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Water Wasted to the Sea?

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If we farmed the Central Valley or managed water supplies for San Francisco, San Jose, or Los Angeles, we might think that freshwater flowing from the Sacramento and San Joaquin rivers through the Delta to San Francisco Bay is “wasted” because it ends up in the Pacific Ocean as an unused resource. However, different perspectives emerge as we follow the downstream movement of river water through the Delta and into San Francisco Bay.

If we were Delta farmers or administered Contra Costa County’s water supply, we would value river

water that flows through the Delta because it repels salt intrusion (Jassby et al. 1995) and protects water quality for drinking, growing crops, and meeting other customer needs.

If we were responsible for protecting at-risk species, we would value river water that flows through the Delta to the bay and ocean because it stimulates migration and spawning of native salmon, Delta Smelt, Longfin Smelt, and Sacramento Splittail while reducing the potential for colonization and spread of non-native fish (Brown et al. 2016). River flow reduces toxic selenium concentrations in clams eaten by sturgeon, splittail, and diving ducks (Stewart et al. 2013), and it delivers plankton and detritus to fuel production in downstream food webs (Sobczak et al. 2002).

If we managed a Bay Area storm water district or sewage treatment plant, we would value water that flows from the Delta into the bay because it dilutes and flushes such urban pollutants as metals, microplastics, and nutrients (McCulloch et al. 1970).

If we directed restoration projects around the bay, we would value water that flows from the Delta into the bay because it brings sediment required to sustain marshes that otherwise would be lost to subsidence and sea level rise (Stralberg et al. 2011; Schoellhamer et al. 2016). Sediment supplies from rivers also sustain mudflats (Jaffe et al. 2007) used as habitat and probed for food by more than a million willets,

sandpipers, dunlins, and other shorebirds during spring migration (Stenzel et al. 2002).

If we fished the Pacific for a living, we would value river flow into the bay because it carries cues used by adult salmon to find their home streams and spawn (Dittman and Quinn 1996), it brings young salmon to the sea where they grow and mature, and it creates bottom currents that carry young English Sole, California Halibut, and Dungeness crabs into the bay (Raimonet and Cloern 2016) where they feed and grow before returning to the ocean.

If we liked to romp along the shore or served on the California Coastal Commission, we would value rivers that flow to the sea because they supply the sand that keeps California's beaches from eroding (Barnard et al. 2017).

Finally, if we were among those who want to conserve California's landscape and biological diversity, we would value river water that flows to the sea because it creates one of the nation's iconic estuaries, and sustains plant and animal communities found only where seawater and freshwater mix (Cloern et al. 2016).

Is the fresh river water that naturally flows through the Delta to San Francisco Bay and on to the Pacific Ocean "wasted?" No. The seaward flow of freshwater is essential to farmers, fishers, conservationists, seashore lovers, and government agencies that manage drinking water supplies, restore wetlands, protect coastlines, and clean up sewage and storm pollution. Wasted water to some is essential water to others.

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We thank Andrea Alpine and Michael Healey for thoughtful comments on early drafts of this essay. Interested readers can explore the latest update of *The State of Bay-Delta Science, 2016* in a collection of three *SFEWS* special issues (*Vol. 14, Issue 2*; *Vol. 14, Issue 3*; and *Vol. 14, Issue 4*). Begin with the introduction to this series by Healey et al. 2016 to learn more about the deep scientific foundation upon which this essay was built.

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