



Reframing Introduced Species Policy in the Delaware Estuary Watershed

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- Habitat alteration
 - Physical, chemical, structural, etc.
- Interaction with native species
 - Food, space, nutrients, etc.
- Predation on/by native species
 - Not a co-evolved relationship
- Potential parasites/pathogens
 - Not co-evolved vectors/receptors
- Change in native species diversity
 - Potential consequence of the above

→ Pest



→ Pest

→ Invasive



Terms We Use – A Continuum

- Pest
- Invasive
- Nuisance



Terms We Use – A Continuum

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- Alien



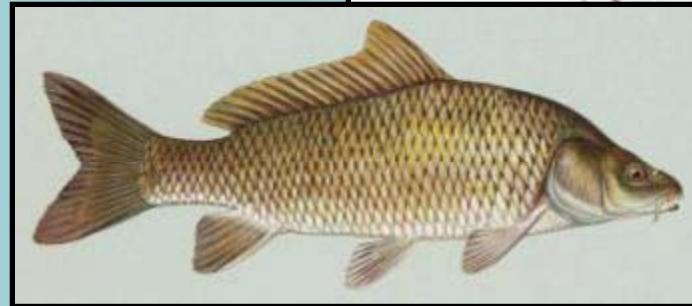
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Terms We Use – A Continuum

- Pest
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- Introduced



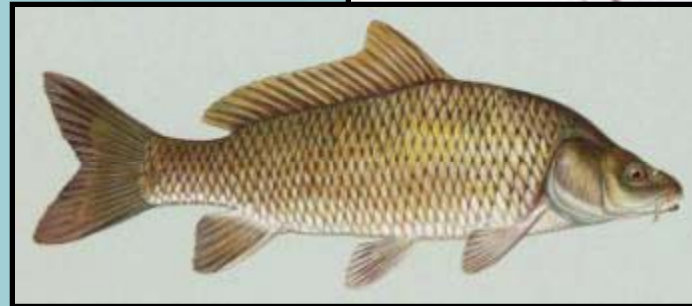
Terms We Use – A Continuum

- Pest
- Invasive
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- Alien
- Exotic
- Introduced
- Naturalized



Terms We Use – A Continuum

- Pest
- Invasive
- Nuisance
- Alien
- Exotic
- Introduced
- Naturalized
- Cultivated



→ The terms we use can vary according to:

- Amount of actual or *perceived* harm
- Amount of actual or *perceived* benefit
- History of introduction
- Mode or rapidity of introduction
- Whether introduction was intentional or accidental
- Distance from “original” ecology
- Human psychology
- ...and some introduced species are so engrained that we now fail to notice them

Is Ecology all that Matters?



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When one of these non-economic categories is threatened, and if we happen to love it, we invent subterfuges to give it economic importance.”

Aldo Leopold

A Sand County Almanac

1949

A possible corollary to Leopold?

One basic weakness in a conservation system based wholly on *ecological* motives is that some members (*even introduced ones*) of the land community have *economic* value...

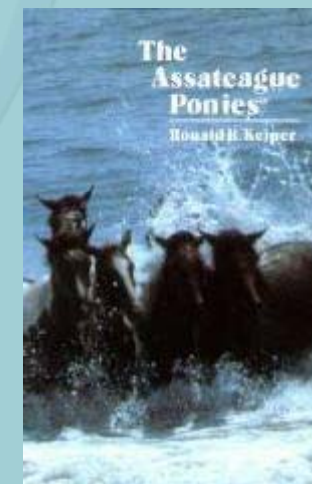
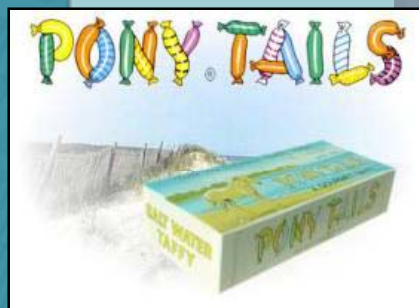
When one of these *economic* categories is threatened, and if we happen to love it, we invent subterfuges to give it *ecological* importance.

