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THE GROWING PROBLEM OF INVASIVE SPECIES

JOINT OVERSIGHT HEARING

BEFORE THE

SUBCOMMITTEE ON FISHERIES CONSERVATION, WILDLIFE AND OCEANS

JOINT WITH THE

SUBCOMMITTEE ON NATIONAL PARKS, RECREATION, AND PUBLIC LANDS

OF THE

COMMITTEE ON RESOURCES
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JOINT OVERSIGHT HEARING ON THE GROWING PROBLEM OF INVASIVE SPECIES

Tuesday, April 29, 2003

U.S. House of Representatives

Subcommittee on Fisheries Conservation, Wildlife and Oceans, joint with the

Subcommittee on National Parks, Recreation, and Public Lands

Committee on Resources

Washington, DC

The Subcommittee met, pursuant to call, at 1 p.m., in room 1324, Longworth House Office Building, Hon. Jim Saxton [Vice Chairman of the Subcommittee on Fisheries Conservation, Wildlife and Oceans] presiding.

STATEMENT OF THE HONORABLE JIM SAXTON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY

Mr. SAXTON. The Subcommittees on Fisheries Conservation, Wildlife and Oceans and Parks, Recreation and Public Lands will conduct this joint oversight hearing on the growing problem of nonnative exotic and invasive species. And before I go on, I just need to ask unanimous consent that Mr. Hefley be permitted to participate in the joint hearing for the purpose of an opening statement and questions. And if you, Mr. Hefley, would like to come on over and join up with us, that will make us look unified as we always are.

Mr. FALEOMAVAEGA. Chairman yield?

Mr. SAXTON. Be happy to yield.

Mr. FALEOMAVAEGA. I thank the Chairman and I want to extend my personal welcome to the distinguished gentleman from Colorado whom I have had the personal privilege of knowing, and being an outstanding member of this Subcommittee that I want to join the Chairman in welcoming my good friend from Colorado to join us and to participate in our hearing this afternoon.

Mr. SAXTON. Thank you, Mr. Faleomavaega.

It has been estimated that there are more than 5,000 nonnative species in the country. Many of these species, like food crops and domestic livestock, have made invaluable contributions to our society. However, a growing number of foreign species which are referred to as invasive are destroying thousands of acres of critical

habitat and endangering the long-term survival of dozens of indigenous plants and animals and undermining our entire ecosystems.

Invasive plants have infested some 100 million acres in the United States and $14.4 billion is spent each year to offset crop losses and for increased pesticide use because of invasive species. According to a Cornell University study, economic losses and associated control costs exceed some $137 billion per year. That is a staggering figure and there can be no denying that invasive species are a growing problem that is adversely affecting our National Wildlife Refuges, National Forests and National Parks.

I have another page and-a-half which I ask unanimous consent be included in the record. With that, it gives us a sense for the general topic today. And at this time, I will be happy to yield to the Ranking Member also from New Jersey, Mr. Pallone.

[The prepared statement of Mr. Saxton follows:]

Statement of The Honorable Jim Saxton, a Representative in Congress from the State of New Jersey

Good afternoon. Today, the Subcommittees on Fisheries Conservation, Wildlife and Oceans and National Parks, Recreation and Public Lands will conduct this joint oversight hearing on the growing problem of non-native, exotic or invasive species.

It has been estimated that there are more than 5,000 non-native species in this country. Many of these species, like food crops and domestic livestock, have made invaluable contributions to our society. However, a growing number of foreign species, which are referred to as invasives, are destroying thousands of acres of critical habitat, endangering the long term survival of dozens of indigenous plants and animals, and undermining entire ecosystems.

Invasive plants have infested some 100 million acres in the United States and $14.4 billion is spent each year to offset crop losses and for increased pesticide use because of invasive insects. According to Cornell University, economic losses and associated control costs exceed some $137 billion per year.

This is a staggering figure and there can be no denying that invasive species are a growing problem that is adversely affecting our National Wildlife Refuges, National Forests and National Parks.

As someone who has witnessed the destruction of hundreds of acres of wetlands from non-native species, I am sadly aware that we are losing the battle against these unwanted invaders. The list of horror stories including species like the brown tree snake, mitten crab, purple loosestrife, coqui frog and zebra mussels is growing each day.

It is for this reason that we have seen a host of new legislation introduced to address invasive species. These include: the Harmful Invasive Weed Control Act, the National Invasive Species Control Act, the National Aquatic Invasive Species Act, the Aquatic Invasive Species Research Act and the recently enacted Nutria Eradication and Control Act. While the focus of this hearing is not on these legislative measures, I am interested in hearing the extent of the invasives problem, the amount of money being spent to eliminate these species, whether the National Invasive Species Council has become the clearinghouse on invasives and what are the gaps in our existing laws.

Unless an effective invasive species strategy is developed in the near future, we will continue to see the destruction of vital habitat and an increase in the number of species that must seek protection under our Endangered Species Act.

I look forward to hearing from our distinguished witnesses and I am pleased to join with my friend and Colleague, the Chairman of the Parks Subcommittee, George Radanovich as we begin this hearing process.

Mr. PALLONE. Thank you, Mr. Chairman. This is the all New Jersey day, I guess.

Mr. SAXTON. And Colorado and California.

Mr. PALLONE. I was near your district over the weekend.

Mr. SAXTON. He should have warned you.

STATEMENT OF THE HONORABLE FRANK PALLONE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY

Mr. PALLONE. I wanted to say that I look forward to the hearing today and I know it is a joint hearing with our colleagues on the Parks Subcommittee.

From aquatic invaders like zebra mussels to terrestrial culprits such as the brown tree snakes in Guam, which we heard from our colleague in previous hearings, to plants like purple loosestrife, invasive species leave no habitat in the United States untouched. After habitat loss, invasive species are the greatest threat to natural biodiversity that we face today. Invasive species, which include plants, fish, insects and other organisms, cost the United States more than $100 billion each year. Annual losses associated with some of the most expensive invasive species are in excess of $100 million per species.

Aquatic and coastal habitats have suffered serious ecological consequences due to invasive species, and as a representative of a largely coastal district, I am concerned about the threats to native habitats in my home State. In New Jersey the invasive European green crab could become a serious threat to local clam fisheries, although New Jersey scientist Paul Jivoff has shown that blue crabs may act as a barrier to the spread of the green crab. We are obviously hopeful that this biological barrier will hold.

The rapa whelk, an invasive snail that drills through oyster shells, has begun to spread into the Delaware Bay from the Chesapeake Bay. Additionally, invasive species of the marsh grass Phragmites is out-competing native marsh grasses and altering coastal and estuarine habitats. This last invader has become a symbol of the difficulties of balancing the negative impacts of an invasive species with the cost of eradication.

The scale of the existing invasive species problem is striking. There are pressing needs in all States and territories for controlling ongoing invasions. But effective preventive measures combined with early intervention could reduce some of the economic costs and loss of habitat associated with establishing invasive species. I am interested in hearing from today's witnesses how best to identify potential threats and to prevent future introductions and hope that today's witnesses can shed some light on whether existing statutory authorities are adequate or whether they should be strengthened to directly address this threat.

For example, could the scope of the Lacey Act, which prohibits the introduction of injurious wildlife, be expanded to include more species? Furthermore, could the Act be used more aggressively as it was by Secretary Norton in last year's high profile case of the northern snakehead fish in Maryland?

We have been regrettably slow in addressing invasive species introductions and establishment in the United States, and I look forward to this hearing as a way to gain practical guidance in how to initiate or how to mitigate I should say the current problems and how to most efficiently head off future invasions.

Thank you, Mr. Chairman and my colleagues.

[The prepared statement of Mr. Pallone follows:]

Statement of The Honorable Frank Pallone, a Representative in Congress from the State of New Jersey

Thank you Mr. Chairman. I look forward to this afternoon's joint hearing with our colleagues on the Parks Subcommittee to hear expert testimony from such a diverse group of witnesses.

From aquatic invaders like zebra mussels, to terrestrial culprits such as brown tree snakes in Guam, to plants like purple loosestrife, invasive species leave no habitat in the United States untouched. After habitat loss, invasive species are the greatest threat to natural biodiversity faced today.

Invasive species, which include plants, fish, insects, and other organisms, cost the United States more than $100 billion each year. Annual losses associated with some of the most expensive invasive species are in excess of $100 million per species.

Aquatic and coastal habitats have suffered serious ecological consequences due to invasive species, and as a Representative of a largely coastal district, I am concerned about the threats to native habitats in my home state. For example, the invasive European green crab could become a serious threat to local clam fisheries, although a New Jersey scientist, Dr. Paul Jivoff, has shown that blue crabs may act as a barrier to the spread of the green crab. We're obviously hopeful that this biological barrier will hold. The rapa whelk, an invasive snail that drills through oyster shells, has begun to spread into the Delaware Bay from the Chesapeake Bay. Additionally, an invasive species of the marsh grass Phragmites is out-competing native marsh grasses and altering coastal and estuarine habitats. This last invader has become a symbol of the difficulties of balancing the negative impacts of an invasive species with the costs of eradication.

The scale of the existing invasive species problem is striking. There are pressing needs in all States and territories for controlling ongoing invasions. But effective preventative measures, combined with early intervention, could surely reduce some of the economic costs and loss of habitat associated with established invasive species. I am interested in hearing from today's witnesses how best to identify potential threats and to prevent future introductions.

I hope that today's witnesses can shed some light on whether existing statutory authorities are adequate or whether they should be strengthened to directly address this threat. For example, could the scope of the Lacey Act, which prohibits the introduction of "injurious wildlife," be expanded to include more species? Furthermore, could the Act be used more aggressively, as it was by Secretary Norton in last year's high profile case of the Northern Snakehead fish in Maryland?

We have been regrettably slow in addressing invasive species introductions and establishment in the United States. I look forward to this hearing as a way to gain practical guidance on how to mitigate the current problems, and how to most efficiently head off future invasions. Thank you.

Mr. SAXTON. Mr. Radanovich?

Mr. RADANOVICH. Thanks, Mr. Chairman, for holding this meeting. A brief statement to read if I may and also want to submit for the record and ask unanimous consent to submit a statement on behalf of Jimmy Duncan.

Mr. SAXTON. Without objection.

[The statement submitted for the record by The Honorable John J. Duncan, Jr., from Dr. Daniel Simberloff, Professor, University of Tennessee, Knoxville, Tennessee, follows:]

Statement submitted for the record by Dr. Daniel Simberloff, Professor, University of Tennessee, Knoxville

I am Daniel Simberloff, and I am very grateful to the Committee members and particularly to Congressman Duncan for permitting me to submit this testimony for inclusion in the written record about a matter of great concern to me, invasive introduced species. As a faculty member at the University of Tennessee, Knoxville (the Nancy Gore Hunger Professor of Environmental Studies), I direct the Institute for Biological Invasions. I have conducted extensive research in environmental areas (and have published some 400 technical papers), and much of my research program for many years has been focused on impacts of invasive introduced species.

WHAT INVASIVE INTRODUCED SPECIES DO

Invasive introduced species have many economic and environmental impacts. Some are obvious; others are subtler but no less important. An estimate of their cost to the U.S. economy is US$137 billion annually. Worldwide, introduced species are second only to habitat conversion as a cause of species endangerment and extinction; in this matter, they outrank harvest, pollution, disease, and global warming combined. Impacts of introduced species such as the chestnut blight in the eastern U.S., the sea lamprey in the Great Lakes, and the gypsy moth in eastern North America have long been known. Other more recent invaders, such as the zebra mussel and the Asian longhorned beetle, have burst onto the scene with much publicity and (in the case of the mussel) rapid ecological and economic damage. However, because these impacts are so multifarious and often subtle, many people are unaware of the full scope and depth of this problem. Further, introduced species sometimes remain innocuous for decades, then suddenly explode to become serious pests. Thus, some fraction of currently harmless introduced species will become plagues. In sum, species introductions are a global change of the first order, and their ecological and economic impacts over the last century surely exceed those caused by global warming. However, they have received insufficient public attention.

Impacts of the majority fall into several well-defined categories.

Habitat Change and Ecosystem–Wide Impacts

Because so many species are tied to particular habitats, an introduced species that greatly changes habitat can transform an entire community. The zebra mussel (from southern Russia) has greatly modified many ecosystems. By 2000 it ranged over much of the eastern United States and Canada. Most public attention has been focused on its economic impacts through fouling and clogging water pipes, with costs of billions of dollars. Ecological impacts are equally drastic. Its dense aggregations smother native mussels, many of which are endangered, and it has converted substrate in some areas into a jagged mass of mussel shells. In addition, it decreases phytoplankton densities, thus affecting fish, zooplankton, and other invertebrates. The very existence of many native molluscs is threatened, and there are many impacts on other species. Worse, this mussel interacts with other invaders to increase the impact of both the mussel and those species, as I will describe below.

Introduced plants more frequently cause ecosystem-wide impacts via habitat change, because plants often constitute the habitat for an entire community, and because terrestrial, aquatic, and marine plants can overgrow large areas. The Japanese green alga Codium fragile (dead man's fingers or oyster thief) has profound effects in North America. It arrived in Long Island Sound by 1957 and has since spread south to North Carolina and north to Canada. It attaches to molluscs and destroys them, and it displaces native algae. In the Gulf of Maine, it is the main species in a group of invaders that has completely transformed native communities.

Plants can change entire ecosystems even without overgrowing native species by modifying ecosystem traits and processes. For example, in Florida, Australian paperbark trees, with spongy outer bark, and highly flammable leaves and litter, have led to increased fire intensity and frequency. These changes, in turn, have helped paperbark replace native plants on ca. 400,000 acres, with been many subsequent changes to the regional community. This is one of many cases in which introduced plants, by modifying natural disturbance regimes, affect entire ecosystems. In the arid U.S. Southwest, Mediterranean salt cedars cause severe water loss because of their deep roots and rapid transpiration. On the volcanic island of Hawaii, the Atlantic nitrogen-fixing shrub Myrica faya (firebush) has invaded young, nitrogen-poor areas. As there are no native nitrogen-fixers, native plants have adapted to the nitrogen-poor soil, while introduced species cannot tolerate it. Now a wave of plant invaders aided by the firebush is establishing over large areas.

An introduced species, such as a pathogen or herbivore, that removes a dominant plant or plants can affect a whole community. For example, the Asian chestnut blight fungus reached New York on nursery stock in the late nineteenth century, spread over 250 million acres of eastern North America from Ontario to Georgia in less than 50 years, and killed almost all mature chestnuts. Because chestnut had been a dominant tree in many areas, impacts on the native community were enormous. For example, several species that depended on chestnut went extinct, and nutrient cycling was heavily effected.

Species Effects

There is a gradient between ecosystem-wide impact, as is caused by drastic habitat change, and impact on single species. I will describe various forces in terms of how one species affects another. There may be little further impact on the community, or the impact may spread to many species. Often, as in the chestnut blight

case, an invasion must have had drastic impacts on a wide swath of the community, but data do not exist to detail the impact. For instance, all the earthworms of much of Canada and the northern United States are Eurasian immigrants. It is difficult to believe that the immigrant nature of animals as crucial to ecosystem function as earthworms cannot have had major impacts on whole ecosystems, but there has been no published research on the problem.

Competition

Individuals of one species can prevent individuals of another from garnering resources, by fighting, for example. Or two species can affect one another's populations when both use the same resource. Some of the best-known cases of competition concern impacts of introduced species on natives. For example, the alewife, an Atlantic coastal fish, spread through the Great Lakes by the Welland Canal. The alewife reduced zooplankton populations, and competition for this resource contributed to the disappearance of native salmonid fishes. Alewives now dominate Lake Michigan and account for 70–90% of fish weight.

European brown trout interfere with feeding by brook trout by displacing them from their favored feeding habitats, by increasing their periods of inactivity, and by reducing feeding activity. Introduced plants can poison the environment. For example, the African crystalline ice plant accumulates salt, which remains in the soil when the plant decomposes. In California, this plant excludes native plants that cannot tolerate salt.

Predation

Many introduced species prey on native species, sometimes driving them to local or global extinction. The sea lamprey first arrived in Lake Ontario in the 1830s either by migrating through the Erie Canal or by hitchhiking on ships moving through the Erie and St. Lawrence canal systems; it then moved to Lake Erie through the Welland Canal. In combination with other factors, lamprey predation led directly to extinction of three Great Lakes fishes, the longjaw cisco, the deepwater cisco, and the blackfin cisco. Along with overfishing, watershed deforestation, and pollution, lampreys devastated populations of all large native fish. Economic impacts were dramatic; catches of many species declined 90% or more. Declines of these large fish rippled through the food web, and populations of several smaller fish species increased. As lampreys switched to these species in the absence of larger prey, many of them declined.

There are even more dramatic impacts of introduced predators. For example, the rosy wolf snail of Florida and Central America was introduced to many islands around the world in a failed attempt to control the previously introduced giant African snail. The rosy wolf snail attacks native terrestrial, arboreal, and even aquatic snails on these islands and has already caused the extinction of at least thirty species, including many in Hawaii. The brown tree snake, introduced in cargo, has eliminated ten of the eleven native forest bird species on Guam.

Herbivory

The best known impact of herbivores is economic damage by various insect pests of agricultural crops and forests. In 1869, the gypsy moth came to North America from Europe in a futile effort to generate a silk industry. It escaped in Massachusetts and occupied much of eastern North America. The moth feeds on many woody plants. Defoliation by this moth weakens trees and thereby increases their susceptibility to other insects and diseases. In some areas, repeated defoliation has caused up to 90% mortality of preferred host trees, thus greatly changing forest composition. There are many subsequent impacts on other species after a major infestation of woody plants. Litter amounts and decomposition increase, thus increasing nitrogen loss in stream flow, while both defoliation and reduction of oak mast production affect bird populations.

The Russian wheat aphid, from southeastern Europe and southwestern Asia, spread to Mexico in the 1980s, arrived in the United States, and quickly spread through the western part of the United States and Canada. It attacks not only wheat but also barley and other plants. It has cost ca. $1 billion so far in yield losses and control costs, and it has led to the near elimination of wheat and barley crops in some regions. It has ecological as well as crop impacts. For example, it infests crested wheatgrass, planted for soil conservation, and the Eurasian seven-spot lady beetle, introduced to combat the aphid, has displaced native ladybeetles in many areas.

Disease

In addition to major ecosystem-wide impacts as for chestnut blight, an introduced pathogen can have huge impacts on one species. Whirling disease is a European

parasite that penetrates the head of juvenile trout, where it causes the fish to swim erratically, impeding their feeding and predator avoidance, and most young fish die. Spores reach the substrate when an infected fish dies or is eaten by a predator (in which case the spores are expelled in feces). There they withstand freezing and drying, remaining viable for 30 years. They are eaten by an aquatic worm, in whose gut the spore is converted to a mature form that infects trout.

Rainbow trout are highly susceptible to whirling disease, which reached North America in 1955 and has since spread widely in the U.S. West. It arrived in North America by a tortuous route. North American rainbow trout were transplanted to Europe, where they acquired whirling disease from brown trout, a European native that harbors the parasite but resists the disease. Frozen rainbow trout from Scandinavia were then exported to Pennsylvania supermarkets. A stream flowing through a residential area carried the parasite to a fish hatchery. Fish spread the parasite from there to many other states, where it has been an economic disaster. In many streams in Montana and Colorado, whirling disease afflicts over 95% of the rainbow trout.

Hybridization

Introduced species can gradually change a native species, even to the point of extinguishing it, by mating with it. Introduced rainbow trout, for example, hybridize with five native trout species listed under the Endangered Species Act. Gene pools of these species are gradually coming to resemble that of rainbow trout. In addition to game fish, fish introduced for biological control and released for bait have caused hybridization and even extinction, and there are many similar examples among mammals, birds, and plants.

Even if hybrids are sterile, hybridization can cause extinction. The bull trout, a candidate for threatened status under the Endangered Species Act, hybridizes with introduced brook trout. Because of sterility, poor mating success, and low progeny survival, there is almost no backcrossing into parental populations. However, the bull trout are at a disadvantage because much of their reproductive effort is wasted in these hybrid matings, and they are declining.

Hybridization between a native and an introduced species can even produce a new invasive scourge. For example, cordgrass of coastal eastern North America was introduced to England in the mid–19th century, but it was a harmless, uncommon exotic there. Occasionally it hybridized with the native Spartina maritima, but these hybrids were sterile. Then, ca. 1890, one such hybrid individual underwent a spontaneous chromosomal mutation (doubling its number of chromosomes) to become a fertile new invasive weed, S. anglica. It has more recently invaded northern Puget Sound, where it is the target of a so far futile control effort because it is destroying the habitat of large intertidal areas.

Combinations of Effects

Introduced species often interact with other factors to generate an impact, and these interactions can be complex. Habitat loss is the most common cause of species endangerment (85% of all imperilled species), followed by introduced species (49%), which exceeds the sum of the next three most common factors (pollution [24%], overexploitation [17%], and disease [3%]). However, most species are threatened by more than one factor, as evidenced by the fact that these percentages sum to more than 100%. For example, the impact of sea lampreys combined with those of overexploitation, habitat destruction, and pollution in the Great Lakes to reduce many populations of large fishes dramatically. Recall that one important impact of defoliation by gypsy moths is to weaken trees, thereby rendering them more liable to death by a host of other causes, including impacts of other insects and diseases, both native and introduced.

One way in which an introduced species interacts with another factor to the detriment of native species, communities, and ecosystems is by synergism with other introduced species. Often an introduced species remains innocuous in its new home until another species invades, when the prior species becomes a huge problem. In south Florida, for example, fig trees were common for at least a century, restricted to residential settings because they could not reproduce without specific fig wasps. Recently, the fig wasp of one fig species invaded, and that fig is now spreading rapidly, including into natural areas. The impact of an exotic plant species is often exacerbated by introduced animals dispersing its seeds. For example, seeds of the nitrogen-fixing Myrica faya in Hawaii are primarily dispersed by an introduced bird, the Japanese white-eye.

One introduced species can also modify the habitat to favor a second invader. Such interactions can even aid both. Zebra mussel filtration increases water clarity, which in turn promotes growth of Eurasian watermilfoil. In its own right, Eurasian

watermilfoil is one of the most troublesome aquatic invaders of North America, but it also aids zebra mussel populations by providing additional settling substrates and helping to disperse zebra mussels between water bodies. Thus a mutualism between two damaging invaders worsens the impact of both.

HOW WE DEAL WITH INVASIVE INTRODUCED SPECIES

We can manage introduced species in three ways. (1) We can keep them out. (2) If they get in, we can find them quickly and try to eradicate them. (3) If they establish widely and are harmful and ineradicable, we can keep them at levels low enough that impacts are acceptable.

Keeping them out

Keeping out invaders is less costly than trying to reduce or eliminate them. Interdiction must target two categories of introductions, planned and inadvertent ones, that call for somewhat different procedures. Planned introductions typically account for about half of all introductions, and detrimental effects arise from planned introductions at least as frequently as from inadvertent ones. Deliberately introduced horticultural plants are often especially problematic.

The fact that many introduced species are deliberately introduced suggests that keeping out many invaders should be straightforward—simply decide which planned introductions carry substantial risk and forbid them. This effort has not been very successful for several reasons. First, there is often dispute about whether an introduction is likely to be harmful, or whether the harm is likely to outweigh the benefit. Second, impacts of introduced species are notoriously hard to predict, though a well established principle is that species problematic in one place have a high probability of being problematic elsewhere. This unpredictability means that formal quantitative risk assessment procedures for introduced species are at a very early stage of development and cannot yield accurate probabilities and cost estimates. Nevertheless, the rapid expansion of global trade and the associated multilateral trade treaties such as those of the World Trade Organization have led to a situation in which introductions are assumed "innocent until proven guilty," and "proof of guilt" must be established by formal risk assessment procedures. The upshot is that, at the international level, it is difficult for a nation to exclude a specific introduced species or a product that might carry one without being charged with economic protectionism. The recent rejection by the World Trade Organization of Australia's attempt to exclude frozen imported salmon from Canada is partly due to the Australians' inability to provide a quantitative assessment of the risk that the salmon would carry disease organisms that might harm native fishes. This rejection is in spite of the fact that whirling disease that arrived in frozen trout from Sweden has already devastated many North American rainbow trout fisheries.

The only way to solve this problem is to accept the principle that potential introductions are guilty until proven innocent and subject to expert scrutiny before they can be imported. New Zealand's 1993 Biosecurity Act enshrines this notion and has led to substantial success in curbing harmful introductions while permitting normal levels of trade and commerce.

Inadvertent introductions are hard to stop; these species hitchhike on products (such as insects in plant material) or exploit pathways that might carry many invaders, such as ballast water or untreated wooden packing. For large ports with much shipping and passenger activity, interdiction of such invaders is laborious, though sufficient effort can be very effective.

Eradication

Many people believe eradication is nearly impossible, particularly if a species is widely established. However, there have been many successful eradications, not only from islands but from continental regions. Unfortunately, many good eradication projects have not been well publicized. Smallpox has been eradicated from the entire earth (except for vials in Atlanta, Moscow, and perhaps a few terrorist redoubts), and Anopheles gambiae, the African mosquito vector of malaria, was eradicated from 31,000 km2 of northeastern Brazil. There are many successful eradications of mammals from islands. It is worth noting that, although eradication of plants is often more difficult than that of animals, some plants have been eradicated. Two noteworthy successful projects are the eradication of Kochia scoparia from 10,000 acres spread out over 600 miles in Western Australia and the eradication from Laysan Island of the sandbur.

Several features typify eradication successes:

(a) A can-do attitude

In almost every instance, from the global eradication of smallpox down to the elimination of rats from small islands, someone had to be willing to make a wholehearted effort to eradicate in spite of naysayers claiming it was impossible.

(b) Sufficient economic resources to complete the project

Public agencies have sometimes moved to reduce funding for a project when it is so near to completion that the invader has ceased to be a problem.

(c) Clear lines of authority, and enforcement powers

Because individuals can subvert an eradication campaign (for instance, by importing and/or releasing individuals of the target species), because some eradications must be undertaken on private property, and because some target areas fall under several governmental jurisdictions, it is important that someone be clearly in charge and able to compel cooperation. For many eradications, a promised economic or health benefit has helped to get public support, but often a few dissenters remain, and someone has to be able to force people to cooperate.

(d) Appropriate biology of the target organism

Although sufficient effort can probably eliminate any species over a small area, some species are easier to eradicate than others. The feasibility of eradicating some widespread invaders requires their having appropriate biology. There has to be some weak link in the species' life cycle.

Maintenance Management

If eradication fails, there are four main approaches to maintaining low populations of a species to minimize its impact: mechanical control, chemical control, biological control, and ecosystem management. None is a silver bullet, but each has been effective in particular cases.

(a) Mechanical control

Mechanical control encompasses many techniques, such as hand-pulling plants and shooting or trapping animals. Although complex machinery can be used, such as various gadgets to remove invasive plants, mechanical control often involves simple methods but massive amounts of labor. Organized volunteer labor can be effective. For instance, the State Nature Preserves Commission of the State of Kentucky has had good success controlling musk thistle by using volunteers convicted of drunk driving to pull it up.

Hunting and trapping can be effective controls against some animals, if pursued at high enough levels and with unwavering consistency. The Alberta Rat Patrol has kept Alberta largely free of Norway rats at low cost. First discovered at the eastern border of Alberta in 1950, rats are primarily controlled in the province by rigorous inspection, with food source elimination, anticoagulant baits, and hunting by seven provincial rat patrol officers playing key roles. The population has been reduced to a point where every year ca. 50 infestations are discovered and destroyed, and discovery of a single rat in Calgary or Edmonton is a major news story.

(b) Chemical control

The well-known human health and other non-target impacts of early-generation pesticides, such as DDT and other chlorinated hydrocarbons, are legendary and have led to a type of chemophobia among many environmental advocates. Many modern pesticides, however, have far fewer (if any) nontarget impacts and, if used judiciously, can be useful in managing invaders. Many plants and animals have been successfully controlled partly or wholly by chemicals.

Chemicals have two frequent disadvantages as parts of maintenance management rather than eradication programs. First, they are often expensive, particularly if used over large areas. Second, species evolve resistance to pesticides, so that increasing amounts are required, and eventually the pesticide is ineffective against its target.

(c) Biological control

Biological control entails deliberately introducing a new species—a natural enemy of some invasive introduced pest. In agriculture and silviculture, some striking successes have been recorded by biological control. These successes have led some managers to advocate biological control as a "green" alternative to chemical control.

However, most biological control projects do not work. Also, just as with some pesticides, some biological control agents have non-target impacts. Another potential problem is that biological control agents, much more easily than chemicals, can disperse from areas of introduction to other regions where they may cause harm. Finally, biological control introductions are usually irreversible, as typical biological control agents (e.g., small insects) are among the most difficult species to eradicate. With chemical control, if the method does not work or has unexpected side effects, one can simply stop using it. With biological control, if the initial introduction has established a population, active means are required to remove it, and the probability of success is not high. Thus, although biological control is a useful part of the arsenal in the battle against introduced species, it must be used judiciously and is often unlikely to succeed.

(d) Ecosystem management

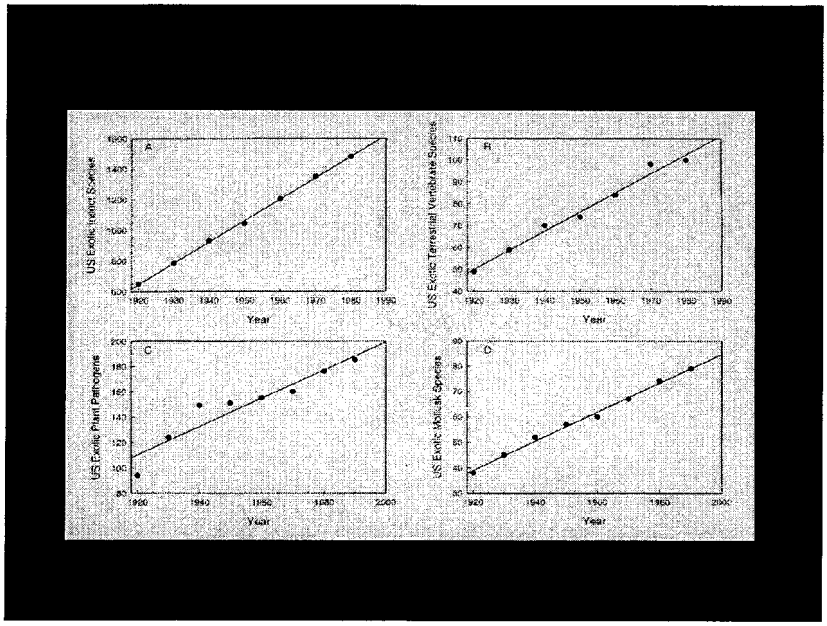
It is sometimes possible to manage an entire ecosystem so as to favor native species as a group over most invaders. For example, good pasture management keeps musk thistle from becoming a major weed, as native grasses outcompete it. Similarly, maintenance of a natural fire regime in pine forests of the southeastern United States has stemmed the invasion of introduced species. Resource management agencies have lately become great enthusiasts of ecosystem management. However, ecosystem management has been more a theoretical concept than a set of management techniques, and it has rarely been tested rigorously for an extended period.

Thus, there are many technologies for maintenance management, and for each there are successes and also failures. No one technique is best for managing all introductions, but each has a role to play in particular projects, depending on the target pest, the setting, and experience in similar situations.

HOW ARE WE DOING? CAN WE DO BETTER?

The establishment of the Federal Invasive Species Council in 1999, pursuant to Executive Order 13112, is a promising step in bringing the attention it deserves to the problem of introduced species. However, progress has been painfully slow in developing policies and methods commensurate with the scope and impact of the problem, and we are a long way from being effective. This fact is demonstrated by Fig. 1, which shows how, for four groups taken as examples (insects, molluscs, plant pathogens, and terrestrial vertebrates), the number of introduced species establishing in the United States has continued to grow at an unabated pace for a century (data from unpublished study at the National Center for Ecological Analysis and Synthesis, Santa Barbara).

Fig. 1. Increase in established introduced species in the United States.



There are three key reasons why the problem is out of control. Two have been signaled by the United States General Accounting Office in reports to Congress.

First, funding to deal with the problem is woefully small relative to the size of the problem, and it is disproportionately aimed at a very few invaders (cf. GAO Report GAO/RCED- 00–219, "Invasive Species: Federal and Selected State Funding to Address Harmful, Nonnative Species").

Second, lack of coordination and integrated response to invaders greatly hinders the process of eradicating or restricting them (cf. GAO Report GAO–01–724, "Invasive Species: Obstacles Hinder Federal Rapid Response to Growing Threat").

The Invasive Species Council is attempting to address part of the latter problem by improved early warning/rapid response systems.

Third, the introduced species community, led by the Federal Government, has failed to develop existing technologies adequately and especially to seek totally new approaches. The existing approaches have become institutionalized and are typically well-established in particular agencies. As in any institution, there is resistance to new approaches and difficulty in recognizing that what has been done in the past is not working well enough. The Invasive Species Council, formed from existing Federal agencies, has constituted a major advance, but the constituent agencies (and therefore the Council as a whole) have tended to support approaches they are already invested in and sought primarily to do more of the same, but better. As an example, the management plan produced by the Council focuses management efforts for established introduced species very heavily on biological control and much less on the other three technologies.

It is striking that a leading component of the revolution in biotechnology, genetic manipulation, has been largely absent from academic and agency discussions about how to deal with introduced species. One can easily imagine a variety of ways in which genetic manipulation techniques could be marshaled to make introduced species less prone to become invasive or various management procedures more effective, but such efforts have not advanced beyond the academic discussion stage. For example, the possibility of applying the seedless technology patented at the University of Connecticut to neutralize the spread of invasive ornamental woody plants is being studied at the University of Connecticut and the University of Tennessee. Congress should take the lead in encouraging such efforts.

STATEMENT OF THE HONORABLE GEORGE RADANOVICH, CHAIRMAN, SUBCOMMITTEE ON NATIONAL PARKS, RECREATION, AND PUBLIC LANDS

Mr. RADANOVICH. Thank you, Mr. Chairman. As Chairman of the National Parks, Recreation and Public Lands Subcommittee, I too am aware of the serious nature of invasive species in our Nation's public lands, particularly in central California where the yellow starthistle has and continues to infest the productive ag lands of the Central Valley. This single invasive weed is causing serious ecological damage in the valley because it forms dense thickets and rapidly depletes soil moisture, preventing the establishment of other species and displacing nutritious forage and native California grasslands.

The yellow starthistle is but one example of 94 types of nonnative weeds, not to mention thousands of other invasive nonnative plants, animals and insects both on our land and on our Nation's waterways that continue to attack our native flora and fauna and costs this Nation billions annually in economic losses. Collectively these unwelcome invaders introduce new diseases, turn productive and dynamic rangelands, forests and refuges into monolithic ecosystems unable to support cattle, native wildlife and migratory birds.

While the introduction of invasive species in America occurred almost immediately with the arrival of many of our ancestors, it was not until international trade and international travel made the world smaller and many of these invading species made our work in our country.

Finally, in 1999, an executive order was issued and brought much needed national attention to the invasive situation. The executive order required the entire Federal bureaucracy to develop and coordinate a national effort not only to eradicate and control existing exotic species, but more importantly to prevent new invaders from becoming established or even entering the country.

Prior to 1999 while each department worked to control invasive species under its jurisdiction, there was no national leadership or oversight on such issues as wholesale eradication, prevention, early detection and rapid response. It is now 2003 and our country remains under continued attack on all fronts from these elusive and determined unwelcomed travelers. While we seem to be effective at keeping the brown tree snake from becoming established in Hawaii, other exotic species continue to take hold in our country.

I want to thank the Chairman for holding this hearing and look forward to the testimony from all the witnesses, especially our administrative witnesses who I hope will update members on the improved Federal coordination, what statutes if any could be amended to grant the government greater authority to prevent invasive species from entering the country and how nongovernmental partners might help at the local level to control the spread of exotic species.

[The prepared statement of Mr. Radanovich follows:]

Statement of The Honorable George Radanovich, Chairman, Subcommittee on National Parks, Recreation, and Public Lands

Thank you, Mr. Saxton.

As Chairman of the National Parks, Recreation, and Public Lands Subcommittee, I, too, am aware of the serious nature of invasive species on our Nation's public lands, particularly in Central California, where Yellow Starthistle has and continues to infest the productive agricultural lands of the central valley day by day and acre by acre. This single invasive weed is causing serious ecological damage in the valley because it forms dense thickets and rapidly depletes soil moisture, preventing the establishment of other species, and displacing nutritious forage and native California grasslands.

The Yellow Starthistle is but one example of the 94 types of nonnative weeds, not to mention thousands of other invasive, non-native plants, animals, and insects—both on our land and in our Nation's waterways—that continue to attack our native flora and fauna and cost this Nation billions—not millions—annually in economic losses. Collectively, these unwelcome invaders introduce new diseases, turn productive and dynamic rangelands, forests and refuges into monolithic ecosystems unable to support cattle, native wildlife, or migratory birds.

While the introduction of invasive species in America occurred almost immediately with the arrival of many of our ancestors, it was not until international trade and international travel made the world smaller that many of these invading species made their mark in our country. Finally, in 1999 an executive order was issued that brought much needed national attention to the invasive situation. The executive order required the entire Federal bureaucracy to develop a coordinated national effort to not only eradicate and control existing exotic species, but more importantly, to prevent new invaders from becoming established or even entering our country. Prior to 1999, while each department worked to control invasive species under its jurisdiction, there was no national leadership and oversight on such issues as wholesale eradication, prevention, early detection and rapid response. It is now 2003 and our country remains under continued attack on all fronts from these elusive and determined unwelcome invaders. While we seem to be effective at keeping the brown tree snake from becoming established in Hawaii, other exotic species continue to take hold in our country.

I look forward to the testimony from all our witnesses, especially our Administrative witnesses, who I hope will update Members on the improved Federal coordination, what statutes, if any, should be amended to grant the government greater authority to prevent invasive species from entering the country, and how non-governmental partners are helping at the local level to control the spread of exotic species.

