

Testimony by David M. Lodge

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Subcommittee on Fisheries, Wildlife and Oceans

Hearing on
Aquatic Invasive Species and the Aquatic Nuisance Species Task Force
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Madame Chairwoman and Subcommittee members, I am honored to have the opportunity to participate in this hearing. I thank the subcommittee, especially Chairwoman Bordallo, for the invitation to testify.

As you may know from my resume, I come to the issue of invasive species from the perspective of an active researcher in this field and from my experiences at the science-policy interface. I have been working on invasive species for 24 years. I am the Director of the Center for Aquatic Conservation and a Professor of biology at the University of Notre Dame. My colleagues, collaborators, and I have many on-going research projects on various aspects of invasive species. The topics of particular relevance to this hearing include: (a) forecasting the spread and the environmental and economic impact of many aquatic nuisance species; (b) measuring and controlling the impact of invasive rusty crayfish and other species spread by the bait trade; (c) developing species screening protocols, focused on fishes, aquatic mollusks, aquatic and wetland plants and other potential aquatic nuisance species; and (d) combining economic and ecological risk analyses to guide allocation of resources among management options. I am a past Chairman of the national Invasive Species Advisory Committee.

The problem: increasing numbers of harmful alien species

Everywhere biologists look, we find more and more alien species, with the total number of alien species increasing over time, apparently at an accelerating rate in some places (Ricciardi 2006, Cohen and Carlton 1995). Perhaps more important than the number of species is the fact that in many situations the abundance of these aliens reaches extremely high levels--like that of silver and bighead carp in midwestern rivers, the aquatic weed hydrilla in southeastern and increasingly in Midwestern lakes, nutria in Chesapeake Bay and Louisiana coastal marshes—so that there is literally very little room

left for native species, even those that are highly valuable in recreation or for commercial harvest. The total environmental and financial impact is very high.

The cost of eradicating just one aquatic weed, hydrilla, from one lake in northern Indiana near my home will be about \$0.5 million/year for 4-5 years, for a total expenditure of about \$2-3 million. And this is a good investment because if Indiana doesn't eradicate this infestation—the first by this species in Indiana—it is likely to end up like Florida. Florida spends many millions annually to control hydrilla and other aquatic weeds that impede navigation, harm fisheries, clog irrigation pipes, and damage ecosystems. And just this summer the first infestation of this species in Wisconsin was discovered. In addition, imported animals, or the parasites and pathogens that come with them can endanger human lives, as the monkeypox and SARS have so vividly illustrated in recent years. Alien species are one of the major management challenges faced on most of the national forests, wildlife refuges, national parks, the Great Lakes, and in coastal waters. In aggregate, some have estimated the damages to the US from alien species, both aquatic and terrestrial, to be at least \$120 billion/year (Pimentel et al. 2005).

Each of the species that cause this damage is fascinating biologically, with its own idiosyncrasies. Thus I could go on and on telling you about the 184 alien species known to exist in the Great Lakes or the 220 or so species in San Francisco Bay, or the many species in Chesapeake Bay, the Hudson River and so on. But I won't go into all those details about specific species, because we would lose the forest for the trees—or 'lose the lake for the species,' if you will. What is more important for today, and for using science to inform a policy discussion, is to get the big picture. And the first brushstroke in that big picture is that while there are hundreds of species of concern, there are far fewer pathways by which these species arrive (Lodge et al. 2006). By pathway, I mean an industry or human activity that moves species around. A manageable number of pathways exist, and I mean that literally. Improved management and policy must focus especially on pathways if we are to prevent future invasions.

While we are now stuck with many damaging species, which require better local, state, and federal legal authority and resources to control or eradicate them, I will focus in my points below on the benefits and long-term cost effectiveness of preventing the importation of additional harmful species. Only the federal government can effectively reduce the flow of harmful organisms across the US border, and federal policy to prevent the introduction of additional species must focus on the pathways by which they are introduced.

The primary pathways by which aquatic species are introduced into the U.S. include shipping; intentional stocking by private and public agencies; aquaculture; the pet industry; the horticultural and watergarden industries; the live bait industry; the biological supply industry; and the live food industry (Lodge et al. 2006). Nationwide, all have been important. Currently the relative importance of different pathways differs regionally in the U.S. Although shipping has received far more attention from Congress than the other pathways, shipping is not the most important pathway in many parts of the country. Given the jurisdictions of this committee and the purposes of today's hearing, I'll focus the rest of my comments today on pathways by which alien species, especially aquatic alien species, are imported intentionally into the U.S. Among these pathways, perhaps the most important by number of species and number of individual organisms introduced are the pet industry (including the aquarium trade) (Padilla & Williams 2004,

Defenders of Wildlife 2007) and the horticulture industry (including watergardens) (Keller & Lodge 2007). These pathways are collectively referred to as ‘organisms in trade’ or ‘commerce in live organisms’ (Lodge et al. 2006).

