

Do Non-Native Species Harm the Natural Environment?

Thesis

Neither economics nor biology has shown that “non-native” and “native” species differ in value. No experiment demonstrates that one kind of organism is more likely to be harmful than the other kind or than species taken at random.

“An invasive species is an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health” (Executive Order 13112).

- Everyone understands what is meant by “harm to human health.”
- It is not hard to reach consensus in many instances about what constitutes “economic harm.”
- Is there any way to agree upon or to measure “environmental harm”?

The “impacts of exotic species on native biodiversity and ecosystem processes vary widely in kind and magnitude. Whether these are considered to be positive or negative, good or bad is a subjective value judgment rather than an objective scientific finding” (Brown and Sax 2005, 483).

Everyone understands the idea of
harm to human health

<http://www.cartoonbank.com/item/39511>

“What have you done with Dr. Millmoss?”

That a creature is native, wild, or “natural” suggests nothing about whether it is dangerous

<http://www.cartoonbank.com/item/122205>

“Tell them how hard we worked to protect their habitat”

The question is not whether the creature is native or exotic;
the question is whether you eat it or it eats you.

<http://www.cartoonbank.com/item/31848>

A disease-causing organism may be native, even an “heirloom,” but this does not make it any safer, better, or more desirable.

<http://www.cartoonbank.com/item/41793>

“I suppose it was very sweet and old-fashioned of him, but, still, it was syphilis.”

Tobacco has been grown on the American Continent since about 6000 BC and was used by native cultures at about 3000 BC. That it is native does not make it more or less dangerous to your health.

<http://www.cartoonbank.com/item/47397>

“If you still want to belong to an organization dedicated to killing Americans, there’s always the tobacco lobby.”

The tick that carries Lyme disease in deer (or reindeer) is native. This does not make it less dangerous.

<http://www.cartoonbank.com/item/43080>

Doctor tells Santa Claus,

“It’s Lyme disease again.”

The Centers for Disease Control and Prevention celebrated its 60 anniversary last year. The provenance of a pathogen or a poisonous plant will influence *how* but not *why* the CDC acts to control or eliminate it.

<http://www.cartoonbank.com/item/121840>

"You appear to have caught that bug that's been going around my waiting room."

That an established species is native or alien predicts nothing

- Some cold-blooded animals (ectotherms) cause harm; no correlation has been demonstrated between “ectothermic” and “harmful.” This is true as well of non-native species. With respect to established species no empirical correlation has been demonstrated between “being non-native” and “being harmful” or indeed between “being non-native” and any biological quality.
- A hundred native and a hundred non-native species established in an environment, if selected randomly, will not be distinguishable with respect to any observable attribute.

Everyone understands the idea of harm to agriculture

<http://www.cartoonbank.com/item/32836>

One cow, speaking to others: 'But, in the final analysis, aren't we all mad?'

Nearly all crop plants and livestock raised in the United States derive from species that evolved elsewhere.

- The exception:

<http://www.cartoonbank.com/item/24090>

Which is native – the crop or the pest adapted to it? Does it matter?

<http://www.cartoonbank.com/item/45355>

“Today’s objective is the genetically modified corn in this quadrant!” (Insects discuss plans to attack a cornfield.)

Plants and animals rapidly co-evolve with human beings; this is Darwinian adaptation.

<http://www.cartoonbank.com/item/66637>

Hiker comes across a mother bird feeding McDonalds fries to her chicks

Crops are Invasive Species *Par Excellence*

- They are introduced non-native species
- They spread in monocultures over huge areas to the detriment of native species
- Like every species, crops depend on other organisms for their survival – e.g., *homo sapiens*. No creature is “self-sustaining;” none can exist independently of others.
- The farmer is just the eggplant’s way of making another eggplant.