Mr. SAXTON. Thank you very much. Our normal procedure is to have an opening statement from the Ranking Members but inasmuch as this is a joint hearing and inasmuch as the Congress is not in session this afternoon, we are going to go on to others. But

if the members would kind of take their statements and we will include your entire statement in the record, if you just get your basic message across, because we have three panels, including 17 witnesses, and we need to move along.

Mr. Faleomavaega.

Mr. FALEOMAVAEGA. I, too, would like to thank Chairman Pombo and our senior Ranking Member, Mr. Rahall, for their leadership in putting this joint hearing together and you also, Mr. Chairman, and our Ranking Member, Mr. Pallone, in bringing this hearing to the forefront. I notice also we have such an excellent mixture of experts from all over the country in addressing these very serious issues from the brown tree snakes. We have got a bunch of snails and toads that were unheard of in my islands and I don't know what we are going to do with them.

I would like to offer my personal welcome on behalf of my colleague Mr. Abercrombie to Dr. Fred Kraus from the Department of Natural Resources and the Bishop Museum in the State of Hawaii. I look forward to hearing from him and his insight to the problems we are faced with in the Pacific area, and I look forward to hearing from our witnesses.

Mr. SAXTON. Ms. Bordallo.

Ms. BORDALLO. Thank you, Mr. Chairman. I will make mine very short. I am here to listen to the experts that are going to be witnesses today and to get an update on the brown tree snake problem that has been affecting Guam for a number of years as well as the State of Hawaii. And if my colleague from American Samoa has a problem with snails, we will send you our brown tree snakes because they will take care of that.

Thank you, Mr. Chairman.

Mr. SAXTON. Thank you. Mr. Hefley.

STATEMENT OF THE HONORABLE JOEL HEFLEY, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF COLORADO

Mr. HEFLEY. Thank you very much, Mr. Chairman. You know I appreciate your kind words and the kind words from my friend from American Samoa. It is good to be back here in this room and I got to tell you I miss it, but I still have interest in many of these issues and want to be helpful wherever I can. I really appreciate your having this hearing today and you have some outstanding witnesses. And from the number of people in the room there is obviously a strong interest. And I appreciate that as well because oftentimes when you start talking about the problem of weeds, people think that is a gardening issue.

And I introduced H.R. 119 a year or so ago, which is the Invasive Weed Control Act, went through the process, was ready to go to the floor, got caught up in the last days of the session and actually didn't make it to the floor, but we were ready to put it out of this Committee. I don't think it was controversial and I think it would have done some good. If I could speak to that very quickly.

You know invasives often are trivialized as a national policy issue, but it is a very serious subject that affects thousands of Americans. I believe invasives to be one of the most serious environmental problems that we really have facing us today. It has

been estimated that some of these weeds increase their populations by 14 percent each year and if left unchecked can render land useless for ranching and farming.

George and I certainly from the West can see this where they spread across the prairies and just destroy the land for any good useful purpose, and those of you who live in coastal areas know that the aquatics do the same thing or if you travel through the South where you see a vine that actually takes over everything and covers it up, houses, barns, telephone lines, we see how serious invasives can be.

Some species—we had a lot of fires in the West last year and some of these weeds increased the fire risk twentyfold. So in terms of just Federal land, the Bureau of Land Management estimates invasive weeds infest over 100 million acres across the United States. That is just Federal land, not private.

In developing my bill, I came to believe that the National Invasives Program lacked focus. Much was spent on study or devoted to a specific pest, but there was no coherent plan for dealing with this ongoing problem. What my bill seeks to change by authorizing $100 million a year for 5 years to fund local on-the-ground weed management entities to eradicate, not to study—you know, study is good, but we put so much time into study while these things continue to progress—not to study but to eradicate invasive weeds.

Groups receiving these funds would have 1 year to carry out their projects and then report to the National Invasive Species Council about their success or failures. This program would operate under the auspices of policymakers at the Interior Department as part of a comprehensive interagency effort on invasives. H.R. 119 does not try to be all things to all people, but through such a focused approach I believe we can begin making headway on this problem very soon.

Two other comments: H.R. 119 contains some provisions which were aimed at getting it to the floor last year, provisions to include aquatic invasives and placing control of the program under the existing Federal Interagency Committee for Management of Noxious and Exotic Weeds. I am happy to have those stay in the bill.

There is some talk that Mr. Gilchrest may introduce an aquatics bill. If he does so that may want to be stripped out of here, but I am perfectly agreeable to have it in here if not. And there is some question about the oversight of the program, but I believe overall policies should be set at a high enough level to ensure the effort does not become lost in some bureaucratic turf battles.

Over the past 3 years I think we have seen a heightened awareness of the invasives problem. It is my hope this heightened awareness will translate into adoption of a national invasives program in this Congress. And with that, I will close and again thank you very much.

[The prepared statement of Mr. Hefley follows:]

Statement of The Honorable Joel Hefley, a Representative in Congress from the State of Colorado

Thank you, Mr. Chairman. Mr. Speaker, every spring for the past 17 years, a man named George Beck has visited my office from Colorado State University to talk about weeds.

George would talk about bills to combat weeds, sponsored by Senator Akaka, then by Senator Craig. And every year, these bills never seemed to pass. And George would return the next year and start all over again.

This is the bill George and weed managers across the country have been pushing for all these years. Hopefully, this is the year, we can enact it into law.

While funding has existed to combat weeds and other invasive species since the 1980's, invasive weeds have for the most taken a back seat to agriculture and hardwood pests. Unfortunately, it has been during this period that these once benign pests have permanently rooted themselves in our landscape, and in certain areas displaced native vegetation altogether.

While the subject of weeds may seem to some unsuitable for the House of Representatives to be debating, it is indeed a very serious subject affecting thousands of Americans. Harmful, invasive weeds cost this economy billions annually and affect millions of acres of private and public land. In fact, some of these insidious invasive, non-native weeds increase their populations about 14 percent per year, and left unchecked, can easily overtake the land and displace native plant populations rendering the land and water useless for ranching and farming.

In addition, some of these weeds have proven themselves far more devastating than once thought—there are examples where some species of weeds have changed the ecology of the land increasing its fire risk twenty fold. In terms of just Federal land, the Bureau of Land Management estimates that invasive weeds infest over 100 million acres across the United States. In many areas of the West, invasive weeds have created dangerous monoculture ecosystems.

What my bill seeks to do is to authorize a substantial sum of money—$100 million a year for five years—for a focused effort to eradicate invasive terrestrial weeds. It would do this by directing these funds to state and local weed management entities, though the National Invasive Species Council and the states. Those groups receiving funds would have a year to carry out their projects, then report back to the Council on their successes and failures. The aim is eradication, not study.

H.R. 119 includes a number of changes from its predecessor, H.R. 1462, in the 107th Congress. First, it eliminates the role of the Advisory Council on Invasive Species and instead directs the Secretary of the Interior to develop the weed program and in evaluating state grant requests.

It requires the governor of a state to consult with the secretary prior to allocating 100 percent of the Federal share for a project.

It clarifies that a weed management entity involving more than one state may use the funds under this Act so long as it meets the requirements of each state.

And it clarifies that funds from this Act are not intended to replace assistance available under such programs as the Pulling Together Initiative of the National Fish and Wildlife Foundation.

There are two other portions of H.R. 119 which deserve comment—the role of the Federal Interagency Committee for the Management of Noxious and Exotic Weeds, or FICMNEW. After the Resources Committee passed H.R. 1462 last year, some, including the Agriculture Committee, suggested that many of the functions we assigned to the National Invasive Species Council could be and were already being carried out by FICMNEW. In order to get the bill to the floor before recess, we proposed to amend the bill with a manager's amendment designating FICMNEW as the lead body. That is the language in H.R. 119.

However, after a year's consideration of this subject, I would favor amending H.R. 119 to restore the bill's previous intent to place leadership in the Advisory Council on Invasive Species. In fact, many of the people who serve on the Council are the same people who serve on FICMNEW. My view is that the terrestrial species program should be guided by a policy-making body—such as the council—as part of a comprehensive national invasives eradication campaign. FICMNEW seems, to me, to focus more on relations between various Federal agencies with a stake in fighting invasives. While I would not rule out a role for FICMNEW in the eradication effort, I fear placing the terrestrial program's leadership at too low a level in the bureaucracy would result in great deal of internal debate and little accomplished on the ground.

Second, H.R. 119 contains provisions involving aquatic weeds, a concession to my friend from Maryland (Mr. GILCHREST). But it is my understanding that Mr. Gilchrest plans to move an aquatics bill through his Subcommittee this year. If this is the case, I will leave it up to Mr. Gilchrest and the Resource Committee as a whole to determine whether my aquatics language is needed in H.R. 119.

During the drafting of H.R. 119, we made a conscious effort NOT to be all things to all people. Billions are spent on invasives each year with little apparent success, I believe, because of a lack of focus. Instead, we drafted H.R. 119 with the thought

it could dovetail nicely with other existing programs combating aquatics and animals. You are aware of several pieces of legislation dealing with invasives in this Congress—Mr. Gilchrest's aquatics bill and the proposal offered by the gentleman from Michigan (Mr. Ehlers) to codify the Advisory Council on Invasive Species. I believe these bills, together, would comprise a focused, comprehensive national invasives policy.

As I stated at the beginning of this statement, I have heard about the problem of invasive species practically since the day I arrived in Washington 1987. And every Congress, people have agreed it was a serious problem and, every Congress, adjournment has come with no action. But over the past few years, there seems to be a growing awareness in both Houses and in the Administration that something must be done. I would hope this is the year we pass this legislation and get on with the business of reclaiming our land.

Thank you.

Mr. SAXTON. Thank you, Mr. Hefley. We would like to move right along to our first panel of witnesses. Our first panel consists of Dr. James Tate, Science Advisor to the Secretary of the Department of Interior; Dr. Chuck Lambert, Deputy Under Secretary of Marketing and Regulatory Programs, USDA; Dr. Stephen Brandt, Director of Great Lakes Environmental Research Lab of NOAA; Dr. Edwin Theriot, Mississippi Valley Division, Army Corps of Engineers; and Mr. John Baughman, Executive Vice President, International Association of Fish and Wildlife Agencies.

Gentlemen, welcome aboard and how about if we start over on our left, your right, and lead off with Dr. Tate.

STATEMENT OF DR. JAMES TATE, JR., SCIENCE ADVISOR TO THE SECRETARY, U.S. DEPARTMENT OF THE INTERIOR

Dr. TATE. Thank you, Mr. Chairman and members of the joint Committees.

Mr. SAXTON. And by the way, let me just say if you would make your statements as concise as possible and your entire written testimony will be placed in the record.

Dr. TATE. Thank you, Mr. Chairman. I welcome you all and thank you for having us, Mr. Hefley in particular. I am Jim Tate, Science Advisor to Secretary Norton. I would like to make three points, many of which you have already made, but clarify for you, and the rest will be in my written testimony.

First of all, this is a very costly problem we are dealing with and we do not yet have the correct legislative answer to the invasives species problem, but I know we are all working on it very hard. Second, Interior is very deeply involved in these issues, and the third thing is we need a lot more information before we understand thoroughly what invasive species are about and how they work.

I use the term that America is under siege. At this time I think it is our own doing. The United States is experiencing a tide of organisms coming into this country and only a small percentage of those that come in multiply and become invasive. I need to stress that the word "invasive" does not necessarily mean it is a nonnative species. Some of the things we do cause native species to become invasive as well.

You have already mentioned the $100 billion or more that invasive species cost us. I think personally that is probably less than really is the cost. When we start looking at cost of invasive species, including pathogens, West Nile virus, these are all things

that are extremely costly to us and to our plant and animal communities and things that probably cost more than the $100 billion that was estimated 3 years ago.

At Interior we attempt to combat invasive species across all species and across all habitats on public and private lands through cooperative programs, also in interjurisdictional waters. But invasive species affect us all. Their impacts can't be parsed out. In a sense, we are all global gardeners. And our gardening is part of the problem here. Interior is a steward of 438 million acres of public lands, 18 percent of all the lands in the United States. Our eight bureaus manage one out of every five acres of land in the United States, most of these of course in the American West.

In Fiscal Year 2001, we spent approximately $38 million at the Department of Interior. In keeping with one of our great responsibilities at Interior as a co-chair of the National Invasive Species Council and with the advice of the Invasive Species Advisory Committee, we are running a program to bring new staffing to the Invasive Species Council and to seek OMB support for performance based budgets at the Invasive Species Council.

Along with the 10 Federal departments that are members of the Invasive Species Council, we are implementing the National Invasive Species Management Plan and we are managing a crosscut budget effort. It began in Fiscal Year 2004 where we focused on prevention, early detection, rapid response and control. And the White House, the OMB have seen the progress that we made in Fiscal Year 2004. And in the current fiscal year, they have moved into seven new areas where they are looking to ask us for performance based budgetary activities in the Invasive Species Council.

Last thing I want to mention is the need for additional research. I have taken the liberty of bringing along many copies of last week's Science News, which has a very interesting article in it. Among the things revealed in that article is one of our invasive species. In the Southwest we deal with a thing called salt cedar, or tamarisk, and curiously enough it demonstrates how little we know about some invasive species. According to research mentioned in this Science News, the tamarisk we have in the Southwest actually comes from two different parts of Eurasia, two different species in Eurasia that did there meet each other. But in the United States, those two species have hybridized and are now creating an organism with hybrid vigor, with additional ability to become invasive and to deal with our native plants and our native animals.

With that, I would thank you for your time and we would be willing to answer questions at your convenience.

[The prepared statement of Dr. Tate follows:]

Statement of Dr. James Tate, Jr., Science Advisor, U.S. Department of the Interior

Mr. Chairman, and Members of the Committee, I am Jim Tate, Science Advisor to Secretary of the Interior Gale Norton. I am pleased to be here today to provide you with an overview of invasive species issues that the Department of the Interior (Department) and its bureaus face while carrying out their varied missions.

As steward of some 438 million acres of public lands, the Department and its eight bureaus manage more than one out of every five acres of land in the United States. The Bureau of Land Management (BLM), with some 262 million acres, is the largest Federal landholder, and energy and mineral operations on its lands generate over $2 billion in revenue. The National Park Service (NPS) manages more

than 84 million acres in 388 parks, and the U.S. Fish and Wildlife Service (FWS) manages 93 million acres in the National Wildlife Refuge System for wildlife conservation and recreational uses. The Bureau of Reclamation (BOR) operates a system that creates 40 billion kilowatt hours of power and carries water to more than 31 million people in the West.

Unfortunately, the large amount of land and infrastructure under the Department's jurisdiction brings with it an array of invasive species problems impacting nearly every aspect of our work.

Scope of the Problem

As an initial matter, resource management agencies have a tendency to focus most on what we can do or are doing to address this problem. But we are also here to discuss the scope of the problem generally. With this in mind, it is appropriate to first highlight an important aspect of this problem that is not always the focus of our attention: the majority of invasive species problems can be traced directly to everyday legitimate human activities. In this regard, our actions can have unintended and, in some cases, far-reaching, consequences. I highlight this point not to be critical of any particular industries or activities but to raise awareness of an issue that can frequently be overlooked during discussion of the technical aspects of this problem. Perhaps we, as resource managers, should keep this issue in mind as we work to become more proficient in forming partnerships with other agencies, states, private landowners, and others to prevent, detect, respond to, and control invasive species.

In plain terms, invasive species are a costly economic problem. Invasive plants alone are estimated to cause more than $20 billion per year in economic damage. Other estimates that include invasive animals and pathogens push the total cost to the U.S. economy to more than $100 billion each year.

In addition to damage to the economy, our nation is losing precious wildlife habitat and suffering mounting natural resource productivity losses to the encroachment of invasive plants and animals. As an estimate of ecological harm, up to 46 percent of threatened and endangered species owe their listing in whole or in part to the uncontrolled spread of invasive species. In fact, invasive species threaten many fish and wildlife populations, and have the potential to degrade entire plant and animal communities.

As noted above, each of the Department's land management bureaus now routinely addresses invasive species issues during the course of their day-to-day management duties.

Let me provide you with a few examples.

- Invasive species affect National Wildlife Refuges from the State of Alaska to the Caribbean Sea. As previously noted, invasive species have caused significant declines of protected species and degrade millions of acres of refuge lands, waters, and wetlands. These invaders have become the single greatest biological threat to refuges and to FWS's wildlife conservation mission. Management actions by the FWS to control invasive species have been taken on over 300 separate refuges. Among the most insidious plant invaders on refuges are salt cedar, leafy spurge, perennial pepperweed, Canada thistle, Brazilian pepper tree, purple loosestrife, Australian pine, Chinese tallow trees, old world climbing fern, phragmites, and melaleuca. Non-indigenous invasive animals such as brown tree snakes, nutria, and feral pigs degrade habitat and reduce populations of native fish and wildlife.
- In addition, the Lacey Act, which is administered by the FWS, restricts the importation and interstate transportation of wildlife deemed "injurious"—those wildlife for which the importation or interstate transportation could have negative impacts on the interests of agriculture, horticulture, forestry, human beings, and the welfare of wildlife and wildlife resources in the United States. There are currently 12 genera of mammals, four species of birds, three families of fishes, one species of crustacean, one molluscan species, and one reptile species listed as "injurious" under the Lacey Act. FWS has received petitions for listing the black carp, bighead carp, and silver carp as injurious species.
- Our national park units have not been spared from this burden. Exotic plants currently infest approximately 2.6 million acres in the National Park System, reducing the natural diversity of these places. For example, Badlands National Park in South Dakota is the largest mixed grass prairie protected by the NPS, yet over 10,200 acres are occupied by non-native invasive plants, including 2,000 acres by non-native grass species. Moreover, critical habitat for bighorn sheep and elk are being invaded by and, in some localities, completely replaced by, exotic plant species. This can result in a reduction of carrying capacity for the habitat. Similarly, Gulf coast national parks provide critical stopover and

nesting habitats for neo-tropical birds on their way to and from nesting and wintering habitats. Invasive species like Chinese tallow and Cogan grass are displacing native bottomland hardwood and other native habitat needed by these imperiled bird species.

- The Bureau of Land Management currently estimates that up to 35 million acres—nearly 15 percent of the lands it manages—are infested with invasive and noxious weeds which can impact the economies of those states in which they are found. For example, spotted knapweed alone costs the State of Montana an estimated $42 million annually; tansy ragwort invasion has caused losses of $6 million per year to the state of Oregon. Approximately 25 million acres of BLM lands are infested with annual grass species such as cheatgrass or downey brome, red brome and other Mediterranean species. These grass species frequently are the first plants to appear after wildfire and are rapidly invading sagebrush and desert ecoregions. It is also estimated that over 300,000 acres of BLM lands are infested with salt cedar. Control of salt cedar on BLM lands is especially important. I will more to say about salt cedar later.
- With responsibility for maintaining water delivery to much of the West, the Bureau of Reclamation is also engaged in the battle against invasive species. For example, the BOR estimates that salt cedar consumes as much as 2.5 million acre-feet of water annually in the arid Southwest; sometimes more than the annual rainfall. Invasive weeds such as salt cedar and purple loosestrife overtake habitat along rivers. Noxious weeds, like leafy spurge and yellow starthistle, devour about 4,600 acres of western Federal lands daily. Leafy spurge is now estimated to infest about 5 million acres in about 23 states and to cost about $140 million in damages annually in the United States. The whole upper Rio Grande is choked with salt cedar, which crowds out native vegetation and habitat.
- Burrowing mammals can weaken canal levees and earth embankments to cause seepage and flooding. Mitten crabs and other exotic species multiply quickly and can overwhelm entire ecosystems. Bacteria in wells plug screens and sand within aquifers with slime and biomass, causing severe production losses in wells. Other threats loom on the horizon. For example, zebra mussels, which spread to the eastern United States from Europe in the late 1980s, attach to structures and can clog intakes and water treatment systems. Control can cost an average of $250,000 per facility per year.
- The factors contributing to plant invasions are complex. The number of invasive plants affecting the Department's trust responsibilities is increasing rapidly, and the biology of most of the invaders is inadequately understood.

In short, this is a widespread and highly complex problem.

What can be done?

In general, the Department believes that the most effective and least costly method of reducing the impact of invasive species is to prevent their initial introduction. In the case of unintentional introductions, effective preventive measures involve identification of pathways and reducing the risk associated with those pathways. Indeed, Congress recognized this principle in the Nonindigenous Aquatic Nuisance Prevention and Control Act (Act), which recognizes, for example, that ballast water is a major pathway for the introduction of aquatic species. As such, the Act requires mandatory regulations on ballast water management for vessels entering the Great Lakes, and voluntary guidelines for other parts of the country.

Similarly, a number of methods have been used to prevent the introduction of pathogens and parasites associated with commercial species, including raw timber, horticultural plants, and pets, to name a few. The International Council for Exploration of the Seas has taken another approach by developing a protocol for use with aquatic species. In each case, the major emphasis is on preventing release of first generation imports.

As noted above, major pathways of introduction should be identified in order to prevent the unintentional establishment of invasive species. After major pathways have been identified, methods of interdiction should be developed with an eye toward causing minimal disruption to international commerce.

After prevention, the early detection of and rapid response to new invasions is paramount. For example, veterinarians, wildlife rehabilitators, and epidemiologists began to share information immediately upon discovery of West Nile virus and its impact on wild birds and humans here in the United States. In this case, mechanisms do exist for the Centers for Disease Control to act promptly with local health and wildlife officials. While fighting invasive species must necessarily compete with other budget priorities, we are continuing to work toward development of similar

systems that we hope will allow us to work with states and private citizens to rapidly respond to invasive species outbreaks.

Rapid response is essential to stop a newly arrived invasive species. Control of a well-established invasive species is many times more difficult. After establishment, a single control strategy seldom is sufficient and an integrated management strategy is usually needed. Integrated pest management (IPM) is a strategy that focuses on long-term control of pests and the damage caused by them through a combination of biological control, habitat manipulation, creative agricultural practices, and sequence and timing of actions. Pesticides can be used, but under guidelines established to minimize risks to human health, beneficial, and non-target organisms.

Department of the Interior Program Highlights

Given the amount of land and diversity of resources under its jurisdiction, the Department necessarily must be one of the leaders in working toward the control of invasive species. With this in mind, the Department is using existing authorities to combat invasive species on public and private lands and in inter-jurisdictional waters. The key to controlling invasive species is to work in partnership with a broad spectrum of states, non-governmental organizations, and private interests. Some brief examples of what we are currently doing on the ground at the Department follows.

National Invasive Species Council

The Department provides administrative support for the National Invasive Species Council (Council) and the Invasive Species Advisory Committee to build direct stakeholder involvement and collaboration between Federal agencies and non-federal partners. Interior bureaus work closely with Council staff to implement the invasive species activities called for in the first National Invasive Species Management Plan (Plan): leadership and coordination, prevention, early detection and rapid response, control and management, restoration, international cooperation, research, information management, and education and public awareness.

In keeping with that Plan, a "cross-cut" budget proposal for Federal agency expenditures concerning invasive species was prepared, for the first time, for the Fiscal Year 2004 budget. Based on the leadership provided by the National Invasive Species Council, the President's Budget for Fiscal Year 2004 focuses on seven areas for collaboration: ballast water management technologies, all-taxa early detection/monitoring system, sudden oak death in the southern Appalachian mountains, Maui early warning pilot project, Asian carp in the Chicago Ship and Sanitary Canal, tamarisk (salt cedar) control in the southwest, and nutria control in Louisiana and Maryland. The Department strongly supports the Council's efforts to identify areas of cooperation, to define common strategic goals, and to determine measurable performance standards. While the crosscut includes only a subset of total invasive species activities, it is a starting point for more comprehensive cooperative efforts that the Office of Management and Budget has encouraged for the Fiscal Year 2005 budget cycle.

National Park Service

The principles of coordination, targeted funding, and accountability are fundamental aspects of the nonnative invasive species management strategy pursued under the National Park Service's five-year Natural Resource Challenge program. As part of this program, a new management strategy, called the Exotic Plant Management Team (EPMT), was implemented to control harmful nonnative invasive plants. By Fiscal Year 2002, nine teams have been fielded to identify, treat, control, restore, and monitor areas of parks that were infested with harmful exotic plants. The nine teams serve 95 parks, in the Chihuahuan Desert–Shortgrass Prairie, Florida, Hawaii, the National Capitol Region, Lake Mead, the Northern Great Plans, California, the Gulf Coast, and the North Cascades.

The success of each EPMT derives from its ability to adapt to local conditions and needs. Each team sets work priorities based on a number of factors including: the severity of threat to high-quality natural areas and rare species; the extent of targeted infestation; the probability of successful control and potential for restoration; and opportunities for public involvement. The EPMTs have treated more than 68,000 acres and eradicated 9 species of harmful weeds from park lands. The Fiscal Year 2003 budget provides funding for seven additional EPMTs. Funding of these teams will raise our capacity to control invasive plants at 152 parks or approximately 40% of the parks in the lower forty-eight states. These new teams are in the process of mobilizing and will be controlling harmful weeds in the summer of 2003.

Fish and Wildlife Service

The Invasive Species program implements the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990, as amended by the National Invasive Species Act (NISA), and provides funding for Aquatic Nuisance Species (ANS) Task Force personnel, Task Force regional panels and their activities, and Aquatic Nuisance Species grants to states and Tribes to implement state or interstate ANS management plans. It also funds seven FWS regional coordinators and their respective invasive species activities. These coordinators work closely with the public and private sector to develop and implement invasive species activities.

The Program has also worked closely with the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce, the Environmental Protection Agency, and the U.S. Coast Guard to develop measures to control the introduction of aquatic nuisance species through ballast water. Additionally, working with the ANS Task Force Communication, Education and Outreach Committee, FWS has led the development of a national public awareness and partnership campaign, Stop Aquatic Hitchhikers! Designed for the entire conservation community, the campaign targets aquatic recreation users about actions they can take to stop the spread of aquatic invasive species. The primary resource is a national web site: www.ProtectYourWaters.net. Currently, this campaign has leveraged $2.3 million of Federal and non-federal funding to support aquatic invasive species outreach activities.

Additionally, through the Partners for Fish and Wildlife Program, which provides financial and technical assistance to private landowners, FWS helps landowners improve productivity of their lands by minimizing the spread of invasive species and improving habitat for a variety of fish and wildlife species. FWS has funded a number of different types of invasive species projects through the program, including prescribed burning, physical removal, fence construction, and restoration of native plant communities.

Over 470,000 acres were treated in Fiscal Year 2002. Further, a National Strategy for Management of Invasive Species is being developed that will include assessment information, monitoring recommendations, and best management practices, and will guide invasive species management on refuges nationwide. Preventive efforts, including an emergency rapid response program for the Refuge System, are key to preventing newly discovered infestations from gaining a foothold on refuges. Plans to initiate "strike teams," similar to those used by the NPS, are proposed for funding in Fiscal Year 2004. In conjunction with the National Wildlife Refuge Association, the Nature Conservancy, and the U.S. Geological Survey (USGS), a new program is being initiated this year that will use trained refuge professionals and volunteers to create a strong network for the early detection of invasive species.

Bureau of Land Management

The BLM is a partner in over 40 weed management areas in the Western United States, and conducts weed treatments on over 300,000 acres of range and forestlands annually. In addition, BLM is working on implementing the National Fire Plan to reduce invasive weeds by managing and reducing fuels and working with partners to enhance native plant restoration. One example is BLM's work through the Great Basin Restoration Initiative (GBRI) to restore degraded rangelands that are now dominated by flammable exotic grasses, like cheatgrass, and restore these areas to perennial vegetation before they convert to noxious weeds.

Bureau of Reclamation

The BOR is working with many partners to monitor and counter threats from invasive species that impact the management and delivery of water resources in the West. BOR's integrated pest management program uses a combination of mechanical, chemical, biological, and cultural methods to control invasive species. This program also provides technical assistance and special studies and demonstration projects to promote IPM concepts and solve specific pest problems. BOR also works on coordinated programs involving research, monitoring, education, and control to develop an effective management program.

U.S. Geological Survey

Finally, USGS provides client bureaus with research on all significant groups of invasive organisms in both terrestrial and aquatic ecosystems—from microbes to mammals.

USGS research provides the fundamental understanding of invader biology and factors in the vulnerability of habitats needed for developing effective responses. USGS also provides information and useful tools for early detection and assessment of newly established species, monitoring invading populations, predicting their

spread and impacts, and for prevention, management and control. Through the National Biological Information Infrastructure, USGS also has an important role developing information networks to make reliable information on invasive species available to stakeholders. Recognizing the importance of expanding scientific cooperation, USGS has established the USGS' National Institute of Invasive Species Science. The Institute is helping to facilitate cooperation between USGS programs and other agencies and organizations with complementary scientific capabilities in addressing invasive species threats to our ecosystems and natural heritage.

I hope that this brief overview makes clear that our goal is to maximize use of not only our bureaus' expertise but also that of our partners in state and tribal governments, as well as private landowners, in the fight to control invasive species. In this same vein, many of the Department's bureaus contribute to other initiatives, like the National Fish and Wildlife Foundation's (NFWF) "Pulling Together Initiative," the BLM's "Partners Against Weeds" (PAWS), and the FWS's Partners for Fish and Wildlife," with the goal of building partnerships with private landowners to eliminate harmful weeds and restore native plants and animal communities. Six of the seventeen member agencies on the Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW), which works to coordinate invasive weed management policy and information sharing, are from the Department of the Interior.

Adequacy of existing statutory authorities

We believe that existing statutory authorities are generally adequate to carry out effective prevention, early detection, rapid response, and control for most invasive species. However, one of the action items listed in the National Invasive Species Management Plan is for the National Invasive Species Council to conduct an evaluation of current legal authorities relevant to invasive species. This evaluation is to include an analysis of whether and how existing authorities may be better utilized. Once this review is finished, and if warranted, recommendations will be made for changes in legal authority.

Conclusion

I want to thank you for providing the Department the opportunity to offer this very general picture of the problem of invasive species and our programs and efforts to address them. Our goal is to ensure that our invasive species actions emphasize coordination of existing Federal efforts and local programs in order to strengthen ongoing invasive species programs and support new partnerships and initiatives. We look forward to working with the Committee and our partners—states, Tribes, and private individuals—to develop prevention, control, and management initiatives that recognize and strengthen these existing partnerships.

Mr. Chairman, this concludes my prepared remarks. I am happy to answer any questions you or other Committee members might have.

Mr. SAXTON. Thank you very much. Dr. Lambert.

STATEMENT OF DR. CHUCK LAMBERT, DEPUTY UNDER SECRETARY FOR MARKETING AND REGULATORY PROGRAMS, U.S. DEPARTMENT OF AGRICULTURE

Dr. LAMBERT. Thank you, Mr. Chairman. I am pleased to be here on behalf of USDA to discuss invasive species. As a farm boy growing up in western Kansas I learned at an early age the necessity of identifying and controlling invasive species. And even today as I drive across the countryside, it is kind of second nature for me to be on the outlook for Canadian thistle, bind weed and other species that I learned about in my childhood.

In today's mobile globalized world, invasive species have the means to move quickly from one habitat to another, and USDA does have extensive authority under the law to address these and other invasive species. The Plant Protection Act and Animal Health Protection Act give USDA the authority to set import regulations that help keep exotic pests and diseases out of the U.S. USDA officials also have authority to respond swiftly to detections that po-

tentially threaten U.S. agriculture, natural resources and the environment.

Six agencies within USDA have leadership roles in preventing and dealing with the introductions and spread of nonnative invasive species in the U.S. APHIS, or the Animal and Plant Health Inspection Service, provides an integrated safeguarding system to protect America's agricultural and natural resources. The Forest Service addresses invasive species that have been recently detected or have become entrenched on Federal lands under the agency's purview. The Natural Resources Conservation Service works with private land owners to use funds available through the Environmental Quality Incentives Program, the Wildlife Habitat Incentives Program and the Wetlands Reserve Program.

Secretary Veneman recently announced the opening of a new sign up for Conservation Reserve Program and released $1.8 billion for conservation assistance on working lands and to protect environmentally sensitive lands. Funds from within these programs can be used to eradicate, control and/or replace invasive species to achieve conservation goals.

Other USDA agencies closely coordinating with managing invasive species include Agricultural Research Service, CSREES and Economic Research Service. These agencies provide vital research and communications functions to invasive species management.

As my longer statement describes, USDA specialized agencies have distinct missions but they also work toward one primary goal with protecting the Nation's agriculture and natural resources and food supply. One of the most important initiatives we have undertaken is to participate in the National Invasive Species Council in the development of the interagency crosscut budget that Jim has already discussed. This budget helps agency personnel share information and provides a comprehensive view of the resources that each department and agency brings to the table for preventing and controlling invasive species.

USDA agencies are also members of several interagency, interdepartmental coordination groups that address invasive species. These groups help bring coordination and focus across the various program areas. The National Invasive Species Council is co-chaired by Department of Interior and Department of Commerce, and USDA brings a coordinated effort to work and involve the Federal agencies and ensures the resources are used widely and in a cooperative coordinated manner.

Besides the Departments represented on this panel, Department of Defense, Homeland Security, State, Transportation and the Environmental Protection Agency are members of the Council. The Council helps Federal agencies communicate not only with each other, but with State and local officials. Coordination of State, Federal, tribal, county and local governments and individuals are critical in the prevention and early detection and control of invasive species.

USDA is working to fill any gaps in contingency planning for detections of invasive species in natural or remote areas of the country. Situations involving invasive species can be extraordinarily complex. They cut across not only geographic but also agency

boundaries. In some cases we lack the knowledge to properly look for and eradicate new invasive species.

I will conclude my remarks with a couple of examples that are in addition to the brown tree snake and the coqui frog and nutria and exotic Newcastle glassy-winged sharpshooter, citrus canker and a whole host of other diseases that we work to prevent and eradicate. The emerald ash borer is an exotic forest pest recently discovered in Michigan, Ohio and portions of Canada. Officials of the Forest Service and APHIS are working closely with State and local representatives in Michigan and Ohio to determine just how widespread the emerald ash borer is and what we need to do to stop its spread. Removal of infested trees has already begun.

Finally ARS, APHIS, the Forest Service and Department of Interior have coordinated with State officials and local land owners to control leafy spurge on grazing lands in the West. Private landowners have welcomed control of this pest on neighboring public lands that often were viewed as a source of reseeding after controls were implemented by private property owners.

USDA appreciates the Committee's interest not only on the Invasive Species Program but also on the challenges we regularly face in responding to new situations working with new partners and taking into consideration different interests and viewpoints. Thank you for the opportunity. I look forward to responding to your questions.

[The prepared statement of Dr. Lambert follows:]

Statement of Dr. Chuck Lambert, Deputy Under Secretary for Marketing and Regulatory Programs, U.S. Department of Agriculture

Thank you. I am pleased to be here on behalf of the U.S. Department of Agriculture to discuss invasive species in the United States.

We do not need to spend a lot of time discussing the dangers inherent in invasive species, those injurious animals, micro-organisms, and plants that have the ability not only to survive, but to thrive in new environments. That many of these species are already here in the United States, or are being kept at bay nearby, highlights the fact that, in today's world, invasive species have the means to move quickly from one habitat to another. To understand how this is possible, we simply need to trace the routes that international and domestic travelers and cargo follow on a daily basis. As one of USDA's posters on this subject reminds us, "Not All Alien Invaders Are From Outer Space." We know that these dangerous invaders may try to hitch a ride in travelers' suitcases or agriculture produce bound for U.S. markets.

USDA has extensive authority under the law to address invasive species in the United States. The Plant Protection Act and Animal Health Protection Act, for example, give USDA the authority to set import regulations that help keep exotic pests and diseases out of the United States. When necessary, USDA officials can also respond swiftly to detections of invasive species that potentially threaten U.S. agriculture or the environment. USDA officials can quarantine affected areas, remove affected or exposed plants or animals, and, in serious cases, pay compensation to growers and producers in an effort to prevent the further spread of the pest or disease.

To help prevent invasive species from making their way to the United States, USDA enters into animal and plant health agreements with other countries to either prohibit imports from areas in which a pest or disease may be prevalent or to require treatments to mitigate the potential of an infestation. USDA also may implement preclearance inspections of imports at foreign ports, before they even arrive in the United States. In addition, about 2,700 inspectors recently moved from USDA to the new Department of Homeland Security. These personnel prevent the entry of articles that can endanger U.S. agriculture through inspections of people, cargo, and modes of transport at U.S. borders. While these inspectors now report to the Department of Homeland Security, they remain closely linked to the agriculture mission and will be available to assist us should an emergency situation arise.

Despite these efforts, the increased number of pathways available to invasive species can jeopardize our country in numerous ways, from public health, to the economy, to our native ecosystems. The estimated economic harm to the United States from biological invaders runs in the tens of billions of dollars and may exceed $120 billion annually. The reported number of cases of West Nile virus in birds, horses, and humans has risen dramatically each year since the disease was first confirmed in the Northeastern United States in 1999. The Asian longhorned beetle remains a problem in the New York City and Chicago areas. Various introduced weeds, such as giant hogweed, yellow starthistle, and kudzu, consume some 3 million acres of U.S. land every year. Nutria are responsible for the loss of marsh grasses in the Chesapeake Bay. And plant pests and diseases, such as citrus canker, sudden oak death disease, and the glassy-winged sharpshooter, threaten important domestic industries that employ thousands and are vital to State economies.

The Federal Government must deal with the problem of invasive species in a strategic manner. For this reason, the National Invasive Species Council was created through an Executive Order in 1999 to help plan for future challenges and coordinate prevention and response efforts across the country.

The Council, co-chaired by USDA and the Departments of Commerce and the Interior, coordinates the work of involved Federal agencies, ensuring that resources are used wisely and that our experts are consulted regularly. It helps Federal agencies communicate not only with each other, but with members of the public, industry groups, and State and local officials.

Of recent note, for example, the Council is working to provide State officials with expanded roles in the planning and coordination of efforts to address invasive species in the United States. In addition, the Council appoints members to the Invasive Species Advisory Committee (ISAC). The ISAC is comprised of an array of scientific and policy experts who provide information and advice for consideration by the Council and recommend plans and action against invasive species at the tribal, State, and regional levels.