The current situation—legal alien species are overrunning the country

The situation with these pathways is dire: while our borders have become much tighter for humans, and while we have increasingly earnest debates about human migration, we continue to leave the door wide open for alien organisms from any part of the world. While some have suggested that our screen door has huge holes in it, a more accurate metaphor might be that the door is simply open. The screening programs that exist are not up to the task. The result is that virtually all organisms besides humans are allowed free entry into this country, whether or not they have high potential to introduce or carry human disease, disrupt fisheries or forestry or aquaculture, or destroy our wildlife and ecosystems.

For example, I believe that it would surprise most of your constituents--and perhaps you--to learn that importing into the US any of the following alien species would be perfectly legal (as long as these species could be legally exported from their native countries):

- Australian saltwater crocodiles
- African puff adders
- Gaboon viper
- king cobra
- Australian crayfish

An average of 4100 venomous snakes were imported annually from 2000-2005, about 95% of which were imported for the pet trade (from FWS LEMIS database via Christina Romagosa, pers. comm.). Venomous snakes are the species that pose the most danger to humans but they are hardly alone in threatening us or the things we care about. Burmese pythons are not venomous, but they are consuming endangered species in the Everglades; lionfish from the Indian Ocean are increasingly abundant along the Atlantic and Gulf coasts and can poison SCUBA divers; and carps from Asia are bankrupting commercial fisheries in Midwestern rivers.

Importations of ornamental plants have a stark legacy of bringing dangerous pests and pathogens with them that have destroyed beloved native trees and changed our forests forever: American elm and chestnut are gone; beech, hemlock, dogwood, butternut, and many species of oak are now succumbing to other pests and pathogens from afar. Sudden oak death, probably imported into California on rhododendrons, is like an invisible wildfire slowly spreading eastward across the continent, leaving dead oak forests in its wake. But the number of imported animal species is growing tremendously.

In 2003, imported mammals included a mixed bag of African rodents that caused a human epidemic of monkey pox in the Midwest. An effort to exterminate Gambian pouched rats—the species most responsible for the monkeypox outbreak, from Florida’s Grassy Key is still underway. Of the Center for Disease Control’s 32 most important zoonotic pathogens—organisms that cause disease that can be transmitted from animals to humans--40% are species alien to the U.S. Many probably arrived in legal imports of

animals in the pet trade. In short, every conceivable sort of plant and creepy-crawly, together with their diseases, are flooding into the US from every part of the globe. This booming trade is all perfectly legal.

According to the U.S. Fish and Wildlife Service (FWS) annual imports into the U.S. include at least 203 million fish, 6.4 million reptiles and amphibians, 260,000 birds, and 90,000 mammals. And this does not include the millions of plants imported by the horticulture and watergarden industries for which the US Department of Agriculture (USDA) is responsible. The identity of many of these imported organisms is not even reported or is at least not retained, as Defenders of Wildlife's recent *Broken Screens* report documented for animals (www.defenders.org/animalimports). This is particularly true in the wholesale and retail markets for both plants and animals, as Reuben Keller and I recently documented (Keller and Lodge 2007). Nevertheless these unknown organisms are allowed entry and sale throughout the US.

Existing legal authorities and species screening

Under current policy, species are not screened for potential harm before they are imported. Rather species are outlawed only *after* they cause serious and widespread harm. At that point, the invasion is often irreversible, and we are doomed to suffer the damages forever. If we adopted the same risk analysis practices for importation of food or the introduction of drugs into the marketplace, many of us would frequently suffer serious illness from food borne pathogens or serious side effects from untested pharmaceuticals. Increasingly that is exactly the state of our cultivated and natural ecosystems—rapidly declining ecological health from an onslaught of invasive alien species. Under current policies, there are few exceptions to this *laissez faire* approach (see Defenders of Wildlife 2007 for a more complete review).

To protect human health, the Department of Health and Human Services has authority under the Public Health Service Act to prohibit the importation of species that may carry diseases that can spread to humans. HHS currently prohibits the importation as pets of about six taxa of organisms including some African mammals, bats, primates, civets, and aquatic turtles.

To protect agricultural and forestry production, the USDA, under the Plant Protection Act and the Animal Health Protection Act, has authority to prohibit the importation of plants, insects, pathogens or other organisms that would harm plants, farm animals, or fishes and other organisms in aquaculture. Under their authority, USDA currently prohibits the importation of about 100 categories (mostly species) of organism, including at least 19 aquatic weeds.