Example - Largemouth Bass in DE Estuary



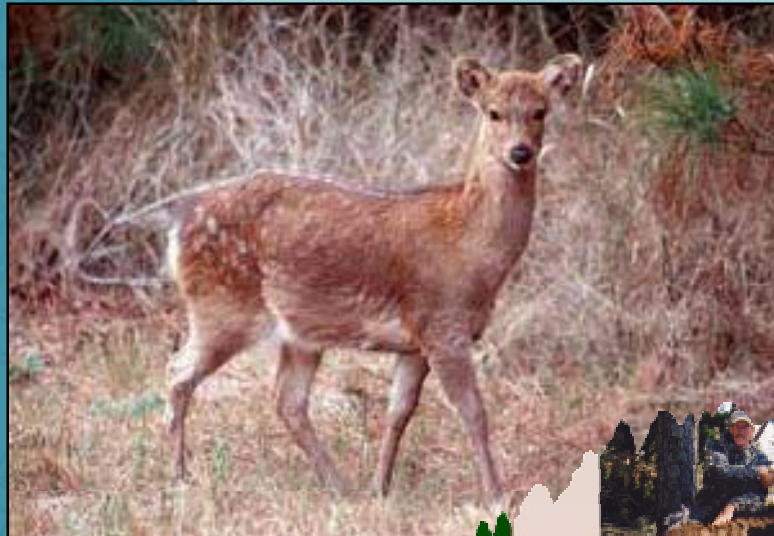
- Introduced to watershed from Miss. Basin
- Considered “naturalized”
- Nearly ubiquitous in fresh waters of the region
- Significant predatory species
- Supports recreational fishing economy
- Joins a host of other introduced fish (e.g. black & white crappie, bluegill, channel catfish, walleye, smallmouth, rainbow & brown trout, carp, etc.)





- Introduced in historic times
- Now known as “wild ponies”
- Mostly confined to the island
- Alters barrier island habitat through grazing – birth control program
- Supports substantial tourism economy

Example – Sika Deer (Elk) in MD



- Introduced to MD from Asia in 1916
- Slowly expanding its range, even into DE
- Called a “heritage species”
- Mixed reports on whitetail competition
- Supports small but lucrative hunting industry



RATES
 ALL PRICES INCLUDE GREAT LODGING USUALLY WITH A FULL KITCHEN.

Wild Boar Hunts - Two days \$475 (includes 2 Hogs and Lodging)

Wild Bear and Whitetail Deer Combo Hunts - Two days \$725 (includes 2 Hogs, 2 Whitetails and Lodging)

Archery - \$900 for three days for Whitetail or Sika Season starts Sept. 15th in Md. Lodging included.
 Muzzleloader or Rifle - \$1,100 for three days for Whitetail or Sika Deer. Lodging included.

Our Hunting Lodge

Hunters young and old are invited to relax and stay at DGA Outfitters Hunting Lodge. We provide comfortable lodging for up to 10 people complete with separate bath facilities and a potbelly stove.



Example – Pacific Salmon in the Great Lakes



- Chinook and Coho salmon
- Introduced to Great Lakes throughout 20th Century to control alewife
- Est. \$3 – \$4 billion in annual revenues
- Called a fisheries management “miracle”
- State-run hatcheries continue to stock
- ~ 30% of Lake Michigan predator population



Is it conceivable that some introduced species in the future might also become integral or even *vital* to our economy?




European Honey Bee – New Jersey’s official state “bug” enacted into law in 1974

Cognitive Dissonance?

- How do we come to terms with ongoing species introductions in a human/environment system in which extant non-native species are already integral to our sustainable economy?

“No integrated strategy exists to guide science, management and policy actions regarding invasive non-indigenous species.”



White Paper on the Status and Needs of Science in the Delaware Estuary

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<http://www.delawareestuary.org/scienceandresearch/sciencereports/white.pdf>

→ First, some postulates:

- 100% safeguarding against introductions is not possible in a global economy
- Natural dispersal also occurs at many spatial and temporal scales
- Sometimes, the positive effects of an introduction can outweigh the negative effects (i.e. introduction is not necessarily invasion)
- Many introduced species are already here to stay

→ Then, our challenge:

- Develop a policy framework that acknowledges these points and addresses the issue in a consistently applicable way into the future

- Scientifically, unambiguously, and consistently define terms: “native”, “alien”, “harm”, “invasive”, “sustainable”, etc.
- Once operationally defined, develop objective metrics *a priori* to assess ecological effects
- Also scientifically consider both economic *costs* and *benefits* of an introduction
- Explicitly consider roles that other impacts (e.g. disturbance, pollution, climate change, etc.) play

- We should beware of unsupported value judgments (i.e. “good” vs. “bad”).
- A new species should not immediately imply “**PANIC!**”.
- We should examine quality data, and as much of it, as we can.
- Scientifically collected experimental results (when we have them) must trump testimony and anecdote.
- Our metrics should be able to distinguish *natural* from *anthropogenic* dispersal from the data

The fundamental challenge of defining what we want and need from our environment underpins nearly every policy decision that we can make.

Humans are uniquely adapted to be able to change our environment and to understand *some* of the consequences of doing so.

Therefore, we should articulate and discuss our vision of the environment *and* our place in it. Only after this discussion takes place can we approach any policy in a consistent and rational manner.