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Unnatural Landscapes: Tracking Invasive Species by Ceiridwen Terrill

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BOOK REVIEW

Unnatural Landscapes: Tracking Invasive Species. 2007. Ceiridwen Terrill. University of Arizona Press, Tucson, AZ. $17.95. 220 pages. ISBN 0-8165-2523-4.

Ceiridwen Terrill's book is an astute glimpse into the ever-growing field of invasive species. The author is well versed in ecological processes and has firsthand understanding of environmental impacts caused by introduction of nonnative species into established communities. Her book is divided into 4 chapters exploring 4 landscapes susceptible to biological manipulation and focusing mainly on island biogeography.

The author interacts with park managers and biologists who have keen knowledge of the local effects of exotics. She skillfully gleans environmental wisdom from these frontline naturalists and summarizes her findings in an easily understandable language. Some of these findings go beyond the understanding that nonnative species outcompete natives for minerals, water, and spaces. Nonnatives also alter streambed courses and fire regimes, have negative effects on human health and the economy, and can be the focus of emotional debates.

The 4 island ecosystems the author discusses are Nevada's Anaho Island, Ash Meadows National Wildlife Refuge and its California neighbors Death Valley and Fish Slough, the Midriff Islands in the Sea of Cortes, and California's northern Channel Islands. Using these ecosystems as examples, she illustrates that "islands are central to conserving biodiversity worldwide" (p. 6).

Invasive species can have multiple impacts on the landscape and can have a perpetual dynamic that is not initially obvious. For example, fire season in the Great Basin may not have been as detrimental as it once was. Before the arrival of introduced grasses, like cheatgrass (*Bromus tectorum*), native bunchgrasses and shrubs were spaced apart such that fire could not easily jump from plant to plant. Fires were small because a continuous cover of fuel was not present, and they occurred only every fifty years or so. With the introduction of nonnative grasses, flammable linkages were established so that a fire could spread rapidly from native plant to native plant. These hot, rapid fires destroy the native vegetation and leave the soil temporarily nutrient rich. The high availability of these nutrients in turn encourages the voracious growth of introduced grasses before native plants can become reestablished. Fire helps cheatgrass spread and expand its range, which then provides fuel for even more fires and more cheatgrass. If cheatgrass and other nonnative grasses invade an island, the fire effect is even more dramatic, perhaps to the extent of driving all native island life to extinction.

Invasive species can create other ecological catastrophes that are even more complex and far-reaching. The Channel Islands off the coast of southern California provide such an example. The Channel Islands are home to a variety of native species that are not found anywhere else in the world. The author focuses on the 4 northern islands, known as the "Galapagos of the north." They were once one large "super island," but fluctuating sea levels filled in the valleys, splitting the large island into 4 parts, allowing for unique life forms to evolve on each island.

One animal in particular has captured the attention of the author: the island gray fox (*Urocyon littoralis*). Fox numbers fell from nearly 1300 individuals to a mere 100 within 10 years. The drastic population reduction can be traced directly to DDT—a pesticide aptly used to combat insect pests. By 1939, DDT was a common chemical applied within the continental United States. The chemical accumulated in the food chain, and top predators harbored the highest concentrations. Bald Eagles (*Haliaeetus leucocephalus*) are an example of a top predator that suffered the consequences of DDT. The chemical causes eggshells to thin and then crack before the chicks can

hatch. Bald Eagles on the Channel Islands were reduced to a dozen or so breeding pairs by the 1950s, and were eventually extirpated from the islands. With a niche newly opened and free for the taking, the nonnative Golden Eagle (*Aquila chrysaetos*) moved in. Unlike Bald Eagles, Golden Eagles kill and eat island foxes. The Golden Eagles initially fed on the nonnative pig (*Sus scrofa*), introduced on the islands in the 1850s. However, the eagles quickly learned that island foxes, having no natural enemies, were easily caught compared to the cunning pig. Without the pigs, the Golden Eagles likely would not have stayed long enough to discover the easily caught island fox. The pig is not necessarily innocent: they threaten 9 native plants and root up the landscape. This series of events illustrates how an ecological system can be drastically altered: a chemical revolution led to the population explosion of 2 nonnative species at the expense of 2 native species, among many others (see Roemer et al. 2002, 2004).

