Reasons for Optimism About California WaterFix From a Fish Perspective

Scientists Peter Moyle and James Hobbs give their reasoning for qualified support for the controversial tunnels project that will affect Delta fish and fisheries.

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A juvenile delta smelt inside a rearing tank at the U.C. Davis Fish Conservation and Culture Lab, located on the grounds of the California Department of Water Resources – John E. Skinner Delta Fish Protective Facility near Byron, California. Dale Kolke / California Department of Water Resources

THE DELTA SMELT is on a trajectory toward extinction in the wild. Heading into 2017, the spawning adult population was at an all-time low, although this past wet winter has apparently seen a small resurgence. However, increasingly warm summer temperatures in the Delta may dampen any upswing. Given the long-term trajectory of the population and climate predictions for California, maintaining delta smelt in the Delta for the next 20–30 years is not likely to happen without significant improvements to the habitat.

So, what happens to the remaining smelt when they encounter California WaterFix? This is the proposal centered around building two tunnels under the Delta to move Sacramento River water directly to the export pumps in the South Delta, benefiting Bay Area and Southern California cities and southern Central Valley farms, as well as reducing the problem with reverse flows across the Delta.

In Hobbs et al. (2017), we gave cautious support to WaterFix. Here is our reasoning for qualified support for such a controversial large-scale infrastructure project that will affect Delta fish and fisheries. Our motivation comes from two facts:

(1) The status quo is not sustainable; managing the Delta to optimize freshwater exports for agricultural and urban use while minimizing entrainment of delta smelt in diversions has not been an effective policy for either water users or fish.

(2) Delta infrastructure (mostly levees) is old and increasingly vulnerable to catastrophic failure. Large-scale collapse of Delta levees will likely result in massive intrusion of saltwater into the Delta, shutting down water exports from the South Delta. Flushing this salty water will require large amounts of freshwater, further stressing water supplies. The most likely fix will be construction of an emergency freshwater transfer system, which may actually make conditions worse than the status quo, from an ecosystem perspective.

So where do we see reasons to be optimistic about WaterFix from a fish perspective?

- Entrainment of smelt into the export pumps in the south Delta should be reduced because intakes for the tunnels would be upstream of current habitat for delta smelt and would be screened if smelt should occur there.
- Flows should be managed to reduce the north-south cross-Delta movement of water to create a more east-west estuarine-like gradient of habitat, especially in the North Delta.
- Large investments should be made in habitat restoration projects (EcoRestore) to benefit native fishes, including delta smelt. (Editor's note: EcoRestore is an initiative of the California Natural Resources Agency to restore 30,000 acres of the Delta by 2020.)

Uncertainties

There are huge uncertainties associated with WaterFix and EcoRestore, especially in terms of their effects on fishes. Together, they are a giant experiment that may or may not work as promised, no matter what the models and experts say. The giant fish screens for WaterFix, for example, will be pushing screening technology to the limit, having to protect weak swimmers like smelt and small sturgeon, as well as juvenile salmon.

WaterFix is supposed to operate using an adaptive management framework, to deal with uncertainty. This means management activities can change as construction and operations proceed, as conditions change and as new information becomes available. The framework for adaptive management is just being established by the Delta Stewardship Council for EcoRestore; it appears to involve many diverse agencies and it isn't clear how consensus decisions will be achieved. "True" adaptive management treats each management action as an experiment with testable hypotheses and continuous monitoring that allows success or failure to be determined. Large-scale experimentation with projects of this magnitude is difficult, even with adequate monitoring. In short, adaptive management is a good idea, but making it work at this scale would be unprecedented.

EcoRestore has many uncertainties as well. Although restoration of tidal marshes should benefit salmon, water birds and many other species, the potential for restored tidal wetlands to support delta smelt and other pelagic fishes is at best weakly supported with current scientific data. Large-scale experimentation with EcoRestore projects will be challenging and will likely require 20+ years of data to make reasonable assessments

There are also trust issues with WaterFix. For it to work as promised, we have to accept that:

- Water will continue to be exported at roughly the same rates as it has been, with no increase in exports, but no decrease as well.
- It will be operated without significant increases in water being diverted upstream of the Delta.
- Full implementation of EcoRestore will occur and alleviate many of the endangered species issues.
- Water for the environment will not be sacrificed every time there is a water emergency (the co-equal goals promise).

Trusting the operation of the project is a problem because under emergency conditions, such as another severe drought, environmental water could be reallocated for other uses (e.g., through Temporary Urgency Change Petitions to the State Water Resources Control Board). An additional

worry is that the current administration in Washington, D.C., which shows little concern for environmental issues and endangered species, could apply additional pressure or new regulations to change the water allocation system.