The most important tool at the Council's disposal is its invasive species management plan. Developed and regularly fine-tuned by participating Federal agencies, the plan keeps involved officials on the same page and in contact with one another. National in scope, it is a blueprint that not only steers Federal efforts, but also helps us remain flexible and responsive to new situations.

For its part in the coordinated effort against invasive species, USDA provides its partners and cooperators with expertise in the areas of invasive species prevention, emergency response, control, and scientific research. These are some of the things that we do best, and we have refined our efforts in these areas over many years. The following points offer a brief overview of USDA's primary responsibilities with regard to invasive species, followed by more specific examples of some of the work being done by each of USDA's participating agencies:

- Prevention of new harmful introductions: USDA provides an integrated safeguarding system to protect America's agricultural and natural resources against invasive species. USDA's safeguarding system includes port inspections, quarantine treatments, detection surveys, and eradication efforts. Domestic programs also prevent the spread and establishment of invasive species within the United States.
- Management of Federal lands: USDA works to address invasive species that have been recently detected, or have become entrenched over the years, on Federal lands under our purview. This work includes controlling outbreaks and restoring impacted areas.
- Providing technical advice and assistance: Working directly with State officials and private landowners, USDA officials can often utilize and disseminate the latest information and technology developed by our researchers in the fight against invasive species. In many instances, new techniques and tools developed by USDA researchers and methods development specialists have made real differences during emergency outbreak situations and as part of our longer, sustained campaigns to control and eradicate invasive species.
- Research and technology development: USDA actively supports and carries out the empirical research necessary to establish basic knowledge of invasive species already present in the United States or located outside our borders. USDA also conducts research at the ecosystem level. With this knowledge base, USDA and its partners can take the appropriate steps to exclude invasive species and respond effectively to the ones already here in our country.
- Regulation: USDA works to develop science-based regulations that protect U.S. agriculture and the environment from invasive species and balance the needs and interests of producers, growers, shippers, and a host of other businesses and individuals across the country.

Within USDA there are six agencies that have leadership roles in preventing and dealing with the introduction and spread of nonnative invasive species into the United States. These agencies are involved in research, regulation, operations, partnerships, technical and financial assistance, and education.

The primary focus of our Animal and Plant Health Inspection Service (APHIS) is to protect American agriculture. In combination, APHIS activities are commonly referred to as our safeguarding system and encompass a broad range of efforts, including inspections, surveys, and pest and disease eradication programs. APHIS' new strategic plan emphasizes the protection of ecosystems against the establishment of harmful and costly invasive species. To meet this goal, APHIS officials, among other things, conduct in-depth analyses of the major pathways invasive species can follow into the United States. With this information, APHIS can adjust and tighten components of its safeguarding system to close down these pathways and maintain its high level of vigilance against the introduction and spread of harmful invasive species.

In other areas, the Agricultural Research Service (ARS) provides USDA with the latest innovations and technological breakthroughs in the field of invasive species management. ARS cooperates extensively with university and private partners to conduct research on a wide variety of pests, invasive plants, and animal diseases. These efforts are focused on detection technology for ports of entry, systematic research to rapidly identify exotic species, and pesticide application technology. ARS also conducts research on biologically based pest management, remote surveillance of pests targeted by integrated pest management programs, and restoration of grazing lands. ARS scientists and the Agency's stakeholders and partners can develop large scale, multi-disciplinary research teams, as well as targeted species-specific projects.

Agencies like the Forest Service and the Natural Resources Conservation Service are focused on taking care of our Nation's environmental resources. Coordination and consultation is important between Federal and private landowners who work together to manage nonnative weeds that grow across boundaries. The coordination and priority setting that occurs between Federal, State, and private partners becomes more critical as State and Federal funds that affect multi-jurisdictional boundaries are allocated. In locations where a national forest is adjacent to private land and invasive species have become a serious problem, the Forest Service can allocate funding to that location in a coordinated effort by combining resources from the National Forest System and State and Private Forestry Deputy Areas.

The Natural Resources Conservation Service can work with private landowners to use funds available through the Environmental Quality Incentives Program, the Wildlife Habitat Incentives Program, and the Wetlands Reserve Program. Secretary Veneman recently announced the opening of a new sign-up for the Conservation Reserve Program and released $1.8 billion for conservation assistance on working lands and to protect environmentally sensitive lands. Within this program, funds can be used to eradicate, control, and/or replace invasive plants to achieve conservation goals.

Invasive species can substantially increase the threat of catastrophic wildfires by increasing the amount of dead and dying vegetation on the landscape. In the aftermath of wildland fires, timely rehabilitation and stabilization projects also are critical to preventing additional threats to ecosystems posed by invasive species. As part of the President's Healthy Forest Initiative, USDA and the Department of the Interior have proposed two proposed categorical exclusions to the National Environmental Policy Act (NEPA) that will increase the ability of the agencies to expeditiously reduce hazardous fuels and engage in restoration projects.

The Cooperative State Research, Education, and Extension Service (CSREES) supports USDA agencies at the local level with outreach efforts and research programs at Universities and land grant colleges as well. In addition, CSREES is working along with APHIS right now to bolster our Nation's diagnostic laboratory infrastructure—a critical initiative with regard to homeland security and our ongoing vigilance against foot-and-mouth disease and other exotic pests and diseases of concern.

And, finally, USDA's Economic Research Service (ERS) conducts research and analysis of economic issues connected to agriculture and the environment, including invasive species, integrated pest management programs, biodiversity, and agricultural and environmental sustainability. ERS is also developing a new research program that will concentrate on examining the economics involved in managing invasive species in the United States. Research generated by this program will assist USDA officials in making policy and program decisions and directing resources to needed areas.

These specialized agencies have distinct missions, but they all work toward one primary goal of protecting the Nation's agriculture, environment, and food supply. Addressing invasive species is a large and multifaceted part of this task, but USDA works to coordinate efforts and present a unified front. One of the most important initiatives we have undertaken is to participate in the development of an invasive species interagency "cross cut" budget, led by the National Invasive Species Council. The Fiscal Year 2004 crosscut contained only a subset of USDA activities, in the Fiscal Year 2005 effort we plan to include all USDA programs and other efforts related to invasive species. This initiative is helping agency personnel share information and resources and reduce repetitive activities. We are also better able to support research that gives us new tools to improve our prevention and response programs. And we can consider and develop new approaches to longstanding problems.

USDA agencies are also members of several interagency/interdepartmental coordination groups that are working to address invasive species in the United States. These groups include the Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW); a new interagency group called Managing Invasive Insects, Animals and Diseases; and the Aquatic Nuisance Species Task Force. Participation in these groups, in addition to ongoing interaction with professional societies and academia, helps our officials stay in close contact with other Federal agencies, scientific and industry experts, and a host of other groups all working in different areas of the invasive species effort.

In the fight against invasive pests, USDA realizes that community groups and residents are some of our strongest allies. USDA and our cooperators can't be in every neighborhood, every forest, every park simultaneously looking for exotic pests. Each extra pair of eyes, then, that we can rely on to look for signs of plant disease, strange-looking insects, or exotic weeds are an invaluable asset to our surveillance programs.

In last year's homeland security supplemental funding package, USDA received additional funding to support pest detection activities. We have distributed this money to the States so they can help us improve the infrastructure needed to organize, coordinate, manage, and facilitate pest detection surveys at the State level. The objective of this pest detective initiative is to educate and enlist the cooperation of appropriate nongovernmental groups—gardeners, tree wardens, university diagnostic laboratories, and nature conservancies—to be on the lookout for exotic and indigenous plant pests and diseases. Because these groups are on the front lines, they will likely prove most efficient and effective in detecting signs of pests and diseases at the field level.

In conjunction with expanded surveillance for invasive pests, we acknowledge the absolute necessity of being able to respond to serious pest and disease detections in a swift and coordinated manner. USDA has specific emergency response guidelines for many of the invasive plant and animal pests or diseases that pose a significant threat to the United States, including foot-and-mouth disease, bovine spongiform encephalopathy, and some exotic fruit flies. We've developed these response plans in conjunction with our Federal, State, and local partners and even conducted exercises to test our preparedness. To ensure maximum speed and effectiveness, we have rapid response teams stationed around the country ready to travel to detection sites to coordinate Federal, State, and industry containment and eradication efforts.

APHIS, based on the model developed by the Forest Service to manage fire response efforts, has moved to the incident command approach to emergency response. Incident command places teams of emergency personnel and managers directly in the field to coordinate response efforts. These teams, in turn, report to incident commanders on the scene, in addition to a national incident commander and other involved officials across the country. By virtue of their placement and size, the teams and their commanders have a high level of autonomy, are able to respond quickly to new or evolving situations, and can provide extremely timely information to decisionmakers. In addition, teams from various local, State, and Federal agencies all speak the same language when working an emergency and can tap into a wider network of resources.

APHIS also has a new Emergency Operations Center located within the Agency's headquarters outside Washington, D.C. The Center is an 8,800-square-foot, state-of-the-art facility that serves as the national command center for management of APHIS emergency programs. During an emergency, it can support 65 personnel and operate 24 hours a day, 7 days a week. The Center's communication capabilities include video teleconferencing, advanced computer interfaces, and Geographical Information System mapping. The Center, in combination with quick-response incident command teams, gives APHIS the tools and resources necessary to effectively co-

ordinate and manage the comprehensive response to emergency situations that have the potential to seriously affect U.S. agriculture or the environment.

USDA is also working right now to fill the gaps in contingency planning for detections of invasive species that may occur in natural or remote areas of the country, places that are difficult to access or located away from our routine monitoring and surveillance efforts. USDA, for instance, is participating with FICMNEW in developing an early warning plan for invasive plants. To protect the environment, the public health, and agricultural industries, it is essential that we monitor for and respond swiftly to all invasive species introductions. As we've learned, the risk of spread and damage to our resources is too great for us not to be prepared.

Now, while USDA has worked hard to ensure that we have the infrastructure, tools, and support necessary to address invasive species in today's world, there are some instances when we find ourselves challenged by an unforeseen problem. Situations involving invasive species can be, at times, extraordinarily complex, cutting across not only geographic but agency boundaries. Another complication is that in some cases we lack the knowledge to properly look for and eradicate new invasive species. In these situations, Federal officials must oftentimes balance quick response with patience and planning. Emergency research also needs to be made a priority and incorporated into response plans to give officials the information and tools necessary to do their jobs. And, most importantly, the interests and needs of those most affected must always remain in focus.

One example is the emerald ash borer, an exotic forest pest recently discovered in Michigan, Ohio, and portions of Canada. This pest, a relative of the Asian longhorned beetle, demonstrates the frustration that can be brought about by invasive species. Many years ago, after the exotic Dutch elm disease wiped out trees across the country, ash trees were planted in backyards, forests, and parks. Many of these trees have reached the size of the elms they replaced, and now another invasive species threatens them. Officials with the Forest Service and APHIS are working closely right now with State and local representatives in Michigan and Ohio to determine just how widespread emerald ash borer is and what we can do to stop its spread. Removal of infested trees has already begun in parts of Michigan and Ohio.

Another example is that of sudden oak death disease, a newly identified forest disease. The disease, which has killed thousands of tanoaks and oaks in coastal areas of central California, was introduced into the United States a few years ago. At that time, APHIS and the Forest Service developed a National Sudden Oak Death Detection Survey of forests through the Forest Service's Forest Health Monitoring Program. Since the establishment of the survey, small infestations were recently found in southern Oregon and eradication efforts have begun. Laboratory investigations indicate that other oak species, including northern red and pin oak, are susceptible to the pathogen. The Forest Service and APHIS are working closely with other Federal, State, county, and local government agencies, as well as nonprofit organizations to ensure a coordinated sudden oak death detection survey is implemented in high-risk areas nationwide.

In Florida's Everglades, Old World climbing fern, a plant native to Africa, Asia, and Australia, has become well-established in many areas, smothering shrubby and herbaceous plants on the ground and climbing into the tree canopy. In some places, the fern has engulfed entire Everglade tree islands, pinelands, and cypress swamps. It has even spread across open wetland marshes. As a result, native plants have not been able to regenerate, as thick mats of old fern material have accumulated on the ground. And, should a fire occur, the fern can help to spread the conflagration along the ground, up and on top of trees, and even through wet areas. Because of these serious threats, for the last several years, USDA and its partners in Florida have been working to stop the spread of Old World climbing fern. While herbicides and hand-cutting have registered some success in specific areas, these techniques cannot be used across the entire Everglades, and herbicides cannot be used in certain sensitive areas. USDA researchers, therefore, are also examining the potential of employing biological control organisms against this plant. With further research and the appropriate approval, it may soon be possible that tiny moths, mites, or perhaps some other organism may be deployed in the Everglades to check Old World climbing fern.

A final example of a challenging situation involving an invasive species is the coqui frog in Hawaii. This small, invasive frog has become established in areas of the State, much to the displeasure of many residents, tourists, biologists, and agricultural producers. However, at the same time, the frog is beloved in its natural home of Puerto Rico, and animal rights groups have objected to efforts to address its presence in Hawaii. USDA scientists have been working to develop suitable control techniques that may help to reduce coqui populations in Hawaii. While USDA

is currently conducting more study in this area, our officials in Hawaii have also taken the lead in drafting a management plan for Caribbean tree frogs in the State.

USDA appreciates the Committee's interest in not only our programs to address invasive species, but also the problems we regularly face in responding to new situations, working with new partners, and taking into consideration different interests and viewpoints. As USDA's point person for invasive species, I am learning much in these areas as well, and I look forward to working with the Committee in the future. Thank you for the opportunity to be here today.

Mr. SAXTON. Thank you very much, Dr. Lambert. Dr. Brandt?

STATEMENT OF DR. STEPHEN BRANDT, DIRECTOR OF GREAT LAKES ENVIRONMENTAL RESEARCH LAB, NOAA

Dr. BRANDT. Thank you, Mr. Chairman.

Having major responsibilities for the Nation's coasts, NOAA is keenly concerned about aquatic invasions. Aquatic invasions cause significant ecological disruptions and economic costs to the Nation estimated in the billions of dollars. You are threatened by coastal invasions if you fish, swim, eat fish or seafood, are a recreational boater, if you drink Great Lakes water, if your power company uses water for cooling or if your State depends on tourist dollars.

Invasive species are identified as a leading cause of the loss of biodiversity in aquatic environments worldwide, perhaps second only to habitat destruction. Invasive species can replace or eliminate native species, alter habitats, change contaminant cycling and interfere with human use of natural resources.

New Zealand regards the problem as a national marine biosecurity issue. Over the past few decades the rates of invasions have accelerated. Large aquatic environments are most vulnerable, and once established in an ecosystem an invader changes that ecosystem. Each new invader is unique and thus specific impacts vary from region to region.

Hundreds of invasive species have entered each of our major coastal waterways. The large size and complexity of these ecosystems make it difficult to initially detect a new invader under the surface of the water and nearly impossible to eliminate it.

As an example, the invasion of zebra mussels in the Great Lakes has gained the attention of the Nation. The Great Lakes are unique because they provide the gateway to America's heartland. Zebra mussels currently threaten all freshwater systems in the U.S., including those on the West Coast. Just the cost of chemically treating industrial and municipal water intakes is $100 to $400 million per year in the Great Lakes alone. Zebra mussels also cause toxic algae blooms which can cause taste and odor problems in drinking water, and research has indicated that the zebra mussel is now responsible for the loss of a bottom dwelling organism that has been in the Great Lakes since their formation. This is harmful to the whitefish commercial fishery and is threatening a $4 billion sports fishery.

Similar stories could be told in San Francisco Bay, Chesapeake Bay, Hawaii and other large ecosystems. Prevention is critical, but we must first identify how these species are being introduced. In our coastal systems ballast water transport and discharge from ships is the major invasive pathway. Over two-thirds of recent introduction are likely due to ship borne vectors. Nine of the last 12

species that entered the Great Lakes in the last 10 years have come from ballast water. The rate of introductions is increasing because of the expansion of trade and the speed of transportation. Ballast carries organisms ranging from human pathogens to fish, and recent research by NOAA and its partners has shown that ships without ballast water carry enough residual material and live organisms to pose a significant threat as well.

The NOAA Ballast Water Technology Demonstration Program has funded a variety of projects to evaluate technologies and practices to prevent further introductions from ballast tanks. This work has been fruitful, but none of the technologies are yet ready for widespread use. There are other significant pathways as well such as inadvertent aquarium releases, hull fouling, live bait introductions, inadvertent transfer by boaters and canals that link different water systems. Changes in coastal water quality and habitats can also alter their vulnerability to invasions.

For example, the Great Lakes are currently being threatened by the Asian carp that was an escapee from aquaculture sites, which is moving up the Mississippi River and can enter the Great Lakes via the Chicago Sanitary and Ship Canal. An electronic barrier has been set up to try to prevent entry into the Great Lakes.

NOAA's National Sea Grant Program has also been instrumental in helping States to develop statewide invasive species management plans and have been leaders in working with the bait and aquaculture industries to mitigate inadvertent introductions.

Control activities are very costly. Educating user groups can also be an effective way to reduce the inadvertent transfer of species from one body of water to another. Eradication is rare, expensive and requires true partnerships. Early detection, rapid scientific assessment and response may help managers to maximize successful control and also minimize impacts.

NOAA has established a pilot project with the Bishop Museum in Hawaii to conduct early detection monitoring for new invaders. If successful, this program will be expanded to other coastal regions as resources permit. To minimize ecological and economic impacts we need to understand the basic biology of the invader, how the ecosystem will change and what will be the extent of the impact and can we adapt our management strategies to accommodate its presence.

NOAA recognizes the importance of this issue and will continue in our efforts to deal with aquatic invaders. To this end NOAA has recently incorporated aquatic invasive species as a major theme in its new strategic plan in consultation with our partners and consistent with the national management plan.

Finally, research underlies all of these activities. In order to maximize use and coordination of NOAA scientific resources, NOAA is in the process of creating a NOAA-wide National Center for Aquatic Invasive Species Research.

I hope this brief summary of my more extensive written comments will be useful. Thanks for the opportunity to be here today, and I am happy to answer any questions.

[The prepared statement of Dr. Brandt follows:]

Statement of Stephen B. Brandt, Director, Great Lakes Environmental Research Laboratory, National Oceanic and Atmospheric Administration, U.S. Department of Commerce

Good afternoon, Chairman Gilchrest and Chairman Radanovich. My name is Stephen Brandt. I am Director of the Great Lakes Environmental Research Laboratory, a research component of the National Oceanic and Atmospheric Administration (NOAA) within the Office of Oceanic and Atmospheric Research.

NOAA is the Nation's premier Federal agency, with responsibilities for enhancing the value of and protecting the vital resources in both marine and Great Lakes ecosystems. The Great Lakes Environmental Research Laboratory (GLERL) is NOAA's leading institution for aquatic invasive species research and has authorization to carry-out such research. Therefore, I am grateful for the opportunity to discuss the scope of the invasive species problem, although I will restrict my comments to aquatic invasive species, given the nature and mission of my agency.

Scope of the Problem

Invasive species now constitute one of the largest present, and future, threats to our coastal ecosystems, our coastal economies, and human health in our coastal regions. Our coastal ecosystems are not just inconsequential bodies of water that happen to be adjacent to the lands we live on—rather, they support and nurture our society and our economy, they harbor and provide valuable natural resources for human use that both feed us (fisheries, water supply) and entertain us (recreational boating, fishing, and swimming), and they protect our shoreline (coral reefs, wetlands and marshes) from the extremes of nature.

Species invasions are now a major global concern, with serious implications and consequences for the United States at National, regional, and local scales. Aquatic species invasions are threatening and impacting coastal ecosystems worldwide and many coastal states are taking or planning some form of protective action. The natural barriers that have limited the range of aquatic organisms are being rapidly overcome by anthropogenic activities. Let me say here that the majority of invasive species vectors are the result of perfectly legitimate activities, which have unintended consequences. I do not wish to be critical of private individuals, or any particular industry, I simply want to highlight that innocent activities can have major, cumulative, long-term affects on our environment.

Ship-borne ballast water is the most significant vector of introductions for aquatic invasive species worldwide (NRC, 1996). Other significant vectors include inadvertent aquarium releases, live-bait introductions, recreational boating and semi-submersible oil platforms. Changes in coastal water quality and coastal habitats can alter the vulnerability of some of the nations coasts to invasions (Carlton, 2001). Invasive aquatic species have caused significant economic losses and ecological disruptions in the U.S. and elsewhere. Invasive species are identified as a leading cause of species extinction and loss of biodiversity in aquatic environments worldwide, perhaps second only to habitat loss (Vitovsek, P. M., H. A. Mooney, J. Lubchenco and J. M. Melillo. 1997. Human domination of Earths Ecosystems. Science 277:494–499). Invasive species can replace or eliminate native species, change nutrient and contaminant cycling, affect ecosystem productivity, and can cause losses of economically valuable fisheries. Some invasive species, such as the zebra mussel, can change the structure of entire ecosystems and cause direct economic harm by clogging water intakes for municipal or industrial uses. The resulting economic damages are shared by all natural resource beneficiaries, including industrial and municipal water users, recreational boaters, the fishing public, riparians, vessel operators, and beach users. New Zealand, an island nation particularly vulnerable to aquatic invasions, regards the problem as such a major threat that at the Federal level they refer to it as a National "marine biosecurity" issue.

Scientists have been quick to identify the major species invasion "vectors," these "vectors" being the means by which species are able to move between ecosystems. Increases and changes in ballast water transport, hull fouling, recreational boating, semi-submersible oil platforms, inadvertent aquarium releases, live-bait introductions, canals, and aquaculture are the major ones (Ruiz, G. M., J. T. Carlton, E. D. Grosholz, and A. H. Hines. 1997. Global invasions of marine and estuarine habitats by non-indigenous species: mechanisms, extent, and consequences. American Zoologist 37:621–632.; Ruiz, G. M., P. W. Fofonoff, J. T. Carlton, M. J. Wonham, and A. H. Hines. 2000. Invasion of coastal marine communities in North America: apparent patterns, processes, and biases. Annual Review of Ecology and Systematics 31:481–531.; Carlton, 2001). To be certain, some natural processes, such as storms, have been responsible for transporting species between separated ecosystems, but human activity has surpassed and overwhelmed both the scope and speed at which

nonindigenous species are being delivered to new ecosystems. For example, unwanted alien pests are entering Hawaii at a rate estimated by the U.S.G.S. to be about 2 million times more rapid than the natural rate (http://www.hear.org/); a Canadian study based on DNA and genetics calculated that human-mediated dispersal of crustacean zooplankton now exceeds natural dispersal by up to 50,000 times (Hebert, P. D. N. and M. Cristescu. 2002. Crustaceans, invasions and genes. Can. J. Fish. Aquat. Sci. 59:1229–1234).

Ballast water transport and discharge is, by far, the most universal and ubiquitous of the major aquatic invasion vectors and represents the greatest immediate threat to most coastal state ecosystems. Over two-thirds of recent, non-native species introductions in marine and coastal areas are likely due to ship-borne vectors (Ruiz, G. M., P. W. Fofonoff, J. T. Carlton, M. J. Wonham, and A. H. Hines. 2000. Invasion of coastal marine communities in North America: apparent patterns, processes, and biases. Annual Review of Ecology and Systematics 31:481–531). The rate of introductions in various coastal ecosystems continues to increase with expansion of trade and the speed of transportation. There are an estimated 35,000 ships plying the oceans today. James Carlton, a noted scientist, once estimated that at any time of day there are several thousand aquatic species being carried in the ballast tanks of ships moving between coastal states (Carlton, J. T. 1999. The scale and ecological consequences of biological invasions in the world's oceans. In Invasive Species and Biodiversity Management. O. T. Sandlund, P. J. Schei, and A. Viken, eds. Kluwer Academic Publishers, Dordrecht, Netherlands. 195–212; Carlton, J. T. 2001. Introduced Species in U.S. Coastal Waters: Environmental Impacts and Management Priorities).

Ballast water is not only ubiquitous, but carries organisms ranging from human pathogens to fish. The port states of Brazil and Argentina require some ships to chemically disinfect their ballast tanks before being allowed entry rights, because of the fear of human pathogens such as cholera. A November 2000 report in the science journal Nature documented the presence of both types ("serotypes" O1 and O139) of cholera bacteria that are associated with human epidemics in the ballast tanks of 93% of ships sampled in Chesapeake Bay.

However, ballast water is not the only vector of importance in some regions. There are 24 species of non-native algae in Hawaiian waters at present, some of which have taken over whole areas of coral reef. Some of these algae have been introduced via hull fouling. Inappropriate release of aquarium species is a major source of nonindigenous species in Hawaii's inland freshwater streams and ponds (ANS Task Force Meeting, November 2002).

In the Great Lakes region, ballast water, escape from aquaculture sites, and the aquarium and bait trades appear to be the most significant vectors. The most recent known potential aquatic invasion threat comes not from ballast water, but from a combination of aquaculture and canals—as the Committee members may know, three species of large Asian carp (silver, black, and bighead) that escaped from aquaculture sites in our southern states are moving up the Mississippi River system and are within striking distance of the Great Lakes via the Chicago Sanitary and Ship Canal. An electronic barrier has been set up in the canal to try to stop the spread of this introduction into the Great Lakes.

All mainland coasts of the United States—East, West, Gulf, and Great Lakes, as well as the coastal waters of Alaska, Hawaii, and the Pacific Islands, have felt the effects of an ever increasing number of successful aquatic species invasions. I suspect that members of this Committee are already familiar with some of the gross statistics—202 known or possible nonindigenous species in Chesapeake Bay (Smithsonian Environmental Research Center, Edgewater, Maryland, Mariner Invasion Research Lab website: http://invasions.si.edu/Regional/reg—chesapeake.htm), over 230 in the San Francisco Bay estuary (National Invasive Species Council. 2001. Meeting the Invasive Species Challenge: Management Plan. 76 pp), at least 162 in the Great Lakes waters (Mills, E. L., J. H. Leach, J. T. Carlton, and C.L. Secor. 1993. Exotic species in the Great Lakes: a history biotic crises and anthropogenic introductions. J. Great Lakes Res. 19: 1–54.; Ricciardi, A. 2001. Facilitative interactions among aquatic invaders: is an "invasional meltdown" occurring in the Great Lakes? Can. J. Fish Aquat. Sci. 58:1–13.), at least 544 in the 5-state Gulf of Mexico coastal system (USEPA (U.S. Environmental Protection Agency). 2000. An Initial Survey of Aquatic Invasive Species Issues in the Gulf of Mexico Region. Version 4.0. Table 5. EPA 855–R–00–003. September 2000.) and in Pearl Harbor and Honolulu, almost half the species are non-native. Prince William Sound, Alaska is the recipient of large amounts of ballast water originating from the west coast of the U.S., including San Francisco Bay, an invasive species hot spot.

The effects on the invaded ecosystems of many of these foreign species have appeared—to the casual human observer—to be minimal. However, once established

in an ecosystem, an invader, by definition, changes that ecosystem. Each new invader will have its own niche, type of effect, degree of change it produces, and timing with which its impact may become discernable. Losses in one part of an ecosystem can reverberate throughout the ecosystem to affect all resources within it. Our coastal ecosystems function in finely tuned balance that evolved over millennia. When that balance is disrupted, such as by changes in the structure and function of the food web through shifts and reductions of important native food web components, the services and benefits provided by the ecosystem are put at risk, and affect our economy through loss of resource value or added expenses to recover, restore, and maintain desired resource values.

Some Examples

First, from my own backyard—the Great Lakes. Great Lakes resource managers have been cognizant of this problem, and have been dealing with managing invasive species for nearly half a century. The sea lamprey and alewife were two of the key invaders into the Great Lakes in the 1950's, having reached the upper lakes aided by the interconnecting canals. These invaders were costly to the Great Lakes. Management efforts have been directed at control either though direct means (with the sea lamprey) or through the introduction of a predator, the Pacific salmon, for the alewife. The sea lamprey, the Great Lakes' oldest documented aquatic invader, caused the collapse of fish species that were the economic mainstay of a vibrant Great Lakes fishery. Before sea lampreys entered through canals, the United States and Canada harvested about 7 million kgs. (15 million lbs.) of lake trout in lakes Huron and Superior annually. By the early 1960s, the catch was only about 136,000 kgs. (300,000 lbs.). The fishery was devastated, with losses in the billions (Great Lakes Fishery Commission web site: http://www.glfc.org).

Extensive scientific research, during which over 6,000 chemicals were tested, identified a chemical treatment leading to a program that controls, but cannot eradicate, the lamprey. The cost to the United States and Canada has increased over time and is now about $14M per year. However, I would also point out that for a $14M per year expense, lake trout and salmon recreational sport fisheries valued at an estimated $4B became possible again and are thriving.

More recently, the zebra mussel invasion into the Great Lakes has captured the attention of the nation on this issue. You are likely familiar with the zebra mussel—which we refer to as the "poster child" for aquatic species invaders. The Great Lakes basin is the aquatic gateway to the heartland of America and a hot spot for aquatic species introductions to major interior sections of the U.S. While the spread of aquatic species introduced in most U.S. coastal ecosystems is generally restricted to adjacent contiguous coastal ecosystems, the Great Lakes provide a pathway for freshwater-adapted invasive species to spread throughout the interior waters of the central and eastern United States. One need only examine the spread of zebra mussels to understand this—they are now found outside the Great Lakes—St. Lawrence River system as far west as eastern Arkansas, as far south as the Mississippi delta below New Orleans, Louisiana, and east as far as the Hudson River estuary north of New York City. You have probably heard of the economic costs attributed to zebra mussels clogging water intake pipes. They have fouled industrial and municipal water intakes, which must now be chemically treated on a regular basis throughout the summer months to keep them flowing. Estimates of the annual cost of zebra mussel control and mitigation range from $100 to $400 million per year in the Great Lakes basin, but the zebra mussel has already spread throughout most of the eastern half of the country.

Do you know that the zebra mussel is also responsible for the repeated reoccurrence of blue-green algae blooms in certain large areas of the Great Lakes? These algae produce a toxin known as microcystin. These algae also cause water quality taste and odor problems in the municipal water supplies in affected areas. Research at the NOAA Great Lakes Environmental Research Laboratory has also implicated the zebra mussel in the slow, but steady elimination of Diporeia, a shrimp-like animal that has been a dominant bottom-dwelling organism in the Great Lakes since their formation at the end of the Ice Age. Diporeia are the primary food source for lake whitefish, a commercially valuable fish species in the Great Lakes. Loss of Diporeia is an example of an invasive-species caused food web disruption that can be directly linked to declines in the body condition of lake whitefish. As a result, lake whitefish are becoming thinner and less marketable for the commercial fisheries. For several fish species, including bloater (Coregonus hoyi), whitefish (Coregonus clupeaformis), slimy sculpin (Cottus cognatus), yellow perch (Perca flavescens), and trout-perch (Percopsis omiscomaycus), Diporeia is the principal prey. These fish are, in turn, the primary food of the trout and salmon that support most of the Great Lakes sports fishery. Research is examining the impact of this

disappearance on the $4B sports fishery. Moreover, declines in the popular yellow perch population in Lake Michigan followed the establishment of zebra mussels and are also believed to be directly linked to some form of ecosystem or food web disruption. The more we know, the better we can mitigate economic losses

In San Francisco Bay, the introduced clam Potamocorbula amurensis is such an efficient filter feeder that it has eliminated phytoplankton blooms in the northern portion of the Bay. Since phytoplankton are at the very base of the food chain, it is expected that there will be cascading impacts throughout the food chain. Studies have also demonstrated that populations of zooplankton and mysid shrimp in San Francisco Bay have dropped. Although there has been little research on the next link in the chain, the fact that juvenile fish feed on zooplankton and mysid shrimp should raise concern. In most food chains the higher organisms—clams, mussels, and fish, for example- are often the basis for economically valuable fisheries, and the implications of cascading food web disruption include loss of fishery value, loss of recreational (fishing) opportunity, and loss of income and jobs. A recent study has raised another issue related to this invasive clam species. Researchers have found very high selenium concentrations in the clams, which could have an impact on birds and fish that feed on them.

In the Chesapeake Bay, resource managers are very concerned about the potential impact on native Bay species of the recent invader, the veined rapa whelk (Rapana venosa), a gastropod mollusk originating from the Sea of Japan. Since it feeds on bivalve mollusks, the Bay's clams and oysters are threatened by the spread of the rapa whelk.

Also in the Chesapeake Bay, and in Louisiana, coastal wetlands are being lost due to the voracious appetite of the introduced nutria.

A University of Hawaii study estimated the cost of invasive algae to be $20 million per year for the island of Maui alone.

In summary, invasive species are ubiquitous and represent a global scale problem, but with impacts and economic costs hitting us at the national, regional, and local scales. Aquatic invasive species affect virtually every coast of the United States. The invaders range from bacteria and human pathogens, to plants, to small and large aquatic animals. In aquatic ecosystems, the rate of invasions is accelerating as the magnitude of travel and trade increases and as the speed of transporting materials increases. There is no doubt that such invasions have major economic and environmental consequences and affect each of us individually.

Efforts to Prevent, Control or Eradicate

Prevention

Before touching on control activities, I think that it should be emphasized that prevention is our first and most important line of defense against species invasions. Control is often much more expensive than prevention, and sometimes becomes an ongoing expenditure. The example of the sea lamprey provided earlier in this testimony illustrates this. An investment made to prevent an introduction is quite often the most cost effective method of dealing with a potential problem.

The Members of this Subcommittee are likely familiar with the concept of ballast water exchange, its use as an invasive species risk reduction method, and its limitations. To address the serious limitations to mid-ocean ballast water exchange, Congress initiated a competitive research program by adding Sec. 1104 of the National Invasive Species Act of 1996, which is administered for the Department of Commerce by the NOAA Sea Grant Program Office in partnership with the Department of Interior's Fish and Wildlife Service (FWS) and the Maritime Administration (MARAD). This program was designed to encourage development and demonstrate technologies and practices that will prevent nonindigenous aquatic species from being introduced into the Great Lakes and other waters of the United States. Projects funded under this program are selected through an annual peer-reviewed open competition process.

The Ballast Water Technology Demonstration Program has funded projects covering all stages of technology development and demonstration, from bench-scale investigations through pilot scale demonstrations, including some full-scale field tests on ships engaged in commercial activity. Additionally, NOAA invites the submission of additional ballast water research proposals through the more general aquatic nuisance species competitive grant program administered by the National Sea Grant College Program under Sec. 1202(f) of the Act. Shipboard tests have occurred for eight of nine ballast treatment techniques discussed in the 1996 National Research Council report titled, Stemming the Tide: Controlling Introductions of Nonindigenous Species by Ships" Ballast Water, as well as for some newer technologies not covered in that report.

Since 1998, the technologies being investigated have matured so that more projects involve full-scale tests of ballast water treatment equipment and fewer involve small laboratory scale experiments. These shipboard tests have brought us significantly closer to the development of mature ballast water treatment technologies, but none is ready for widespread use by the maritime fleets of the world. There is general consensus that "there is no currently universal technological solution, nor is there likely to be one in the very near future, and mid-ocean ballast water exchange is currently the only practical ballast water management option...(direct quote from Harmful Aquatic Organisms in Ballast Water, submitted by the United States to the International Maritime Organization, Marine Environment Protection Committee, 48th Session, Agenda Item 2, July 17, 2002).

The difficulty arises when attempting to move these technologies to full-scale shipboard testing under operational conditions. Limitations of space and power on commercial vessels, and limitations in the rate of ballast water treatment that can be achieved with systems amenable to shipboard retrofit, have so far precluded any near-future practical application of these technologies on all but a few small vessels in the existing commercial fleet. In addition, actual full-scale testing of these systems relies of the availability of suitable commercial ships as test platforms. While the industry has been generally supportive and has made operating vessels available for testing, commercial ships operate on very tight, yet changeable schedules, and first and foremost they operate to serve their commercial clients. Any experimental testing of ballast water treatment systems must be done on a "not to interfere" basis. This means that the scientists and engineers attempting to test and verify their systems at operational scale and under operational conditions, do not have full control over the test timing or test conditions. Commercial ships cannot readily be delayed or diverted to rerun an experiment or to adjust testing conditions.

NOAA recognizes that continued work is needed in all areas of prevention, not just ballast water technology research. NOAA's National Sea Grant Program has played a major role in defining the research agenda on aquatic nuisance species, including ballast water research. The 2000 report, "Aquatic Nuisance Species Report: An Update on Sea Grant Research and Outreach Programs," documented work on 22 species in 24 states, the largest of its kind. Sea Grant programs have been instrumental in the development of state invasive species management plans on every coast, and have been leaders in working with the bait and aquaculture industries to mitigate inadvertent introductions. Sea Grant developed the Hazard Analysis and Critical Control Point (HACCP) approach to identify and correct practices that could present a risk of invasive species. This HACCP program is now in use in fish hatcheries in many states and by the U.S. Fish and Wildlife Service.

Complementing the broad resources Sea Grant brings to the university community, the NOAA Great Lakes Environmental Research Laboratory is in the final year of a three-year, multi-institutional research program to assess the risk of invasion posed by No–Ballast–On–Board ("NOBOB") vessels in the Great Lakes. NOBOB vessels are those that do not carry pumpable ballast water as they enter the Lakes fully loaded with cargo. However, residual ballast in their tanks have now been documented by this research to contain live organisms and dormant viable eggs of invertebrate and algal species. These residuals can mix with lake waters brought on as ballast when cargo is offloaded at ports in the Great Lakes, which may eventually be discharged in other ports. The results of the NOBOB research are already being made available and should assist the shipping industry and regulators in determining best management practices for reducing the amount of residual sediment and live organisms in ballast tanks. Another part of that program is evaluating the effectiveness of mid-ocean ballast water exchange as a barrier to potential invasions, with several experiments being planned for this year.