To protect wildlife and natural ecosystems, the Fish & Wildlife Service has authority under the Lacey Act to prohibit importation of animals or animal diseases that would harm wildlife or the ecosystems on which they depend. FWS currently prohibits the importation of 19 kinds of organisms as “injurious wildlife”. (About a third of the listings are for species, while the remainder is a combination of genera and families.) Over half the taxa listed were already established in the country before their sale was prohibited and they continued to spread and cause damage after their listing as injurious. The average time that the FWS has taken to decide on a species has increased to over 4 years. During the almost 5 years that the FWS took to list silver carp, the species spread from its release from aquaculture in the southern Mississippi basin up the Mississippi

River, up the Missouri River, and up the Illinois River so that it is now knocking on the door of Lake Michigan via the Chicago Sanitary and Ship Canal. Results for Great Lakes fisheries could be disastrous if the species is not kept out of Lakes Michigan. Clearly the current injurious wildlife provision of the Lacey Act is largely a failure.

In aggregate, then, perhaps 150 kinds of organisms are currently prohibited entry to the U.S. This set of policies, and their implementation, illustrate three major policy problems.

First, single species can cause many problems that cut across agency jurisdictions and create overlapping legal authority. For example, the African rodents that the pet industry delivered to the US in 2003 brought monkeypox to the US, which caused an epidemic of human disease. Only because human health was directly threatened was quick action taken (by Health and Human Services) and a ban on future imports instituted. Had the human health issues been less severe or slower to develop, the disease could easily have spread to native prairie dogs and other wild animals, and therefore brought dramatic changes to ecosystems across the western US, and made endemic forever a human and wildlife disease. The situation could easily have turned out more like West Nile Virus, another alien disease that we are now doomed to live and die with forever.

Second, while the country is now protected from future importations of these roughly 150 kinds of organisms, many of these prohibited species were already well established and causing severe damage before subsequent importation was banned. Even without additional individuals being imported, the species have spread and caused increasing damage to human health, agriculture, forestry, wildlife, and our ecosystems. We are now stuck with these species and the damages they cause. In short, the implementation of these policies has usually been reactive. The policies have not been effective tools of prevention, which would be a far more cost effective approach.

Third, among the 1.5 million known species on earth, there are thousands of species that (a) would be harmful if introduced to the US; and (b) are increasingly likely to be introduced as the industries that introduce live organism grow and become increasingly international. Yet we still do not have in place policies by which these species, particularly animal species, will be screened for potential harm *before* they are imported. The need for improved policies becomes more urgent every day.

In short, the existing policies and their implementation are not consistent with established policy goals. Congress and the Executive branch have made clear repeatedly that it is their responsibility to dramatically reduce the harm from existing alien invasions and prevent new invasions. It is understandable that in past decades we did not have policies that could effectively accomplish those goals. The threats were much smaller; and the relevant scientific and technical expertise did not exist to screen species accurately before they were imported. We have such scientific expertise now. What is missing is the policy by which to implement the expertise in ways that are more consistent with the expressed goals of better species control and prevention of future invasions.

The solution: better policy in which to implement recent scientific tools

Many of these species imported as pets or ornamental plants bring beauty, interest, and pleasure into our lives. The biological supply industry supports vital

education and research missions. Aquaculture and bait species provide recreation and food. But a substantial proportion of species imported by each of these and the other commercial pathways in live organisms, on the other hand, are very harmful. They contribute greatly to the estimated \$120 billion in annual damages caused to the US by invasive alien species. Taxpayers or other industries end up suffering damages that cannot be slowed or reversed, or they pay for private or government control and eradication efforts where those are feasible. In other words, the industries that import live organisms are subsidized by the tax payer. In economic terms, these industries have substantial externalities that require a policy remedy.

The solution is a policy like those that govern other substantial risks in the U.S.: a policy under which species (like drugs and food) are screened for potential harm before their entry into the marketplace is allowed. While the scientific expertise to do this with sufficient accuracy did not exist a few decades ago, recent scientific advances, in which species screening is often 90% accurate, make this possible (Kolar & Lodge 2002, Marchetti et al. 2004a, Marchetti et al. 2004b, Lodge et al. 2006, Fowler et al. 2007, Keller, Drake & Lodge 2007, Keller & Lodge 2007). Species proposed for importation can be screened, the screening can be done quickly, and entry can be prohibited for those most likely to be harmful, while the vast majority of alien species, which are benign, can remain in commerce. We can be confident of applying these principles to the U.S. because they have been tried and proven effective in Australia.

