California WaterBlog
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Ten realities for managing the Delta

Posted on July 23, 2015 by UC Davis Center for Watershed Sciences

Levee break on Upper Jones Track, June 3, 2004. *Photo: California Department of Water Resources.*

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By Peter Moyle

I have been working on Delta fishes for nearly 40 years. Increasingly, I have curmudgeonly thoughts about what is needed to make the ecosystem work better. Here I present these thoughts as "Ten Realities" – statements of the obvious that are often overlooked in public debates about the system.

Reality No. 1: The historical Delta ecosystem cannot be restored. The Delta of today bears almost no resemblance to the Delta of 100 years ago. Late 19th century residents would have a hard time recognizing the place.

Gone are the tule-filled flood basins and marshes. Hardly a trace of riparian forest remains. Only 3 percent of the historical wetland acreage exists today. About the only familiar features would be the main sloughs and river channels, and even they have high levees on both sides (Whipple et al. 2012).

What this means is that Delta ecosystem cannot be restored to look or function as it did at some idyllic point in the past. Too much has changed for that to happen. How do you bring back tule or cattail marsh to an island that has sunk 30 feet from decades of farming its peaty soil? You can't. How do you reverse the dominance of alien plants and animals in the Delta? You can't (Lund et al. 2007, 2011).

Reality No. 2: The Delta is not one place. Ecologically, the Delta is at least three places: the North Delta, the Central Delta and the South Delta.

Each place is distinctly different in the extent, distribution and characteristics of historical habitat types – tidal wetlands, waterways, lakes and ponds, and riparian forest – as detailed in a recent investigation of the Delta's ecological history (Whipple et al. 2012). Although the habitats have been dramatically altered, differences in habitat types still hold today.

The differences are important in deciding where habitat improvements will have the best chance of success. The North Delta, for example, is where farming is likely to be sustained indefinitely – and where some of the biggest opportunities for habitat restoration exist. (Moyle et al. 2012). The Central Delta, in contrast, is most likely to change to open water as the result of floods, rising sea level and earthquakes (Lund et al. 2010).

Reality No. 3: All species are not equal. Traditionally, habitat restoration efforts have aimed to recover populations of all native species – rare or not – by creating reserves or parks with restrictions on development. The approach is noble, but it rarely works in aquatic ecosystems. That's because human activities have already transformed most systems beyond the point they can be meaningfully restored (Reality No. 1).

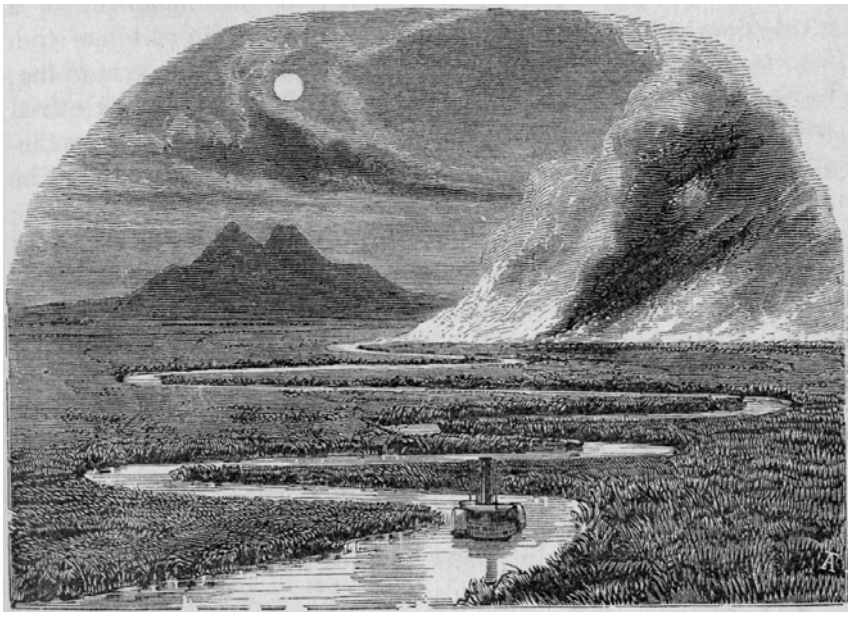
We *should* have ecosystems that contain as many California endemic species as possible. But preservation is a demanding enterprise. It requires intensive management of human-dominated ecosystems that contain mixtures of native and non-native species. We humans decide by our actions which of these species are desirable and worth preserving, often without making a conscious choice.