In recognition of the likely long-term use of ballast water exchange as an invasive species management option, GLERL, in partnership with the Navy and with the assistance of the shipping industry, is just beginning to explore the use of computer modeling and computational fluid dynamics to better understand the mechanics and dynamics of fluid flow in a ballast tank during exchange. We hope that this will help identify ways to improve the consistency and efficiency of exchange, thus improving the level of protection ballast water exchange may provide for our coastal ecosystems. The proposal for this research was competed and funded under the Ballast Water Technology Demonstration Program.

Control

There is a tendency to equate control activities with eradication, but they actually encompass a wider range of options. Once an invasive species is established and widely distributed, eradication is often not possible. Under such circumstances, con-

trol activities may include reducing the size of populations, containing the invasion, or mitigating the impact of a species. Harmful affects can often be minimized with early detection, understanding, and prediction of potential impacts and adaptive management.

We can learn much about controlling invasive species from our counterparts on the terrestrial side, who, at least in the area of agriculture, have been dealing with the issue for more than a century. However, there are many ecological, biological, logistical and economic issues related to controlling aquatic invaders that have no counterpart on the terrestrial side. In these situations, new research must be conducted and totally new control tools devised. As an example, two summers ago we were confronted with a major bloom of Australian spotted jellyfish in the northern Gulf of Mexico. They were so plentiful that shrimpers had to stop fishing because they could not cast their nets without the jellyfish clogging them. A rapid survey in areas where the jellyfish were most abundant showed that they were removing virtually 100 percent of zooplankton from the water column. We recognized immediately that this was a major food web disruption in the making, but we were confronted with the fact that no one had ever tried to control jellyfish populations in the past, and we had no idea of how to accomplish control measures. Although this particular infestation died off, we are researching responses for the next time the situation occurs.

We are also having to learn how to conduct biocontrol in ways our terrestrial counterparts have never had to consider. Biocontrol is the introduction of a predator or pathogen that affects an invasive species. It is a well-established technique for control of terrestrial invasive species such as weeds. Before such an introduction takes place, it is important to determine that the biocontrol agent does not cause unintended harm to native species and is safe for humans. The Army Corps of Engineers and the Department of Agriculture have been successful in finding biocontrol agents for some aquatic plants such as alligator weed and purple loosestrife, and there is research directed toward other aquatic plant species such as giant Salvinia, Hydrilla, and Spartina.

However, very few biocontrol agents have been developed for aquatic animals. With guarded optimism, I would like to report, however, that research supported jointly by NOAA Sea Grant and FWS, may have had a breakthrough in this area. Pseudomonas bacterium, a pathogen that destroys the digestive gland of zebra mussels, has been discovered, and it appears not to harm native species of mussels or other animals. The scientists who found the Pseudomonas bacterium looked at over 600 different pathogens. Although early results are promising, it is important that further research verify that the agent poses no risk to native mussels, the environment, or human health.

I would also like to mention another important control activity—education and outreach. Educating user groups can be an especially effective tool. This is particularly true in the case of invasive aquatic species, and the Aquatic Nuisance Species Task Force is making a concerted effort in a couple of areas. One of the most significant pathways for the spread of successful invaders such as zebra mussels and aquatic plants is recreational users. Such species are often carried from one body of water to another by boats. The Aquatic Nuisance Species Task Force has made a concerted effort to reduce boating as a pathway for introduction. NOAA, FWS, and the Coast Guard have all funded efforts to educate boaters. There is evidence that such an approach may help contain invasive species. A recent study by Minnesota Sea Grant comparing states that had aggressive education campaigns with states where very little was being done, showed that education can not only increase boater awareness, but also change boater behavior. In addition, the 100th Meridian project funded by FWS has, so far, prevented the spread of zebra mussels to western states on recreational boats. A major challenge looming in the near future may be to prevent or respond to the unintentional spread of aquatic invasive species, like the zebra mussel, during the Lewis and Clark Bicentennial celebration starting this year.

Eradication

While eradication is usually much more difficult and expensive than prevention, it can sometimes be accomplished when the necessary players can react quickly and work together. With fingers crossed, I would also like to report the apparent successful eradication of a species that has received considerable attention recently—Caulerpa taxifolia, the so-called "killer algae of the Mediterranean." Caulerpa was found in a lagoon just north of San Diego in the summer of 2000. After two and a half years work to eradicate a rather small infestation in a cooperative effort involving several Federal and State of California agencies, we now have gone two consecutive quarters without detecting any new growth of the invasive algae.

The Caulerpa eradication project illustrates two important points. First, eradication efforts, even small ones, are expensive. It has cost the State of California and other contributors (including NOAA) over $4 million to eradicate this rather small infestation, and the monitoring necessary to ensure that eradication is complete will increase this amount. Second, in most instances, control and eradication efforts require active partnerships with State governments. Not only do they have primary jurisdiction over most areas, but they also have more on-the-ground resources available.

Another example of an apparently successful eradication was reported in connection with the African sabellid polychaete worm, introduced into California coastal abalone farms in the mid- to late–1980s via an imported South African species. These worms infest and weaken the shells of the California abalone, reducing growth rates and production, and thus, their value. Sea Grant sponsored researchers showed that these worms can also infest many types of native marine snails, not just abalone. In the late 1990s researchers completed a reportedly successful project to eradicate the sabellid from a coastal area where it had been transmitted to native gastropods. However, there are recent reports indicating that a few isolated cases may still remain or that the pest has reemerged in a few locations. This illustrates just how difficult it can be to achieve total eradication of an aquatic pest.

Early Detection and Rapid Response

Early detection is necessary before we can have any hope that rapid response may be potentially successful. To this end NOAA's National Ocean Service has established a pilot project with the Bishop Museum in Hawaii to conduct early detection monitoring for new invaders in key Oahu harbors and bays. If successful, NOAA will expand the program to other coastal regions as resources permit. However, early detection may prove problematic, since it is difficult to know, for any particular ecosystem, where to focus monitoring, what to look for, and when to look, yet the alternative, a broad an unfocused monitoring program, can rapidly become expensive and untenable. As NOAA develops this program it will explore these issues through applied research to develop new or modified monitoring techniques and tools.

Rapid response to new species invasions may help managers, industries, and researchers establish the nature of a new invasive species, its current and potential distributions, vectors of dispersal, potential ecological and industrial impacts, and potential control and/or eradication options. For example, when notified of a new invasive species in the U.S., the Animal and Plant Health Inspection Service (APHIS) under the U.S. Department of Agriculture, one of the oldest invasive species-fighting organizations in the United States, organizes a 'New Pest Advisory Group' consisting of government officials and appropriate experts. This group meets and acts quickly to discuss the known biology of the organism, its potential damage and range, mitigation strategies, and possible actions. Based on these discussions, the group makes a recommendation to APHIS to either take action, or not, on the newly detected exotic pest. This process was used to respond to the discovery of the invasive "pine shoot beetle" in 1992 on a Christmas tree plantation near Cleveland, Ohio. Within a few days of being notified, APHIS brought together concerned parties from industry, academia, and state and Federal agencies in a "New Pest Advisory Group" to share information and develop response strategies. Through this process, they were able to rapidly establish the extent of its distribution and potential impacts on industry, and start the process to develop a regulatory response.

At the present time, no framework exists to support and carry out rapid scientific assessment of new aquatic invader populations. Yet gathering and verifying information and compiling summary findings and recommendations is a necessary precursor to supporting informed and effective resource management decisions that do not waste taxpayer funds on costly eradication attempts that have little chance of success. When a new invasion is reported, a team of appropriate experts needs to be quickly assembled to gather and verify information and assess whether the invasion is a candidate for attempted eradication or control. A framework needs to be developed under which a rapid scientific invasion assessment team can be assembled and activated in response to reports of new species. Rapid assessment of new AIS arrivals can be useful in helping resource managers become aware of new demands on the ecosystem and to plan management actions. For example, the Fish Health Committee under the Great Lakes Fishery Commission has developed a model program and risk assessment guidelines for evaluating new fish diseases that may be useful in developing a similar framework for aquatic invasive species.

What if We Fail (to Prevent, to Control, to Eradicate)

Once a species has become established in an ecosystem, the ecosystem, by definition has changed, and the species is nearly impossible to eradicate. An invader redefines the ecosystem. Unlike many chemical contaminants that dissipate through time, invasive species do not have a "half-life" and they are here to stay. We can try to contain the species, but it is very difficult to actually control the species in large ecosystems, and there is no silver bullet for control because each new invader has its own unique life history and place in the ecosystem. Thus, for many invasive species, control may entail finding methods of reducing their impact, or, lacking any viable control or eradication, humans may have to adaptively manage the affected ecosystems and resources. Long-term changes in an ecosystem caused by an invader may necessitate adapting our management of water quality and economically valuable resources, such as fisheries, to the altered conditions. This requires revision of management strategies (i.e., adaptive management) that can only be accomplished on the basis of scientific understanding of the changes that have occurred. How can this be done?

Of fundamental importance are the following concerns: How does that changed ecosystem affect the ecology and economy of the region? What will be the extent of the impact? And can we adapt our management strategies to accommodate its presence? This requires answers to two critical and equally important questions:

(1) What is the basic biology, life history, and reproductive strategy of the invasive species?

and

(2) How will this new species fit into and change the ecosystem functioning?

The answer to the second question clearly demands that we know how the ecosystem functions to begin with. Fundamental ecosystem understanding and long-term data sets will lead to early detection and evaluation. Once there is a basic understanding of the ecosystem, assessing the role of each new invader is somewhat easier. In contrast, once a species enters, it is too late to ask, what was the ecosystem like before the invader arrived? A study that lasts only 1–2 years is insufficient because the natural year-to-year variability in an ecosystem can be high or unknown.

For example, over the last 15 years the Great Lakes have undergone a new wave of species invasions dominated by exotic invertebrates- zebra mussels, quagga mussels, the spiny waterflea and the fishhook waterflea. Unlike previous invasions in which vertebrates dominated (e.g., sea lamprey and alewife), these invertebrates inserted themselves in the lower trophic levels and thus disruption percolates up through the food web with potentially serious consequences to fish communities. This bottom-up effect on the food web eliminates the potential application and modification of existing fisheries models to make fishery management decisions. Scientists at GLERL, in partnership with the Great Lakes Fishery Commission, are conducting research to quantify and develop tools for forecasting the rate and extent of food web impacts of these four invaders for use in assessing the need to revise fishery management plans in the Great Lakes.

Legal Gaps

One of the action items listed in the National Invasive Species Management Plan is for the National Invasive Species Council to conduct an evaluation of the current legal authorities relevant to invasive species. The evaluation is to include an analysis of whether and how existing authorities may be better utilized. Once this review is finished, and if warranted, recommendations will be made for changes in legal authority.

The Congress anticipated one emphasis of this Administration in 1990 when it set up a structure that encouraged coordination and cooperation among several Federal agencies. As I have pointed out in this testimony, there are significant areas in which agencies on the Aquatic Nuisance Species Task Force are establishing priorities together, sharing expertise, and jointly funding specific actions. This same concept has been carried through in the broader Invasive Species Council. This Administration has made more efficient use of resources—whether human or financial—a priority. Such cooperation and coordination is particularly important in the area of invasive species where partnerships with other Federal agencies and State governments are often necessary. At the urging of the Administration, a pilot crosscutting budget on invasive species was prepared for Fiscal Year 2004, which included interagency cooperative activities. In Fiscal Year 2005 the plan is to expand the invasive species activities included in the crosscut.

Finally, the invasive species problem is nationwide and is most effectively coordinated at the national level. However, implementation at the regional (coastal) or ecosystem level is most practical and makes the most sense, since different U.S. eco-

systems will have different invasive species issues and characteristics, i.e., the ecological and economic impacts, source regions, mechanisms, and pathways for invasion will not be the same, nor of the same importance.

Working to Find Solutions

We were asked how to solve this vexing problem. It will take time, resources, long-term dedication, and the national will. I suspect that the problem will never be totally solved. Because species invasions are so closely linked to human economic and recreational activities, I can guarantee you that there will be new introductions despite our best efforts. Control efforts will still be needed both for new introductions and for those species already here. We can, however, reduce the number of new introductions by interdicting the most significant pathways. There is promising new research on genetic engineering coming out of Australia that may provide a way to eradicate certain invasive species. And, we can reduce the impact of species that have been introduced by detecting them and responding quickly, and by learning how to best adapt to those that are successful.

We can also reduce the impact of invasive species by developing new tools for control and by more effectively coordinating our utilization of resources, not only among the various Federal agencies but also with our partners on a State and local level. As demonstrated by the eradication of Caulerpa through a joint State, Federal and university partnership and by the unparalleled continuing contributions of Federally funded programs to advancing invasive species research, and providing useful management tools and solutions, preventing and controlling invasive species is a task that will only be successful if the Federal Government has adequate resources and authority to work closely and quickly with the States, universities, and citizens in regions affected by aquatic invasions.

Because the problem will continue into the future, we must recognize that a continuing commitment is necessary. Although it is certainly ambitious, the National Management Plan prepared by the Invasive Species Council does provide a good blueprint for the range of activities that will be necessary to fully address the invasive species issue.

Particularly in marine and coastal areas, the science of biological invasions is still very young, and we are still learning, yet significant progress has been made in some areas. There is, however, much more that remains to be accomplished. As a trustee for marine and coastal resources, NOAA recognizes the importance of this issue and will continue in our efforts to deal with aquatic invaders. To this end, I am pleased to report that, under the leadership of Vice Admiral Lautenbacher and with the active support and involvement of Deputy Assistant Secretary Timothy R.E. Keeney, NOAA has incorporated Aquatic Invasive Species as a major theme in its new strategic plan. GLERL and the National Sea Grant Program Office have worked together with other elements of NOAA towards this end. GLERL is charged with leading the development of the NOAA-wide implementation plan. The plan will include elements of prevention, monitoring for early detection, rapid response, and management (eradication, control, adaptation) of successful invaders, as well as international cooperation and information exchange, and coordination with external programs under the National Sea Grant Program. The plan is being developed in an inclusive cross–NOAA process, after which it will be distributed to our constituent and partner communities for comments and suggestions prior to being finalized.

Underpinning all elements of the NOAA plan will be a broad program of coordinated NOAA research, involving NOAA labs such as GLERL and their external partners, as well as the National Sea Grant Program network. As pointed out in the National Management Plan (National Invasive Species Council, 2001), "Research supports each aspect of the Plan. Research assists policy makers in assessing gaps in authority and program policy, and it supports invasive species resource optimization, prioritization, and public outreach efforts." In order to maximize use of NOAA's scientific resources and to assure cross–NOAA prioritization and coordination of research activities, NOAA is in the process of creating a National Center for Aquatic Invasive Species Research, to be housed at and administered by GLERL.

Chairman Gilchrest, Chairman Radanovich, and Members of the Subcommittee, this concludes my testimony for today. Thank you for the opportunity to testify, and I would be happy to respond to any questions that the Subcommittee may have.

Mr. SAXTON. Thank you very much, Dr. Brandt. Dr. Theriot.

STATEMENT OF DR. EDWIN THERIOT, MISSISSIPPI VALLEY DIVISION, ARMY CORPS OF ENGINEERS

Dr. THERIOT. Thank you, Mr. Chairman. I am pleased to be here to testify on aquatic invasive species. My testimony will focus on invasive aquatic nuisance species, which is what the Corps of engineers addresses in the inland waterways and, where we have specific authority, focus on those problems.

Invasive aquatic species such as hydrilla, Eurasian watermilfoil, zebra mussels, Chinese mitten crab, mosquitoes transporting West Nile virus and others can have a profound effect on the function and values of water resources in the United States. These species are out of their native habitat and have no natural predators and their growth and reproduction is prolific.

The Army Corps of Engineers tries to undertake research control and eradicate aquatic nuisance species. We also have authority to remove aquatic growth from navigable waters to allow for navigation and flood protection. In addition, we have through the Aquatic Nuisance Species Prevention and Control Act of 1990, and amended in 1996, worked on aquatic nuisance animals such as zebra mussels and others.

The Aquatic Plant Control Program has two primary components. The first is a component for undertaking activities to control aquatic plants in specific waters that is cost shared, 50-50 basis, with non-Federal interests. The second is the research component, 100 percent Federal funded, for development of cost effective, environmentally compatible management technologies. The objective is to develop cost effective, environmentally compatible aquatic plant management technologies which address national needs and priorities, research conducted under this program and research efforts and cooperative research efforts with other Federal agencies and State agencies, universities, local governments and private industry. Research efforts focus on developing capabilities to use host specific biological agents, improve technologies for oversight, enhance growth for native endemic plants, developing integrated management strategies and development of techniques to establish desirable aquatic vegetation.

In Fiscal Year 2004 the budget request was $3 million. Since this fiscal year, the Corps' annual aquatic control program budget request has been approximately that amount with the focus being on the research component. In the invasive nonplant species area there are many zebra mussels which clog intake structures, reduce hydro power output and colonize endangered species. The Corps is responsible for these infrastructures.

The Chinese mitten crab burrows into flood control levees and dams, threatening their structural integrity. The failure of levee and dam could cause catastrophic economic and human loss to the region. Some dredge material disposal areas have mosquito breeding habitats located near large population centers. We have already had to dispatch scientists to some of these areas to investigate whether these mosquitoes harbor the West Nile virus.

We are working with other Federal agencies and the National Invasive Species Council to develop a more coherent program for prevention, early detection and control of invasive species. To date, the research has resulted in development of guidance concerning

control of zebra mussels, information systems, zebra mussel chemical call, control handbooks for facility operators, and the results of this research has been available to all interested parties and will continue our efforts to find better methods to prevent—and inexpensive effective control for aquatic invasive species.

We are working with the National Invasive Species Council to develop a uniform method for reporting economic costs of invasive species impacts. We are working with NISC to improve reporting of interdiction and management costs through invasive species interagency costs cut budget. The Fiscal Year 2004 crosscut contained only one substantive Corps activity. In Fiscal Year 2005 efforts we plan to expand the number of activities included.

In general, we believe the existing statutory authority for the Army Corps of Engineers program for research and actual control of aquatic plant and nuisance species is sufficient. However, one of the action items listed in the National Invasive Species Management Plan is for the National Invasive Species Council to conduct an evaluation of current legal authorities relevant to invasive species, and we welcome this.

We believe the majority of the Americans are not aware of the severity of invasive species problems in the United States or the damage that occurs to our natural resources and our economy. We believe that the coordinated approach and interagency cost cutting budget and management plan now under the NISC is sound and will lead to national multiagency integration of prevention and management strategies.

In summary, our authorities are limited to inland waterways and are limited to control of these species after they have arrived. We feel that priority should be placed on preventing their introduction; second, to allow us to do rapid response, to eradicate species when detected early.

My time is up. Thank you, sir.

[The prepared statement of Dr. Theriot follows:]

Statement of Dr. Edwin Theriot, Director of Management, Mississippi Valley Division, U.S. Army Corps of Engineers, Department of the Army

INTRODUCTION

Mr. Chairmen and members of the Subcommittees, I am Dr. Edwin Theriot, Director of Management in the Mississippi Valley Division, United States Army Corps of Engineers. I am pleased to be here today to respond to your questions concerning the invasive species affecting this Nation and the programs of the Army Corps of Engineers focused on addressing these problems. My testimony will focus on invasive aquatic nuisance species as that is the area most affecting the Army's Civil Works program and where we have specific authorities focused on the problems.

SCOPE OF THE INVASIVE SPECIES PROBLEM

In the broader picture, the introduction of invasive animals and plant species into habitats and ecosystems is a major threat to the well-being of the Nation. According to the National Invasive Species Council, invasive species account for about $137 billion every year in economic costs. The strength of this Nation is based on the diversity and abundance of our natural resources. Our natural resources provide food to feed our nation and others; provide the resources needed by industry to strengthen our economy and move goods efficiently and cheaply; provide opportunities for our people to enjoy the beauty and benefits of these diverse habitats and ecosystems; plays major role in the heritage of our country; and, create security for future generations. The replacement of these natural habitats and ecosystems with large monocultures of non-native species threatens our well-being and the strengths that make us a great country.

Invasive aquatic species, such as hydrilla, Eurasian watermilfoil, zebra mussels, Chinese mitten crabs, mosquitoes transporting West Nile virus, and others, can have a profound effect on the function and values of the water resources of the United States. These species are out of their native habitat, have no natural predators and their growth and reproduction is prolific. The population of a species can become so large that it can: impact the movement of ships and/or barges moving goods on our waterways; take up large amounts of space which significantly reduces the ability of the water body to store water for flood control or irrigation; slow the flow of water causing siltation and nutrient loading; clog machinery, valves, water intakes, and pipes that support operations affecting navigation, the generation of power and water supply; impede or prevent recreational activities such as boating, swimming, or fishing; and, can cause oxygen and light deprivation that significantly decreases water quality. In cases such as the West Nile virus the invasive species can be a direct threat to human health.

EFFORTS TO CONTROL OR ERADICATE UNWELCOME INVADERS

The Army Corps has authorities to undertake research and other activities to control and eradicate aquatic nuisance species. They are the Aquatic Plant Control Program, authorized by section 104 of the River and Harbor Act of 1958, as amended, the Removal of Aquatic Growth program, authorized by the River and Harbor Act of 1916, as amended, the Non-indigenous Aquatic Nuisance Species Prevention and Control Act of 1990 (PL 101–646), and the National Invasive Species Act of 1996 (Subtitle C, Sec. 1202 (i)(3)(A)). In spite of these efforts and the efforts of others, invasive species continue to be introduced and many are spreading at an alarming rate. According to a General Accounting Office report issued in October 2002, all current efforts by the United States and Canada are not adequate to stop the introduction of invasive species into the Great Lakes from ballast water alone.

Aquatic Plant Control Program

The Aquatic Plant Control Program has two primary components. The first is a component for undertaking activities to control aquatic plants on specific waters that is cost- shared on a 50/50 basis with non–Federal interests. The second is a research component (100 percent Federal funding) for the development of cost-effective, environmentally compatible management technologies.

The focus of the control component is selective eradication of specific types of exotic or nuisance aquatic plant infestations. Control actions would be implemented in areas where aquatic plant nuisance species threaten the regional economy because of negative impacts to navigation, flood control, public health, water quality, fish and wildlife, drainage, irrigation, and to a lesser extent, recreation. The control component of the program is not applicable to Federal agency projects or facilities.

The Aquatic Plant Control Research Program (APCRP) is the research component of this program. The objective of this research is to develop cost-effective, environmentally compatible aquatic plant management technologies, which address national needs and priorities. Research conducted under the APCRP involves Corps of Engineers research efforts and cooperative research efforts with other Federal agencies, state agencies, universities, local governments, and private industry. Research efforts focus on developing capabilities to use host-specific biological agents, improved techniques for using herbicides, enhanced knowledge of the role of aquatic plants, developing integrated management strategies and guidance, and the development of techniques for establishing desirable aquatic vegetation. The APCRP provides water resources managers with the tools needed to restore aquatic ecosystems to achieve sustainable benefits provided by a healthy and diverse native aquatic plant communities. The effective use of new technologies is ensured through the appropriate transfer of information and techniques using a variety of media. Some of the new tools and products developed include the approval to release 12 insect biological control agents, environmentally compatible and user-safe formulations of aquatic herbicides, an ecosystem approach to aquatic plant management, techniques for ecosystem restoration, PC-based simulation and plant growth models, an automated system for detection and mapping of submersed aquatic vegetation, and an Aquatic Plant Information System on CD–ROM providing information on the identification and management of over 60 plant species.

The Fiscal Year 2004 budget request is $3 million. Since Fiscal Year 1996, the Corps annual Aquatic Plant Control Program budget request has been approximately that amount, with the focus being on the research component with the maximum return. Due to specific direction provided by Congress, much of the funding provided has been directed at specific control activities thereby limiting and delay-

ing specific research efforts to control new invasive aquatic plants such as Giant Salvinia and Arundo donax.

Removal of Aquatic Growth

In addition, we have activities in Alabama, Florida, Louisiana, Mississippi, and Texas. These activities ensure the removal of aquatic plant nuisance species in navigation channels that would impede the movement of commercial vessels. These activities are supported with "Operations and Maintenance" funding at 100 percent of Federal Cost. The average expenditures for these operations are approximately $4 million per fiscal year.

Invasive Non-plant Species

In addition, there are many other invasive species that impact or have a high potential to impact Corps civil works projects. Zebra mussels clog water intake structures, reduce hydropower output, and colonize on endangered species. The Chinese mitten crab burrows into flood control levees and dams, threatening their structural integrity. The failure of a levee or dam could cause catastrophic economic and human loss to a region. Some dredged material disposal areas have mosquito-breeding habitats located near large population centers. We have already had to dispatch scientists to some of those areas to investigate whether those mosquitoes harbored the West Nile virus. Carp are causing extensive problems in river systems—eating native vegetation and disrupting the food chain. The Chicago Sanitation and Ship Canal Barrier system was completed last year to interdict carp going upstream and round gobys in the Great Lakes from entering the Mississippi River system.

We are working with other Federal agencies and the National Invasive Species Council (NISC) to develop a more coherent program for prevention, early detection and control of invasive species. Our Invasive Species Research Program is currently funded at about $750,000 annually. To date the research has resulted in the development of guidance concerning control options, a Zebra Mussel Information System, a Zebra Mussel chemical control guide, a control handbook for facility operators, and guidance on dispersal barrier options to prevent the spread of aquatic invasive species. The results of this research have been made available to all interested parties and we will continue our efforts to find better methods for the prevention and inexpensive effective control of aquatic invasive species. We are working with the NISC to develop a uniform method for reporting economic cost of invasive species impacts. We are also working with NISC to improve reporting of interdiction and management costs through the invasive species interagency "cross cut" budget. The Fiscal Year 2004 crosscut contained only a subset of Corps activities, in the Fiscal Year 2005 effort we plan to expand the number activities included.

IS EXISTING STATUTORY AUTHORITY SUFFICIENT?

In general, we believe that the existing statutory authority for Army Corps of Engineers programs for research and actual control of aquatic plant and nuisance species is sufficient. One of the action items listed in the National Invasive Species Management Plan is for the National Invasive Species Council to conduct an evaluation of current legal authorities relevant to invasive species. The evaluation is to include an analysis of whether and how existing authorities may be better utilized. Once this review is finished, and if warranted, recommendations will be made for changes in legal authority.

We believe that the majority of the Americans are not aware of the severity of the invasive species problem in the United States or the damage that occurs to our natural resources and our economy. We believe that the coordinated approach, and the interagency cross cut budget and management plan now underway by the NISC is sound and will lead to National multi-agency integration of prevention and management strategies

CONCLUSION

We need research to prevent invasive species from degrading our locks, dams, and hydropower facilities. We know, for example, that zebra mussels accelerate the erosion rates at lock structures but we do not have techniques to coat those structures to prevent the zebra mussels from becoming attached. Further work needs to be done on ballast water to prevent the introduction of new species. Again, we are encouraged by the interagency ballast water management proposal between the U.S. Geological Survey, the Fish and Wildlife Service, the Coast Guard and the National Oceanic and Atmospheric Administration as a part of the Fiscal Year 2004 invasive species cross cut budget. We would also recommend further herbicide research to examine slow release formulations and perform research on target specific types of herbicides. Natural biocides also need attention as a natural way of controlling some invasive species. Many of the species that are causing the greatest economic and ec-

ological impact have natural predators in their countries of origin that keep the species populations in balance.

Finally, we think it is important that all Federal agencies inform the public about the economic cost of invasive species and what they can do to prevent introductions of new species to areas not infected. We cannot overstate the importance of human intervention. We are concerned that the U.S. population does not have a true grasp of the full impact that invasive species have on their day- to- day lives or understand the economic cost that these species represent. Accordingly, we think the invasive species public awareness survey proposed by agencies of the Department of the Interior and Department of Agriculture as part of the invasive species interagency cross cut budget will be an important step forward. The survey will increase our understanding about what the public knows about invasive species, and inform our decisions to target educational activities that address the knowledge gaps.

Thank you for the opportunity to present this information. I would be pleased to answer any questions.

Mr. SAXTON. Thank you. Those buzzers had nothing to do with it. Mr. Baughman.

STATEMENT OF JOHN BAUGHMAN, EXECUTIVE VICE-PRESIDENT, INTERNATIONAL ASSOCIATION OF FISH AND WILDLIFE AGENCIES

Mr. BAUGHMAN. Thank you, Mr. Chairman, and members of the Subcommittee. My name is John Baughman, and I am the Executive Vice President of the International Association of Fish and Wildlife Agencies. All 50 State wildlife agencies, America Samoa and Guam are among our members. I appreciate the opportunity to present our perspectives on the topic raised in your invitation letter.

The scope of the invasive species problem is large and growing larger and the issues crisscross the Nation. Giant salvinias are a significant threat to water conveyance, water conservation, fishery resources and water based recreation in the Southwest. Zebra mussels have demonstrated their virulence with regard to fisheries productivity and diversity in the Great Lakes. New Zealand mud snails apparently reduce productivity of western trout streams without providing any positives, and they have spread to multiple sites in the West, including Yellowstone Park and the Grand Canyon.

The Association and its member State wildlife agencies support a comprehensive, coordinated, practical and workable national management approach that focuses on these species that are truly invasive and deleterious. We believe emphasis should be placed upon the prevention and illegal importation and release, whether it is intentional or accidental, of invasive species. To that end we must better fund and coordinate Federal agencies responsible for safeguarding our borders.

We must also address opportunities for partnerships with State and local agencies to assure better coordination of preventive accidents. We are concerned about the implementation of Federal policy for determining which species will be designated, "invasive" in the absence of a well-defined decisionmaking process that involves the States as appropriate partners.

Invasive species management must recognize that not all introduced alien species are deleterious. In fact we productively manage many introduced species to the benefit of the people of our States and the Nation. Pheasants and brown trout are good examples.

A major jurisdictional concern is the potential assertion of Federal authority over Fish and Wildlife that is not within Federal purview. A clear process of identifying deleterious species must be a collaborative effort with the States and affected stakeholders. We are concerned that strategies outlined in the National Invasive Species Management Plan may proceed with a broader interpretation of, "invasive" than the National Invasive Species Council intends.

To adequately protect our borders and effectively respond to unwanted invasions, partnerships among Federal, State, tribal and local jurisdictions are essential. We can only mount effective lines of defense and responses to recognized invasions if all partners share similar capabilities and are coordinated in their efforts.

Building the capability and capacity of State and local partners to respond is a must. Early detection of deleterious species and a real ability to respond rapidly are also essential to defend against invasives. We endorse the concept of rapid response teams, including State, tribal and local entities. This approach with intended Federal support may provide the most economical means to eradicate or control invasive species.

States welcome a well orchestrated Federal leadership role in addressing invasives that recognizes State authority for management of resident fish and wildlife and does not attempt to usurp or control the management of those species under State jurisdiction. To effectively and appropriately meet the objectives of Executive Order 13112 and the National Invasive Species Management Plan, greater emphasis should be placed upon the partnership and shared authority between the Federal Government, tribal interests, the States and other effective stakeholders.

The Association believes that a national approach to prevention, control and management of invasive species needs to include nonregulatory incentive driven programs that support and build capacity at the State and local level and encourage voluntary cooperation of affected private entities and communities.

Awareness by the public and industry will be key to successful prevention and control efforts. The American public is an educated public, and informed awareness is needed to gain support for invasive species management coordinated lines of defense. We need to work better with existing management and legislative mechanisms before seeking out new pervasive Federal authorities.

For example, the Lacey Act has been used, as mentioned before, to help control deleterious species. Other existing Federal and State laws and regulations should be worked on before we seek further authorities. A mechanism for coordinating the activities of Federal agencies already exists with groups such as the Federal Interagency Committee for the Management of Noxious and Exotic Weeds and the Aquatic Nuisance Species Task Forces. The Association recommends that established interagency Committees such as these should be utilized to their fullest potential by the National Invasive Species Council.

In closing, the Association and its members look forward to working with Congress and our Federal, State and local partners to develop and implement sound national policy for prevention control and management of invasive species.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Baughman follows:]

Statement of John Baughman, Executive Vice–President, International Association of Fish and Wildlife Agencies

Mr. Chairman, members of the Subcommittees, my name is John Baughman. I am the Executive Vice–President of the International Association of Fish and Wildlife Agencies. The Association was founded in 1902 as a quasi-governmental organization of public agencies charged with the protection and management of North America's fish and wildlife resources. The Association's governmental members include the fish and wildlife agencies of the states, provinces, and Federal Governments of the U.S., Canada, and Mexico. All 50 states are members. The Association is a key organization in promoting sound resource management and strengthening Federal, state, and private cooperation in protecting and managing fish and wildlife and their habitats in the public interest.

As you are aware, the State fish and wildlife agencies have broad statutory authority and responsibility for the conservation of fish and wildlife resources within their borders. The states are thus legal trustees of these public resources with a responsibility to ensure their vitality and sustainability for present and future citizens of their States. State authority for fish and resident wildlife remains the comprehensive backdrop applicable in the absence of specific, overriding Federal law. The State fish and wildlife agencies thus have concurrent jurisdiction with the Federal agencies for migratory birds, threatened and endangered species and anadromous fish. Because of our responsibility for and vital interest in the conservation of fish and wildlife resources, we have a significant vested interest in working to address the problem of invasive species and their impact on fish and wildlife populations and the terrestrial and aquatic habitats that support those populations.

The Association appreciates this opportunity to present to the Subcommittees our perspectives on the four topics raised in you invitation letter: 1) scope of the invasive species problem; 2) efforts to control or eradicate invasive species; 3) whether existing statutory authority is sufficient to stop the expansion; and 4) recommendations to solve the problem. Recommendations are offered by the Association throughout the testimony in the hope they will contribute to solving problems and resolving issues.

Scope of the Problem

The Scope of the problem is large and growing larger. From giant salvinia to zebra mussel, from round goby to yellow star thistle—- the issues crisscross the nation. Impacts to fish and wildlife resources and wildlife-related recreation are both direct and indirect. Giant salvinia is a significant threat in the southwest to water conveyance, water conservation, fisheries resources, and water based recreation (fishing, hunting, and boating). Zebra mussels have demonstrated their virulence with regard to fisheries productivity and diversity in the Great Lakes. New Zealand mudsnails apparently reduce productivity of western trout streams without providing any positives, and they have spread to multiple sites in the west, including the Grand Canyon.

The numbers provided in your letter of invitation to this hearing give an idea of the magnitude of the problem. Estimates of over $100 billion in annual losses to the U.S. economy and 5,000 acres of public wildlife habitat lost each day to noxious weeds underscore the need for active management efforts to combat invasive species. The Association and its member state wildlife agencies agree with and support a comprehensive and coordinated approach to address this issue of national importance by working together at the national, state and local levels to implement a practical and workable national management approach that focuses on those species that are truly invasive and deleterious.

Efforts to Control and Eradicate Invasive Species

We believe that emphasis should be placed upon the prevention of illegal importation and release of invasive species into the United States and its territories, either intentionally or accidentally. Such prevention, in particular at the borders of our nation, is the key to a successful national invasive species program. To that end, we must better fund and coordinate Federal agencies responsible for safeguarding our borders from invasive species. We are very supportive of this kind of funding. We must also address opportunities for partnerships with state and local agencies to assure better coordination of prevention activities.

Management of pathways (the means and routes by which invasive species are imported and introduced into new environments) is the most efficient way to ad-

dress the unintentional introduction of invasive species. The Association supports efforts underway to identify high-risk invasive species pathways and to develop effective technology and education programs to reduce the threat of introduction.

We are concerned about the implementation of invasive species policy in the absence of a well-defined process. Although numerous attempts have been made to better define and qualify "invasive species," the definition is still in question. Invasive species management must recognize that not all introduced or alien species are invasive. In fact, we productively manage many introduced species to the benefit of the people of our states and of the nation. We are concerned with the implementation of policy that lacks a clear process for determining which species will be designated "invasive" and the identification of a predictable decision-making framework for making this designation. This is particularly important to our member states, who have responsibilities for managing resident fish and wildlife. A clear jurisdictional concern is the potential assertion of Federal authority over wildlife that is clearly not within Federal purview. A clear process must be described by which we will identify the "bad actors." A clear process, if applied to resident wildlife, must be a collaborative process with the States and affected stakeholders. We are concerned that strategies outlined in the National Invasive Species Management Plan may proceed with a broader and inappropriate interpretation of "invasive", broader than perhaps even the National Invasive Species Council intends.

To adequately protect our borders and effectively respond to invasions, partnerships among Federal, state, tribal, and local jurisdictions are essential. A national approach to addressing the invasive species problem must include improving expertise and building capacity at the State and local level. We can only mount effective lines of defense and responses to recognized invasions if allied forces share similar capabilities and are coordinated in their efforts. Building the capability and capacity of State and local partners to respond is essential.

Prevention is the best defense, but it's difficult because we don't always know the "bad actors." Early detection of bad actors once introduced is essential to the defense strategy with a real ability to respond rapidly. We support the concept of rapid response teams as long as their actions are conducted in close cooperation with, and include, state, tribal, and local entities. This approach, with attendant funding from the Federal Government, may provide the most economical approach to eradication or control of established invasive species. Federal regulation compliance issues need to be addressed in order to permit rapid response teams to battle invasive species aggressively and effectively. Existing Federal compliance requirements can delay and impede a response to what the National Invasive Species Management Plan terms an "emergency", thereby rendering the response ineffective.

The importance of a multi-jurisdictional approach to prevent, detect, control, and eradicate invasive species cannot be overstated. Because some Federal lands or resources on those lands are managed either by or in cooperation with state agencies, potential conflicts could occur if a clearly defined process is not established to require cooperation between partners. Similarly, where Federal lands are adjacent to state or tribal lands, invasive species management plans must complement one another to ensure effectiveness.

We have serious concerns about implications of invasive species management on legal jurisdictions and sovereign authorities. State fish and wildlife agencies have primary authority and responsibility for resident fish and wildlife species and any preemption of state authority must, of course, emanate from Congress and not by Executive Order. States would welcome a well-orchestrated Federal leadership role in addressing invasive species that recognizes state sovereignty and does not attempt to usurp or control the management of those species under state jurisdiction. To effectively and appropriately meet the objectives of Executive Order 13112 and the National Invasive Species Management Plan, greater emphasis should be placed upon the partnership and shared authorities between the Federal Government, tribal interests, the states, and other affected stakeholders. The Association supports the adoption by the Invasive Species Advisory Council, an advisory committee that supports the National Invasive Species Council, of guidelines for successful Federal/State partnerships to combat invasive species.

