CONSERVATION BIOLOGY

Of Birds and Bureaucracy

Jared Farmer

SEEKING REFUGE: Birds and Landscapes of the Pacific Flyway. Robert M. Wilson. Foreword by William Cronon. xvi + 245 pp. University of Washington Press, 2010. $35.

To see wildlife in spectacular abundance, it's not necessary to visit a wilderness preserve like Yellowstone National Park. Some of the greatest concentrations of birds in North America can be found within the agricultural grid, on tiny refuges sustained by irrigation wastewater from corporate farms. On the Pacific Flyway, one of North America's four migratory bird corridors, 60 percent of migratory wildfowl winter in California's Central Valley, one of the most intensively cultivated regions on Earth.

This coexistence of avian migration and industrial agriculture is the result of concerted efforts as well as incidental effects. In the early 20th century, irrigation projects disrupted the flyway by destroying wetlands used by migrating birds. These wetlands are "like links in a chain," writes geographer Robert Wilson, and the flyway is "only as strong as its weakest link." Wilson's new book, *Seeking Refuge,* recounts the history of governmental efforts to repair or refashion particular links. The outcome can hardly be called natural. Today's refuges, which bear only a passing resemblance to former habitats, were produced rather than preserved.

Migratory birds do not behave like spawning fish that insistently return to their home waters. As Wilson says, wildfowl know how and when to migrate, but not precisely where. The ducks and geese of western North America generally move along the corridor between the Pacific Coast and the Rocky Mountains, but the exact routes and destinations vary from species to species, population to population, and year to year. After spending the summer at a breeding ground in Alaska or Canada, a population on the Pacific Flyway travels to a "staging area" such as the mouth of the Bear River at the Great Salt Lake or the marshlands of the Klamath Basin on the California-Oregon border. Following such a sojourn, it continues southward, most likely to central or southern California. The Golden State used to offer a rich variety of aquatic habitats, including the Sacramento River delta, vernal pools, tidal marshes along San Francisco Bay, inland salt marshes at Owens Lake and Mono Lake, and what was once the largest body of water in the American West, Tulare Lake, covering as many as 800 square miles during wet cycles.

Not anymore. By the 1930s, 90 percent of California's wetlands were gone. People turned Bay Area marshes into salt ponds; they converted large parts of the delta into fields and pastures; they drained Tulare Lake and made it a cotton plantation; and they siphoned away the inflow of Owens Lake, creating a dusty playa. Farther south, in Mexico, the delta of the Colorado River progressively dried up as farms and cities appropriated the flow.

The government generally facilitated this ecological regime change, but different agencies played contradictory roles. In the 19th century, the federal government gave "swamps" and "overflowed" lands to states. As states drained such property, they could sell it and use the proceeds to drain more land. In 1902, Congress created the U.S. Reclamation Service (which in 1923 was renamed the Bureau of Reclamation)—a whole agency devoted to remaking the deserts and wetlands of the West into irrigated farmlands, with no regard for birds or fish. At the same time, the Bureau of Biological Survey (which after an administrative merger in 1940 was renamed the U.S. Fish and Wildlife Service) was doing its best to preserve avian habitats. *Seeking Refuge* describes the efforts of the Biological Survey and then the Fish and Wildlife Service to maintain the Pacific Flyway within the new irrigated landscape engineered by the more powerful reclamation agency.

Wilson begins with the example of the Klamath Basin. Early in the 20th century, the Reclamation Service spent a lot of money there transforming an incredibly productive wildlife habitat into a moderately productive agricultural district, despite low demand from homesteaders. It didn't matter that President Theodore Roosevelt had established a wildlife refuge there in 1908, because the Klamath Lake Reservation, as it was called, lacked water rights. In 1917, carrying out a plan made years earlier, the Reclamation Service went ahead and cut off the water to Lower Klamath Lake, forcing it to evaporate. Visiting the area in 1935, Biological Survey ornithologist Frederick Lincoln lamented, "It doesn't even support a good crop of weeds. . . . A jack-rabbit would starve on it."

It was Lincoln who invented the term *flyway,* after analyzing data from a large-scale avian banding program. By 1930, he and his network of volunteers had banded 740,000 birds and had collected 10,000 bands from dead specimens. Comparing where a bird had been banded with where its body was found allowed ornithologists to hypothesize about the route the bird might have taken between those points. Lincoln named four flyways in North America: the Atlantic, the Mississippi, the Central and the Pacific. The four-region concept grew out of field research, but it also reflected bureaucratic thinking; Lincoln simplified and rationalized a complex natural phenomenon into something comprehensible and mappable. The Bureau of Biological Survey deployed the concept to promote its mission and, as Wilson says, to "compartmentalize space." Not coincidentally, the Survey reorganized itself into four administrative zones that roughly matched the flyways.