For example, if we want a Delta sport fishery, we should emphasize striped bass rather than largemouth bass. They're both alien predators, but striped bass need an estuary. If you're managing for striped bass, you're more likely to have an estuary that also happens to be good habitat for most native fishes. Keep in mind, though, that the Delta is not homogenous (Reality No. 2). Largemouth bass might be best suited for deeply subsided regions, which may never accommodate natives well.

Reality No. 4: We know a lot about the Delta. "We need better science," or, "We don't know enough," are common rationales for staying the course on Delta management. In reality, the Delta is part of the world's most studied aquatic ecosystem, the San Francisco Estuary.

Environmental scientists have been steadily taking pulse of the estuary for more than 50 years, be it water quality, fish populations or volume of inflows. The Biennial Bay-Delta Science Conference consistently draws hundreds of researchers. There is even a scientific journal devoted exclusively to the estuary.

I agree that there is never enough information to make decisions with absolute certainty. But we have a lot of information today to guide restoration efforts (Healey et al. 2008; Lund et al. 2010). We have to be willing to take the risk that some decisions made today will be wrong, or at least not exactly right, in retrospect.



Steamboat on the San Joaquin River, circa 1860, with field of tules on fire and Mount Diablo in background. *From Scenes of Wonder and Curiosity in California by James M. Hutchings.*

Reality No. 5: The Delta will change dramatically, no matter what. When interest groups say they want to protect the Delta, they essentially mean they want to protect the status quo. They think of the orchards, the row crops and the levees as constants, as with the largemouth bass fishery and the winter cornfields full of sandhill cranes and swans.

But the Delta has always been changing, especially in the past 150 years (Reality No. 1). Dramatic, rapid change is in its future (Lund et al. 2007; Lund 2011). An earthquake, giant storms and/or sea level rise will transform much of the estuary into open water.

This is not hyperbole. Levees give way even in the absence of extreme events. It was a calm and sunny day in June 2004 when a 350-foot section of levee on the Jones Tract west of Stockton collapsed, flooding farmland and sending officials scrambling to restore the levee and pump out the island.

Reality No. 6: Island flooding is a mixed bag for native fish. Flooded islands at intertidal elevations can create more habitats for some native fish, as the flooding of Liberty Island demonstrates.

Levee breaks and flooding of deeply subsided islands in the south and central Delta will create lakes that favor non-native fish and invertebrates. But with the right flows, salinity and temperature, flooded islands also could support desirable plankton-feeding fishes such as young striped bass and delta smelt (Moyle 2008).

Reality No. 7: Climate change will alter the Delta ecosystem. Regional climate change is likely already affecting the magnitude, timing, duration and temperatures of flows to the Delta.

The projected increase in frequency and magnitude of winter floods will increase pressures on levees and the likelihood of widespread, multi-island floods, particularly in the south and central Delta. Also, many levees will not be able to sustain climate-induced sea level rise, which is projected to be 1 to 1.5 meters by the end of this century.

Longer periods of drought, another predicted effect of climate change, would result in more fresh water being captured for humans and less flowing through the Delta for fish. In dry years, temperatures may reach levels lethal for native fishes such as delta smelt (Brown et al. 2011). Thus, many native fishes in the Delta may not survive under climate change (Moyle et al. 2012). But if we plan for climate change – for example, use cold water storage of upstream reservoirs combined with the cool, deep pools in the subsided delta – we we may be able to create conditions for most of these fishes to make it.

Reality No. 8: Alien species cause major ecosystem changes. The Delta is part of the most "invaded" estuary in the world. The pace of invasions appears to have increased in recent decades. At least 185 alien species of aquatic and terrestrial plants and animals now inhabit the Delta. They have profoundly changed Bay-Delta food webs and habitats, mostly (but not always) to the detriment of native species.

Two of the bigger ecological troublemakers are the Brazilian waterweed (*Egeria densa*) and the overbite clam (*Potamocorbula amurensis)*. With densities as high as 10,000 per square meter, the dime-size clams suck up enormous amounts of plankton, robbing Delta smelt and other pelagic fish of food. Meanwhile, dense patches of the prolific Brazilian waterweed are slowing tidal flows and creating lake-like conditions favorable to bass, sunfish and other non-native fish.