The Association believes that a national approach to prevention, control and management of invasive species needs to include non-regulatory and incentive driven programs that support and build capacity at the State and regional level, and encourage voluntary cooperation of affected private entities and communities. Awareness by the public and industry will be essential to successful prevention and control efforts. The American public is an educated public, and informed awareness is essential to gaining their support for invasive species management and implementation of coordinated lines of defense. Our messages need to be consistent and understandable.

Adequacy of Existing Statutory Authority

We need to work with existing management and legislative mechanisms to effectively implement them before seeking out new and pervasive Federal authorities. While we may have ineffectively implemented the Lacey Act to date, it does offer a process for making a determination that a species is "injurious." Making the Lacey Act and other existing Federal and state authorities effective should be the first step in closing gaps. During the last Congress, the Association supported timely reauthorization and improvement of the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 as amended by the National Invasive Species Act of 1996. We were encouraged by the addition of provisions that provided funding to states for early detection, pre-screening of intentional introductions, development of state or regional rapid response plans, and stronger monitoring efforts, which are needed for effective state management actions. We understand that substantially similar legislation has been introduced in this Congress and the Association will be reviewing the legislation with the hope that reauthorization can be accomplished in a timely manner.

A mechanism for coordinating the activities of Federal agencies already exists with groups such as the Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW) and the Aquatic Nuisance Species Task Forces (ANS). The Association recommends that established interagency committees such as FICMNEW and ANS should be utilized to their fullest potential by the National Invasive Species Council.

The Association and its member agencies look forward to working with Congress and our Federal state and local partners, including private individuals and NGOs to develop a truly collaborative approach to implementing sound national policy for invasive species, and a predictable process for identification of the species invasions that we must address together.

This concludes my prepared remarks. I am happy to answer any questions that you or other Committee members might have.

Mr. SAXTON. Thank you all for sharing your thoughts with us this morning. We obviously appreciate it very much because we look at this, as you do, as a very important set of subjects. Let me ask this question. As legislators, when we want to solve a problem we oftentimes look for a new law or new set of laws or new initiatives of some kind, and this subject has been on the minds of legislators and others for quite some time. As a matter of fact, our staff has compiled a list of legislative initiatives which resulted in laws, administrative initiatives which resulted in regulations of one kind or another, which we have listed here, and we have been able to identify 23 sets of efforts to deal with these issues. And I am not sure that we have made any significant progress over the broad range of issues that face us that we generally refer to as invasive species.

So what do you see as—do we need to kind of start at ground zero and review everything that we have done and throw out some of the stuff that doesn't work or what is the problem? We need money? And I am looking inward. I am not looking outward at you. I am trying to identify where it is that we need to go, and I would be interested in your thoughts.

Before I do that, it has been suggested that the folks standing in the back and I know there are more folks standing in the hallway, if you folks would like to come up and take these seats in the U-shaped lower tier here, so to speak. And if somebody would like to inform the folks in the hall that there is newly available standing room.

I can name just a few of these 23 items, the Alien Species Prevention and Enforcement Act, the Animal Damage Control Act, the Endangered Species Act, the Federal Seed Act, the Federal Insecti-

cide, Fungicide and Rodenticide Act, the Lacey Act, the Nonindigenous Aquatic Nuisance Prevention and Control Act, the National Invasive Species Act, the Plant Protection Act, the Organic Act, the Water Resources Development Act, the Wild Bird Conservation Act, et cetera, et cetera, et cetera. These have all been well meaning efforts, and here we are having another hearing trying to figure out how to deal with this problem. What do we need to do?

Dr. THERIOT. Mr. Chairman, I have been involved in the aquatic nuisance species prevention and control activities for many years. I think we have plenty authority, but we need to coordinate their efforts. There was a study done as part of the Aquatic Nuisance Species Prevention and Control Act for intentional introductions where it looked at all authorities and tried to coordinate and make recommendations to this Committee and Congress. And I think that needs to be picked up again and looked at and maybe refined. But we do need coordination and we need authority to act.

I think one of the biggest—from my perspective and our authority within the Corps of Engineers protecting inland waterways, we need some authority, not just the Corps but all agencies, to rapidly respond to early detection of newly introduced invasive species to allow us to get there quickly and eradicate it when it is possible. Often we run into obstacles where Federal interest is in conflict with state authorities. We need to work in partnership with the States to act.

Mr. SAXTON. I am told here that the National Invasive Species Council is currently conducting an evaluation on current legal authorities relevant to endangered species to determine whether existing authorities are sufficient or can be better utilized. Tell us about this National Invasive Species Council, this initiative, and when their work might be completed.

Dr. TATE. Thank you, Mr. Chairman. The Invasive Species Council is one of the things that we are doing right. We need to take the Invasive Species Council and expand it to include State efforts, tribal efforts and in the name of cooperation and coordination, communication, the Secretary's four Cs. The existing legislative authorizations are in the management plan and this is the management plan which I am sure you have seen on other occasions. There is a list here of legislative authorities currently extant. We have as one of our tasks to look at whether we need more and we need better coordination. The Council is the right place to do it, we believe, and it is the right place to do it in an expanded fashion.

Mr. SAXTON. I won't push this question from you now but I would like to talk maybe in a less formal setting about how we might enhance the capabilities of the Council if that is what you are saying we need to do. It certainly seems to be a logical way to move forward. Let me ask you a question just from my personal experience. The question is this: If a species from domestic United States from the West Coast, such as salmon were introduced on the East Coast, would it be considered an invasive species?

Dr. TATE. A species out of its original normal range and in a new range, when it becomes invasive, starts to affect our economy and the plant and animal communities, the answer is yes.

Mr. SAXTON. Is there a way to control—just take that example. Somebody years ago, and that is why I am asking the question,

somebody years ago decided they wanted to introduce some species of salmon in the Delaware River and some of us from New Jersey and Pennsylvania were very much concerned that it might do something to the balance of nature, if you will, and be invasive in the Delaware River. How do we control those kinds of introductions of species that may not be native to an area.

Dr. TATE. Putting this in the light of your earlier question about legislative authorities, the answer to your specific example is we probably don't know how and when it might become invasive, or if it would become a useful addition to the fish fauna in the Chesapeake or the Delaware Bay. We don't know that.

One of the things you asked about earlier is what legislation in that list you have there—for example, there is the tamarisk bill that is coming from Colorado right now and we do need research on tamarisk. We have to understand how and why it became invasive. We need to understand how in your example that salmon in the Chesapeake or Delaware Bay would become invasive or if it would.

These are things we simply don't know at this time. But the most important thing probably is something I failed to mention earlier. We have a handout on our performance-based budget, crosscut budget, that I would like to enter into the record if I may. What it does is it uses the money that you already are providing for this in the most effective possible way. It is something I failed to ask you if I could put that in the record earlier.

Mr. SAXTON. Thank you very much. My time has expired. Mr. Faleomavaega.

Mr. FALEOMAVAEGA. Thank you, Mr. Chairman. I appreciate the panel's testimonies. I seem to be getting the impression—I want to thank you, Mr. Chairman, for giving us an overview, given the fact that there are some 23 already statutory legislation on the part of the Congress addressing the very issue.

I would be the last person to question your expertise, Dr. Tate, as a scientist, but I need your help because I'm getting somewhat of a contradictory statement from your remarks to the extent that you say that on the one hand we know very little about invasive species; at least that is what I seem to get from your statement. Then on the other hand you immediately say, but we do know it costs $20 to $100 billion a year for this problem. I would like to know from your statement if I am depicting this in a correct fashion.

I will say this. I am surprised, if this is the position of the Department of the Interior, that you know very little about invasive species; but how can we equate that if you are saying at the same time it is costing our people $20 to $100 billion for losses in economic well-being because of invasive species? Can you help me with that?

Dr. TATE. I will certainly try. You are correct that it does cost us at least $100 billion a year—us, the economy of the United States, our ability to keep the engines of commerce going, to achieve the lifestyle we have achieved here in the United States. That cost is to all of us, and one of the points I was making is that cost is because of all of us. What we are spending, actually spend-

ing, is a very, very small percentage of that—of public and private dollars, a very small percentage is actually being spent.

How can we spend it effectively? I think one way of getting at what is effective in this small amount that we do spend on this very large problem is through the crosscut budget effort that we are making. Another is to have focused and coordinated research on specific things. It is in that context that we don't know enough. The best way to manage, for example—

Mr. FALEOMAVAEGA. Let me proceed because of my time, Dr. Tate. Maybe you could also respond to this question I have. Among all the Federal agencies, USDA, the Department of the Interior, the Department of Commerce, the Corps of Engineers, and probably even the Department of Defense and even the State Department, which Federal agency of all the agencies have more application of resources addressing this very issue of invasive species?

Dr. TATE. If you are directing the question to me, we spend about $38 million in Interior, which is 5 percent of the total Federal investment.

Mr. FALEOMAVAEGA. No, no. I'm saying which—and please don't get me wrong, I'm not addressing this to you specifically, to all the other gentlemen—which of all the Federal agencies have the responsibility of having to deal with this issue more than any other? Is the Department of the Interior the one that is faced with this issue more so than any other agency or what? Maybe Agriculture? I don't know. Could you give us your best opinion on this?

Dr. LAMBERT. The Department of Agriculture probably has the largest share of the budget attributed to invasive species management. The range is from weeds to invasive animals to diseases, and so it is a broad range of invasives that affect not only agriculture but the natural resource base as well.

Mr. FALEOMAVAEGA. Dr. Lambert, maybe you can help me then. What resources are at the Department of Agriculture addressing this issue of invasive species, since it seems that your agency more than any other Federal agency is the one faced with this problem? Do you believe that there are enough resources committed in addressing the issue of invasive species as far as the Department of Agriculture is concerned?

Dr. LAMBERT. As always, there are never enough resources, I guess is the simple answer. But there are resources there that can be brought to play. We have improved our—

Mr. FALEOMAVAEGA. How much are we committing in resources moneywise? You can submit that for the record. I'm sorry.

Dr. LAMBERT. We'll get back to you.

Mr. FALEOMAVAEGA. My time is getting short. I really enjoy this. I want to join the Chairman, gentlemen, that if this is really a real, serious issue, if it is costing the American people $20 to $100 billion, would you agree that we need to set up some kind of national policy through Federal legislation if this is the only best possible procedure on how we could address this issue? Or do you think we ought to continue saying, let's do preventive issues with the least cost as suggested by some of you in your statements? How can we do that if we are really serious about addressing the issue? Or is the issue serious in itself? Is it really a serious national crisis that we have to address this? Or are we going to continue holding hear-

ings for the next weeks, months, and years, just as the Chairman had said?

We have already put 23 things in place and I don't know if we are in sync. Maybe it is our fault. But in developing a national policy, should we develop a Federal statute, a Federal law to coordinate this? Or are we just going to be adding more problems than the problem that now exists? I would like your honest opinions on this.

Dr. LAMBERT. From our viewpoint, the species that crop up are not the ones where we have line item, ongoing budgets to address. A year ago we didn't know we were going to have exotic Newcastle disease in California. Three years ago we didn't know we were going to have the Asian longhorned beetle in New York.

Mr. FALEOMAVAEGA. I know my time is up. Just one question, Dr. Lambert, because I think you are the point man here. I sense it. You are the point man. We might even be in the wrong Committee hearing room, OK? You are the point man. Tell me honestly, Dr. Lambert, with all the things we have said and the statements that all of you have presented in an excellent way, what is your suggestion of how we could develop this national policy since, after all, USDA seems to be having the full load on this responsibility?

Dr. LAMBERT. It still gets back to coordination, cooperation, communication.

Mr. FALEOMAVAEGA. I could not agree with you more on that, Dr. Lambert. What is the solution?

Dr. LAMBERT. Continued vigilance. Addressing these early. Vigilance at the ports to stop them from being introduced. If possible—

Mr. FALEOMAVAEGA. Like Homeland Security? Let's develop Homeland Security. Do you think that this is the level that we should develop this serious policy?

Dr. LAMBERT. There are roughly 4,000 positions at Homeland Security that are dedicated to protecting the ports of entry; 2,400 of those were at Agriculture. The others came from Immigration—INS.

Mr. FALEOMAVAEGA. Mr. Chairman, my time is up and I apologize.

Mr. SAXTON. Thank you. It was an interesting line of questioning. I just would like to add for the record in case somebody may read this later, the Federal activities involving obligations of invasive species activities—just let me read this real quickly: The Department of Agriculture in the year 2000 spent $556 million, Interior spent $31 million, Defense spent $14 million, State spent $9 million, Commerce spent $5 million, National Science Foundation spent $5 million, Department of Transportation spent $4 million. There are some others of lesser amounts. In spite of the fact that it is costing us a lot of money in losses, we are making some financial commitment to it.

Ms. Bordallo.

Ms. BORDALLO. Thank you, Mr. Chairman. I would like to follow up with the funding here, because I think both the Chairman and my colleague from American Samoa have kind of hit the nail on the head. You mentioned, some of you, about coordination. Does that mean that some agencies are not really aware of others, what they are doing? Is that what you are saying? Is there a task force or a

panel of some kind that includes all of your agencies? What is the name of that task force or panel where you all sit down at a table and discuss these problems?

Dr. LAMBERT. The National Invasive Species Council is the one that brings the departments and agencies together, and then internally we have coordinating mechanisms for the agencies within the Department.

Ms. BORDALLO. So then you are coordinated, is that correct?

Dr. LAMBERT. Absolutely.

Ms. BORDALLO. The other thing is, I don't know, does anybody have—maybe it is the Department of Agriculture that would have a handle on the moneys part, the funding for different problems? Because I come from a territory. We have been inundated with the brown tree snake now for years. We are very grateful and thank you very much to the Federal Government for the assistance they have given us, but the problem is still there. It has a tremendous economic impact on our island because we depend on tourism, and nobody is going to come to an island where there are brown tree snakes hanging from the trees, so they say. But Hawaii and Guam are impacted. I don't know about American Samoa as yet, but it is probably only a matter of time. Is there going to be additional funding for this? Does anybody have a handle on how much money?

Dr. LAMBERT. There is $400,000 in the 2003 budget for brown tree snake control. APHIS does have people on the ground in Guam that can coordinate with the Department of Defense and a whole variety of control measures for the brown tree snake.

Ms. BORDALLO. Is that the entire amount, $400,000?

Dr. LAMBERT. That is what is in the 2003 budget; yes, ma'am.

Ms. BORDALLO. That is what is left over or has it already been expended, do you know that? What about the 2004 budget, do you have anything set aside? At one time there were millions of dollars.

Dr. LAMBERT. There is also money in the Department of Defense budget, $1 million. This is the USDA APHIS portion.

Ms. BORDALLO. Could any of you just give me some idea of what the funding will be, what is left for 2003 and what is anticipated for 2004? My office would greatly appreciate that.

Dr. TATE. We would be happy to provide those numbers for you and get back to you with it.

Dr. TATE. The Department of Interior, the Department of Agriculture, the Department of Defense all contribute to that effort. We just recently had a typhoon on Guam, if I recall, and it was quite devastating. Among the things that happened was it took down all the barriers that kept the brown tree snakes from getting into the ports, into the airport, into the harbor areas. When those things were down, there was another effort being made in other places like Hawaii that was very, very important and that was the interdiction that my associate Dr. Lambert just referred to. That interdiction temporarily kept, as far as we know, brown tree snakes out of Hawaii while our defenses were down on Guam.

Those kinds of things are not necessarily budgeted but are efforts that are cooperative under the National Invasive Species Council's efforts.

Ms. BORDALLO. To set this record straight, we had two typhoons, 5 months apart, super typhoons. We are in dire need of assistance.

I would appreciate if you could give us some idea of what is being done, what is going to be done, and the funding that is going to be allocated to the territory of Guam. Thank you, Mr. Chairman.

Mr. SAXTON. Thank you, Ms. Bordallo. Very good.

Mr. Gibbons.

Mr. GIBBONS. Thank you very much, Mr. Chairman. I apologize to our witnesses for arriving late and missing most of your testimony. I do know that there are probably more resources that could be applied in any program over any period of time that are needed. There is always room for more resources, no matter what program you are in is what I am trying to say.

My question to you is—and I will just throw this one out there—is how do you in the government deal with the eradication of the species, whether it be flora, fauna, or animal, when that species is cute and cuddly, whether it is the coqui frog in California or something like that? How do you deal with that? It's an invasive species. Public uproar has oftentimes been a wedge between the eradication effort and doing nothing. How do you deal with that? I will just let anyone who wants to answer that question deal with the public effort on that.

Dr. BRANDT. I'll speak, because we deal with things underwater and don't really deal with cute and cuddly things. I think education is a key component to that. I think the whole issue with the zebra mussel and stopping the spread of that animal from lake to lake was through extensive education efforts, largely through the NOAA Sea Grant Program and others. I think you need to educate the public on exactly what that animal is doing in the system.

Mr. GIBBONS. Sometimes you get one of these cute and cuddly little leopards out there that the public believes is so important, so critical to the future of their children's happiness that they won't let you get rid of it. No matter what you do we can't—I know we had some kind of a pike fish in one of the northern California lakes near the district that I represent, that the public uproar over killing the fish actually brought it to a halt compared to the death and destruction that fish was doing to the other native species that were in the area in that lake. So that would be an underwater species that you deal with.

You obviously get into the same sort of public opinion which makes your life, your goal, your work, your effort, far more difficult than it should be and probably spend much of your time in lawsuits, in court trying to deal with those issues versus actually applying the resources to the eradication of the species. I just would like to hear from the other agencies, whether it is the Department of Agriculture or the Interior, what you do when it gets down to cute and cuddly species that are invasive.

Mr. BAUGHMAN. Mr. Chairman, I can't speak of invasives from the Federal standpoint, but certainly being a former State wildlife director, we dealt with all the cuddly—from grizzly bears and mountain lions to squirrels. It is one of those things that is a necessity of human/wildlife, of human/plant conflicts, that there has to be some control actions at times that are not very popular. You usually have people who are 180 degrees polarized on every one of these issues. Usually the agency people end up right between them. We always try not to make those spectator sports, act very profes-

sionally, very directly, and try to keep the people informed but try not to make public spectacles of these things.

I think this brings up an interesting point, though, that these programs are largely going to be developed and implemented on the ground locally by people that people in your communities know. This is why I stressed the need for coordination with the States. To be successful we are going to be more effective with our money and more popular with our programs to have the things delivered locally by the entities that already exist, though they do not exist in the capabilities and capacities right now to handle some of these new emerging problems. I would just strongly recommend that we increase those local capabilities and capacities to handle those things through the existing mechanism and through the people that your people in those communities know right now and that we will be far more successful. You won't get away from that cuddly aspect, though. It is not a popular thing when you are destroying cuddly creatures.

Mr. SAXTON. I would like to thank each of you for your participation here this afternoon. We have a lengthy agenda.

We will move on to the next panel. Actually Mr. Gibbons is going to take the chair for the next panel so that I can tend to some other things. Thank you again for being here. If the members of the second panel would take their places as soon as this panel vacates, we would appreciate that. Thank you.

Mr. GIBBONS. [Presiding.] If we could get the next panel seated at the table so we could move this hearing along, it would be appreciated.

Ladies and gentlemen, for those of you wishing to carry on cordial conversations, we would appreciate you taking those conversations out to the hall so we can get the next panel seated. I will introduce the next panel while they are being seated. It will be Mr. G. Ray Arnett, former Assistant Secretary for Fish, Wildlife and Parks from the Department of Interior; Mr. Bill Pauli, President, California Farm Bureau Federation; Ms. Myra Bradford Hyde, National Cattlemen's Beef Association; Mr. John P. Connelly, President, National Fisheries Institute; Mr. John T. Shannon, State Forester of Arkansas, on behalf of the National Association of State Foresters; and Dr. Phyllis N. Windle, Senior Scientist, Union of Concerned Scientists.

I would remind our witnesses that we try to limit your remarks to 5 minutes each. Your full and complete statement will be entered into the record. So if you want to summarize and highlight the more salient aspects of your testimony, I would encourage that. As I said, your testimony will be entered in its complete written form into the record. I am not sure who to begin with here but I would start with Mr. G. Ray Arnett, for opening remarks. Mr. Arnett.

STATEMENT OF G. RAY ARNETT, FORMER ASSISTANT SECRETARY FOR FISH AND WILDLIFE AND PARKS, U.S. DEPARTMENT OF THE INTERIOR

Mr. ARNETT. Thank you, Mr. Chairman, members of the Committee. Due to the time limitation, I would like to have my full remarks entered into the record.

Mr. GIBBONS. Without objection.

Mr. ARNETT. Thank you. My name is G. Ray Arnett, and I hasten to add that other than sharing the same surname, former MSNBC commentator Peter Arnett is not a relation of mine. I want to make that clear.

I reside in Stockton, California and am one of the many happy constituents of the Honorable Richard Pombo, Chairman of the House Committee on Resources. My almost six-decade career in wildlife and national resources issues include serving President Ronald Reagan as Assistant Secretary for Fish and Wildlife and Parks in the Department of the Interior where the two major agencies under my jurisdiction were the National Park Service and the U.S. Fish and Wildlife Service.

Prior to that, former Governor Ronald Reagan appointed me the Director of the California Department of Fish and Game, and I served in that capacity during both of the Governor's administrations, 1968 to 1975. The environmental agendas that we implemented during those years encouraged farmers, ranchers, and other private landowners to develop, maintain, and enhance wildlife habitat on privately owned land. Those benefits continue to this day and serve as excellent examples of public benefits that flow from private land ownership without government intervention or funding.

Before arriving in Washington, D.C. in 1980, I had volunteered 18 years of service to the National Wildlife Federation as a member of the board of directors, including two terms as the Federation's President-elect. I was a founder of the Congressional Sportsmen's Foundation and the Congressional Sportsmen's Caucus. I also was a founder and CEO of the U.S. Sportsmen Alliance, which was formerly the Wildlife Legislative Fund of America, and the Wildlife Conservation Fund of America.

During World War II it was my privilege to defend America's freedoms, including the right to own private property, when serving as an enlisted man and as an officer for 4-1/2 years with the United States Marine Corps, and another 3 years when recalled to active duty during the Korean conflict.

As Assistant Secretary for Fish and Wildlife and Parks, I watched helplessly as the Endangered Species Act, that laudable, well-intentioned law, became the victim of mission creep by zealots, not only in the Federal bureaucracy but by the defenders of wildlife, the Environmental Defense Fund, the Humane Society of the United States, the Nature Conservancy, the Sierra Club, the Wilderness Society, and a number of other environmental and animal rights nongovernmental organizations that historically have opposed the consumptive use of renewable resources.

Let us not repeat the mistakes of the Endangered Species Act, an Act that history has painfully shown—has been bad for wildlife, bad for ranchers, bad for farmers and bad for private landowners, and bad for our Nation's economic health.

I conclude with the following four recommendations:

The first recommendation is to enact no legislation establishing a Federal agency for the control of invasive species. Federal and State administrators already have adequate authority as some of those Members of the Congress just named 23 of them. The last

one that I can remember was the Agricultural Risk Protection Act of 2000.

If my first recommendation is accepted, to have no invasive species act, then the need for my other recommendations are not there. But in case my first recommendation is not accepted, my second recommendation is that if an invasive species act is created, the enabling legislation must include language requiring written permission from the landowner before entering the landowner's property to conduct a survey, the landowner must be provided with a copy of all the data obtained in that survey. The United States Constitution demands that individual rights of our citizens, which include property rights, must be safeguarded. Enabling legislation, therefore, must include language ensuring that the constitutional guarantee is guaranteed.

My third recommendation is that the term "nonindigenous" and another term, "nonnative," not be included in the enabling legislation. To avoid any doubt when listing species for control or eradication, the appropriate terms to use are "harmful" and "noxious," without specifying whether they are indigenous, nonindigenous or nonnative.

My fourth and final recommendation is the term "invasive species" must be clearly defined. Under the Endangered Species Act, for example, the term "species" has become corrupted. Did legislators intend the Endangered Species Act to include listing subspecies, races, subpopulations, population segments and even distinct population segments? I think not.

To prevent that type of abuse, with invasive species, the legislation must specify species only, eliminate the word "invasive" in exchange for the words "noxious" and/or "harmful"; then include the phrase "whether native or nonnative to any ecosystem."

With those modest recommendations, there should be fewer objections to and less doubt about the intent of invasive species legislation.

That concludes my remarks, Mr. Chairman. I thank the members for their attention and for providing me this opportunity to express my opposition to additional Federal legislation and/or regulations to control species of harmful plants and animals.

Mr. GIBBONS. Thank you very much, Mr. Arnett.

[The prepared statement of Mr. Arnett follows:]

Statement of G. Ray Arnett, Stockton, California, former Assistant Secretary for Fish and Wildlife and Parks, U.S. Department of the Interior

Mr. Chairmen, thank you for the invitation to testify before you today. Your invitation is greatly appreciated.

My name is G. Ray Arnett, and I hasten to add, other than sharing the same surname, former MS/NBC TV news commentator, Peter Arnett, is not, and I repeat not, related to me.

I reside in Stockton, CA, and am a happy constituent of the House Committee on Resources Chairman, Richard Pombo, who has earned great respect during his years in Congress, and enjoys an enormous following of supporters among residents of California's 11th Congressional District.

My almost six-decade career in wildlife and natural resources issues, include serving President Ronald Reagan as Assistant Secretary for Fish and Wildlife and Parks, Department of the Interior, where the two major agencies under my jurisdiction were the National Park Service and the U.S. Fish and Wildlife Service.

Prior to that, former Governor Ronald Reagan appointed me as the Director, California's Department of Fish and Game. I served in that capacity during both of the governor's administrations—1968 to 1975.

I am especially pleased with the environmental agenda we were able to implement during those years, and the successes we had with programs that encourage ranchers, farmers, and other private landowners to develop, maintain, and enhance wildlife habitat on privately owned land. Those benefits continue to this day, and they serve as excellent examples of public benefits that flow from private land ownership without government intervention or funding.

Before coming to Washington, D.C. in 1980 to serve President Reagan again, I had given 18 years of volunteer service to the National Wildlife Federation (NWF) (1962–1980) as a member of the board of directors, including two terms as the Federation's president-elect (1976–78). I was a founder of the Congressional Sportsmen's Caucus, and the Congressional Sportsmen's Caucus Foundation, and a founder and CEO of The U.S. Sportsmen Alliance, (formerly the Wildlife Legislative Fund of America, and the Wildlife Conservation Fund of America) (1978–1980).

Prior to my professional career and commitment to wildlife resources and the environment it was my privileged to help defend America's freedoms, including the right to own private property, when serving as an enlisted man and an officer for 4 1/2 years with the U.S. Marine Corps during WWII, and another three years when recalled to active duty during for the Korean Conflict.

As Assistant Secretary for Fish and Wildlife and Parks during the Reagan Administration, long after the ESA was enacted in 1973, I watched helplessly as that laudable, well-intentioned law became the victim of "mission-creep" by zealots, not only in the Federal bureaucracy, but also The Humane Society of the U. S., The Sierra Club, The Nature Conservancy, The Wilderness Society, and a number other NGO's.

The Endangered Species Act, as the name implies, was enacted to protect species of flora and fauna that were thought to be in danger of extinction. Okay, but soon "mission-creep" became involved to the point that not only was the species listed, but then their subspecies, then their races, then their populations, then distinct populations, and even population segments.

Let us not repeat the mistakes of the Endangered Species Act—an Act that history painfully shows is bad for wildlife, bad for ranchers, bad for farmers, bad for private property landowners, and bad for our nation's economic health.

Generated by extreme environmentalists, "mission-driven creep" set in, and under mandates of the Endangered Species Act, private landowner abuses became the rule rather than the exception. It is beyond common sense to entertain a notion to provide Federal agencies and mission-oriented NGOs, additional authority to go after flora and fauna species that were not known to exist in North America to welcome the Pilgrims arriving at Plymouth Rock.

Legislation or regulations concerning invasive species must be devoid of the "native/non-native" designation. Non-indigenous species should be evaluated on whether they are likely to cause economic or environmental harm or be harmful to human health.

For example, the Noxious Weed Control Act of 2003 (S. 144 ES), introduced by Senator Craig, a man who I admire greatly, and a number of other bills pending, include in their language the ill-defined term "non-native" to an ecosystem. In other words, pre–Christopher Columbus, and this troubles me.

Many flora and fauna species are non-native and they are beneficial. Surely, invasive species legislation must not be intended to eradicate beneficial non-native species. Therefore, invasive, or non-native, species must be weighed against known beneficial utility and desirability

Federal agencies need no additional authority to control invasive species. Such authority already is available. There is no need to create another costly, wasteful, dictatorial layer of Federal bureaucracy by enacting invasive species legislation, only with the hope that it might, someday, prevent or eradicate plant and animal invasive species detrimental to our environment.

Let us not set into motion another system that creates another bureaucratic Frankenstein to run roughshod over the Constitutional rights of American citizens, while knowing there is strong doubt that it could even marginally improve the problems that already exist with unwanted harmful species.

In the eye of the beholder, the term "invasive species" is mischievously subjective. As mentioned above, not all invasive species are unwelcome, nor do all invasive species cause harm. America's sportsmen pump billions of dollars into the American economy, harvesting and managing desirable non-native (invasive) species such as ringneck pheasants that flourish in my state of California and throughout the Great Plains; chukar partridges in the Rockies and all of our Western states; brown trout virtually anywhere in U.S. inland waters; striped bass along the shores of the

Pacific Ocean and in the rivers and streams of the Sacramento–San Joaquin Delta, and salmon in the Great Lakes.

In California alone, there are many other beneficial species, of wildlife that historically are not native to the state, such as the wild turkey, whitetail ptarmigan, eastern gray squirrel, rock dove, and mute swan, to mention a few. Indeed, carrying the invasive species logic to extreme, the horse and beef cattle are invasive species, regardless of their benefit to man. The list is extensive, and it concerns me that there are no safeguards to prevent an overzealous invasive species czar from eradicating these desirable species, because they might, someday, be thought to "endanger" native, pre–Columbus, flora and fauna.

In closing, the recommendations I have to offer are as follows:

1) If my first recommendation is accepted then there is no need for the others. My recommendation is that no legislation be enacted that will establish a Federal agency to focus on invasive species of wild animals and plants. Federal and state administrators responsible for taking care of problems caused by harmful and noxious species already have adequate authority provided in the National Environmental Policy Act of 1970, the National Forest and Management Act of 1976, the Department of Agriculture Organic Act of 1982, the Clean Water Act Amendments of 1987, and The Agricultural Risk Protection Act of 2000 (Title IV), to name but a few. Additional legislation creating a costly and larger Federal bureaucracy, especially one with interagency status, to handle harmful, species, is not only wasteful it is unneeded. No new law is needed. There are laws and then there is action. What is needed is action.

2) In the event my first recommendation is unaccepted, my next recommendation is that enabling legislation must include language requiring Federal agencies, private organizations, and/or NGO's, to receive written permission from the landowner, not just a renter or lessee, before entering the landowner's property to conduct a survey, and the landowner is to receive all data obtained in a survey on his or her property

Some who oppose this requirement are sure to claim that it is unconstitutional to require landowner written permission. Nevertheless, many well-informed scholars, distinguished constitutional lawyers, and I disagree. The United States Constitution unmistakably affirms, leaving no doubt, that the individual rights of United States citizens must be safeguarded.

Without landowner consent, the rights of private property owners have been trampled with impunity. The ESA has given the bureaucracy extraordinary power and authority to trespass and impose terms and conditions, dictating how an owner may or may not manage his or her land. American citizens, hard working, taxpaying individuals, your constituents, have been severely restricted in the use of, and denied access to, many thousand acres of public land managed and controlled by the Federal Government but belonging to the people.

Private property has been taken without fair and equitable compensation. Property owners have been threatened with fines and/or imprisonment for not adhering to ESA mandates. To get a fair trial requires lengthy lawsuits and attorney expenses the average citizen cannot afford, therefore, no contest. Government attorneys are paid by the taxpayers; government has time to wait and wear down landowners to the point that landowners finally give up or their property is condemned. Government wins by default. I feel certain that these abuses can be and will be compounded further by invasive species legislation creating another Federal agency to enforce actions against private property owners.

3) My third recommendation is based on my belief that the terms "non-indigenous" and "non-native" should not to occur in the listing of invasive species targeted for special attention. "Noxious" and/or "harmful" are the appropriate words. Even the term "invasive," for that matter, should not be used due to its "non-native," nebulous definition in Executive Order No. 13112. Further, to ensure the intent of invasive species legislation is not misunderstood or abused, intentionally or unintentionally, I recommend that the enabling language include the phrase "whether native or non-native to any ecosystem." With those changes and the additional phrase, there will be fewer objections to and less doubt about the intent of new invasive species legislation.

Before listing any animal or plant, however, a full Risk Assessment for any species proposed for any category of regulatory, advisory, or "educational" listing must include an economic and environmental assessment of what the negative impact might be when listing species currently available commercially and as game animals utilized by sport hunters, trappers, and anglers.

In reference to the Executive Order mentioned above the problem I see with the term "invasive" is due to its unclear, circular definitions in Executive Order No. 13112, Section 1, Definitions, (f). "Invasive species" itself is defined as "alien" in that

document, which in turn refers to "native" and "a particular ecosystem." The definition in the Executive Order precludes precise meaning.

My fourth and final recommendation is:

4) Because a wildlife species is not indigenous, not native, nor pre–Christopher Columbus, if you like, that is no criterion for listing it for extermination. So, rather than using the term "invasive species," I am suggesting it is far better to use the terms "noxious species" and/or "harmful species." Those two words, "noxious" and "harmful," are the appropriate and preferred terms. They are precise in their meaning, leaving no question about what invasive species legislation intends Only species that are noxious and harmful, regardless of origin, will be listed for control or eradication.

The problems created by not identifying precisely the intent of legislation and the goals to be accomplished became obvious to me as I watched the intentional misuse of the Endangered Species Act. For example, when ESA was enacted, the term "species," was not sufficiently defined to limit flora and fauna for listing. Because of that, the Act's intent has become tarnished and abused.

The ESA, as I am sure you know, was intended to be an effort to save species of flora and fauna from extinction. I suspect most legislators supporting endangered species legislation had in mind saving the Bald Eagle and whales. I emphasize the word "species" for a purpose. In retrospect, there is doubt that Congressional Members suspected the Act would include the listing of subspecies, much less races, populations, subpopulations, population segments, and even distinct population segments? Nevertheless, that is where the Act has taken us today.

What guarantee do we have that an Invasive Species Act will not be abused to such a ridiculous degree, too, unless the intent and language of the Act is precise and clearly defined, leaving no room for misunderstanding or abuse, unintended or otherwise? At this time, there are no guarantees.

This concludes my remarks, Mr. Chairman. I thank each Member for their attention and for providing me the opportunity to express my opposition to invasive species legislation and/or additional, unneeded regulations to control harmful plant and wildlife species.

I will be happy to answer your questions if I can.

Mr. GIBBONS. Mr. Bill Pauli, you are next. I understand that you are under a time constraint. We will understand right after your remarks if you have to leave. That is fine, but we would entertain your remarks at this point.

STATEMENT OF BILL PAULI, PRESIDENT, CALIFORNIA FARM BUREAU FEDERATION

Mr. PAULI. It is no problem. Thank you, Mr. Chairman. I did submit written comments for the record. Thank you very much for having me here this afternoon.

I am Bill Pauli, representing the American Farm Bureau. I am a member of the American Farm Bureau board of directors and President of the California Farm Bureau. I am also a rancher in northern California and farm a lot of the north coast. I have wine grapes, Bartlett pears, and I also raise and grow timber. I have seen firsthand the impact of these invasive species on our water supply, the impact on our fruit and vegetable operations and on our livestock and poultry operations in California as well.

The Farm Bureau is pleased that the Subcommittees are holding this joint hearing on a topic that is so critical and so important to production agriculture. Invasive plants and animals pose an extremely serious problem for agriculture. This afternoon I will provide you with just a few of the many examples of how invasive species are impacting American agriculture and how two bills, if passed, can greatly help to eliminate or alleviate some of these impacts.

First, H.R. 119 would provide funding to the State and local community-based partnership programs for the control of noxious weeds. In agricultural production, invasive plants outcompete crops for soil and water resources, reduce crop quality, interfere with harvesting operations and reduce our land values. On rangeland, invasive plants crowd out more desirable and nutritious forages, cause soil erosion and poison some wildlife and livestock species. A couple of examples of that in my area are yellow starthistle and gorse.

Second, H.R. 1080, the National Aquatic Invasive Species Act of 2003, will effectively address the problems of aquatic organisms entering our waterways through the ballast water of ships arriving from other countries. Introduced fish species frequently alter the ecology of fish ecosystems by reducing natural aquatic vegetation or reducing water quality by increasing turbidity. Examples of these are obviously the Chinese mitten crab and the zebra mussels.

Let's identify the problem. It is the cost to our farmers and ranchers across the country and the cost and effect on our environment. It is estimated that invasive species cost the American people $137 billion a year. In agriculture around the country, invasive species pose an extremely serious problem. Unfortunately, American farmers and ranchers are being economically impacted by the importation of exotic pests and diseases.

Obviously two more examples, the Newcastle and the bovine TB, are just a couple of those. Invading nonindigenous species in the U.S. cause major economic losses in agriculture, forestry, and to our public lands. Environmental damage includes soil erosion and the degradation of levees and dike systems that accelerate wetland loss and the destruction of national wetlands and vegetation. Gone unchecked, invasive species could have a devastating effect on the environment which includes agriculture and many natural resources.

The good neighbor policy. Management of our public lands. Unfortunately our efforts are often hampered by public land managers who do not follow the same sound management practices as our farmers and ranchers. This is a serious issue in terms of how we manage those lands. In my home State of California, more than 3,000 plant species have escaped into the natural ecosystem, causing damage to both managed and natural ecosystems. Publicly owned lands and lands under conservation easements must be managed to control or eliminate invasive species, not allowing them to spread uncontrolled across public lands to our neighboring lands.