Lincoln's longitudinal study showed that migrating birds took a variety of flight paths within a general flyway. This knowledge encouraged the hope that displaced populations could be rerouted to new refuges. To compensate for the loss of marshes in Oregon, the Biological Survey enlarged wetlands in Utah. At Bear River National Wildlife Refuge, founded in 1928, the Survey borrowed techniques from its nemesis, the Bureau of Reclamation: It reengineered the mouth of the river and created a series of diked ponds that could be drained and filled according to schedule—an artificial disturbance regime. The refuge, which had been plagued by avian botulism, became a "super refuge"; the Survey touted its success in turning a "death trap" into a "supply depot."

Building on this success, the agency redesigned the Pacific Flyway. Using revenue from Duck Stamps (hunting licenses also sold as collectibles), it

Wildlife photographers William Finley and Herman Bohlman, who made an expedition to the Klamath Basin in 1905, portrayed the basin marshes as an enticing place for bird watching and wildlife adventure. Their reports were instrumental in getting bird protectionists to lobby for the creation of a bird reservation there. This photograph from the expedition shows Finley and Bohlman taking field notes and studying cormorant eggs on the rocky shore of Tule Lake. From *Seeking Refuge*.

purchased land in the Central Valley, including parcels that had not previously been wetlands. The key site was the Sacramento National Wildlife Refuge, established in 1937. Like a farm, the Sacramento refuge was subject to the water-use regulations of the irrigation district it was part of. Neighboring growers soon complained about "trespassing" waterfowl eating their crops. Because the refuge had junior water rights, the Biological Survey couldn't afford to alienate the senior water users in the district. To solve the problem of "wayward birds," the agency turned the Sacramento refuge into a real farm. It grew rice so that ducks and geese would be less tempted to feed elsewhere. When the migratory birds—trespassers by nature—continued to ignore boundary lines, wardens used surplus military aircraft for "aerial herding." They even resorted to antiaircraft searchlights, mortars, grenades and other small explosives to keep birds in segregated spaces. To prevent "duck farms" from spreading insects and weeds to corporate farms, the agency applied herbicides and pesticides, including DDT. By the late 1940s, writes Wilson, "depredation control was becoming the primary purpose of new refuges." Zoned sanctuaries became mirrors of the very industrial processes and landscapes that had destroyed avian habitats.

Now that the Fish and Wildlife Service owned a super refuge (or holding pen, as Wilson calls it) in the Central Valley, it turned its attention to the Klamath Basin, the "bottleneck" in the flyway. Unexpected help came from the Bureau of Reclamation, which fixed a flooding problem at its Tule Lake sump by sending excess water to Lower Klamath Lake via a new tunnel. Using this gift of wastewater, in the 1940s the Fish and Wildlife Service carried out a "restoration" program that included a barley operation run by sharecroppers. Ducks and geese—the quarry desired by hunters—thrive on grain, so within a few years, migratory waterfowl had returned in dazzling numbers. Wading birds like herons and egrets, however, have different dietary preferences. Monocultural management of the Klamath refuge privileged the *Anatidae* family at the expense of nongame birds, not to mention fish, amphibians and mammals.

Pacific duck and geese populations increased in the mid 20th century, to general approval. But the consensus over this program began to unravel in the 1970s. Recreational hunters, the chief advocates for large populations of waterfowl, declined in number. A growing constituency, environmentalists, had different ideas about the purpose of wildlife. The politics of water also changed. By the turn of the millennium, many California farmers had sold their water rights to coastal cities, which meant that less irrigation water would find its way to sumps and refuges. Finally, Indian tribes began asserting treaty rights to water and fish. Native Americans made good use of the court system, as did environmentalists, who seized upon the Endangered Species Act as a blunt tool.

On the one hand, the Act exponentially increased the authority of the Fish and Wildlife Service. Now it could dictate to the Bureau of Reclamation. On the other hand, species recovery plans could conflict with duck farms. The Endangered Species Act provides no protection for endangered phenomena such as avian migration, only for individual species or for "evolutionarily significant units." Thus the water needs of endangered fish populations trump the needs of bird reservations. For example, in 2001, the Fish and Wildlife Service directed the Bureau of Reclamation to cut off water to more than 1,200 farms in the Klamath Project in deference to coho salmon runs downstream. No water for farms meant no wastewater for birds. Over the summer, Tule Lake and

Lower Klamath Lake shrank. Waterfowl crowded together as farmers lashed out at bureaucrats, environmentalists and Indians. In the wake of multiple lawsuits, Interior Secretary Gale Norton convened a panel of experts to study the crisis. To date, the situation in the Klamath remains acrimonious and litigious.