Reality No. 9: A Delta that is variable in time and space will be best for native fish. We've transformed the Delta from a highly variably ecosystem favored by native fish to a lake-like environment with more uniform habitats.

If we want native fish in the future, we need to reintroduce variability on a large scale. Variability means a wider range both in the conditions of the water – temperature, salinity and turbidity – and in habitat types – tidal wetlands, waterways, lakes and ponds, and riparian forest (Moyle et al 2010).

Reality No. 10: Accomplishing "coequal' goals in the Delta means greatly improving conditions for fish. The 2009 Delta Reform Act mandates that the state achieve the "coequal goals" of providing a more reliable water supply for California and protecting, restoring and enhancing the Delta ecosystem.

The reality is that the water priorities for people and fish and have never been anything approaching equal. The environment has always gotten the short end of the stick.

So achieving coequal goals should mean greatly improving conditions for fish, first, and then figuring out how to share the water better. It means we should give far greater consideration to native and other desirable species in the way we release water from dams and move it through the Delta.

In my gloomier days, I think "co-equal goals" really means just slowing the native fishes' slide towards extinction, so we can say, "Well, we tried." But fundamentally I am an optimist. I like to think of a rosier future for the Delta ecosystem under the rubric of "reconciliation ecology" (Rosenzweig 2002).

This means we accept the fact that all species live in human-dominated ecosystems, and that we must make those systems as welcoming as possible for the desirable (mostly native) species. This means greater integration of natural processes into the management of all areas, whether cities, farms, wildlands or waterways.

This will not be easy. But I love to think of the Delta as the first place in California where reconciliation ecology is applied on a large scale.

Peter Moyle is a UC Davis professor of fish biology and an associate director of the university's Center for Watershed Sciences.

Further reading

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6 Responses to *Ten realities for managing the Delta*

Frances Griffin *says:*
July 24, 2015 at 2:08 am

How did paper water rights get to be 5 times as great as actual water in the system? See the document "Water Heist" by Public Citizen. (Hint: Ignorance plus corruption.)
What actions would be most useful? See the website of the Environmental Water Caucus.

If the Delta cannot be returned to its original state should we just give up and not try to improve its condition in the direction of environmental quality. Of course not. See the action plan proposed by the Environmental Water Caucus, which not surprisingly has a lot in common with the actions recommended in the Public Citizen document.

San Francisco Bay is much cleaner than it used to be. Our air quality has improved over the last few decades. This is because we too appropriate action.

Like

Reply

Gary Dowling *says:*
July 24, 2015 at 12:46 pm

The steamboat pic looks more like the Sutter Buttes area, river size as well.

Like

Reply

Calvin smith *says:*

July 24, 2015 at 1:59 pm

Boy, don't let Restore the Delta read this. You'll never be invited back to the delta.
Also, while I can understand the point about the difference between striped and large mouth bass, both are non-native predators of listed species (anadromous fish and smelt) and should not be protected at all. Natives need a fighting chance, not just a no hum, oh well, we can't make it happene because humans have altered the landscape too much. Other actions involving water management are not dealt with this way and neither should predator fish.

★ Like

Reply

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tom arthur *says:*

July 24, 2015 at 2:37 pm

Peter,
For someone who loves the Delta and is completely biased toward the environmental priority, what groups or political processes do you think can do the most good and could use the most help from an individual citizen? And the opposite question. What group or political process is doing the most damage to the environment?

Thanks for the post,
Tom

★ Like

Reply

Nicholas Graves *says:*

July 25, 2015 at 12:00 pm

Good to see Peter Moyle's 2013 article again. One obstacle to the few GOP politicians who believe in human induced climate change is their election on the basis of "Government can't do anything for you". So we are pretty much done given that working to reverse warming produces free-rider benefits, and thus is inappropriate for the private sector. But GOP voters who are concerned that doing nothing is an immoral act visited on their children and grandkids should think of asking their elected officials, "Then what would you do? We are still supposed to be a government by the people and I am one of them. I know what you are against doing but what is your action going to be to fix our mess?"

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Reply

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