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Author:
Layzer, Judith A., Massachusetts Institute of Technology

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Using Science to Restore California's Bay-Delta

Judith A. Layzer

Associate Professor of Environmental Policy, Department of Urban Studies and Planning
Massachusets Institute of Technology
Cambridge, MA 02139
jlayzer@mit.edu

The State of California and the U.S. Department of Interior have committed to relying on science as a guide to both restoring the Bay–Delta ecosystem and deciding how much water can be exported from that system. In theory, upholding this commitment should be straightforward. In practice, however, figuring out how science can and should guide policymaking is challenging when the problem at hand is complex and multifaceted, and features a cast of savvy, powerful stakeholders with sharply different interests. One reason is that participants in such controversies have long used debates over science as proxies for debates over values. The conflict over the Bay–Delta is no different; recently, for example, representatives of large-scale water users dismissed the suggestion that too much water is being exported from the Bay–Delta system, although more than three-quarters of the scientists surveyed by the Public Policy Institute of California (PPIC) believe that excessive water withdrawals pose a problem (Anonymous 2013).

To make progress in this situation, state and federal policymakers should take a series of bold steps. First, they should articulate a single, clear, overarching goal of ecological restoration for the Bay–Delta. Next, they should establish an adaptive process for soliciting scientific advice and adjusting management to ensure it is consistent with that goal. And finally, they should emphasize the translation of scientific research into compelling political stories that highlight both the intrinsic value of ecological restoration and its necessity for achieving other highly valued goals.

My argument is rooted in the recognition that improvements in the scientific understanding of a problem do not necessarily lead to "better" or more rational policies to address that problem (Layzer 2012). In fact, more science can actually exacerbate policy conflicts, particularly when a policy dispute features players with sharply different values (Graham et al. 1988). In part, this is because additional science can reveal new sources of uncertainty, which advocates can exploit. But, more important, it is because when we ask scientists to answer policy-relevant questions the results are not scientific but trans-scientific; that is, they require scientists to make judgments about risk based on the best-available information (Rushefsky 1986; Weinberg 1972). Embedded in any scientific judgment are value-based assumptions about acceptable levels of risk and the relative importance of various factors contributing to that risk (Litfin 1995). Participants in environmental policy disputes often capitalize on the inherent uncertainty of and judgments involved in regulatory science to promote their own versions of science as authoritative—a phenomenon Robert Service (2003) calls "combat science." The result is intractable technical disputes that conceal fundamental value differences.

The longstanding effort to devise a plan for the Bay–Delta ecosystem is no exception to this pattern; despite decades of negotiations, conflicts over values continue to underpin disputes over science. Underscoring this reality are the conclusions of the PPIC. In its recent report, *Scientist and Stakeholder Views on the Delta Ecosystem*, the PPIC notes:

> The lack of shared understanding on Delta science is a major obstacle to effective ecosystem investments. Most engaged stakeholders consult scientific and government reports regularly, but *key groups that would be affected by change often come to different conclusions than most scientists (and other stakeholder groups) on the nature of both the problem and solutions*. (Hanak et al. 2013, p. 3; emphasis mine).

In short, despite being exposed to the same information, stakeholders draw very different conclusions about what is wrong and what ought to be done.

Counter-intuitively, conflict in the Bay–Delta is exacerbated by the fact that, historically, policymakers have set multiple, co-equal goals. CALFED pursued four goals: (1) restoring the ecosystem, (2) ensuring water supply reliability, (3) enhancing the integrity of the levee system, and (4) improving water quality. More recently, the 2009 Delta Protection Act made ecological restoration and water supply reliability co-equal objectives. And in spring 2013, Jerry Meral, deputy secretary of the California Natural Resources Agency, argued in the *Sacramento Bee* that the recently released draft Bay Delta Conservation Plan (BDCP) offered California the opportunity to attain four goals simultaneously: (1) make its water supplies safer and more secure, (2) avoid the impacts of a natural disaster, (3) restore the ecological health of the Delta, and (4) enhance Delta communities. Insistence on meeting multiple, co-equal goals ostensibly ensures that all stakeholders feel enfranchised. As long as all stakeholder demands are considered equally legitimate, however, disagreements over science are likely to persist—even as policymakers strive (unsuccessfully) to satisfy everyone, or at least to avoid imposing perceptible costs on anyone—at the expense of long-term ecological health.

To mitigate this phenomenon, leaders should establish ecological restoration as the single, overarching goal of management, while seeking to meet other objectives—from water supply reliability to economic development in the Delta—within that constraint. Establishing ecological restoration as the primary goal of management alters the questions we ask of scientists. For example, in effect, policymakers currently ask: What is the minimum amount of water we can leave in the ecosystem without destroying it? If the overall goal is a healthy, functioning Bay–Delta system, however, policymakers might ask: How much water does the ecosystem need to be resilient in the face of variations in climate? Once scientists have established a probabilistic range, policymakers can legitimately select a precautionary water level. They can then work with scientists to allocate the remaining water in ways that impose minimal risk on the health of the ecosystem. This framing will, of course, lead to uncomfortable questions and answers, and require substantial sacrifices among water users. But our early experience with large-scale ecosystem restoration suggests it is the only framing that is likely to result in ecological improvement over time (Layzer 2008).