Environmental harm. Invasive species exact a heavy environmental toll as well. One study estimates that invasive plants and animals have caused or will cause 35 to 46 percent of all species being listed under the Endangered Species Act. That is really significant; 35 to 46 percent. Both plants and animals are at risk primarily because of competition and with predation by nonindigenous species. Studies show that at least 44 native species of fish are threatened or endangered in the United States because of nonindigenous fish species and an additional 27 species are otherwise negatively impacted by these introductions, a significant environmental impact. Measures must be taken based on sound science. As urgent as the need for dealing with this problem is, inappropriate

corrective measures that are not based on sound science cannot be tolerated or accepted.

What can be done? The United States needs an effective and comprehensive national policy that does not interfere with our private lands and private property issues and that protect and prevent the introduction of additional species and deal with the eradication and control of invasive species.

In closing, any program to effectively protect the environment and economy from invasive species must consist of exclusion, detection, and eradication through a concerted effort of private and public stakeholders and the various agencies. We need a comprehensive national policy addressing the introduction and management of invasive species. This policy should include adequate funding spent on programs based on sound science while protecting our private property rights. At this same time, agencies must consider the devastating impacts of invasive species if gone unchecked while developing environmental regulations.

Thank you, Mr. Chairman, and members of the joint Committee for your efforts. Your concern about invasive species' impact on our safe food supply is critical. Impacts on safe trade are very important as we enter into homeland security, and impacts on our environment must all be considered. You face a monumental task. Proceed carefully and diligently. Thank you, Mr. Chairman and members of the Committee.

Mr. GIBBONS. Thank you, Mr. Pauli.

[The prepared statement of Mr. Pauli follows:]

Statement of Bill Pauli, President, California Farm Bureau Federation, on behalf of the American Farm Bureau Federation

Good afternoon. My name is Bill Pauli, President of the California Farm Bureau Federation and a member of the Board of Directors of the American Farm Bureau Federation. I am very pleased to be here this afternoon to discuss the staggering problems caused by harmful invasive species.

We are pleased that the Subcommittees are holding this joint hearing on a topic that is so critically important to agriculture. Both Subcommittees represented here today have jurisdiction over major aspects of the problem—the Fisheries Conservation, Wildlife and Oceans Subcommittee with aquatic invasive species entering the United States by sea, and the National Parks, Recreation and Public Lands Subcommittee with invasive plants and animals on Federal lands. Both of these pathways are of concern to agriculture in California and across the United States.

Invasive plants and animals pose an extremely serious problem for agriculture. Harmful plant and animal pests devastate thousands of acres of croplands and rangelands. While economic costs to agriculture are difficult to pinpoint with any accuracy due to the staggering scope of the problem, a recent study estimated that invasive plants and animals cost the American people $137 billion every year. (Pimentel et al., Environmental and Economic Costs Associated with Non–Indigenous Species in the United States, Cornell University, June 12, 1999).

A 1996 Bureau of Land Management report estimates that invasive plants alone infest over 100 million acres across the United States. The same report says that these plants spread across another million acres each year—an area twice the size of the State of Delaware. It further finds that harmful plants negatively impact an additional 4,600 acres of Federal lands in the western United States PER DAY.

Invasive weeds also substantially contribute to the threat of catastrophic wildfires that have plagued the drought-stricken West for the past few years. Invasive flammable weeds such as cheatgrass fuel wildfires so that they burn hotter and spread faster.

Invasive species also exact a heavy environmental toll. Many invasive species threaten plant, animal or human health. The recently introduced West Nile Virus illustrates the human health risks that invasive species can pose. Invasive species alter plant and animal habitats and ecology. One study estimates that invasive

plants and animals have contributed to 35 to 46 percent of all species being listed under the Endangered Species Act.

Invasive species are especially a problem in my home state of California. California is extremely diverse in terms of land uses and ecosystems. As a result, we produce an extremely wide array of crops that include most of the crops grown in the United States. We also experience most of the problems with different types of invasive species that are encountered elsewhere across the country.

Invasive species entering California through ballast water from ships arriving from other countries is a significant problem. Roughly ninety percent of the planktonic and benthic organisms in the San Francisco Bay and Delta systems are species that were not present in California thirty years ago. Introduced fish species frequently alter the ecology of aquatic ecosystems by reducing natural aquatic vegetation or reducing water quality by increasing turbidity. The Chinese mitten crab and zebra mussel are two examples of an invasive species becoming established in California as a result of ballast water. Farm Bureau supports H.R. 1080, "The National Aquatic Invasive Species Act of 2003," as a way to more effectively address this problem.

Other invasive species significantly imperil California's rangelands. It displaces more nutritious plants in rangelands, pastures, roadsides, and agricultural areas. Today, yellow starthistle infests more than 20 million acres in California alone, with the potential to double that number. It severely impacts livestock grazing because it is an unpalatable plant that displaces more desirable grazing forage. Livestock and wildlife avoid heavily infested areas. It also may be lethal to horses.

Harmful new species enter the United States from various sources every day. Some can be carried great distances. Already established invasive species spread rapidly into new areas. The costs are mounting.

Farm Bureau strongly supports an aggressive program at the local, state and Federal levels to prevent the introduction of invasive species into the United States, and to control or eradicate invasive species that are already here. The management plan developed by the National Invasive Species Council (NISC) titled "Meeting the Invasive Species Challenge" provides a framework for addressing these issues.

Critical elements of a successful program include:

1. A Clear Definition of "Invasive Species" Must be Developed.

In addressing the invasive species issue, it is important to understand that many non-native species are beneficial to man and the environment and therefore should not be considered "invasive" merely because they are not native to the areas in which they are found. Agriculture depends on a large number of native and non-native plants, animals and insects for its viability. Most cultivated crops and many domesticated animals originated outside the United States. Corn, wheat, potatoes, cattle, soybeans, kiwi plants—all originated outside the United States and are "non-native" species. In fact, eight of the top nine most economically significant U.S. plants came from outside the United States.

Current examples of species considered "invasive" but which have beneficial effects on agriculture include the black carp and crownvetch. Black carp provide a significant benefit to aquaculture producers by controlling parasitic snails and mollusks in aquaculture facilities. They are used only in controlled settings, and only sterile (triploid) carp are used. Properly controlled, these fish can be very beneficial to aquaculture facilities, but could be considered "invasive" if they get loose in streams and rivers and multiply. Nevertheless, Farm Bureau supports appropriate regulation of black carp to ensure that it does not become an invasive species. Such regulation includes the use only of triploid (sterile) black carp with adequate inspection to ensure that only triploid black carp are used. We also support a back-up electric fence in Illinois to guard against black carp reaching the Great Lakes area.

Crownvetch is a non-native plant species that is very useful in slope stabilization, beautification and erosion control on highways. It is also useful as a living mulch for no-till corn. Yet it is considered "invasive."

The tendency to consider all non-native species to be harmful must be avoided. "Invasive species" should not be considered synonymous with "non-native species," "alien species," or "exotic species."

"Non-native species" might be more appropriate targets at ports of entry into the United States, either to prohibit their entry or to monitor their entry and subsequent use if intentionally introduced for some beneficial purpose. Once a species is established, the principal factor for considering a species "invasive" is whether the species causes economic and environmental harm.

Because most agricultural crops and livestock are not indigenous to the areas in which they are raised, it is of utmost importance for agriculture that the definition of "invasive species" exclude agricultural products.

The working definition of "invasive species" in Executive Order 13112 and in the NISC management plan is so loosely worded that it could be construed to include agricultural products or other beneficial non-native species as "invasive." It needs to be changed to reflect our concerns expressed above.

2. There Must Be Effective Coordination Among Federal Agencies.

More than 20 different Federal agencies currently have some responsibilities or authority for different aspects of the invasive species issue. Many of these programs overlap or operate independently of one another. Many address different aspects of the invasive species issue, such as prevention at ports of entry or control of pests after they have become established. Many of these programs have a different focus or emphasis. There is a critical need that these authorities, responsibilities and programs be coordinated to achieve maximum results.

The NISC provides the framework for achieving the coordination to effectively address invasive species. The Invasive Species Management Plan provides direction for achieving the necessary coordination. Congress and the Administration must provide the requisite priority and funding for coordinating the substantial Federal invasive species activities. As an administratively created body, the NISC should look to the Executive Branch to provide the priority needed to achieve coordinated results. The Council on Environmental Quality (CEQ) can also play a vital role to achieve Federal coordination with oversight by NISC. Congress can and should provide adequate funding to carry out the invasive species management plan.

3. Federal Coordination Should Support State and Local Invasive Species Control Efforts.

Farm Bureau believes that invasive species issues can be most effectively addressed at the state and local levels. States have the primary responsibility over invasive plant and animal species within their borders, and many states have very active programs to combat invasive species.

Florida is a primary point of entry into the United States. Its massive invasive species problem stems in large part from accidental introduction. Citrus canker, which has cost more that $240 million and resulted in the destruction of thousands of trees, was introduced through Miami International Airport. At a recent Florida Agricultural Pests and Disease Conference hosted by Florida Farm Bureau, exclusion programs were identified as the top priority in Florida for addressing the problem. National priorities cannot be developed in a vacuum—they must be derived from the priorities of the respective states. Together, they form national priorities.

Local, community based partnerships offer the most promise in controlling invasive species within an area. Local partnerships allow for control of invasive species across land ownership boundaries that is an integral part of achieving control. Federal coordination, technical assistance and financial support are necessary to aid these efforts.

An example is the El Dorado County Noxious Weed Group in California. The highly invasive spotted knapweed was detected in the Sierra Mountains east of Sacramento a few years after a wildfire devastated the area. It was first detected on Sierra Pacific Industries commercial timberlands in 1999 and was probably brought in on equipment and erosion control materials used in the fire suppression and timber salvage efforts. This highly invasive weed chokes out native plants and agricultural crops and increases soil sedimentation in creeks and rivers. Hand-pulling and herbicide treatments have been somewhat effective, but due to the steep terrain, heavy fire debris and lack of manpower, the weed has not been eradicated on the original 20-acre site.

The El Dorado County Noxious Weed Management Area (WMA) has raised this project to emergency status. The project partners include representatives from the Eldorado National Forest, Sierra Pacific Industries, El Dorado County Department of Agriculture and California Department of Food and Agriculture. Other members of the local Weed Management Group, including California Native Plant Society—El Dorado Chapter, El Dorado County Farm Bureau and private landowners, have supported the eradication efforts. Grant funding from the state has helped in the eradication efforts over the past three years. Additional Federal support and funding is vital to continue the efforts.

H.R. 119 would provide needed funding through the states to local entities for projects such as this. Farm Bureau supports the enactment of H.R. 119 as a means of supporting local partnership efforts to control invasive species. We urge this Committee to consider this bill and provide swift approval.

4. There Must Be Appropriate Tools Available to Combat Invasive Species.

Pesticides are often the cheapest, most effective way to eliminate problem weeds and unwanted plants. There are increasing regulatory hurdles to using effective

products to deal with invasive species. In Headwaters v. Talent, 243 F. 3d 526 (9th Cir. 2001) the Ninth Circuit Court of Appeals ruled that aquatic herbicides could not be applied without an EPA permit under the Clean Water Act, despite the fact that registrants are required to provide extensive data to EPA on impacts to water in the registration process. These herbicides are necessary to address such invasive weeds as water hyacinth and egeria densa that clog canals and burn out irrigation pumps.

Recently another Ninth Circuit decision extended the scope of Talent and posed a threat to the ability to combat invasive species. In League of Wilderness Defenders/Blue Mountain Biodiversity Project v. Forsgren, No. 01–35729 (9th Cir.) the Court stopped the Forest Service from aerially spraying more than 628,000 acres of forest lands to control a predicted outbreak of the pest Douglas Fir Tussock Moth because the Forest Service failed to obtain a National Pollutant Discharge Elimination System (NPDES) permit under the Clean Water Act. Such permits are required of point sources of pollution discharging pollutants into the waters of the United States. In reaching this result, the Court had to conclude that aerial spraying constitutes a "point source of pollution," "pesticides are pollutants," and "exemptions for silvicultural activities did not apply." The Court held that aerial spraying was a point source because it applied from a "discrete conveyance" (nozzle). More importantly, it found that pesticides were "pollutants." Having ruled on these issues, the Court held that EPA had no discretion to carve out any exceptions such as the one at issue in this case. The United States is considering whether to ask the U.S. Supreme Court to hear this case.

Aerial spraying is an absolutely necessary component of effectively controlling large areas of noxious weeds and invasive plants, especially in the vast areas of the West. If there is to be any hope of containing, much less eradicating, yellow starthistle or other widespread weeds such as leafy spurge or spotted knapweed, aerial spraying is a must. Imposing a requirement that any aerial application must first obtain an NPDES permit will significantly impair our ability to control these species. The impediments thrown up by the Forsgren decision must be addressed legislatively to control invasive species on Federal lands.

Another court imposed restriction on the ability to address invasive species issues involves the interface of the pesticide registration statutes and the Endangered Species Act. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) imposes rigorous data requirements on prospective registrants of a pesticide. Included within the requirements are studies on the possible impacts of a product on plants and wildlife, including species listed under the Endangered Species Act. The Endangered Species Act in turn requires agencies such as EPA to "consult" with the Fish and Wildlife Service in cases where an action—such as registering a pesticide—"may affect" a listed species. This results in a duplication of efforts, since the product has already undergone rigorous scrutiny by EPA.

Several cases have been brought seeking to enjoin the use of pesticides because they have not undergone the "consultation" required by the ESA. At least one Federal district court in Washington State has ruled that such consultations must occur. EPA recently settled a similar case in California. Fortunately, thus far the Federal agencies directly impacted by this line of cases are working toward a solution.

5. More Effective Partnerships Between Federal, State and Local Agencies and Private Landowners Will More Efficiently Address Invasive Species Problems.

The invasive species problem in the United States has reached epidemic proportions. Success will be achieved only if all affected entities work together to control and eradicate invasive species.

Farmers and ranchers can play an important role in combating invasive species. They already spend billions of dollars yearly fighting invasive species on their privately owned lands. Since many or most invasive species occur to an extent on private lands, farmer and rancher cooperation is essential. More effective partnerships with private landowners can maximize efforts to bring invasive species under control.

Government agencies should coordinate invasive species treatment with private landowners. Especially in the West, ownership patterns between state, Federal and private lands are intermingled. Invasive species do not respect boundary lines. In many cases, simply coordinating the timing and treatment method between private and adjoining non-private landowners can achieve significant results.

Agencies should make better use of farmer and rancher management practices to better control invasive species. Livestock grazing can be an important tool in managing invasive plant species. It is a valuable practice for reducing fuel loads that increase the risk of catastrophic wildfire and the resulting emergence of invasive

weeds. Stewardship contracting for healthy forests and rangelands should recognize the benefits of livestock grazing as an environmentally sound method for reducing fuel loads and removing invasive species as well.

There are a number of examples in California to illustrate the benefits that grazing can have on control of invasive species. Goats are being used near Oakland to manage fuel breaks in East Bay Regional Parks and to manage yellow starthistle in nearby areas. In Vasco Caves Regional Park, sheep are used to maintain habitat for the endangered San Joaquin Kit Fox.

Landowner conservation programs should focus on control of invasive species. Since invasive species cause a number of environmentally harmful impacts, almost any approved conservation program could be used to address the issue. For example, invasive species are the second leading cause for decline of endangered or threatened species. Grants under the Private Stewardship Grant Program and the Landowner Incentive Program for improvement of habitat have as a component the control or removal of any associated invasive species. Similarly, invasive species are a leading cause of "unhealthy forests," and grants made from stewardship contracts under the Healthy Forest Initiative might be used for invasive species control. Conservation funds for the Environmental Quality Incentives Program, the Conservation Security Program and other programs could also be used for invasive species management.

Landowner partnerships must be voluntary, cooperative and incentive-based. Such programs should not be regulatory in nature but cooperative. Farmers and ranchers share a common desire with the government to eradicate these destructive pests, so cooperation instead of regulation will achieve the best results.

6. Public Outreach and Education Are Essential.

Public outreach and education are also essential elements of an effective invasive species policy. Individual transportation is a major pathway for the introduction and spread of invasive species. They may be recreational boaters, gardeners, or travelers. In most cases, these people are unaware that they are carrying or spreading invasive species, and they would take greater precautions or corrective actions if they knew the consequences of their actions. Often, the introduction or spread of invasive species results from carelessness that is easily corrected if the consequences are known. In many cases, corrective actions involve nothing more than proper cleaning of boats or fishing gear, but the potential benefits may be significant.

Public education is an important component of any invasive species management policy. An effective education and outreach program involves more than the creation of educational materials on invasive species. The current public outreach effort lacks a sense of importance or even urgency to this problem. The general public must be convinced that the actions they take to prevent introduction or spread of invasive species are important. Affected agencies and Congress must emphasize the importance and priority of the invasive species problem in order to affect public behavior.

7. Research Needs.

Because so little is known about the various invasive species, and new invasives are entering the United States, research needs are great. Research is needed in identifying pathways by which invasive species get into the United States so that efforts can be undertaken to prevent their entry. This is crucial in order to prevent additional costly control and eradication projects. Research is needed to predict which species coming into the United States might become economically harmful. The U.S. Geological Survey is already undertaking some of this research and its efforts should be supported. Biological research into life cycles of known invasive species is important in understanding how to control them. Coordination with scientists in the country of origin would greatly help. Research into the most effective and environmentally sound ways to control or eradicate invasive species is also necessary.

We are pleased that the Subcommittee is holding this hearing on such an important issue. The American Farm Bureau Federation stands ready to assist the Committee in addressing this serious problem.

Mr. GIBBONS. Now we turn to Ms. Hyde from the National Cattlemen's Beef Association. Ms. Hyde.

STATEMENT OF MYRA BRADFORD HYDE, NATIONAL CATTLEMEN'S BEEF ASSOCIATION

Ms. Hyde. Thank you, Mr. Chairman. My name is Myra Hyde, I am the Director of Environmental Issues for the National Cattlemen's Beef Association, and I appreciate the opportunity to be here this afternoon to provide comments on behalf of the cattle farmers and ranchers across America.

The National Cattlemen's Beef Association has long been aware of the economic and environmental harm caused by invasive species and we have urged the Federal Government to recognize them as a priority and to develop a national effort to address the problem. We support the Executive order on invasive species and the National Invasive Species Council. We provided input into the preparation of the national management plan developed by the National Invasive Species Council and through participation in the Invasive Species Advisory Council. We have also worked with Congress to direct resources to and focus attention on invasive species.

While the cattle industry recognizes the threats posed by all invasive species and supports efforts to manage them, we are primarily concerned about the threats posed by invasive weeds. Grassland and shrublands or rangelands occupy about 35 percent of the land area of the lower 48 States, or about 861 million acres. They are unique ecosystems that provide clean water, clean air and wildlife habitat, as well as societal benefits such as open space and recreational opportunities. They are also the lands that cattle producers primarily rely on to feed their cattle, and the health of these lands is a critical factor in ensuring a farm or ranch's economic viability. But they are severely threatened by harmful nonnative terrestrial weed species. Invasive weeds often have little or no forage value for native animals or livestock and they threaten the health of all rangelands by outcompeting and replacing the native vegetation. They can also make areas more susceptible to catastrophic fire and can radically impact the way an ecosystem functions.

Next to habitat loss, invasives are the second greatest threat to the survival of biological diversity. The economic cost of invasives has been estimated to be about $138 billion annually—that we have already discussed—but conservative estimates to cropland, agriculture alone, have been placed at $20 billion each year. Once invasive species are introduced, they lack predators and they are almost impossible to contain. So really prevention, without question, is the easiest way to deal with it and the least costly way to deal with these problems. But in order to prevent the introduction of invasives, we must establish better education and awareness programs to increase understanding of the problem. We need more emphasis on research and funding and for technical advisers as well.

I do know that over the last several years, many of the research programs for rangelands alone have dramatically declined, even though we have got increased demands to find solutions for the problems. Once prevention has failed, the goal should be to stop the spread of invasives before they become economically or environmentally damaging.

New money needs to be directed to a program that gives States maximum flexibility to direct funds where they can be utilized by

local decisionmakers most effectively. Resources can be maximized by diverting these funds to the local level, to assist those who know best how to manage the land and treat the problem, whether the land is Federal or private. We must develop a process for setting priorities, and inasmuch as funding will always be a limiting factor for invasive species control activities, this priority process I think is critical.

We believe that our Federal limited dollars should be directed to projects that hold the most promise for success, whether they are on Federal lands, State lands, or private lands or any combination thereof. Most cattle ranchers spend a lifetime fighting invasive weeds on their farms and ranches. They believe that every effort needs to be made to provide a strong foundation for efficient distribution of Federal funds, strive to avoid duplication, coordinate activities between Federal and State agencies and private landowners and provide the flexibility for decisions to be made locally where the problems arise.

There currently is legislation that has been introduced before this Committee, and we would like to express our appreciation to Mr. Hefley for introducing H.R. 119, the Harmful Invasive Weed Control Act. This bill, we do believe, does not create any new authority. We know that there are already many, many authorities out there. What this bill tries to do is coordinate those activities, but is primarily a funding source, a Federal funding source to the States so that the States can make the decisions where that money can best be spent. It is directed to local weed management entities that are on the ground, they know what the problems are, they know what species are harmful and which aren't, and the local stakeholders are involved in these weed management entities so they can all get together and decide how that money can most efficiently be utilized.

There is also a Senate bill that has been referred to your Committee, S. 144, that would also attempt to do the same thing. Both of these bills NCBA does support and we work very hard to try and find legislation that will get resources to the ground.

Despite all the authorities that are out there, there is not enough money. Most of the funds are directed toward Federal lands. Of the $137 billion that they say are the economic costs, I am not sure how much of that is actually coming out of the back pockets of private landowners, but they do not have a source at this time to help them really allay those costs.

Dr. Lambert spoke earlier about the farm bill. Secretary Veneman announced $1.8 billion in conservation funding. The primary source of that for landowners to use would be the environmental quality incentives program. Almost $700 million has been authorized for 2003, but there is a $1.4 billion backlog in EQIP contracts. That money is not going to get to the ground to fight invasive species.

In closing, I would like to just say that we do support all efforts to get funding and to try and coordinate efforts for invasive species but, again, our primary focus is terrestrial weeds. That is why we are supporting these two invasive weeds bills.

We would like to express our appreciation to you for this opportunity this afternoon. I stand ready to answer any questions. Thank you.

Mr. GIBBONS. Thank you very much, Ms. Hyde.

[The prepared statement of Ms. Hyde follows:]

Statement of Myra Bradford Hyde, National Cattlemen's Beef Association

Chairman Gilchrest, Chairman Radanovich and Distinguished Members of the Joint Subcommittees on Fisheries Conservation, Wildlife and Oceans and National Parks, Recreation and Public Lands:

On behalf of the National Cattlemen's Beef Association (NCBA), the trade association of America's cattle farmers and ranchers, and the marketing organization for the largest segment of the nation's food and fiber industry, thank you for your interest in my comments concerning invasive species.

NCBA appreciates the attention the Committee has directed to invasive species issues and also appreciates the opportunity to speak to these Joint Subcommittees on the scope of the invasive species problem. We have long been aware of the economic and environmental harm caused by invasive species. We have urged the Federal Government to recognize invasive species as a priority issue and to develop a national effort to address the problem. We support Executive Order 13112 on Invasive Species. We support the National Invasive Species Council (NISC) that was established by the Executive Order and provided input into the preparation of "Meeting the Invasives Species Challenge", the national management plan developed by NISC, through participation in the Invasive Species Advisory Council. We have also worked with Congress through the appropriations and other legislative processes to direct resources to, and focus attention on, invasive species issues.

While the cattle industry recognizes the threats posed by all invasive species and support all efforts to manage them, of primary concern to us are those threats posed by invasive weeds. Grasslands and shrublands, often called rangelands, occupy about 35% of the land area of the lower 48 states—861 million acres. These are the lands that cattle producers primarily rely on to feed their cattle and the health of these lands is a critical factor in ensuring a farm or a ranch's economic viability.

Rangelands provide more than just economic benefits, however. They also provide clean water, clean air and wildlife habitat, as well as societal benefits such as open space and recreational opportunities. Grasslands and shrublands are unique ecosystems that are severely threatened by harmful, non-native terrestrial weeds species. Invasive weeds often have little or no forage value for native animals and livestock, and they threaten the health of all rangelands by out-competing and replacing the native vegetation. They also can make areas more susceptible to catastrophic fire and can radically impact the way an ecosystem functions. Cheatgrass is a widespread invasive plant, and is much more likely than native plants to catch and spread fire. The national management plan developed by NISC states that cheatgrass has accelerated the fire cycle in the west by twenty-fold.

Invasives are the second greatest threat to the survival of biological diversity, second only to habitat loss. The NISC management plan estimates the economic costs of invasive species at $137 billion annually. Whereas, conservative estimates to cropland agriculture alone have been placed at $20 billion each year.

Invasive species are spread intentionally and non-intentionally by an almost endless number of sources. And as we become a more global society, the pathways increase exponentially as our methods of travel get easier, borders open and ports of entry become more numerous. Invasives are master hitchhikers, attaching to wildlife, livestock, produce, recreationalists, vehicle tires, and ballast water in ships. Many invasives have been intentionally introduced as ornamental plants.

The tropical soda apple arrived in Florida in 1988 from South America. Seven years later it was estimated that it had invaded 1 million acres in five southern states and Puerto Rico. It spreads by interstate shipment of cattle, hay, and composted manure from infested areas. It replaces edible forage plants and hampers wildlife and livestock movement.

Purple loosestrife, introduced for ornamental and medicinal uses in the 1800's now covers about 4 million acres of wetlands nationally and costs about $45 million a year in control efforts. It can completely take over wetlands where it crowds out native plants and negatively impacts native fish and wildlife.

Examples seem endless and the list continues to grow. And again, because most non-native species lack predators, once they are introduced they are almost impossible to contain. Prevention, without question, is less costly than eradication or long-term control.

An awareness of the problem and a comprehensive approach to protecting ecosystems is necessary to prevent the introduction and/or spread of invasives. Public education and awareness programs will increase our understanding of the problem and will aid in the development of management plans at the Federal, state and local levels. Unfortunately, most educational programs for wildlands, rangelands and croplands to date have been directed mainly at rural populations. Awareness of invasives among the general public is fairly low.

Interdiction and barriers at entry sites are critical, as are the implementation of site-specific management and control measures to prevent establishment and spread from sites of initial introduction. There must also be greater coordination between private landowners and Federal, state and local governments.

There must be accurate and timely early detection and rapid response, which would also require proper training of border inspectors, pest management professionals, land managers and landowners. There currently is no comprehensive national system in place for detecting and responding to invasions of non-native species. Rapid response is also hindered by the lack of a centralized communications network for reporting and disseminating information.

Research and funding for experienced technical advisors are severely limited. In fact, funding for many rangeland research programs has dramatically declined during the past decade, despite the increased demands for solutions to the problems created by invasives.

Once prevention has failed, the goal should be to stop the spread of invasives before they become economically or environmentally damaging. A long-term management plan that integrates research, best management practices, and integrated weed management techniques is critical in order to even attempt to contain invasive species. The management plan developed by NISC is a good start, but implementation has been slow due to funding limitations and other deficiencies that Federal officials have recognized and are working to improve.

New money should be directed to a program that gives states maximum flexibility to direct funds where they can be utilized by local decision makers most effectively. Federal red tape and administrative requirements must be minimized to ensure that the dollars are getting to the ground where they are needed most. For Federal lands, a programmatic environmental impact statement is needed so the agencies can deal with all weeds simultaneously, rather than one at a time.

The best method of fighting these invasions is to act locally. Currently, we have a limited amount of resources. Resources can be maximized by diverting funds to the local level to assist those who know best how to manage the land and treat the problem—whether the land is Federal or private. And because invasive species know no boundaries, any Federal program must allow for funds to be directed where they are most needed.

We should develop a process for setting priorities, inasmuch as funding will always be a limiting factor for invasive species control activities. NCBA believes that our limited Federal dollars should be directed to projects that hold the most promise for success, whether they are on Federal lands, state lands or private lands, or any combination thereof.

Eradication, like containment, depends on integrated, site-specific management techniques, coordination between Federal, state and local governments and landowners, research and public awareness programs, and adequate funding to have any effectiveness at all. However, where invasions are widespread, complete eradication may be impossible.

Most cattle producers spend a lifetime fighting invasive weeds on their farms and ranches. They believe that every effort needs to be made to provide a strong foundation for efficient distribution of Federal funds, strive to avoid duplication, coordinate activities between Federal and state agencies and private landowners, and provide the flexibility for decisions to be made locally where the problems arise. There currently is legislation before the full Committee that NCBA believes would provide a dedicated, coordinated Federal effort to help in the fight against invasive weeds. We support S. 144, the Noxious Weed Control Act of 2003" (Craig, R–ID) that was reported by the Senate on February 11, 2003 and referred to the House Subcommittee on Conservation, Credit, Rural Development and Research. NCBA also supports H.R. 119, the Harmful Invasive Weed Control Act" (Hefley, R–CO). Both these proposals provide financial assistance through States to eligible weed management entities to control or eradicate harmful weeds on public and private land. H.R. 119, however, requires that the Secretary of Interior consult with the Federal Interagency Committee for the Management of Noxious and Exotic Weeds. The original draft of this legislation established the consulting body as the National Invasive Species Council (NISC). We believe this to be the more appropriate consulting body

for the Secretary should be NISC, which is supported by the Invasive Species Advisory Committee, and would urge original draft language be reconsidered.

We are aware that there currently are other legislative proposals that have been offered on invasives beyond these two proposals and we do not oppose those efforts. But because the resource and financial impacts to our industry are so acute, our number one priority must be to focus our attention on efforts to address harmful, invasive weeds.

The National Cattlemen's Beef Association wishes to express its gratitude to Chairman Gilchrest and Chairman Radanovich for holding this hearing and for focusing attention on invasive species. We look forward to working with the Chairmen and members of this Subcommittee on this issue.

Mr. GIBBONS. We turn now to Mr. John Connelly, President, National Fisheries Institute.

STATEMENT OF JOHN P. CONNELLY, PRESIDENT, NATIONAL FISHERIES INSTITUTE

Mr. CONNELLY. Thank you, Mr. Chairman and members of the Subcommittee. I appreciate the opportunity to discuss this important issue with you. NFI is the leading trade association representing the full range of fish and seafood products from "water to table," which means we represent fishermen, aquaculturists, importers and exporters of fish, processors, down through the retailers and the restaurants which eat this healthy food.

Why do we care about invasive species? Invasive species impact the essential fish habitat. They have the potential to introduce new diseases into the environment. They prey on traditional sources of food for the native species and they run the risk of altering traditional fishing practices for the native fishermen.

I would like to just relate three anecdotes, three examples, some of which you will hear about in more detail in the next panel so I will just highlight them. I think you may recall in 1991 there was a very severe epidemic of cholera in Latin America. At the same time in Mobile Bay, Alabama, there was an indication that the ballast water coming from ships that had recently been in Latin America contained the same strain of cholera that existed in Latin America and caused such devastation down in that continent. Our concern is that there are 79 million metric tons of ballast water that come into the U.S. every year. The Chesapeake Bay alone has 10 billion liters of this foreign ballast water each year. The risk is that the ballast water contains microorganisms that impact either fish or human health and the environment. That is one example of the kind of challenge that we face.

Dr. Mann of the next panel will talk at some length about the rapa whelk. Mr. Pallone has already mentioned his concerns about this. Rather than going into some of the technical issues there, I would just note that rapa whelk can actually be harvested and eaten, and some folks have suggested why don't we make this a food source. The concern is that you would need to develop a market for rapa whelk. There is no market. People don't go out and buy this right now. It has a severe impact on the ecosystem. Again, Dr. Mann will describe some of the technical issues in the next panel.

The third example or anecdote is the Chinese mitten crab. Again you have heard some of this described earlier from earlier witnesses. Some folks would ask, a mitten crab, why is that different

from a blue crab or a green crab or any other kind of crab? Why can't we just eat this crab? We have some examples of some of the challenges that this crab represents. Back in the 1930's, this was inadvertently introduced in Germany and caused severe economic harm to the German economy and the seaports there and the fish and seafood industry in that country.

One of the earlier witnesses mentioned that not all invasive species are bad or not all nonnative species are bad. There are cases where ecosystem managers or fishery managers will actually introduce a nonnative species into an environment in order to help solve a problem. I think most folks are aware that the Chesapeake Bay oyster system or fishery is in severe straits. Some of that is caused by pollution. Some of it is just the fishery is dying out. Why that is important, I think, for folks that remember their sophomore year of high school biology is that oysters actually clean water. They are actually a natural filtration system for water. So what the Chesapeake fishery has done is on a test basis introduce Chinese oysters into the Chesapeake Bay as a test case to see whether that will allow the native oyster population to recover and will naturally continue to clean the water within the Chesapeake Bay. What is important about that is those Chinese oysters are sterile, so they cannot be reproduced and that is part of a management technique that would need to be continued to look at, is whether the Chinese oysters should actually continue to be sterilized or whether the fishery manager in that area would actually develop that as a separate fishery outside of a nonnative population.

NFI strongly supports aquaculture as a way to ensure a safe and wholesome food supply of fish and seafood. The key for aquaculture is ensuring that the management systems are in place to prevent the farmed fish from entering into a native environment and causing any kind of problems in the native fish environment. That is an important part of what our Nation needs to do to ensure a safe and healthy food supply of fish.

As far as new authority, we believe there needs to be better coordination among the existing authorities and with key stakeholders. I think the Chairman had mentioned that there were 23 laws already on the books concerning this issue. We believe there needs to be increased funding to implement mitigation plans and to ensure that stakeholders from the business side and the industry side, the State side and the Federal side, coordinate better on this.

Mr. Chairman, that concludes my remarks. I appreciate the opportunity and look forward to answering any questions.

Mr. GIBBONS. Thank you very much, Mr. Connelly.

[The prepared statement of Mr. Connelly follows:]

Statement of John Connelly, President, National Fisheries Institute

Chairmen Gilchrest and Radanovich, Congressman Pallone, Congresswoman Christian–Christensen, and distinguished members of the Subcommittees, on behalf of the more than 700 members of the National Fisheries Institute (NFI), I want to thank you for the opportunity to testify before you on the adverse impacts of invasive marine species on commercial fisheries. I am John Connelly, President of the NFI.

The NFI is the nation's leading trade association for the diverse commercial fish and seafood industry. We are a "water to table" organization, representing fishing vessel owners, aquaculture operations, processors, importers, exporters, distributors,

restaurants, and retail establishments. NFI's mission is to ensure an ample, safe, and sustainable seafood supply to consumers.

The introduction of non-native species into marine and coastal ecosystems may adversely affect commercial fisheries in a number of ways: non-native microorganisms may infect native species with new diseases or public health threats, non-native species may alter essential fish habitat, or non-native species may compete directly with or prey upon traditional commercial fish species. At a minimum these affects can force fishermen to alter traditional fishing practices in terms of gear or time/area of harvest. In its worst form, these invasions may reduce otherwise sustainable harvest opportunities. In either situation, invasions by exotic species can cause serious economic harm to the commercial fishing sector.

I would like to focus on three examples of exotic species invasions of marine or coastal ecosystems to highlight the impacts these invasions may have on commercial fisheries, including:

- The introduction of Vibrio cholera into Gulf of Mexico oysters via ballast water,
- The introduction of rapa whelk into the Chesapeake Bay, and
- The introduction of Chinese mitten crab into San Francisco Bay.

Vibrio cholera and Gulf of Mexico Oysters

In 1991, a new strain of Vibrio cholera 01 (V.c.), the bacteria the causes human cholera, was found in oysters and fish in Mobile Bay, Alabama[1]. The strain of V.c. was identical to the strain responsible for a cholera epidemic in Latin America at that time. The ballast water of ships leaving Latin America and arriving in Mobile Bay, AL tested positive for the V.c. bacteria[2].

While this infection of Mobile Bay was brought under control and no human illnesses occurred as a result, it certainly created considerable concern among both the oyster industry and consumers and highlights the potential threat of invasive microorganism introductions via ship ballast water.

It is estimated that United States ports receive more than 79 million metric tons of ballast water from overseas each year[3]. Chesapeake Bay alone is reported to receive 10 billion liters of foreign ballast water each year[4]. With the United States receiving shipments from all over the world, the potential introduction of exotic microorganisms is tremendous. In fact, scientists estimate that, given the diverse array of microorganisms present in ballast water, various animal diseases and human pathogens may be introduced into U.S. coastal waters via ballast water discharges.

The NFI appreciates the efforts of the maritime community to begin addressing this issue through open ocean ballast exchange. We look forward to working with them to further address the issue in the future.

Rapa Whelk in Chesapeake Bay

In the late 1990s, the rapa whelk was detected in the mouth of the St. James River in Chesapeake Bay. The rapa whelk is a mollusk with a heavy, short-spired shell. It is native to the Sea of Japan. Since its detection, everything that scientists at the Virginia Institute of Marine Sciences (VIMS) have learned about the whelk has them concerned that this exotic species poses a serious threat to the Chesapeake Bay seafood industry.

The rapa whelk consumes bivalve shellfish such as oysters and clams. VIMS scientists believe it has the potential to devastate Chesapeake Bay shellfish stocks. A full-grown whelk can consume two large chowder clams per week. The presence of egg masses on bridges, pilings, and commercial fishing gear indicate the rapa whelk is reproducing prolifically in the lower Bay, releasing millions of eggs. If unchecked, there is a real risk that the rapa whelk could spread throughout the Chesapeake Bay, reeking havoc on shellfish stocks such as oysters already struggling against pollution and diseases.

Interestingly, the rapa whelk has edible meat and its eradication may present a new harvest opportunity for Chesapeake Bay watermen. However, this should only be seen as a short-term development. Not only would consumers need to be educated and a market created for whelk meat but this exotic species will require the development of new fishing approaches for area watermen before it could be successfully developed into a fishery. In addition, the broader ecosystem impacts of this exotic species raise serious questions as to its desirability in the Chesapeake Bay, even if it presented a serious and potentially profitable harvest opportunity.

