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Opinion: The Invasive Ideology

Biologists and conservationists are too eager to demonize non-native species.

By Matthew K. Chew and Scott P. Carroll | September 7, 2011



Japanese Knotweed (*Fallopia japonica*)Wikimedia Commons, selbst fotografiert, Michael Gasperl

The story is all too familiar. An introduced landscape plant like Japanese knotweed has “escaped cultivation” and taken root elsewhere, uninvited. A foreign insect like the emerald ash borer has mysteriously appeared and seems to be spreading inexorably. We are earnestly warned that they are “wreaking ecological havoc” and reputedly costing someone millions or even billions of dollars. We react as if we’re under attack, readily applying the label “invaders” to our unwitting tormentors, as if they collectively had it in for us.

Personifying and demonizing the unfamiliar may help direct our dismay, but we hardly need science for that. When scientists focus on provoking public alarm, our science becomes blurred. Science can help work out the ways people move organisms, and investigate why some introduced populations fail while others grow. The demonizing reflex muddles our recommendations regarding which of these cases we can and should do something about.

In the early 1830s, British botanists began distinguishing between species known to have been introduced to an area by people and those without such a history. By the late 1840s the terms “alien” and “native” had been adopted, and a century later, those labels gained moral force with the rise of environmentalism: natives were natural, innocent, untainted by human association; aliens, like their human enablers, had detrimental “impacts,” not effects. Defense against “biological invasions” became a prominent goal of conservation biologists, who decided by acclamation that “invasive” alien species were a dire threat to biodiversity.



Devil's claw (*Martynia annua*)Wikimedia Commons, Marco Schmidt

But judging non-native species by their “lack” of “native” status is unfounded. First, the concept of nativeness lacks reliable ecological content—it simply means that a species under scrutiny has no *known* history of human-mediated dispersal. And second, not all introductions are so dramatically detrimental as the examples popularized by conservationists and the media. The devil’s claw, for example, a plant “native” to Mexico and surrounding regions, has had no discernible effects on Australia’s existing flora or fauna, despite being recently condemned as a threat to the continent’s biodiversity—long after its introduction in 1860s.

More importantly, sometimes introduced species that persist over decades or centuries become integral to local plant and animal communities, especially so where we have re-engineered the landscape or hydrology to generate an unprecedented environment. Attempting to extract non-natives from such areas may actually destabilize an ecosystem. Consider the tamarisk trees of the southern US plains and deserts. In the early 20th century, academics and government agencies encouraged farmers to plant these Old World trees and shrubs for livestock shade and erosion control. Meanwhile, as the Bureau of Reclamation completely reordered the region’s hydrology with storage and diversion dams, the native riparian woodlands were devastated. The hardier tamarisk trees survived, however, and spread to fill the breach. Since about 1940, an array of federal agencies and environmental groups have spent uncounted hundreds of millions of dollars waging war on tamarisk, despite the fact that ecologists have no idea what would replace it should they succeed. The tamarisk has demonstrated its fitness under now-prevailing conditions, and has become a vital riparian ecosystem component even while the war against it continues.

Conversely, routinely favoring “natives” hardly guarantees desirable outcomes. Almost all agricultural plants and domesticated animals were introduced to the places they now grow, and many face significant native pests. After South American potato plants were introduced to North America, for example, they encountered a resilient native insect now known as the Colorado potato beetle. Bringing potatoes to the insect’s native range created a new association between a crop and an insect, turning the once inconsequential beetles into pests. Any sentiment to save the native beetles from the impacts of potato farming is swamped by calls to save potato farmers from the beetles.



Tamarisk tree Wikimedia Commons, Jerzy Opiola

Thus, neither a blanket condemnation nor a broad endorsement of any species based primarily on its origin or mode of transportation to now-occupied habitats is a sensible approach to safeguarding the world's biodiversity or its food supply. Regardless of "nativeness," ecologists, policy makers, and conservationists should work to exclude potentially harmful pests. But they need to consider all the costs and benefits of every case on its own merits, in its specific context.