The crux of the book, however, comes in the epilogue. We can cite example after example of how invasive species have wreaked havoc on the natural landscape. In a historical context, occasional species introductions are natural, and ecosystems are created with species from elsewhere. But the author makes an excellent point when she cites Bright (1999): "…an ecosystem and its inhabitants cannot absorb the radical species-swapping caused by accelerated and unmanaged global trade. The real problem . . . does not lie with the exotic species themselves, but with the economic system that is continually showering them over the Earth's surface. Bioinvasion has become a kind of globalization disease" (pp. 90–91).

The epilogue attempts to provide some solutions. The 1st step, and likely the most important, is to educate the general public. The invasive species problem tends to stay within scientific circles embedded in a mountain of scientific journals. The public needs to become aware of bioinvasions. Armed with knowledge, there are many things the public can do. At home, we can learn to identify and remove nonnatives from our gardens. We can plant native trees and shrubs that best fit the natural climate of the area. Neighborhoods can develop public awareness campaigns and start a regional promotion of native plants. We can encourage highway departments to use native species along their highway landscapes.

When traveling, we can refrain from carrying animals and plants across borders and respect quarantine guidelines. We can clean recreational boats and immediately drain bilge water after use to prevent the spread of aquatic species. Releasing live bait into the water after fishing can have significant effects in aquatic environments. For example, interbreeding between the California tiger salamander (*Ambystoma californiense*), which is a native, endangered species, and the invasive barred tiger salamander (*Ambystoma tigrinum mavortium*) has produced hybrid salamanders that are more likely to survive than either parent species. When introduced organisms hybridize with natives, the evolutionary dynamics that follow substantially complicate conservation efforts (see Riley et al. 2003, Fitzpatrick and Shaffer 2007).

Politically, we can use our voting power to influence public policy and elect officials with a strong environmental background. We can support legislation that regulates introductions of plants and animals. Letters to the editor are great starting points to bring invasive species awareness to a great number of people.

Donating money to on-the-ground conservation and restoration work can be key in bringing changes through grassroots efforts. As Terrill explains, "restoring native balance doesn't mean going back to some time before Europeans arrived, some pre-conquistador ecology. That's impossible. Restoration means tipping the scales in favor of native plants and animals. It means restoring native ecological processes to the best level we can and supporting the continuance of those processes" (pp. 185–186).

Having an informed citizenry in ecological and environmental issues, including the invasive and exotic species concern, is key to a healthy future and the avoidance of further extinctions of wildlife. If people understand the significant threats invasive species pose, they will be eager to be part of the solution. This book is a good start in this direction.

LITERATURE CITED

BRIGHT, C. 1999. Invasive species: pathogens of globalization. Foreign Policy 116:50–64.

FITZPATRICK, B.M., AND H.B. SHAFFER. 2007. Hybrid vigor between native and introduced salamanders

raises new challenges for conservation. Proceedings of the National Academy of Sciences 104:15793–15798.

RILEY, P.D., H.B. SHAFFER, S.R. VOSS, AND B.M. FITZPATRICK. 2003. Hybridization between a rare, native tiger salamander (*Ambystoma californiense*) and its introduced congener. Ecological Applications 13: 1263–1275.

ROEMER, G.W., T.J. COONAN, D.K. GARCELON, J. BASCOMPTE, AND L. LAUGHRIN. 2001. Feral pigs facilitate hyperpredation by Golden Eagles and indirectly cause the decline of the island fox. Animal Conservation 4:307–318.

ROEMER, G.W., C.J. DONLAN, AND F. COURCHAMP. 2002. Golden Eagles, feral pigs, and insular carnivores: how exotic species turn native predators into prey. Proceedings of the National Academy of Sciences 99:791–796.

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