of data overwhelm the quality of the data, or the reason you are collecting the data in the first place.

All of these changes are things we can all see coming. But there are probably some changes that we cannot see coming. I was in grad school in the mid-1990s when, seemingly overnight, the whirling disease scare burst onto the scene. Many people thought that the future of wild trout was threatened,

that whirling disease was going to obliterate wild trout populations across North America, especially in the west. That never happened. Currently, many people think that climate change is going to obliterate wild trout populations across North America, and around the globe. Is that really going to happen? That depends on how much warming actually occurs, what we do about the warming and about carbon emissions, and how resilient wild trout are to stream warming and reduced stream flow. What other issue might crop up in the next 20 years that will dominate wild trout management, and how much of an impact will it actually have? That is very hard to predict. But regardless of how many challenges we face in managing wild trout in the future, I bet that well after I retire, anglers will still be able to go to countless areas throughout North America and have a good day of trout fishing. Maybe that is just the optimist in me being misguided.

How wild trout management in the future *will not* change, and this is also pretty predictable, is that it will still largely come down to what people want. Abe Lincoln once said “In this age, in this country, public sentiment is everything. With it, nothing can fail; against it, nothing can succeed. Whoever molds public sentiment goes deeper than he who enacts statutes, or pronounces judicial decisions.” He was talking about slavery back then, but it is still a poignant statement, and it applies perfectly to the future of wild trout management. The preservation of native trout in particular, and to all wild trout in general, really comes down to public sentiment.

This is where we come back to the fourth of Dr. Lackey’s core drivers: lifestyle choices and priorities. Will wild trout be a priority for society in the future, and will our lifestyle choices allow space for sustainable wild trout fisheries? Can these values compete with our modern need for instantaneous stimulation? As people in general, around the globe, become less aware of the natural environment, and less associated with it, this will be an increasingly difficult challenge.

In fact, maintaining the public’s interest in nature in general, or wild trout in particular, may be our greatest challenge as fisheries professionals. Sure, kids these days have a reasonably strong resource ethic – perhaps stronger than ever - because they are taught in school curriculums and at home about recycling, buying locally produced foods, minimizing the use of

hormones or herbicides in agriculture, and reducing greenhouse gases. But as we live in a society that is more detached from the natural environment, as fewer parents of children hunt, fish, or spend time in other outdoor recreational activities, and as camping experiences more often involve motor homes with generators at a developed campground and less often involve tents, headlamps or lanterns, and sleeping bags in the backwoods, biologists may find themselves more marginalized than ever before.

This is probably the crux of the matter. Although federal environmental laws are already set up to protect species, public land, and clean water, it is only because people value these things. If those values are diminished, you can bet that protection and preservation of those resources will be diminished as well.

In one of his stand-up comedy routines, George Carlin once said, “The planet has been through a lot worse than us. Earthquakes, volcanoes, plate tectonics, continental drift, solar flares, sun spots, magnetic storms, the magnetic reversal of the poles, comets and asteroids and meteors, worldwide floods, tidal waves, worldwide fires, erosion, cosmic rays, recurring ice ages ... And we think some plastic bags and aluminum cans are going to make a difference... The planet will shake us off like a bad case of fleas.” I think he was right. Long term, and I mean really long term, the earth will be fine. Someday there may not be a trace of our ever having been here. All of this conservation of natural resources, of wild trout, is for ourselves, because we value these things. And if that is true, then how much preservation occurs in the future will come down to the values that our children and grandchildren hold in the future. In other words, it will come down to public sentiment, just as Abe Lincoln said.

But by public sentiment, I do not just mean “values” in the loose sense of the word. As Dr. Lackey has pointed out (Lackey 2001), if you asked people, they would probably say they do value wild salmon (or trout). But are they willing to make the personal or societal changes needed to preserve wild salmon, or wild trout? Dr. Lackey argued that to date, “society has collectively shown scant willingness to adopt the policy choices necessary to reverse the long-term downward trend in wild salmon”. Fortunately, wild trout usually do not have to swim through countless dams and survive commercial, recreational, and tribal harvest like salmon do, so the path for the long-term

preservation of wild trout, I would argue, is a lot easier than for salmon.

So, our best chance, as always, is to reach out to the children, to help instill within them a sincere interest in preserving nature, not in order to save the earth, or to save native species, but because they have a passion for these things. Because they love hiking in the mountains and along rivers, and they love to hunt for, fish for, or watch wild animals in their natural environments. We must help to foster within them an avid interest in these things. That is really all we have to do. Because if they are avid in these interests, something that is beyond “valuing” them, then they will protect these natural resources, and wild trout and all other wild things will continue to have a strong place in the fabric of our society. As Aldo Leopold once said, “there are some who can live without wild things and some who cannot.” We want our children and grandchildren to NOT be able to live without wild things, including wild trout. If they cannot live without wild things, then everything else will work itself out in the wash.

Can we achieve this? Can we help to instill a love of wild things in our children, in such an urban-oriented planet? As I said earlier, I am an optimist. Winston Churchill once defined an optimist as someone who sees the opportunity in every difficulty, and a pessimist as someone who sees the difficulty in every opportunity. Certainly it will be difficult to keep people avidly interested in wild things. But as a profession, we have a great opportunity, and an obligation, to do all we can to promote a love of all things wild, including wild trout.

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