Of course, even with an overarching commitment to restoration, scientific disagreements will arise. For example, scientists will differ over what constitutes a healthy, functioning Bay–Delta ecosystem in the 21st century, in light of the massive changes that have been made. They will debate when and where water withdrawals can be made without impairing the resilience of the system as a whole. Therefore, it is essential to create an adaptive process that engages scientists in the establishment of criteria and benchmarks for success, as well as the development of mechanisms likely to yield the desired results and facilitate adjustments in response to learning over time. Unfortunately, we have few working models of this kind of adaptive process; the most widely cited example involves governing the waterfowl harvest in the Northeast—a situation in which the management objective was clear (to maximize the long-term utility of the harvest) and the benefits of reducing uncertainty were high (Nichols et al. 2007).

More commonly, planners have used adaptive management as an excuse to incur ecological risk, reasoning that management can be adjusted in the future as necessary (Layzer 2008). The BDCP appears to take this tack; for example, in April 2013 the National Marine Fisheries Service raised concerns that the (current draft of the) BDCP assumes its restoration measures will achieve the plan's goals, yet contains little scientific evidence on which to base this assessment (Weiser 2013). This is typical of how large-scale projects like the Everglades Restoration treat scientific uncertainty: by adopting optimistic assumptions about the efficacy of minimalist conservation and restoration measures while ensuring that the demands of water users are met, explaining that adaptive management will correct any deficiencies over time. By contrast, if the overarching goal of the Bay–Delta plan were ecological restoration, planners would work closely with scientists to build in buffers to accommodate uncertainty, so that the risk of failure would fall on water users, not the ecosystem. The emphasis of adaptive management would be on devising experiments to test the efficacy of mechanisms for meeting agricultural and urban water needs (as opposed to demands) with minimal environmental effects.

To build political support for ecological restoration, and for an adaptive management process in service of that goal, policymakers must support not just basic (or even applied) research, but also translation of science into language that policymakers and the public can understand. Scientists working in the Bay–Delta have undergone a decades-long process of "learning" that science alone does not move policy, but rather that science must be converted into stories that resonate with the media, policymakers, and the public. The CALFED Science Program, created in 2000 to inform the collaborative process while remaining neutral, yielded high-quality scientific research and enhanced scientists' knowledge of the Bay–Delta system, but had little discernible impact on policy or politics. In an effort to exert greater influence, beginning in 2007 scientists at the University of California at Davis and the PPIC collaborated on a series of white papers directed at policymakers and the expert community. These papers explicitly pointed out the policy implications of their research, while emphasizing that their recommendations were rooted in credible science (Simmons 2013). Most recently, the San Francisco Estuary Institute collaborated with radio station KQED's Quest science program to create a series of radio stories and interactive materials that convey Bay–Delta history, ecology, and management issues to a broad audience. The hope of its creators was that the series would engage a wider swath of the public than has traditionally been engaged in Bay–Delta politics (Simmons 2013).

While this evolution in tactics is revealing, being asked to translate their research into compelling political narratives creates discomfort among scientists because most strive to maintain a posture of neutral objectivity. They worry that generating simple narratives rooted in explicit values will jeopardize colleagues' perceptions of their professional legitimacy and credibility. Moreover, few are comfortable in the political spotlight or have received training in how to communicate with non-technical audiences. As Andrew Cohen, founder of the Center for Research on Aquatic Bioinvasions, explains, "people go into science to remove themselves from politics. That's what I wanted, but it didn't work out that way" (quoted in Simmons 2013). The science–policy translation challenge has only deepened with the fracturing and polarization of the media. No longer does the public have access to just a handful of information sources; over the past two decades, ideologically based websites have become the norm, with the result that many citizens receive only the news they seek out. During the same period, traditional media outlets—and particularly local newspapers like the *Contra Costa Times*, the *Sacramento Bee*, the *Stockton Record*, and even the *San Francisco Chronicle*—have dramatically curtailed their staff and therefore coverage of Delta-related issues; many of the trained science writers are gone, and generalists are now expected to cover the state's complex, long-standing water controversies (Simmons 2013).

Designating knowledge brokers who are credible and legitimate, and capable of synthesizing the available science, can enable researchers to maintain their professional status while devoting some of their resources to the translation function. Supporting scientists who undergo training in communication, like the kind that organizations such as COMPASS provide, can empower those with strong credentials but little confidence in the public realm. And creating rewards—within academia as well as within state and federal agencies—for those who are skilled at integrating scientific information into policy recommendations will improve the likelihood that scientists with strong communication skills will emerge and opt to take that path.

These recommendations will be controversial. As it turns out, prescribing a process for effectively incorporating science into policymaking is relatively straightforward. The difficulty lies in choosing the goal we are asking science to serve—at least in the realm of ecological restoration. We have no such qualms about, say, cancer or diabetes research; we readily acknowledge that disease is a scourge and that we conduct scientific research in hopes of "curing" it. When it comes to restoring the ecological systems that support life on earth, we are unwilling to make the same commitment. But doing so will strengthen the science–policy link while greatly improving the prospects for achieving all of our goals for the Bay–Delta ecosystem.

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