If you don't trust that WaterFix will be operated as promised, what alternatives do you have? Here some general alternatives:

1. **Status quo.** This means continuing to rely on ad hoc responses to droughts and floods as well as delaying large-scale infrastructure improvements necessary to accommodate sea-level rise, big storm surges, extended drought and earthquakes. Under this scenario, invasive species will become even more dominant, and native species, like smelt, will disappear. There is room here, of course, for innovative programs that reverse island subsidence, control invasive species and reverse declining trends in native fishes through large-scale habitat restoration and pulse flow releases from dams. This will take a visionary effort, led by the Delta Stewardship Council, coordinating the actions of many agencies, a difficult task (see Lund and Moyle 2013 for suggestions on how to do this).

2. **Build one tunnel, not two.** The idea is to build a single tunnel that has just enough capacity to supply urban water needs or function as an emergency conveyance system when large levee failures or severe drought draws seawater into the Delta. This could protect California's urban water supply from catastrophic failure, but from a smelt's perspective, this is just a step above the status quo, because ultimately the pumps in the South Delta will continue to be relied upon for most water exports (the dual conveyance solution). Cross-Delta movement of water will continue, if somewhat reduced, as will entrainment mortality of native fishes. Presumably, EcoRestore would be at least partially implemented, providing some relief for native fishes.

3. **Roll back water delivery volumes to pre-1980 levels.** The goal would be increased flows down the Sacramento and San Joaquin rivers through the Delta and estuary. This would have many positive effects (Cloern et al. 2017) and would be especially beneficial to native fishes, like delta smelt, that require estuarine gradients of temperature, salinity and water clarity. It would also allow for pulse flows to carry juvenile salmon out to sea and to flood parts of the Yolo Bypass for fish-rearing on an annual basis. Higher flows would also enhance the benefits of restoration projects under EcoRestore. Unfortunately, given the politics and value of water in California, this option is very unlikely to happen, unless the environment is assigned an inviolable water right to make it truly "coequal" with other water users.

4. **Construct a north-south cross-Delta channel with reinforced levees, tidal gates, weirs and barriers that would deliver Sacramento River water to the South Delta under most situations** (see Lund et al. 2010). This version of dual conveyance would anticipate the need

for emergency construction of such a facility should levees fail as the result of sea-level rise, flooding, land subsidence and earthquakes, or all four. However, this option would ignore most estuarine ecosystem needs of the Delta, especially if it was operated with little consideration for environmental water during drought conditions. It could be partially mitigated through EcoRestore, provided the restoration efforts were tied to guaranteed flows down the Sacramento River and through the Delta, at key times.

Each of these four options face common challenges: They have to deal with major changes to the Delta wrought by sea-level rise, subsidence of farmed islands in the south and central Delta, increased frequency of large storms/floods and earthquakes. While these projections, most featuring levee collapse, may seem alarmist, scientific studies predict large-scale change is going to happen; it's merely a question of when. Thus, at some point, the south and central Delta will contain large expanses of salty water with reduced tidal influence, ending farming in this region. This new Delta will be a much more difficult place in which to move freshwater to the south Delta pumping plants. Fish and invertebrates will continue to be abundant, but the assemblages are likely to be made up of salt-tolerant forms, such as yellowfin goby, Mississippi silverside, starry flounder, striped bass, northern anchovy, Black Sea jellyfish and overbite clam. Lake-like regions might even be seasonally used by delta smelt, although they will be too warm in summer. Fighting this magnitude of change to keep the status quo will require large investment in levees and barriers, as well as in EcoRestore, making the Delta even more artificial and highly managed than it is today.

So what happens to delta smelt under these options? Assuming partial recovery in response to the wet winter of 2016–17, assuming successful supplementation from a smelt conservation hatchery and assuming EcoRestore and additional measures improve smelt habitat, guided by present biological opinions, the extinction of delta smelt may be prevented. If the tunnels survive lawsuits and political opposition, their operation is at least 10–20 years in the future. Thus, smelt recovery will have to be well on its way for the tunnels to have a detectable effect. Meanwhile, the longer we delay, the more likely drastic large-scale emergency measures will be put in place, with little consideration for environmental or recreational needs.

So, the best option for smelt, and other native fishes, especially salmon, is #3, because it should result in a large increase in freshwater flows through smelt habitat (Moyle et al. 2012). This conclusion is essentially the same as that of the much-ignored Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes (USFWS 1996). The realities of California water politics, however, dictate that one of the other three options is much more likely to happen. Of these options, the WaterFix + EcoRestore option deals best with future changes to the Delta and seems most likely to keep delta smelt, salmon and other desirable fishes as part of the Delta ecosystem. We are past the point where

passive management and ad hoc responses to emergencies will keep delta smelt and most other native fishes as participants in the Delta's ecosystem. Large-scale changes require large-scale, active management solutions, like WaterFix+EcoRestore.

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