A recent analysis demonstrates that the Australian Weed Risk Assessment, instituted in 1997, has probably paid for itself in 10 years, and will save Australia the equivalent of \$1.8 billion over 50 years (Keller, Finnoff & Lodge 2007). By preventing the importation of the small percentage of plants that would cause harm, the lost revenues are more than compensated for by avoiding the damage that would have accrued. By one estimate, the aggregate costs from alien plants in the U.S. are at least \$35 billion annually. Such calculations are based predominantly on the easily quantified costs of herbicides, equipment, and labor to spray, pull, cut, burn or otherwise control these weedy plants in agricultural systems. The damage done to natural forests, wildlife habitat, native plants, waterway navigation, or the water supplies on which humans depend is not fully considered. So the good news—that risk assessment can reduce costs—is even better.

This is especially true because sales of plants and pets in the US are much larger than in Australia, so a screening policy would deliver even larger net benefits to the U.S. The bottom line: the net benefits of global commerce in plants are increased by reducing the negative side-effects of that trade. An ounce of prevention is indeed worth a pound of cure.

It is neither fair nor economically rational to allow importers of harmful alien aquatic plants and animals to reap profits while others suffer disease or damage or are left to pay to control the imported species that spread and cause harm. We do not allow drugs to come to market or chemicals to enter the industrial pipeline without screening for harmful side effects. Why should we accept analogous risks from alien species when an alternative policy of screening would bring both financial rewards and large environmental benefits?

Specific policy recommendations to better prevent future invasions into the US

Congressional action is urgently needed to accomplish the following. These recommendations are consistent stated policy goals, and with recent analyses and recommendations by numerous scientific, NGO, and government reports, including those by OTA (US Congress 1993), the National Invasive Species Council (2001), the National Research Council (NRC 2002), and the Ecological Society of America (Lodge et al. 2006).

- Require screening of plants and animals before importation into the U.S., and legal authority to prohibit the importation of species that constitute too high a risk;
- Require FWS, USDA, HHS, and the Environmental Protection Agency to jointly develop and implement screening protocols that are based on the most recent scientific and technological tools, requiring these agencies to adopt best available screening technology as tools and protocols improve over time;
- Require risk assessment protocols that are
 - Peer reviewed by university and agency scientists
 - Quantitative wherever possible
 - Repeatable
 - Tested for accuracy using best available technology, with tests peer-reviewed and publicly available
 - Transparent in every application of the tool to a species proposed for importation
 - Quick, with a time limit of weeks to months to assess any species
- Specifically, the FWS should have authority analogous to that of USDA and HHS; the injurious wildlife provision of the Lacey Act requires revision or replacement to
 - clarify authority for and require pre-import screening
 - elevate this function to the highest levels within FWS
 - provide powers for emergency listing
 - establish a clear, transparent process for petition by public, requirement for public notification of petition, and rapid timetables for screening
 - clarify the role of economic analysis in the screening to avoid years-long revolving door of proposed rule-making, public comment, proposed rule-making, etc.
- Require a single publicly available list of all species for which any federal agency prohibits importation;
- Make illegal the possession of listed species, and provide authority and appropriations for compensation to consumers required to give up their organisms that became illegal after they purchased them;
- Provide appropriations sufficient for FWS and other agencies to fulfill their legal responsibilities with staff and the resources and the staff needed to conduct the species screening

Damages from invasions spread—an invasion in any congressional district is a threat to the nation’s freshwaters

It is ironic that with all the talk and effort to close our borders to bad food, bad drugs, and terrorists, we continue to invite harmful alien plants and animals, unscreened, into our country. Invasions of alien species are time bombs; the initial self-sustaining population of a species may go unnoticed because so little biological monitoring is done. The population grows slowly at first. By the time it is noticed, the bomb has already exploded. By this point, the species is usually widespread, and its damages are largely irreversible. In the context of endangered species, you’ve probably heard it said that “extinction is forever.” Unfortunately, it is also usually true that invasion is forever. Biological invasions are the least reversible form of pollution. In contrast, most other forms of pollution--like the nitrogen and sulfur compounds of air pollution, the CFCs that destroy ozone, and PCBs—degrade or get buried (unless they are resurrected by invasive mussels), and the problems they cause decline eventually, if only we stop adding molecules of them to the environment. Chemical pollutants, in other words, do not reproduce; species do. Even if we stop adding individual Burmese pythons to the Everglades, nutria to the Chesapeake Bay, brown tree snakes to Guam, and hydrilla to Midwestern lakes, their populations and those of many other invasive species will continue to grow, they will continue to spread throughout their regions and eventually across the continent, and their environmental and economic damage will grow exponentially. New policies can prevent that outcome and bring net economic benefits to the U.S., consistent with U.S. trade obligations under WTO.

Thank you again for the opportunity to offer my thoughts on the impact of invasions in the Great Lakes.

Please enter my entire written and oral testimony and additional publications (which I have submitted) into the published record. I look forward to responding to your questions.

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