No legislation mandates programs directed against non-native species

- The Animal and Plant Health Inspection Service (APHIS) of the USDA operates under enabling legislation (the Lacey Act, the Plant, Plant Pest Act, the Plant Quarantine Act, and the Noxious Weed Act) which instruct it to control or eliminate plant pests and pathogens. These statutes do not single out non-native species in particular or as a kind.
- Similarly the Centers for Disease Control have no mandate to single out non-native organisms as such for special attention or prevention.
- Neither the enabling legislation or the missions of agencies such as the CDC and APHIS justify calls by conservation biologists for programs to control, reduce, or eliminate non-native species per se.

Outside of public health and agriculture the costs of non-native species are conjectural

<http://www.cartoonbank.com/item/39691>

“Lawn fish. They’re hell to get rid of.”

‘Heretofore, estimates of the economic losses arising from invasive species have been far too casual.’ (Hoagland and Jin 2006)

- Conservation biologists constantly refer to cost estimates (about \$120 billion annually) by Pimentel et al. (2000; 2005). These estimates are plainly bogus but are used for their political effect.
- For example, these authors use “potential control costs as a surrogate for losses.” Any species can cost a lot to control – but this only confuses the costs of control with the benefits. (Control costs increase agency budgets but are not self-justifying. Think of the billions Smokey Bear spent to control forest fires).
- If one estimates the population of pigeons at roughly 120 million and the cost to kill them at potentially \$9 each, pigeons on Pimentel et al. reasoning “cause \$1.1 billion per year in damages.” The cost of eliminating a non-native species is confused with the benefit.

Are non-native species more costly than native ones – or than species taken at random? No randomized experiment has ever been attempted comparing the costs of non-native with those other species.

- According to Pimentel et al. (2000, 56), feral cats cost society \$17 billion annually by preying on birds (perhaps including pigeons?) although no economic shortage or scarcity of the birds is shown.
- A Report from the Pew Oceans Commission chided Pimentel et al. (2000) for estimating of the costs of marine introductions on the basis of predictions not observations and, in the instance of the Asian clam, on an extrapolation of a San Francisco “episode that occurred between 1919 and 1921” (Carlton 2001, 5).
- Pimentel et al (2005) states that the costs associated with the damage caused by the zebra mussel “are about \$1 billion/year.” The Pew oceans Commission, following actual data, has given a reasonable estimate of between \$750 million and \$1 billion as the total (not annual) cost paid between 1989 and 2000 in the Great Lakes area to make water intake facilities mussel-resistant.

Environments have changed so much, the idea of what is “native” may be moot in most domesticated places.

<http://www.cartoonbank.com/item/40894>

(View under East River, cross section, with skyline up top, running length of Manhattan. Various machinery, rail lines, secret chambers, fierce creatures.)

What if non-native trees and plants survive better than native ones in the current environment? Are they then “naturalized” to that place. Are most species “naturalized”?

<http://www.cartoonbank.com/item/33451>

- “*commutus clingatus*” “*patheticus moribunda*” “*abarita emaciata*”

We often prefer and depend economically on non-native species in our lawns, homes, gardens, golf courses, etc. because they survive

<http://www.cartoonbank.com/item/52429>

Beware of the Grass

What you consider to be “native” – plants and animals constantly colonize new places – is arbitrary; definitions differ; none is entrenched.

<http://www.cartoonbank.com/item/29687>

“I’m not sure what I am, but I believe I’m a product of Norway.”

Non-native species have an impact on environments – but whether it is positive or negative is not a judgment science can make.

<http://www.cartoonbank.com/item/31494>

“My question is: Are we making an impact?” (One wolf to another, as wolf pack howls at the moon.)

The case against non-native species relies on a few oft-cited pre-selected examples (such as the snake in Guam);
but examples are not arguments

<http://www.cartoonbank.com/item/42658>

“Watch out Fred! Here it comes again.”

Biologists cannot tell by observation or experiment – only by historical inquiry – whether a species is “native” or a system “invaded.” Harm is a *logical* (stipulated) not a *causal* result of introductions because “harm” is defined in terms of an a priori preference for the native.

<http://www.cartoonbank.com/item/5017>

“Pack your things. We’ve been transferred to the South Pacific”

There are two sides to every story

<http://www.cartoonbank.com/item/37086>

“When you’re on their flowers, you’re a snail. When they want to eat you, suddenly you’re an escargot.”