Chinese Mitten Crab in San Francisco Bay

The Chinese mitten crab was first detected in Southern San Francisco Bay by shrimp trawlers in 1992. Since that time, the Chinese mitten crab population in San Francisco Bay has rapidly expanded and it appears likely that the distribution of this exotic crab will involve most of the state of California, according to the Chinese

Mitten Crab Control Committee as reported to the Aquatic Nuisance Species Task Force.

The introduction of the Chinese mitten crab in Germany in the 1930s caused serious negative impacts on fisheries. The crab proliferated and spread so successfully that fisheries suffered significant losses due to damaged catch and gear.

In California, the Chinese mitten crabs are already adversely affecting salmon and other fish by interacting with and damaging and/or eating juvenile fish being collected to bypass water diversions. The economic impact incurred to the salvage operations amounted to over $1 million. In addition, commercial bay shrimp and crawfish fishermen reported large numbers of the crabs in nets and traps in 1998 and 1999, decreasing catch efficiency and increasing operational costs. In fact, it has been anecdotally reported that these fishermen had to shift their time and area of harvests to avoid Chinese mitten crab and some fishermen reportedly simply stopped fishing in response to unavoidable crab aggregations.

In addition to exotic species invasions of U.S. marine and coastal ecosystems such as those just described, there are other invasive species issues I would like to address including the intentional introduction of an exotic species to restore a fishery or ecosystem function and the accidental release into the wild of a non-native aquaculture species.

Intentional Introduction of Non–Native Species

In some cases, fishery or regional ecosystem managers may wish to intentionally introduce a non-native species in order to reestablish a key fishery or ecosystem function. The most notable example, of course, is the intentional introduction of Chinese oysters into the Chesapeake Bay. Native Chesapeake Bay oysters have been decimated by historic overharvest and exposure to lethal pollution-based diseases. With the persistent presence of these diseases in the Chesapeake Bay for the foreseeable future, it will not be possible for the native oyster population to restore itself. In the absence of an oyster population, the Chesapeake Bay loses not only an important commercial fishery but also a critical ecosystem function of water purification by these filter-feeding organisms. It has therefore been suggested that managers allow the introduction of a Chinese oyster that is immune to the pollution-based diseases that plague the Chesapeake Bay to restore oyster benefits to the Bay. The current experiment in this regard involves sterile individuals and could be considered an aquaculture operation more than a restocking of the wild population.

That said, this could present a powerful new tool for improving the health of the Chesapeake Bay and restoring an important fishery. For these reasons, the introduction of the Chesapeake oyster seems to make sense for the Chesapeake Bay. It may be necessary, however to continue to ensure a lack of reproductive capability in these introduced oysters, even in the long term. There are concerns that if established in the Chesapeake Bay as a reproducing population, this non-native species could expand into other U.S. coastal waters and compete with or displace other healthy native oyster populations. The benefits as well as the costs, therefore, need to be carefully analyzed before a full-blown stocking effort is implemented.

Non–Native Species Aquaculture

The NFI strongly supports the development of marine aquaculture as an important mechanism to sustainably and affordably increase seafood production. The NFI also believes marine aquaculture operations must be conducted in a manner that minimizes to the greatest degree practicable the potential establishment of a non-native species in a natural ecosystem. This should be done by focusing aquaculture projects on native species or, where non-native species are used, instituting management practices that minimize the chances of an accidental release (e.g., net structure and location) as well as the probability of the release resulting in the establishment of a viable, reproducing wild population of the non-native species (e.g., single gender crops, nutrition deficiencies, triploid genes).

In conclusion, Mr. Chairman, the NFI is concerned that the introduction of non-native species into U.S. marine and coastal ecosystems presents real challenges that need to be addressed both practically and effectively. We welcome the consideration of this important issue by these Subcommittees. Thank you.

Citations

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Mr. GIBBONS. We turn now to Mr. John Shannon, State Forester of Arkansas, on behalf of all State Foresters. Mr. Shannon, welcome.

STATEMENT OF JOHN T. SHANNON, STATE FORESTER OF ARKANSAS, ON BEHALF OF THE NATIONAL ASSOCIATION OF STATE FORESTERS

Mr. SHANNON. Yes, sir. Thank you. I am the State Forester of Arkansas. I came here yesterday from Cammack Village, Arkansas to visit with the Subcommittees. I represent the State Foresters from all 50 States, from all the territories and from the District of Columbia. Thank you for inviting us.

You have heard one clarification already that some invasives are exotic and some invasives are native and those distinctions may not be very helpful, as Mr. Arnett mentioned. One more distinction is that the road for the transport of invasives is a two-way street. We certainly receive lots of invasives from other countries and we have sent what became invasives to other continents.

Now, for the four issues that were outlined in the invitation to the State Foresters. The first was the scope of the invasives problem. As the Chairman mentioned earlier, the scope is large and I will not repeat the statistics he gave us. I would add two more notes. It is not a Federal issue exclusively. State and private lands are hit hard by invasive species and America's forests have been clobbered by invasive species: gypsy moth, sudden oak death, chestnut blight. I have been a forester 25 years. I have never seen a chestnut forest. They have been obliterated in the United States. Now we have something called balsam woolly adelgid. It is an insect that most Americans have never heard of and it likely will kill every fir tree growing in the Rocky Mountains. So forests have been hurt terribly by invasive species.

Control efforts. One of the members asked earlier, do we need to start from scratch on control efforts? My take-home point here would be no. I think we ought to use the existing experts and the existing authorities. For instance, there is that National Invasive Species Council. They had prepared a management plan. I think we ought to implement the plan. The U.S. Forest Service has a Forest Health Protection Unit staffed with incredibly bright, inventive experts, people who are not only scientifically sound but they are helpful and they return phone calls. The Forest Health Protection Unit needs to be involved in any effort to protect our forests from invasives. And there is a Cooperative Forestry Assistance Act, Federal law, been around for 25 years, has really established a strong partnership between the Federal Government and the States and tribal governments and local governments. I think that is a great platform to start from in continuing those partnerships.

The third issue that was presented before us, is the existing authority adequate? I think there are gaps in the authority. One of

the gaps, I believe, is insufficient promotion of partnerships with the States and perhaps there is a need for new Federal legislation to create some overarching comprehensive approach.

Finally, what are the recommendations of the State Foresters?

No. 1, please support active forest management. And if forest supervisors in your States or territories suggest that to control invasives we need to conduct prescribed burns or use pesticides or cut trees, please support them.

No. 2, the National Association of State Foresters has testified before Interior Appropriations. I hope you will support our appropriations request. And if it please the Chair, I would like to make that written testimony part of the record today.

Mr. GIBBONS. Without objection.

[The statement submitted for the record by James L. Sledge, Jr., President, National Association of State Foresters, follows:]

Statement submitted for the record by James L. Sledge, Jr., President of the National Association of State Foresters, on Fiscal Year 2004 Appropriations, Before U.S. House Appropriations Subcommittee on Interior and Related Agencies

INTRODUCTION

The National Association of State Foresters (NASF) is pleased to provide testimony on the U.S. Forest Service (USFS) $4.8 billion budget request for Fiscal Year 2004. Representing the directors of state forestry agencies from all fifty states, eight U.S. territories, and the District of Columbia, our testimony centers around those Deputy Areas most relevant to the long term forestry operations of our constituents: State and Private Forestry (S&PF), Wildland Fire Management, and Research and Development (R&D). We believe the USFS budget for Fiscal Year 2004, which offers opportunities for advancing the sustainable management of public and private forestland nationwide, can be strengthened through our recommendations.

FIRE MANAGEMENT

The landscape nature of fire calls for cross-boundary management programs grounded in interagency cooperation and stakeholder collaboration. As a long term, collaborative approach to fire management, the National Fire Plan (NFP) brings communities, governments, and agencies together to accomplish activities that reduce wildfire risk and help burned lands quickly recover. NASF urges the Subcommittee to continue its support of the NFP through continued financial backing and increased coordination with states and local communities.

We support the $186.6 million increase in Fire Operations, but recognize that with rising costs for fire suppression additional funding will be needed in the future. With over 85% of fire suppression dollars going to control just 2% of all fires, the cut in Fire Preparedness funding worries us greatly. NASF recommends funding Fire Preparedness at $640.0 million.

As we were reminded in the aftermath of last summer's wildfires, restoration activities following wildfire are critical to reducing soil erosion and protecting water quality. Likewise, reducing dangerously high fuel loads across the landscape can limit the severity of wildfires. NASF recommends funding hazardous fuels reduction at $262.1 million and rehabilitation and restoration at $63.0 million.

State Fire Assistance (SFA) and Volunteer Fire Assistance (VFA) contribute greatly to fire protection on Federal, state, and private lands. State forestry agencies and rural fire districts rely on the technical and financial backing of SFA for fuel treatment, hazard reduction, fire prevention outreach, and other preparedness and protection activities. Local volunteer fire departments, often the first to attack wildland-urban interface fires, depend on VFA's financial support, technical assistance, and firefighting training. When funded adequately, the complementary programs expand state and local firefighting capacity to better match and work in concert with the USFS to respond to wildfires, other emergencies, and national disasters. Our suggested increases in SFA and VFA will ensure that communities are prepared to implement the landscape level activities needed for effective fire management.

Community and Private Lands Fire Assistance (CPLFA), which was authorized in the 2002 Farm Bill, helps establish defensible space around private homes and prop-

erty and educates homeowners about wildfire prevention. By helping communities and landowners reduce their own risk, it provides an effective way to implement the NFP, enhance steps taken through the Healthy Forests Initiative, and reduce the loss of resources and the cost of fighting wildfires. NASF recommends authorizing $15 million for CPLFA, emphasizing community planning and supplemented with funding from the Healthy Forests Initiative. CPLFA provides the connection between the NFP and communities that will ensure that implementation of the NFP is sustained.

FOREST STEWARDSHIP

By encouraging non-industrial private landowners to manage for multiple objectives, forest stewardship management plans help spread the public benefits of environmentally responsible forest management. The Forest Stewardship Program (FSP), which provides the technical expertise for stewardship planning, ensures that management plans are scientifically sound and provide multiple management objectives. NASF applauds the Administration for the $33.6 million increase in funding for FSP over last fiscal year for hazardous fuels reduction, invasive species management, and the sustainable management of timber and non-timber resources. A portion of this increase could further the Administration's objectives on a broad, national scale through a watershed forestry assistance program that provides incentives to enhance water quality. NASF supports allocating $20.0 million for watershed forestry assistance and $45.6 million for FSP.

Forest Stewardship provides assistance to landowners to develop management plans, while the Forest Land Enhancement Program, authorized in the 2002 Farm Bill, provides incentives for landowners to implement sound forest management practices on the ground.

NASF also supports the Forest Legacy Program (FLP), which helps to prevent the conversion of private forestland to non-forest uses through conservation easements and land acquisition. We support the President's increased funding level for FLP of $90.8 million.

ECONOMIC ACTION

The Economic Action Program (EAP) provides important support for forest-based rural development. Forest landscapes are often overloaded with fuels and many rural communities are facing economic transitions. The financial and technical assistance provided by EAP can help develop industries that reduce wildfire risk, restore fire adapted ecosystems, and enhance economic and social well-being. The opportunities provided by EAP to market underutilized, specialty, and non-traditional forest products while working directly with local communities offers a chance to simultaneously revitalize rural economies and solve some of our forest management issues facing much of the country. NASF is currently working with the USFS to restructure the program, and significant progress is being made. NASF recommends funding EAP under Cooperative Forestry at $28.7 million and under the NFP at $12.5 million.

FOREST INVESTORY AND ANALYSIS

NASF has long supported the Forest Inventory and Analysis (FIA), an invaluable inventory of all the nation's public and private forests. Regular forest inventories help foresters and decision-makers adapt management plans to changing forest conditions and document achievements of management. Administered under R&D, the FIA program is also involved with surveys of non-industrial private forest owners, assessments of forest health conditions, and other data useful for landscape level management, benefiting all Deputy Areas. NASF urges the Subcommittee to maintain the Federal responsibility to fund baseline forest inventories and other long term forest research.

The President's request for Fiscal Year 2004, which represents a significant decrease in the FIA budget, would severely hamper the program. In order to maintain base funding and support annualized inventories for each state, NASF recommends funding FIA at $65 million, spread across R&D, S&PF, and the National Forest System (NFS). Our recommendation would bring FIA almost to its full implementation level of $67 million.

URBAN AND COMMUNITY FORESTRY

The Urban and Community Forestry (UCF) program helps sustain and enhance tree cover in metropolitan areas through education, technical assistance, and grants that promote trees and other vegetation as integral components of cityscapes. With about 80% of the nation's population living in urban areas, this is an S&PF program that truly reaches most citizens where they live, work, and play. The increased coordination of S&PF programs across the country from city centers through the

urban-wildland interface to rural areas is exemplified by UCF. Federal UCF monies are leveraged through state forestry agencies with private sector involvement and initiatives. UCF includes a competitive grants program, another way that the funds are used to effectively reach a variety of organizations and entities to enhance urban forestry in America. NASF encourages the Subcommittee to fund UCF at $50.0 million to ensure the continued success of the program.

FOREST HEALTH MANAGEMENT (FHM)

The early detection, control, and prevention of damaging insects and disease is critical to the health of forests on all ownerships. Through its three program areas—Federal Lands, Cooperative Lands, and the proposed Emerging Pest and Pathogen program—FHM provides an important foundation for managing insect and disease outbreaks by reporting on forest health trends, surveying and monitoring, delivering technical assistance, and providing prevention and suppression. NASF encourages the Subcommittee to provide $107 million for these programs. We also recommend $20.0 million in targeted funding for the Healthy Forests Initiative to address the pine beetle infestation reaching epidemic proportions in the southern region.

CONCLUSION

NASF seeks the Subcommittee's support for a Forest Service Fiscal Year 2004 budget that will ensure the continued delivery of a broad range of public benefits from forests. Collaboration among stakeholders across the landscape—federal, state, and local government agencies, private landowners, industry, and non-profit organizations—is necessary to manage for the wide range of forest resources and values found on all ownerships. The S&PF, fire, and R&D programs provide these links, and the Federal share leverages private dollars and provides an important catalyst for collaboration in order to take the work far beyond the usual boundaries of Federal land management. Thank you for the opportunity to provide our testimony.

[An attachment to Mr. Sledge's statement follows:]

NASF BUDGET RECOMMENDATIONS

USDA Forest Service Programs	FY 2003 Enacted	FY 2004 President	FY 2004 NASF
State and Private Forestry	...Dollars in millions...		
Forest Health Management			
Federal Lands	50.0	45.0	50.0
Cooperative Lands	30.8	25.1	31.0
Emerging Pest Fund	-	12.0	14.0
Healthy Forests Initiative (SPB)	-	-	20.0
Cooperative Fire Protection			
State Fire Assistance	25.5	25.4	28.0
Volunteer Fire Assistance	5.0	5.0	6.0
Cooperative Forestry			
Forest Stewardship	32.0	65.6	45.6
Watershed Forestry Assistance	0.0	0.0	20.0
Forest Legacy Program	68.4	90.8	90.8
Urban & Community Forestry	36.0	37.9	50.0
Economic Action Programs	26.3	0.0	28.7
Forest Resources Info & Analysis	4.9	4.0	12.0
International Forestry	5.7	5.0	6.0
Total, State and Private Forestry	284.6	315.8	402.1
Wildland Fire Management			
Fire Operations			
Preparedness	612.0	609.7	640.0
Fire Operations	418.0	604.6	605.0
Other Operations			
Hazardous Fuels	226.6	231.4	262.1
Fire Facilities	1.8	0.0	20.3
Rehab & Restoration	7.1	0.0	63.0
Fire Research	21.3	21.4	27.2
Joint Fire Science	7.9	8.0	8.0
State & Private Forestry			
Forest Health Fed	6.9	7.0	7.0
Forest Health Coop	9.9	5.0	5.0
Economic Action	5.0	0.0	12.5
State Fire Assistance	46.3	46.5	58.0
Volunteer Fire Assistance	8.2	8.2	10.0
Community & Private Land Asst.*	0.0	0.0	15.0
Healthy Forests Initiative	-	-	35.0
Total, Wildland Fire Management	1371.0	1541.8	1768.1
Research & Development	250.0	252.2	254.7
Forest Inventory & Analysis			
State & Private Forestry			
Forest Resources Info. & Analysis	4.9	4.0	12.0
Forest Health Management	2.8	2.8	2.8
National Forest System	6.2	0.0	6.2
Forest & Rangeland Research	41.2	36.5	44.0
Total, Forest Inventory & Analysis	55.1	43.3	65.0

* CPLFA was originally funded $35 million under Wildland Fire Management (WFM) Operations in FY 01. In FY 02, $15 million was provided under WFM Operations for activities that cross the National Forest System boundaries. In FY 03, CPLFA was authorized under the 2002 Farm Bill for $35 million. In FY 04, the program would be funded through S&PF or S&PF Wildland Fire Management.

Mr. SHANNON. Thank you, sir. That includes recommended budget for the forest health protection, forest health management work of the Forest Service, and $20 million would be for southern pine beetle control. That is a native invasive species. We propose that to be part of the President's Healthy Forests Initiative.

Finally, State foresters are pragmatic people. We like early detection and rapid response and we like to study things only as

much as we need to to take intelligent actions. There is a great model for early detection and rapid response. That is the National Interagency Fire Center in Boise, Idaho. Well staffed, trained staff, good facility, good technology, good equipment. If we could match a model like that for the fight with invasive species, we would be off to a good start. Thank you so much.

Mr. GIBBONS. Thank you very much, Mr. Shannon. We appreciate your testimony.

[The prepared statement of Mr. Shannon follows:]

Statement of John T. Shannon, State Forester of Arkansas, on Behalf of the National Association of State Foresters

INTRODUCTION

On behalf of the National Association of State Foresters, I am pleased that Chairman Gilchrest and Chairman Radanovich have asked us to testify on the growing problem of invasive species. NASF is a non-profit organization that represents the directors of the state forestry agencies from all fifty states, eight U.S. territories, and the District of Columbia. State Foresters manage and protect state and private forests across the U.S., which together encompass two-thirds of the nation's forests.

I am representing NASF in my role as Chairman of the Forest Health Protection Committee. Addressing the spread of invasive species is an objective of high priority for my committee, as invasive species weeds, insects, pathogens, animals, etc. are a growing concern among foresters and other natural resource professionals. I hope you find our comments instructive as you consider possible Congressional legislation or other Federal actions to help get ahead of this ubiquitous problem.

In this testimony, I will address the topics you raised in your invitation to testify: (1) the scope of the invasive species problem; (2) current efforts to control or eradicate invasive species; (3) the adequacy of existing statutory authority to stop the expansion of invasives; and (4) our recommendations on how to stop the problem.

CLARIFICATION

Before I discuss the topics you raised, I would like to offer a point of clarification about what constitutes an invasive species.

As natural resource managers, our use of the term "invasive" is often synonymous with "exotic" or "non-native 'species that presumably originate from distant corners of the world and are transported here. Many exotic insects, plants, and animals have become very destructive after entering the U.S. However, it is important to remember that several species indigenous to the U.S. are equally harmful to our environment and economy, as well as those of other countries. In other words, not all invasive species are exotic, and the U.S. is both a recipient and a contributor to the problem.

The red oak borer is a case in point. Populations of the native insects recently have skyrocketed in the Ozark Highlands of Arkansas, Missouri, and Oklahoma. Aging trees and overcrowded conditions due to the long term suppression of fires and the lack of active forest management, exasperated by naturally thin soils, heat waves, and droughts, have helped to create an environment for the red oak borer to thrive. In the Ozark Highlands today, as much as one million acres of dead or dying oaks pose severe wildfire hazards to communities, drinking water supplies, and the health of forests.

SCOPE OF INVASIVE SPECIES PROBLEM

As the Subcommittees are acutely aware, the problem of invasive species is large and growing. A recent report [1] on the status of invasive species efforts published by the Congressional Research Service (CRS) estimates that 30,000 non-native species exist across all the states and U.S. territories. CRS also estimates that economic losses due to invasives are estimated to exceed $123 billion annually in the U.S. The impact of invasives are tremendous, degrading the environment nationwide and affecting a range of industries including transportation, agriculture, recreation, fisheries, and others.

Forestry is no exception. From coast to coast and north to south, forests are suffering from the damaging effects of a long list of invasives: Asian longhorned beetle,

[1] Corn, L.M., E.H. Buck, J. Rawson, A. Segarra, and E. Fischer. 2002. Invasive Non–Native Species: Background and Issues for Congress. Congressional Research Service, Library of Congress. Nov. 29.

gypsy moth, hemlock and balsam wooly adelgid, and other damaging insects; kudzu, privet, callery pear, and other plants; and sudden oak death, apparently caused by a pathogen. Insects, diseases, and noxious weeds especially plague forests across the nation, and aggressive efforts must be taken to keep them under control.

As an example, the wooly adelgids are wreaking havoc on forestlands on both the east and west coasts. The balsam wooly adelgid, a tiny sucking insect that was introduced (probably from Europe) to the east coast of North America about 1900, was first detected on the west coast in about 1930. It infests all true firs (trees in the genus Abies), but is most damaging to North American species such as Fraser fir and balsam fir in the east, and subalpine fir and Pacific silver fir in the west. In some sites, susceptible species have been wiped out. The range of subalpine fir will probably be reduced to just the highest elevations in its current range. When this insect reaches the extensive subalpine fir forests of the Rocky Mountains, it will likely dramatically change those landscapes.

In the east, the hemlock woolly adelgid is destroying streamside forests throughout the mid–Atlantic and Appalachian region, threatening water quality and sensitive aquatic species and posing a potential threat to valuable commercial timber lands in northern New England.

State Foresters, private landowners, and our partners are increasingly spending our limited money and time on controlling outbreaks of these and other invasive forest pests.

EFFORTS TO CONTROL OR ERADICATE

State Foresters are currently involved with several efforts to control or eradicate invasives. In this testimony, I would like to mention three of the most promising efforts underway: (1) National Invasive Species Council; (2) USDA Forest Service programs; and (3) 2002 Farm Bill Programs.

National Invasive Species Council

One of the most important steps made in recent years toward enhancing the capacity to control or eradicate invasive species was the creation of the National Invasive Species Council. Established through an executive order signed by President Clinton in 1999, the Council is an interagency committee gathered to develop recommendations for international cooperation, promote a network to document and monitor invasive species impacts, and encourage development of an information sharing system on invasives.

In January of 2001, the National Invasive Species Council released Meeting the Invasive Species Challenge,[2] a national invasive species management plan that represents the first major Federal attempt to coordinate invasive species actions across government agencies. The plan calls for several areas of emphasis for invasive species management that should be part of any comprehensive effort to address the problem: (1) prevention; (2) early detection and rapid response; and (3) control and management. The plan includes the recommendation that draft legislation be developed to authorize matching funds for states to manage invasive species and to control invasives on state or private lands with the consent of the owner, a prospect that NASF highly endorses and hopes the Subcommittees will consider.

USDA Forest Service Programs

The USDA Forest Service State and Private Forestry (S&PF) Deputy Area has several programs that assist landowners with invasive species management, especially those within the Forest Health Protection unit. As authorized by the Cooperative Forestry Assistance Act of 1978, and amended in 1990, the State Foresters deliver S&PF programs to provide cost-share funding and technical assistance to private landowners. The broad authority of the Cooperative Forestry Assistance Act can provide the infrastructure to jumpstart any new invasive species management programs that the Subcommittees may propose.

Through its three program areas (Federal Lands, Cooperative Lands, and the proposed Emerging Pest and Pathogen program), Forest Health Protection provides an important foundation for managing insect and disease outbreaks by reporting on forest health trends, surveying and monitoring, supporting the delivery of technical assistance, and providing prevention and suppression activities. In our Fiscal Year 2004 budget recommendations,[3] NASF encouraged Congress to include targeted funding under Forest Health Protection for the President's Healthy Forests Initiative to address the southern pine beetle infestation, which is reaching epidemic pro-

[2] Available at http://www.invasivespecies.gov/council/nmp.shtml.

[3] Our testimony before the House Appropriations Subcommittee on Interior and Related Agencies, which includes our Fiscal Year 2004 recommendations, can be accessed at http://www.stateforesters.org/

portions. Also in Fiscal Year 2004, the Forest Stewardship Program has some funding for competitive grants for the purpose of improving forest health by treating invasive insects, diseases, and plants on state and private forestlands.

Invasive species management is also important to the Forest Service's other Deputy Areas, including the National Forest System and Research and Development. These well-established programs need sufficient funding to effectively address invasive species over the long term. Again I would point you to NASF's House Appropriations testimony for our Fiscal Year 2004 budget recommendations.

The Forest Service also works closely with the Animal and Plant Health Inspection Service (APHIS) to detect and rapidly respond to exotic pests that threaten agricultural crops and natural habitats. A 1997 General Accounting Office report[4] suggests that despite increases in funding, staffing, and the use of technology, APHIS is having difficulty keeping up with the increased inspections accompanying increases in trade.

2002 Farm Bill Programs

The 2002 Farm Bill made substantial gains for invasive species management for forestry through authorizing the Forest Land Enhancement Program and the Community and Private Lands Fire Assistance program.

Replacing the Stewardship Incentives Program and Forestry Incentives Program, the Forest Land Enhancement Program (FLEP) provides education, technical assistance, and cost-share funding to private forest landowners. FLEP is designed to keep priorities flexible at the state level as much as possible, with priorities determined with input by State Forest Stewardship Committees. The program can be used for a variety of forestry assistance purposes, including the control, detection, monitoring, and prevention of the spread of invasive species and pests, as well as the restoration of ecosystems altered by invasives. The State Foresters hold great promise for FLEP in terms of landowner assistance, but it must be recognized that invasive species management is only one of many activities that the program supports.

The Community and Private Lands Fire Assistance program, authorized but not funded in the 2002 Farm Bill, will also address the need to control noxious weeds and other invasive species within areas burned by wildfire. Without controlling noxious weeds that invade recently burned lands, areas damaged by fire can become significant sources for the further dispersal of weeds to other areas.

ADEQUACY OF EXISTING STATUTORY AUTHORITY

Although numerous existing Federal statutes or authorities address invasive species, there remain large gaps in law. The publication, Meeting the Invasive Species Challenge, described above, includes a partial list of 40 legal authorities of the U.S. Departments of Agriculture, Commerce, and the Interior, as well as the Environmental Protection Agency and other Federal agencies (see Appendix 3, pp. 62–70). Although work done under these authorities may limit such introductions, many laws do not directly address invasive species control and prevention, and those that do generally target one species that has become problematic. To my knowledge, the U.S. lacks a comprehensive approach to address invasive species, one that makes use of effective partnerships between all levels of government in all regions to identify and quickly respond to threats early (before they become a problem), effectively control outbreaks when they occur, and restore damaged ecosystems.

According to the CRS report mentioned earlier, comprehensive legislation on the treatment of non-native species has never been enacted, and no single law provides coordination among Federal agencies. The National Invasive Species Council may have made some headway in regard to coordination, but its management plan also noted the need to develop legislative proposals to fill gaps in current law. Meeting the Invasive Species Challenge specifically explains that current law does not clearly address the prevention of biological invasion across foreseeable pathways, nor does it provide explicit direction on management during the critical period between the introduction of a new non-native species and the time the species becomes established, when focus must shift from prevention to control.

RECOMMENDATIONS

The development of a comprehensive legislative package to help State Foresters and other resource managers aggressively tackle invasive species issues will be key

[4] Agricultural Inspection: Improvements Needed to Minimize Threat of Foreign Pests and Diseases. GAO/RECD–97–102

to addressing invasive species over the long term. I hope you will keep the following principles in mind as you consider developing any such proposals.

Active Forest Management

Emphasis must be placed on active forest management. When the problem is compelling and the solution is clear, management needs to happen as soon as possible. Some research is needed, but the overall emphasis should be on doing something on the ground where and when the problems occur.

Early Detection and Rapid Response

The early detection, control, and prevention of damaging invasive species is critical to the health of forests on all ownerships. The broad range of sectors that contribute to the propagation and spread of invasive species hold the promise for innovative and incentive-driven solutions. Constituents from these sectors should be at the table in developing solutions.

Existing successful programs may serve as models for early detection and rapid response. For example, the CRS publication noted above suggests that the National Interagency Fire Center (NIFC), of which the State Foresters are a key cooperator, could be a model for Congress to consider when developing rapid response programs. Efforts to quickly respond to wildfires face many of the same challenges of haste, technical needs, and interagency and intergovernmental coordination as do rapid responses to invasive species outbreaks.

A Pathways Approach

Invasive species management should focus on the variety of pathways by which invasive species enter the U.S. We need to identify and build capacity to respond, such as through early detection at ports or other shipping facilities. For example, through early detection measures targeting solid wood packing materials at ports, we might have avoided the spread of the Asian longhorned beetle to the U.S.

Long-term Investment

Long-term programs with ongoing funding are needed if we are to successfully control, mitigate, and eradicate harmful nonnative species on public and private lands. This is due to both the extended survival or dormancy of seeds and the continuous threat of new species introductions from overseas.

State/Federal Partnerships

Effective partnerships between various levels of government, especially between state and Federal agencies, will be critical to promptly dealing with invasive species issues. In guidelines recently adopted by the Invasive Species Advisory Committee, an advisory committee that supports the National Invasive Species Council, the group makes clear that effective partnerships among all levels of government are important first steps to building our capacity to control and eradicate invasive species across the country. The document, Guidelines and Strategies for a Successful State Federal/State Partnership to Combat Invasive Species, was adopted by the committee during its most recent meeting.

The advisory committee will be recommending that the Council use the following guidelines when developing administrative proposals or commenting on Congressional legislation for partnerships between Federal and state agencies:

- Incentive-driven with the voluntary cooperation of the private sector
- Flexible enough to address agency and community needs at the local level
- Support the development of state-level invasive species management plans
- Rapidly respond to priority invasive species that could spread
- Share successful invasive species management techniques among states and regions
- Increase public support and understanding of invasive species issues

CONCLUSION

Invasive species management on all lands will be strengthened through integrated, results-oriented work. Where program areas overlap, limited Federal dollars can be spent most effectively on integrating new and existing programs, and making use of the experts who are already involved with established authorities. By bolstering existing programs as much as developing new ones, a comprehensive package can provide an ideal opportunity to effectively address invasive species in a multi-ownership landscape.

NASF looks forward to the opportunity to work with the Subcommittees to develop and carry out effective, comprehensive programs to address the spread and control of invasive species. We are willing to help draft legislation to address these issues.

I appreciate the opportunity to provide testimony and answer your questions today.

Mr. GIBBONS. We turn now to Dr. Phyllis Windle, Senior Scientist, Union of Concerned Scientists. Doctor, welcome. The floor is yours.

STATEMENT OF PHYLLIS N. WINDLE, SENIOR SCIENTIST, UNION OF CONCERNED SCIENTISTS, ON BEHALF OF THE NATIONAL ENVIRONMENTAL COALITION ON INVASIVE SPECIES

Dr. WINDLE. Good afternoon and thank you. I am a Senior Scientist at the Union of Concerned Scientists, but today I was invited to represent the National Environmental Coalition on Invasive Species, so I would ask that you would make that correction in the hearing record. Our coalition includes 11 environmental or conservation groups with nearly 6 million individual members and activists. I will also address the four topics that you requested.

First, we feel that the scope of the problem and its magnitude are staggering, and both are likely to worsen as international trade and travel increase.

Second, in terms of efforts to control or eradicate unwelcome invaders, we know that a number of groups have had notable successes and there certainly is cause for optimism in some places. But those methods usually apply to a single species in a limited area and at high cost. Certainly efforts are not keeping pace with the scope of the problem.

Third, whether statutory authority is sufficient to limit problems, we would say no, it is not, especially if we talk about gaps in authority as including ones of legislation and oversight but also in how Federal agencies implement their programs, what their mandates are, and how they fund them. A number of authors have examined this issue of authority and gaps and they have all come to the same conclusion. Part of that conclusion is that those 23 pieces of legislation that you mentioned are usually partial and designed for other purposes than the problem we are speaking about today. We do not have a seamless system that runs through all of the steps of preventing new introductions, of responding quickly after detecting them early, managing them well, enforcing our regulations and laws, doing public education and outreach and ensuring that we have the adequate research and monitoring in place to prepare for the future.

Lastly, our recommendations. I would say that we are playing a desperate game of catch-up and largely losing. The invasive species that are already here are being joined by others that are constantly arriving. Preventing new arrivals is absolutely key. For this reason, we would recommend that Federal agencies' statutory commitments be clarified and strengthened. Their aim should be to cut risks of further damaging or potentially damaging introductions as close to zero as is feasible. We recognize that a rigorous program of preimport screening is also essential. We urge that that be put in place for all intentionally introduced species as one way that Federal agencies could implement a stronger mandate. Of course,

there will be clearly noninvasive species that could quickly be cleared and continued through the process for import.

We would want equally stringent means put in place to address the pathways by which inadvertent introductions occur. The proposed National Aquatic Invasive Species Act is probably the best attempt for doing this for ships' ballast water and we would urge quick passage of the two related House bills.

We also recommend that the Federal agencies explore and quickly implement new methods to fund efforts. Relying on Federal appropriations is clearly not working. We can tell from the Federal backlog that many of the agencies have for addressing the problems in front of them.

Our third recommendation is to take additional steps to ensure that international trade is less risky. This means strengthening the mechanisms that are in place in relevant international bodies and ensuring that the Office of the U.S. Trade Representative addresses invasive species issues. Specifically we ask that the Congress not support international agreements that are less protective than U.S. policy.

We are rich in potential legislation in this Congress—a welcome change from what has been the case at other times.

We offer our sincere thanks to all of you who have been involved in drafting or supporting this legislation and for the roles that many of you will take now as these pieces of legislation move through this Committee. We are happy to give a general endorsement to all of the bills that we see in front of us this year, including Mr. Hefley's H.R. 119. We look forward to working with you on their passage and urge you to take action quickly.

Thank you very much.

Mr. GIBBONS. Thank you very much, Dr. Windle and ladies and gentlemen, thanks to each of you for your very helpful testimony.

[The prepared statement of Dr. Windle follows:]

Statement of Dr. Phyllis N. Windle, Senior Scientist, Union of Concerned Scientists, on behalf of The National Environmental Coalition on Invasive Species, American Lands Alliance, Center for International Environmental Law, Defenders of Wildlife, Environmental Defense, Environmental Law Institute, Great Lakes United, International Center for Technology Assessment, National Wildlife Federation, National Wildlife Refuge Association, The Nature Conservancy, Union of Concerned Scientists

Mr. Chairmen and members of the Committee, the National Environmental Coalition on Invasive Species appreciates the opportunity to address you today. It is on behalf of the eleven conservation organizations that constitute this coalition that I am testifying.

Together, our member organizations have nearly six million individual members and supporters. One member of our coalition has protected millions of acres in private preserves and works with over 1,900 corporate sponsors. Several members have affiliates in at least 46 states. One coalition member is made up of more than 150 community groups as well as groups of conservationists, hunters and anglers, and labor unions. Our other members have long provided the scientific, economic, and legal analyses and the responsible advocacy that are at the heart of what we recommend today. Many of us have been tackling issues of invasive species for more than a decade. Thus, we speak from considerable experience.

The threat of invasive species is common ground for all of us here today. Whether we are concerned about conservation, about maintaining healthy rangelands; about sustainable agriculture, fisheries, and forestry, or about trade, invasive species are a threat to our past and future accomplishments. We all want equitable, practical, and cost-effective solutions to this environmental problem.

You asked that we specifically address four topics today:

1. The scope of the problem—Both the scope and magnitude of this problem are staggering and it is likely to get worse as international trade and trade increase;

2. Efforts to control or eradicate unwelcome invaders—Groups have had notable successes but their successes have applied to single species, usually in limited areas, and against long odds and high costs.

3. Whether existing statutory authority is sufficient to limit problems—No, it is not, especially when we consider here gaps not only in congressional law-making and oversight but also in Federal agencies' mandates, implementation, and funding.

4. Our recommendations to solve the problem.

While our coalition has no magic bullets that can completely redress the invasive species problem, we do offer guidance, recommendations, and support for some of the proposals before this Congress, along with constructive suggestions for improving them. We believe these are good ideas that will make a difference.

First and foremost, we recommend that Federal agencies' statutory commitments, their policies, and practices be made more stringent in order to better prevent further introductions of invasive species. Also, we recommend exploring and quickly implementing new methods to adequately fund the efforts that are so urgently needed. We urge that invasive species issues be more thoroughly addressed in arenas dealing with international trade—a root cause of invasive species problems.

1. The Scope of the Problem

Picture the South without dogwoods, Vermont without maple trees, the Chesapeake Bay without oysters, or the Great Lakes without lake trout. Non-native and harmful species are increasingly recognized as a severe threat to our nation's economy, natural resources, and health. Most non-native organisms in the United States are either beneficial or not harmful. A fraction, though, cause damage and, at their worst, the environmental and economic costs are staggering.

Invasive species disrupt the function of ecosystems by altering fire cycles, the flow of water and nutrients, or the kinds of organisms occupying whole areas. As such alterations multiply, what were once unique regional characteristics are beginning to blur. Decades of conservation achievements are being undermined. And the health of resource-based industries is being jeopardized. For example:

- Invasive species are the number one cause of biodiversity loss in the Great Lakes and are expected to be the leading cause of extinctions in North American freshwater ecosystems this century.
- In fact, invasive species represent a primary threat to approximately 50% of the U.S.'s threatened and endangered species.
- Insects and disease pathogens introduced with trade from Europe and Asia have damaged 70% of the 165 million acres of forest in the Northeast and Midwest and threaten both commercial and non-commercial species.
- More than one-third of the grasslands and shrublands of the Intermountain West have been invaded by non-native plants.
- Nearly eight million acres of habitat distributed among half the 540 National Wildlife Refuges across the country are infested by at least 675 different invasive species.
- More than 200 of the 375 National Park Service units have flagged invasive species as a significant management concern that raises the costs of operation and contributes to their backlog of maintenance projects.