Seeking Refuge does not provide policy recommendations. This concise, understated, well-crafted work allows readers to reach their own conclusions. Despite its narrow focus on the activities of the Biological Survey and the Fish and Wildlife Service in Utah, Oregon and California, the book has wide relevance. Wilson quietly demolishes the dichotomy of preservation versus development, and challenges the language of environmental restoration. Wildlife is not "out there"; it is all around us, entangled in the places we live and work. Animals and humans share a "hybrid" landscape. Wilson suggests that wildlife habitat cannot truly be restored to its original state. Like it or not, when we try to save nature we inevitably change it. This is true on the planetary scale and the local scale. By looking to the past, Wilson helps us peer into the future, as we try to imagine the consequences of our efforts and proposals to engineer our way out of the latest environmental crisis.

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COMMUNICATION

Speaking for the Data

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ESCAPE FROM THE IVORY TOWER: A Guide to Making Your Science Matter. Nancy Baron. xxii + 246 pp. Island Press, 2010. $55 cloth, $27.50 paper.

EXPLAINING RESEARCH: How to Reach Key Audiences to Advance Your Work. Dennis Meredith. xvi + 357 pp. Oxford University Press, 2010. $35 paper.

As a child, Joanie Kleypas was drawn to the television programs of Jacques Cousteau, and they played a role in inspiring her to become a marine ecologist when she grew up. But she never dreamed that she herself would get involved in communicating science to the public. Decades later, however, she was forced into that role when her research uncovered important information. Working at the National Center for Atmospheric Research, she was one of a handful of scientists investigating the effects of rising levels of atmospheric carbon dioxide on ocean acidity. When the first model results came in, showing that ocean acidity would increase greatly, the realization hit her that this would pose a huge threat to marine life. She had to excuse herself from a meeting to go throw up.

Kleypas had always shied away from promoting her own work, but the unpleasant revelation that ocean acidification was a very serious problem launched her reluctantly into the public sphere, as she resolved to help policymakers understand and address the matter. Her efforts have paid off: Public awareness of the problem has increased, and federal funds for research have been authorized by the Federal Ocean Acidification Research and Monitoring Act passed by the U.S. Congress in 2009.

Kleypas's story, recounted in Nancy Baron's *Escape from the Ivory Tower*, illustrates the resolve required for investigators to leave their comfort zones in the lab, the field and scientific journals in order to deliver bottom-line, jargon-free information to lay audiences. The book summarizes Baron's decade of experience leading workshops for environmental scientists through the Communication Partnership for Science and the Sea. Her curriculum includes such topics as formulating (and sticking to) a clear message, talking with journalists and policymakers, and promoting a scientific paper. Like her workshops, Baron's authoritative writing is studded with cameo appearances by researchers who have taken the plunge into the public sphere and have sound advice to offer. Some of America's best-known science journalists weigh in as well.

The book is supplemented by an attractive, user-friendly website (http://www.escapefromtheivorytower.com/) that provides, among other things, exercises to help scientists decide how much advocacy they'd like to do, videos of scientists offering advice, and links to effective research-lab websites. Unfortunately, although the book was published in August 2010, three months later many of the online resources mentioned in the text still could not be found on the site.

Escape from the Ivory Tower joins a growing throng of recent publications that exhort, even scold, scientists to convey their work more clearly in order to save the world from environmental disaster and scientific illiteracy. These include Chris Mooney and Sheril Kirshenbaum's *Unscientific America*, Cornelia Dean's *Am I Making Myself Clear?* and Randy Olson's *Don't Be Such a Scientist*. Baron is not a scolder—she presents her guidance with a supportive, can-do attitude. And she defines her readership rather narrowly. "It's time for the very best scientists to engage," she writes, and she's most concerned with high-impact environmental studies that address such problems as the ozone hole and fisheries collapse.

For everyone whose work may be merely fascinating, there's Dennis Meredith's *Explaining Research*, an encyclopedic volume of advice based on the author's 40-year career as a public information officer at research institutions such as Cornell and Duke. Meredith largely dispenses with weighty altruistic reasons for scientists to speak up; instead, he emphasizes how to reach donors, funding agencies, potential students, collaborators and even a researcher's own family. People do want to listen to scientists, he argues; the American public trusts scientists more than journalists and perceives them as heroes. (In his own assessment of 140 movies, Meredith found that heroic scientists outnumbered villainous ones by 6 to 1.)

Having bolstered the reader's morale, Meredith proceeds to deliver an avalanche of guidance on every facet of explaining research, from giving compelling PowerPoint presentations to advising museum exhibits, shooting video, writing press releases, and talking with the media and with policymakers. On topics that are covered by both *Escape from the Ivory Tower* and *Explaining Re-*