We briefly outlined these arguments in a commentary [published in *Nature*](#) this past June, along with 17 other experienced conservationists (including [Joan Ehrenfeld](#), who passed away June 25 after a year-long illness). A few weeks later, *Nature* published four reactions (one with 141 signatories, referred to below as "[the 141 letter](#)") that were echoed in some respects by others we received in direct correspondence. Rather than respond to each letter individually (and repetitively), we have attempted to compile them into general objections to which we can make general responses.

Objection 1: We set up and assailed "straw men."

Our assertion that "invasion biologists and conservationists" generally "oppose non-native species per se," and our suggestion that the same folks "ignore the benefits of introduced species," were met with much contention. But we stand by our statements. Invasion biologists and conservationists are a diverse lot, but historically and continuing to the present, they have broadly conflated the relatively descriptive terms introduced, alien, or nonnative species with the more conceptually troubled metaphorical indictment—"invasive species."

Invasion biologists (none call themselves "introduction" biologists) do seem to recognize the problem, having repeatedly published glossaries that encourage a distinction between merely "introduced" and problematic "invasive" species. But most do not abide by these guidelines. Indeed, even the 141 letter fails to maintain this distinction by hoping that "for some introductions [not some *invasions*], eradication is possible."

Still, the authors maintain that invasion biologists do acknowledge beneficial introduced species, arguing that "nobody tries to eradicate wheat"—a globally widespread crop that was disseminated from the Near East. But some restorationists would certainly replace wheat with "native" grassland if given the means and the opportunity. Regardless, the example simply deflects from our point. Our concern is not primarily focused on forcibly maintained monocultures, but with all ecosystems that are now and foreseeably structured in some part by human agency.

Objection 2: The high evolutionary fitness of introduced species signified by their rapid population growth does not guarantee long-term fitness so it should not be taken as evidence of ecological belonging.

Despite its framing, this objection is primarily concerned with human scale stability and continuity. Many ecologists still presume that natural changes occur only at imperceptible rates and that all “good” ecological relationships are permanent and sustain beneficial community functions. But interactions between organisms and their environments are ecological, regardless of how they came to exist, or how long they persist. Evolutionary fitness is a matter of reproductive success under prevailing conditions, even if those conditions are, from a human perspective, “unnatural.” Conversely, when we seek to modulate fitness to conserve threatened or endangered species, or to eradicate so-called “pests,” we are judging whether an ecological interaction should happen with economic, legal, moral, ethical, aesthetic or cultural criteria. As such, these sorts of manipulations are based purely on human constructs, and should not be mistaken for laws or objectives of nature.

Objection 3: Invasion biology is not worthless.

The authors of one published reaction contended we had implied that invasion biologists had made no useful contributions to ecological knowledge. We made no such claim. But invasion biology, like epidemiology, is a discipline explicitly devoted to destroying that which it studies. This necessarily constrains its research program and colors its communications, both internal and external, in very particular ways. We believe, then, that less confrontational, more objective research approaches have greater potential to produce valuable results.

Objection 4: Our supposed contention that potential invaders are easily identifiable soon after detection, so management circumspection is unnecessary, even harmful, is false.

Like objection 3, this assertion extends our claims by implication. We did not categorically object to programs aimed at preventing introductions or eradicating populations of introduced species when it can be done in a dependable, highly targeted manner.

What we object to is an insistence on permanent, hopeless wars on well- and widely-established non-native taxa, conflicts that continuously disrupt ecosystems where introduced species now play significant ecological roles. Furthermore, as long as the many modes of inter- and trans-continental shipping continue to operate, organisms will unexpectedly move along with materials, goods, and people. Thus, although we respect the values inspiring many local conservation and restoration efforts, we caution that continuous “weeding” creates a further, more permanent dependence on human judgment and activity rather than a lesser, more temporary one.

In summary, our motivations echo those of more familiar forms of biodiversity conservation. Our primary goals are better understanding and managing human ecological influences. The approaches we suggest are no easier than those currently being practiced, as understanding and predicting community ecology will continue to challenge our discipline. However, we believe that more careful framing will permit more realistic characterizations of ecosystems, and better inform the multifarious and often inconsistent motivations underlying management interventions. Hence we wrote to expose and open a very practical debate to a wider array of participants. We are pleased that, in addition to the published responses, we have individually received many thoughtful and interesting comments

from readers worldwide, and we look forward to continued discussion that might lead to more united conservation efforts.

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