Zebra Mussel – Savior or Scourge?

- Eutrophication has plagued the Great Lakes for decades.
- By filtering phytoplankton and other suspended material from the water column, the nonnative zebra mussel has helped clean up Lake Erie and other parts of the Great Lakes, the Hudson River, and many more aquatic environments.
- These mussels are much more efficient at filtration than their native counterparts.
- Many birds feed on them, and the mussels' excrement provides habitat for a food chain anchoring a great diversity of species.
- Biologists credit the zebra mussel with restoring native grasses and fishes by clearing and allowing light to penetrate the water column.
- “macroinvertebrate abundance is enhanced in the presence of zebra mussels” including “5- to 10-fold increases in abundances of deposit feeders” in river sites after dense populations of zebra mussels had been established. (Ricciardi et al. 1997)

“Non-native species can ‘crowd out’ species that are important components of natural communities. Purple loosestrife for example, is a serious threat to coastal marshes and wetlands” (EPA 2006).

- Hager and McCoy (1998) "traced the history of purple loosestrife and its control in North America and found little scientific evidence consistent with the hypothesis that [it] has deleterious effects. . . . Loosestrife was initially assumed to be a problem without actually determining whether this was the case."
- Nicholson (1999) noted that "a large number of animals have been found to use loosestrife, including more than 200 species of insects and 40 species of birds along with some mammals, amphibians, and spiders."
- Farnsworth and Ellis (2001; cf. Morrison 2002; Gardner et al. 2001) found, "Species richness, other diversity metrics, and stem density of other species were not significantly correlated with the density of present cover of *L. salicaria* stems."

With very few exceptions, colonizing species add to local species richness

- Far from “beating” native species in biologically rich areas, non-indigenous species tend to “join” them (Ricciardi and Cohen 2007).
- During “the last few centuries following European colonization, relatively few insular endemic plant species have become extinct, whereas invading species have approximately doubled the size of island floras—from 2,000 to 4,000 on New Zealand; 1,300 to 2,300 on Hawaii; 221 to 421 on Lord Howe Island, Australia; 50 to 111 on Easter Island; and 44 to 80 on Pitcairn Island” (Brown and Sax 2007; see also Sax, Gaines, and Brown 2002).

Native and non-native species facilitate each other forming larger communities

- Gilbert and Lechowicz (2005) argue as a result of their empirical research “that conditions favoring native species richness also favor exotic species richness, and competitive interactions with the native flora do not appear to limit the entry of additional species.”
- Many studies indicate in general a significant positive relation holds between native and non-native biodiversity (Lonsdale 1999; Sax 2002; Sax and Gaines 2003; Meiners et al. 2004).
- Invasive species destroy the idea of an “equilibrium” enforced by competitive or biological exclusion and demonstrate a “theory of biotic acceptance” or the idea that sites “that are good for native species are also generally good for exotic species, and thus, ‘the rich get richer’” (Fridley et al. (2007; Huston 2004). Rosenzweig (2001, 365) concludes, “local diversities are headed for much higher steady states.”

Through mutation, hybridization, radiation, the founder effect, genetic drift, and God-knows-what other processes of evolution, non-native species (along with genetic engineering, breeding, etc.) can add infinitely to the variety of creatures – increasing global biodiversity.

<http://www.cartoonbank.com/item/115537>

Policy recommendations

- Support the traditional work of the CDC, APHIS, and other agencies that operate under a meaningful, objective, measurable, and non-arbitrary concept of harm.
- Define “harm to the environment” if possible in a way that is not mere *diktat* but is defensible, for example, in spiritual, aesthetic, or ethical terms. There is no scientific basis for such a concept.
- Rescind Executive Order 13112 and disband the Invasive Species Council.

Let landowners decide what they want on their property and entrust common lands to voluntary groups, associations, and local authorities.

<http://www.cartoonbank.com/item/122811>

The weeds – I want them whacked.

It is too late to preserve Eden

<http://www.cartoonbank.com/item/22682>

*Frankly, I think we'll regret introducing
the organisms into the environment*

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