Economic Damage

We have no complete accounting of invasive species' economic costs across the nation, although estimates of overall annual losses of many tens of billions of dollars have been put forth. Some well-documented numbers indicate the magnitude of the economic damage:

- Between the late 1980s when the zebra mussel arrived in the Great Lakes and 1994, documented cumulative losses to about 50% of the Great Lakes' water users were $60.2 million.
- In the early 1990s when leafy spurge infested several million acres in the upper Great Plains, it caused an estimated economic loss of $130 million per year; heavy infestations have reduced the value of some ranch land by 90%.
- During the 2001–2002 fiscal year, more than $22 million in Federal, state, and local funds were spent to manage mostly aquatic plants on more than 53,000 acres in Florida alone.
- In 2001, $10.7 million in Federal and state funds were spent to slow the spread of European gypsy moths across a band of 56 million acres in nine southeastern and midwestern states.

- Tamarisk—a weed of riparian areas—is estimated to have extracted water worth an estimated $39–$121 million per year if the water had been used instead for irrigation in 12 western and Great Plains states.
- Mediterranean and Mexican fruit fly outbreaks cost $37 million in 2002 and are expected to cost $63 million in 2003. If these flies become established, losses to crop damage and export markets could exceed $821 million per year.

As the world's largest economy, the introduction of invasive species into the United States through trade is of primary concern. For example, the vast majority of goods and people arriving in North America arrive by way of the United States. Additionally, in 2000, one in every two marine vessels in the world's active fleet visited the United States, and the United States had 14 of the world's 30 busiest airports by cargo volume. Only two percent of incoming shipments are inspected, however, and other, more effective strategies for protection have not been put in place. The result is a significant gap in our frontline defense against preventing both terrestrial and aquatic introductions.

Our concerns transcend regions and ecosystems. There are clear risks to the nation's waters, forests, farmlands, rangelands, wetlands, natural areas, and public and private property values. While much research and management has focused on agricultural systems in the past, we now have enough experience in non-agricultural areas to know what sorts of policies are needed in these areas—ones that also contribute to the nation's economy and quality of life.

2. Efforts to Control or Eradicate Unwelcome Invaders

With thousands of invasive species in the United States, curtailing their continued spread throughout the country is an important aim. There are exciting examples of groups successfully doing just that.

Eradicating populations of invasive species has the advantage of providing a long-term solution. In the past, eradication was often perceived to be nearly impossible. But recent efforts suggest that, for a surprisingly large group of species and under the right conditions, eradication holds promise. For example, eradication of mammals, especially on islands and especially those that are plant-eaters, often works. Eradication of widespread terrestrial plants is more difficult but not impossible with persistence and—often—with sizeable budgets and a great deal of volunteer help, too. Eradication of aquatic invaders is likely the most to difficult to achieve, but may be possible in cases where new species are detected early and quickly treated.

These are among recent and anticipated successes of eradication campaigns:

- The Nature Conservancy staff reclaimed the Coachella Valley Preserve in California from tamarisk. The trees were planted as a windbreak but spread, outcompeted native plants, and used enough water to dry up some desert pools. Tamarisk was removed from tens of acres of wetlands. Today the vegetation has returned to its native composition and a spring flows that had been dry for years—a very visible success in a high-value locale.
- The National Park Service continues to protect the most pristine rain forest remaining in Hawaii. In the late 1970s, an invasion of feral pigs threatened a particularly valuable area of Haleakala National Park. The University of Hawaii and the National Park Service cooperated to study the pigs' impacts along with options for their control. In the mid–1980's staff constructed fences and snared the pigs inside until the entire population was removed—in about four years. Now, snares catch the few pigs that enter the park via occasional holes in the still-maintained fences.
- Officials expect to eradicate the Asian longhorned beetle from Chicago this year. This insect was detected in Chicago in 1998. Since then, concerted efforts by Federal, state, and city officials have almost succeeded in eradicating the beetle from five outbreak areas. Experts expect to find the last active beetles this year. These efforts involved the destruction of more than 1,400 trees and a cost of tens of millions of dollars. Unfortunately, efforts to eradicate the more widespread infestations in New York and New Jersey have not had the same success and a previously unknown outbreak was discovered in Jersey City last year. Failure to complete eradication of this insect could result in damage exceeding $600 billion.
- Federal, state, and local partners are preparing to eradicate nutria from Maryland's Eastern shore. The nutria, an invasive rodent from South America, is destroying thousands of acres of wetlands from Maryland to Louisiana by feeding on the roots of wetland plants. A team of partners, including the U.S. Fish and Wildlife Service, U.S. Geological Survey, Maryland Department of Natural Resources, University of Maryland, and local governments, groups, and landowners, is working together to control and eradicate this animal on the Eastern Shore of Maryland. Researchers are studying the behavior, population dynam-

ics, and impacts of nutria; creating models of the system; and then evaluating strategies to effectively eliminate this species and to help the vegetation recover. Once the best eradication strategy is determined, partner groups will implement it.

When conditions do not permit eradication, a number of jurisdictions have adopted a practice called "maintenance control," an approach pioneered in Florida. The focus is on keeping invasive species' populations at levels low enough for their harm to be tolerable.

There are also notable successes with this approach:

- Ongoing efforts have reduced populations of sea lampreys by 90% in most areas of the Great Lakes. Sea lampreys reached the Great Lakes after shipping canals were built from the Atlantic in the early twentieth century. They are parasitic aquatic vertebrates that attach to and prey on a wide variety of large fish—and contributed significantly to the collapse of the Great Lakes fisheries. For example, the U.S. and Canadian harvest of lake trout went from about 15 million pounds in Lakes Huron and Superior annually to about 300,000 pounds per year in the 1960s due to lamprey-induced mortality. Now U.S. and Canadian officials, along with state experts and other partners, use a combination of methods to keep sea lamprey populations low. These include population assessments, treatment with chemical lampricides, physical barriers, traps, and the release of sterile males, a form of biological control.
- The National Park Service's Exotic Plant Management Teams are cutting weed problems in all parts of the nation. They have successfully eradicated local populations of weeds or reduced them to manageable levels for 21 plants in 19 national parks, monuments, or other Federal properties.
- Test treatments of spartina grass have been successful at Willapa National Wildlife Refuge in southwestern Washington, the largest estuary in the northwest United States region outside Puget Sound. Spartina is treated from amphibious tractors equipped with a Global Positioning System (GPS) to guide infrared precision spray booms. This effort has resulted in immediate benefits for migratory shorebirds.

These examples represent significant successes at controlling or eradicating highly damaging invasive species. We know that there are others. The time is ripe to share and replicate these successes, many times over. Also, we can draw from these examples key lessons for making U.S. policy more effective. We've learned that certain, single species can have devastating effects. We know that effective management often requires a long-term commitment, with stable funding. Relaxing efforts for even one year can allow organisms to rebound and set back efforts substantially. Public and private groups make such long-term commitments because the damage of some invasive species is so high and the benefits of their control are so sizeable.

We must note, however, that the resources we put into managing invasive species do not approach being adequate. At present, technology allows only localized eradications of widespread invaders. Meanwhile, the floodgates remain open to more invaders. Given these challenges, we believe it is time for us, as a nation, to reexamine our fundamental approach to invasive species. While these eradication and control efforts are laudable, ultimately prevention of introductions is the most effective measure to protect our natural and other resources. The Committee is wise to ask whether the legal authority exists on which to base more effective policy.

3. Whether Existing Statutory Authority Is Sufficient

For U.S. policy and programs to successfully address the large-scale threats posed by harmful, non-native species, there must be authority to effectively carry out several major types of activities:

- Prevention—to keep the most damaging invasive species from reaching the United States and becoming established here.
- Early Detection and Rapid Response—to monitor and detect new, potentially damaging species quickly and to respond to them rapidly while eradication is still possible.
- Control and Management—to coordinate ongoing efforts with local, state, regional, Federal, and international authorities to minimize impacts of existing invasions and prevent their spread.
- Public Outreach and Education—to educate the public about the seriousness of the threat and inform individual actions that can limit the introduction or spread of harmful, non-native species.
- Research and Monitoring—to invest in effective and environmentally sound control technologies and other tools, and in the biologists and biological research needed to ensure long-term success.

A number of authors have examined whether adequate authority exists and they have come to the same conclusion: current authority is not sufficient to solve the problems we face. Existing policies and programs typically include some combination of these elements but there are many gaps—gaps that result from a number of sources. Agency mandates may be confusing or incomplete. Federal agencies may fail to fully implement existing statutory authority. Legislatively authorized levels of funding may not match actual appropriations. Or there may be areas where Federal efforts fall between the cracks of congressional jurisdiction.

As a result, current U.S. policy is a jigsaw puzzle with many holes. Most of the missing pieces were identified more than a decade ago, yet little has been done to put them in place. These are among the most serious gaps:

- Federal agencies have no clear legislative mandate to fully protect the nation's resources from the worst risks of international trade.

Agencies lack a clear legislative mandate to use their existing authority to implement a level of protection as close to zero risk of further harmful invasions as is feasible. Too often agencies (and especially USDA's Animal and Plant Health Inspection Service, or APHIS) act as if they are mandated to promote unfettered free trade rather than to limit international trade so as to prevent further harmful invasions. This may appear profitable in the short-run but, in the long-term, the environmental and economic costs will be high.

- Specific gaps in statutory authority remain.

Where Federal law does exist, there are often major exceptions in authority. For example, the Lacey Act is our nation's chief means of restricting imports of invasive animals. However, it restricts only a limited set of species or species groups and the process by which new species are added is slow and cumbersome. Nor does any agency have authority for invasive organisms, like the coqui frogs in Hawaii, that arrived with plants but are not themselves plant pests.

In fact, many clearly harmful actions that people would probably agree should not be allowable—like dumping water hyacinth into public waters—are. And not all of the people either inside or outside of government agencies agree on what current law allows their agencies to do. Federal agencies report that they are often requested to undertake tasks that may not be authorized under current law, like taking emergency action. Occasionally, they will fill such gaps on an informal, ad hoc, basis because of pressing local needs. But that can leave agencies on shaky legal ground.

- Federal agencies with existing authority sometimes fail to exercise it in important ways, creating a gap in implementation.

Major problems in implementation are common, e.g., the brevity of current "dirty lists" under the Lacey Act and the Plant Protection Act of 2000 and the time it takes to add organisms to these lists. One especially important such gap occurs in the way APHIS is implementing the Plant Protection Act. This law clarified that APHIS has responsibility to protect wetlands, grasslands, rangelands, and other natural systems from pests, including insects, diseases, and weeds. With a few exceptions (e.g., the Asian longhorned beetle), APHIS has continued to emphasize agricultural systems. We fear this gap in implementation will increase now that APHIS' port inspection duties have been transferred to the Department of Homeland Security, further distancing inspectors from concerns regarding pests of natural systems.

- The lack of adequate funding can itself create gaps where agencies might otherwise be willing to be innovative and entrepreneurial in applying their authority.

More proactive agencies often move forward on the basis of general direction from Congress if their funding is generous enough to encourage innovation. Such is not the case regarding invasive species. For example, appropriations have never reached the levels authorized by the National Aquatic Nuisance Prevention and Control Act of 1990 or its 1996 amendments, even for the popular cost-sharing grants to states where demand far exceeds funds available.

There is at least one key gap in jurisdiction among the congressional committees responsible for oversight of invasive species issues.

If APHIS should undertake the protection of natural resources, as the 2000 law requires, it is not clear that the House and Senate Agriculture Committees would be the most appropriate groups to conduct oversight. No other committee has that jurisdiction now, however, and we would support the Resources Committee seeking joint jurisdiction in this specific area.

- Federal agencies often have competing missions when it comes to invasive species.

It is not unusual to find certain agencies promoting the same species that others are attempting to eradicate or control. So far, no means have been developed to resolve such differences. The interagency National Invasive Species Council (NISC)

should be in a position to do this and its staff has begun developing a process for competing agencies to discuss such conflicts. However, NISC has no statutory authority for this task and therefore limited ability to change agency practices. The Council on Environmental Quality (CEQ) has responsibility for addressing interagency conflicts but it has not become involved in this issue. However, CEQ and NISC are cooperating to provide agencies with guidance on applications of the National Environmental Policy Act.

The sorts of gaps described here in Federal law, policy, and practice are often paralleled in states. Increasingly, though, state officials are becoming impatient with lax Federal policy or with long delays in making improvements. For example, a number of states are moving forward with their own standards for managing the ballast water of ships, in the absence of strong Federal measures, and establishing their own coordinating councils to streamline state action. We expect that such efforts will increase as the cumulative numbers of invasive species in the country continues to rise and their economic, environmental, and health costs are more accurately tallied.

4. Recommendations to Solve the Problem

Our intent is to strengthen Federal agency mandates, as well as their policies and practices. Our long-term goal is to implement a level of protection that is as close to a zero risk of further harmful introductions as is feasible. We propose to reach this long-term goal with a flexible toolkit of economic and other methods. Until we set such a goal, we cannot know if our work is succeeding. And failure is too costly—for a problem that multiples with delay.

Our top priority: preventing the introduction of additional damaging species.

Nowhere is it truer that an ounce of prevention is worth a pound of cure.

While the Committee on Resources is responsible for minimizing invasive species' damage on lands and waters under Federal jurisdiction, this effort will fail unless backed up by more effective programs to prevent the entry and establishment of new invaders. The current U.S. approach of creating a short list of harmful species to regulate often limits the import of species only after extensive private investments have been made in it, after injurious species have already escaped into the wild, or after eradication is no longer possible.

Therefore, we recommend that all species intentionally imported into the United States be effectively evaluated for invasiveness prior to import. Those known to be invasive or those highly likely to harm native biodiversity and ecosystems and other important resources should be kept out. Key legislation being proposed does not include rigorous screening and agencies are moving too slowly. We consider careful and thorough pre-import screening essential.

We envision that many clearly safe species would be exempt from this process. Large groups of obviously useful species, like cattle, crop varieties, and clearly noninvasive organisms could be quickly given a green light for continued entry. We believe that such a program can be based on science and not impose unnecessary trade barriers or protectionism. In fact, such approaches work elsewhere, such as for plants in western Australia, and they have been successfully tested in Hawaii.

The Committee on Resources has jurisdiction over two statutes that could be used in such a screening system—the Lacey Act and the proposed National Aquatic Invasive Species Act. APHIS has chief responsibility for controlling entry of plants, weeds, plant pests like insects and diseases, and diseases of livestock and poultry; oversight falls to the Agriculture Committee. Any comprehensive screening effort would also involve agencies which this Committee oversees, e.g., the Fish and Wildlife Service.

The Federal Government must also do a more thorough job of preventing inadvertent introductions through major pathways such as those that occur in the ballast water of ships or attached to ships; those that arrive with solid wood packaging, logs or lumber; those that come with living plants or as parasites on imported animals; and the fish and mollusk diseases that are carried with aquaculture imports. For the past decade, much effort has focused on limiting introductions in ballast water. But unfortunately, the rate at which new aquatic invasive species are colonizing the Great Lakes has not declined despite implementation of Canadian ballast water exchange guidelines in 1989, followed by mandatory U.S. requirements set in 1993 for ships entering the Great Lakes. This suggests we need to redouble our efforts, quickly develop and implement ballast water discharge standards to protect all national waters, and perhaps consider alternate means of moving goods into the Great Lakes region. We support these steps. We also support phasing out the use of wood as a packing material and ensuring that logs, lumber, and chips imported from everywhere except Canada be treated to eliminate invasive species.

Our second priority: adding to available funding

Relying upon Federal appropriations alone has not provided either adequate or sufficiently flexible funding to address growing problems. Long backlogs of needed but unfunded efforts are typical of Federal land management agencies. For example, in 1998, efforts against invasive species cost the National Refuge System $13 million. Today, the backlog of known invasive species projects on refuges has increased to more than $150 million, fully 15% of the entire operations backlog. Likewise, the National Park Service cannot control invasive species on 93 percent of its affected lands.

Rapid response programs to manage newly detected invasive species when their populations are still small must be one of our highest priorities. Yet funds for emergency actions are not available to every agency that needs them, when it needs them. Often these resources are most needed at the end of the summer and early fall—just when Federal agencies tighten contracting and accounting practices in preparation for the change in fiscal years. Funding for research is woefully scarce. The identification of potential new invaders, better knowledge of invasive species life cycles, a more thorough understanding of their impact would accelerate our capacity to both prevent and control invaders. Funding for enforcement is also scarce yet we know that stronger enforcement can enhance measures' effectiveness.

Knowing the key role that reliable funding plays, we recommend that efficient, and effective programs have the long-term commitment of resources they need to continue. Examples include the program to control sea lampreys in the Great Lakes, the National Park Service's Exotic Plant Management Teams, Federal research on forest health, and Federal cost-sharing for states to implement their state-wide aquatic invasive species management plans. We feel that the first responsibility of this committee is curtailing invasive species on Federal lands. After that, we support cost-sharing programs with other land and water managers.

Thus NECIS recommends that additional means be explored and implemented by which the amount of government funding available to address all aspects of invasive species issues can be substantially increased or supplemented with other sources for prevention; early detection and rapid response; control and management; research and monitoring; enforcement; and public outreach and education. Appropriations are not enough.

We support the constructive use of economic policy tools, such as incentives, to prevent harmful invasions and to control them when they occur. This could include implementation of a fee-based approach, such as has been used successfully in the past to create the Oil Spill Liability Trust Fund. We suggest that NISC be charged with examining the full range of other possible funding options and report back to the Committee on its findings by January 1, 2004.

Our third priority: making international trade less risky.

Finally, we recommend strengthening mechanisms and regulations to prevent the import and export of invasive species via trade in North America and the broader international community.

There are several ways to accomplish this. First, the United States should make more effective use of multilateral conventions, including the Internatonal Plant Protection Convention, the Convention on Biological Diversity, and agreements handled by the International Maritime Organization. Second, the regulations issued by international bodies charged with protecting plant and animal health should be strengthened, particularly with regard to managing the major pathways by which invasive species are moved. Third, the U.S. Trade Representative should be advised to address invasive species' movements, impacts, and standards for their regulation within the negotiation of bilateral and multilateral free trade agreements. Finally, the United States should not become party to international agreements intended to protect ecosystems from introductions of invasive species if the agreement is not at least as protective as U.S. standards.

5. NECIS Positions on Pending Legislation

In this Congress, there is a wealth of proposed legislation that addresses various issues regarding invasive species. We appreciate the level of interest and importance the topic is now receiving. Also, we congratulate the sponsors who have worked so hard on these bills. In general, we support the legislation offered by members of this Committee as well as the bills referred to it.

Here, we highlight just a few of the aspects of various bills that we find particularly helpful and also list a few of our concerns. We are available to suggest ways to strengthen key provisions, to integrate similar aspects of different bills, and to ensure their passage.

- The Species Protection and Conservation of the Environment Act (SPACE)

• H.R.119 The Harmful Invasive Weed Control Act

We applaud efforts to use Federal funding as an incentive to encourage local government agencies, private organizations, and individuals to be more proactive in managing invasive and invading species. The Aldo Leopold Native Heritage Grant Program offered in the SPACE bill is commendable not only in that it provides such incentives, but also in that it provides additional incentives for innovative technologies, early detection, and rapid response. We are particularly supportive of the 100 percent Federal funding proposed in SPACE for rapid response. There is broad consensus—among organizations, scientists, and government representatives—that such rapid action is the single most cost-effective way to stop incipient invasions. We further appreciate that, in SPACE, successful projects can be renewed. Sadly, invasive species control rarely ends completely and the accomplishments achieved in these projects will likely need additional, although likely less expensive, follow-up management and monitoring.

As for our concerns, finding efficient ways to manage invasive species is a shared goal of all NECIS members. These bills could promote such efficiency, not just through the innovative technology they already encourage, but by promoting projects and products that can serve as models for efficient and effective control. In this regard, we encourage the Committee to include language that mandates broad publication of the results of good projects so that they can be replicated elsewhere. Also, it is our hope that appropriations for other important programs not be diverted to fund Federal cost-sharing for these grants. Therefore we urge you to enlist the help of your colleagues on the Appropriations Committees to provide sources of additional funds.

• H.R.1080 The National Aquatic Invasive Species Act of 2003

• H.R.1081 The Aquatic Invasive Species Research Act

These companion bills reauthorize legislation first passed in 1990 and updated in 1996. We support a great many of these bills' provisions. We applaud the broader geographic and taxonomic coverage; new efforts to monitor new invaders are important; provisions for rapid response, identification and management of high risk pathways; and annual updates to the lists of species whose import is limited by the Lacey Act or the Plant Protection Act. The bill takes a very modest step toward pre-import assessment of species' invasiveness. It aims to move the nation away from a primary reliance on ballast water exchange to ballast water treatment and also to develop environmentally sound methods managing aquatic invaders.

As for our concerns, the deadlines for setting and implementing new ballast water management standards are years away. Likewise, the relatively weak provisions for pre-import screening will not apply for several years and then a very large group of organisms in trade are exempted. There is no requirement that the proposed screening process be carefully reviewed by independent and qualified experts. Nor is a mechanism included to ensure that funding is adequate. We would not support Federal preemption of state ballast water standards, which is sometimes discussed as a trade-off against setting additional fees.

• H.R.989 The Great Lakes Ecology Protection Act of 2003

This bill requires that final standards for treating ballast water to remove non-indigenous organisms be issued on a strict timeline. We support the intent to rapidly implement provisions called for in 1996.

• H.R.266 The National Invasive Species Council Act

• The Species Protection and Conservation of the Environment Act (SPACE)

The Federal response to invasive species needs to be on firmer footing and authorizing the National Invasive Species Council in legislation is an easy and important way to achieve that. Therefore we support the codification of the full Executive Order that established the Council and its Advisory Committee. We believe this will help ensure the timely implementation of the Council's first and subsequent National Management Plans and provide the public with recourse if implementation slows. We believe it is essential to enact that part of Section 2 of the Executive Order which Federal agencies have so far done little to address—the sections asking them to identify their own actions which affect the status of invasive species and not authorize, fund, or carry out actions likely to promote or introduce such species in the U.S. or elsewhere. This section also gives agencies authority for the full range of actions needed to make U.S. policy more comprehensive. We consider both areas essential.

As to our concerns, we are not certain that frequently rotating the Council's chair among three Federal agencies will be workable. The transition between Presidents delayed the Council's work by more than a year; we fear additional time will be lost with each transition to a new chair, and with any changes to staff that occur at the same time. We recommend placing the Council staff within the Executive Office of

the President, which would provide a permanent "home" for the Council's work while also elevating the status of the issue.

• H.R.695. The Tamarisk Research and Control Act of 2003

In the absence of more comprehensive legislation, species-specific approaches focus on critical threats to the biological diversity, natural resources, and economy of a specific state or region. They also provide for improvements to the science of managing the species. In the future, we hope to see more comprehensive legislation on terrestrial invasive species that includes many of the concepts included in this bill, as well as in the new Nutria Eradication and Control Act of 2003 (P.L. No. 108–16).

6. Conclusion

In summary, NECIS believes that the problems associated with invasive species have very real and practicable solutions. This issue is common ground for the farmer, rancher, and the environmentalist; for the academic and the policy maker; for the importer and the consumer; and for developed and developing countries. Solutions require the participation of all of us.

We look forward to working with the Committee on the tasks before us. Thank you for the opportunity to testify. I am pleased to answer any questions you might have.

Mr. GIBBONS. I have just one question which I will throw out there and then we will turn to the members for individual questions. When there is a conflict between existing statutes that this government has created—for example, the Endangered Species Act and other species or other acts which would deal with invasive species, statutory authority such as an invasive species authority which would deal with the tamarask? We have heard about the problem with tamarask versus the south willow flycatcher which is an endangered species. The south willow flycatcher is nesting in the tamarask. How do you deal or how do you propose to deal with a conflict of existing statutory authorities in the management of an endangered species versus the elimination of an invasive species? At what point do you draw the line and ask yourself the value of one species versus the other?

Mr. GIBBONS. And I will start over here with Mr. Arnett. And if you have any suggestions, that would be helpful.

Mr. ARNETT. Thank you, Mr. Chairman. Perhaps the easiest answer, perhaps not the most acceptable to many, is to bring some common sense back into the legislation both of endangered species and the many invasive species bills we have. It has become so complex now that it is almost impossible to adjudicate between what you were suggesting.

And we can't use pesticides; there are certain plants they want to get rid of that are invasive, but also are a harboring ground for an endangered butterfly. Someplace along the line, some common sense has to be used, and that should be left in the hands of State directors, whether they are agricultural directors, fish and game directors or whoever they may be.

Most of these problems that everybody has talked about or that I have heard anyway, I don't think anybody doubts that invasive species is a problem and it is a worse problem in the West, as far as the flora goes, than it is in other parts of the country, and it should be eradicated. But it shouldn't be a Federal responsibility to take care of that for the ranchers in Nevada or California or wherever they may be. Someplace along the line, the jurisdiction has to go back to where it belongs at the State level and let them take care of their own problems.

As an example, it should be up to the State whether they may want to have an invasive species. In California, we have the striped bass, a very fine sport fish. It is not necessarily a commercial fish there, but we chose to bring the striped bass back there in the 1800's. It is not indigenous to the Pacific coast and the inland waters of the State of California, but it was up to the people at that time to decide whether they wanted that invasive species, and they brought it into the State.

So I guess my short recommendation is that someplace Congress is going to have to look clearly at the Endangered Species Act and see where it has gone from where it was intended. I think it has gone far beyond its original intent and, someplace along the line, that common sense has to be brought back, included with the invasive species and the endangered species so that some kind of dedicated purpose for the benefit of mankind can be brought into play.

Other than that—

Mr. GIBBONS. Does anybody else have a comment? Dr. Windle, would you like to make a comment to that interface, that conflict?

Dr. WINDLE. The conflict between Federal agencies is nothing new and it is probably not unique to this area. When the Office of Technology Assessment examined this question back in 1993, they found that was frequently the case, that one agency would be promoting a species and another agency would be trying to get rid of it. I think that is one of the reasons why the National Management Plan addresses this question and suggests that maybe the National Invasive Species Council could be a forum where people with different approaches and the different agencies could sort out these issues.

Mr. GIBBONS. In the 2 seconds I have remaining, is there a solution in a conflict situation between species with the laws that we have on the books? Do you feel that there is a solution capable between the willow—south willow fly catcher and the tamarisk that would be suitable to all parties, or are we going to find ourselves involved in litigation from here till, you know, whatever point in the future you want to talk about?

But is there a possible solution or are we in a position, in a situation where we have no alternative?

Dr. WINDLE. I don't have a short answer for your question about that specific example. I don't believe that the National Invasive Species Council has the authority to mediate in situations like that. The Council on Environmental Quality has as its task resolving some such conflicts, but I don't think they are involved now, either.

So there is not an immediate solution for you and I agree that it is going to be difficult.

Mr. GIBBONS. Ms. Bordallo.

Ms. BORDALLO. Thank you very much, Mr. Chairman. I have certainly been enlightened, and I appreciate your testimony. You all have different fields. I think, in listening, what we have come up to or come to the conclusion is that the problem is staggering and that we need comprehensive legislation to address these problems and work closer together.

I have just a couple of quick questions, and it has to deal with science; and maybe Dr. Windle you would be the one to answer it. Throughout the hearing it has become clear that prevention is the key to our problem in the long run. What kind of approaches can be applied and do you need a grant program or do you have moneys? Are the scientists working on this? Because as someone mentioned here, we have one problem, but before we can solve it, we have another problem on hand.

So are there funds that you are requesting?

Dr. WINDLE. My organization is not, nor is the coalition that I speak for. I think perhaps when Dr. James Carlton and Gregory Ruiz speak to you on the next panel, they may have some things that are particularly pertinent to that. One specific piece of legislation that would reauthorize the National Invasive Species Act is directly about research. That would be very helpful, including an element that would provide for education of younger scientists.

Ms. BORDALLO. Of course, I am coming back to—and I want to thank you for remembering the territories in your comments, because many times we forget that we do have some very important territories that belong to the United States. And we have problems as well.

From a scientific perspective, Doctor, is there an estimated date—or maybe some others can answer—that when we can see that there will be an eradication of the brown tree snake in our territory? I don't know if any work is being done on this. All I know is we are getting money and funding from the Federal Government to handle the problem, but what about the prevention? What about the eradication?

Dr. WINDLE. I don't know any details about that, but I know that there is a brown tree snake Committee that works under the Aquatic Nuisance Species Task Force, and they could probably give you a better answer than I; and I would be happy to refer you to them.

Ms. BORDALLO. Is there anyone here on the panel of witnesses that belongs to that?

All right. Thank you very much, Mr. Chairman, and I think what we need here and what we are hearing is that we need a comprehensive piece of legislation to address some of these very important needs. Thank you.

Mr. PETERSON. [Presiding.] Mr. Grijalva?

Mr. GRIJALVA. No, thank you.

Mr. PETERSON. We would like to thank the panel; we appreciate your coming and educating us.

We now will bring the next panel forward. We will invite Dr. Gregory Ruiz, Mr. Roger Mann, Dr. James Carlton, Mr. Fred Grau, Mr. James Beers and Dr. Fred Kraus to now join us.If you could take our seats here, we can get started.

Mr. PETERSON. We first would like—if we could have order, please. Thank you. We want to thank—I am going to go down in the list here to Mr. Fred Grau, President of Grasslyn, from my district, from Penn State; and we want to thank him for the beautiful bouquet of invasive species on our right over here. And he can talk about that, but it is not often that people bring us flowers.

I am an avid gardener. This weekend I was moving my perennials around. I guess some of those would be invasive species, but I still love them. We want to thank you for beautifying our room here; and welcome to Washington and please proceed. You have a 5-minute limit.

STATEMENT OF FRED V. GRAU, JR., PRESIDENT, GRASSLYN, INC., STATE COLLEGE, PENNSYLVANIA

Mr. GRAU. Thank you, Congressman. Thank you, Mr. Chairman and Committee members, for the privilege of testifying before you here today. My name is Fred Grau and I am the President of Grasslyn, Inc., a family owned farming and seed business based in Snyder, Colorado, and State College, Pennsylvania.

The clear water in Slab Cabin Run, a charming brook flowing through our Pennsylvania farm, eventually finds its way to the Chesapeake Bay. We grow crops such as corn, but our mainstay for the last half century has been Penngift crownvetch seed.

Crownvetch, enacted as the Pennsylvania State conservation and beautification plant, is unsurpassed in its ability to control erosion on steep, infertile slopes in the central and eastern United States. It has saved countless tons of soil and pesticides from entering the fisheries of the Chesapeake Bay. It smothers out harmful weeds and builds top soil in the process. It is clearly beneficial.

However, crownvetch is not native. It is an invasive species according to the Natural Resources Conservation Service. It is even a "noxious weed" according to the Federal Highway Administration.

Yellow starthistle, the Brown Tree Snake and kudzu are known pests. But other invasive species are useful and the result of years of government research.

For example, tall fescue is the most important single turf and forage species in America and is also indispensable as a permanent slope cover. It is almost certainly a major component of your lawn, your kids' athletic field or your local golf course. Before you is a strip of top-quality sod composed of 50 percent tall fescue. It is the one closest to the front of the room.

Why fescue? It requires less water, less fertilizer, less pesticides. It is economical, functional, beautiful and environmentally friendly.

But fescue's contributions don't end with turf or animal feed. Ask roadside managers from Virginia or Pennsylvania departments of transportation what two species are indispensable to their mandate for economical, aesthetically pleasing slope stabilization. Their response will be crownvetch and tall fescue.

Why then does the United States Department of Agriculture specifically term tall fescue an invasive species and prohibit its use in the Conservation Reserve Enhancement Program, or CREP, in the Chesapeake and Potomac watersheds? The expressed purpose of this program is to reduce nutrient and sediment loading under the Chesapeake Bay agreement. Simply put, it is nonnative and doesn't fit into the artificial, new, "natives are good, nonnatives are bad" paradigm.

There is another box of turf. This is a putting green. It is 100 percent bent grass. Bent grass is invasive according to USDA and Virginia's Department of Conservation and Recreation, or DCR.

There is a vase of flowers. I purchased this bouquet this morning from a local florist. Every flower here displayed came from the florist's stockroom. Every flower is or is a close relative of an "invasive species."

The daisy: Do we ban members of this family because its subspecies cousin, the naturalized ox-eye daisy is considered noxious by the Ohio Department of Agriculture?

Baby's breath: What would prom night be without the lad's attempt to pin the corsage on your daughter's gown? But California considers this a noxious weed.

The majestic iris: Do we really want Virginia DCR and their partners, the Virginia Native Plant Society, to set the stage for elimination of this unique beauty? Both consider a close relation, yellow iris, to be an invasive species.

Finally, the lily: Those who prefer to drive through fly over country cannot help but notice the small, isolated clumps of orange radiance punctuating the green landscape of a Piedmont summer. Maryland's Department of Natural Resources names its virtually indistinguishable cousin, the day lily, as invasive.

I believe an invasive species law will replicate the abuses of subspecies listings as has occurred under the Endangered Species Act. Federal agencies already have the authority to control harmful species. They will still have it without the trojan horse of a natives-only invasive species bill and the massive bureaucratic expansion that will ensue. Harmful species need no new law or initiative to be dealt with, as the effective eradication of the snakehead fish in Maryland recently demonstrates.

The basic framework of any regulation or legislation should be harmful versus beneficial and not a misguided fixation on native versus nonnative. If current policy mistakes are codified, then 280 million Americans will be senselessly shackled by the newest weapon in the extremist arsenal, an Invasive Species Act.

Thank you.

Mr. PETERSON. Thank you very much.

[The prepared statement of Mr. Grau follows:]

Statement of Fred V. Grau, Jr., President, Grasslyn, Inc., State College, Pennsylvania

Thank you Mr. Chairman and Committee members for the privilege of testifying here today.

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Why, then, does the United State Department of Agriculture (USDA) specifically term tall fescue an "Invasive Species" and prohibit its use in the Conservation Reserve Enhancement Program (CREP) in the Chesapeake and Potomac Watersheds? The expressed purpose of this program is to "reduce nutrient and sediment loading under the Chesapeake Bay Agreement". Simply put, it is non-native and doesn't fit into the artificial, new, natives-are-good, non-natives-are-bad paradigm.

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The basic framework of any regulation or legislation should be harmful versus beneficial, and not a misguided fixation on native versus non-native.

If current policy mistakes are codified, then 280 million Americans will be senselessly shackled by the newest weapon in the extremist's arsenal: an "Invasive Species Act".

Thank you.

Mr. PETERSON. Dr. Gregory Ruiz, Marine Ecologist, Smithsonian Environmental Research Center.

STATEMENT OF DR. GREGORY M. RUIZ, MARINE ECOLOGIST, SMITHSONIAN ENVIRONMENTAL RESEARCH CENTER, EDGEWATER, MARYLAND

Dr. RUIZ. Thank you for the opportunity to be here, and good afternoon. I am a senior scientist at the Smithsonian Environmental Research Center on the shore of Chesapeake Bay. I have studied marine invasions for about 15 years and had the Marine Invasion Research Laboratory, which has research staff in Chesapeake Bay and San Francisco Bay working truly on a national scale. Today, I wish to highlight the current state of knowledge and some critical gaps in the science and management of marine invasions.

What do we know? Biological invasions are a major force of change in coastal marine ecosystems, driving significant ecological

changes and impacting many dimensions of society. Chesapeake Bay and San Francisco Bay can be used to illustrate the status of nonnative species in marine communities. Over 150 nonnative species are established in tidal waters of each bay.

In the Chesapeake, the nutria, a South American mammal, is destroying salt marshes. The parasite MSX has contributed to the demise of the native oyster fishery and undermines recovery efforts.

In San Francisco Bay, multiple species of Spartina, and emergent salt marsh plant are crowding out and hybridizing with native marsh plants affecting key habitat for many animals. The Chinese mitten crab, as we have heard about today, has impacted water management by pumping facilities when outbreaks of migrating crabs clog associated fish collection screens.

The rate of newly detected marine invasions has increased exponentially for North America and shows no sign of decline today. Each year, thousands of nonnative species are still transferred to U.S. Waters by human activities. The door is open for new invasions and further steps are clearly needed.

What should we do? One clear priority is prevention of new invasions through vector management. Vector management strives to interrupt species delivery by human transfer mechanisms or vectors. Unlike species base management, vector management requires no assumptions about the performance or impact of species and can simultaneously prevent the invasion of multiple species through interruption of the transfer process.

Management of the shipping vector is a critical first step to reduce the rate of new marine invasions. This recognizes the overall dominance of shipping and transfers and invasion of marine species. Efforts being advanced for ballast water management should reduce the rate of invasions, but there are limitations. Among these, the level of reduction and invasions expected for various management actions are unknown. This results from uncertainty about the dose response relationship, where the relationship between the number of organisms released and those invasions that result. We simply don't know how low to go in reducing species transfer, which complicates identifications of the goal or standards for management such as ballast water treatment.

In addition to vector management, considerable enthusiasm exists for species-based management, but predictive capabilities are extremely limited at the present time, especially for aquatic systems. A high level of uncertainty often exists about whether a species will become established, spread and have severe impacts.

The current controversy about the introduction of an Asian oyster to Chesapeake Bay provides an illustrative example. We clearly need to develop the predictive science marine invasions, but we are not there yet.

I wish to focus particular attention on the importance of tracking invasion patterns and rates as the fundamental building block for invasive science and management. Only standardized field-based measures or surveys can inform us about this—the spatial patterns and tempo of invasion, the where, when and how of invasions. Only standardized surveys provide a critical feedback loop to evaluate the effective management actions to stem the flow of new invasions.

Further identifying which species invade is critical to the development of predictive capability. More broadly, field-based measures are necessary to address many key questions. Are invasion rates changing over time? How does invasion pattern or risk vary among regions? What factors influence susceptibility to invasion? What is the quantitative relationship between species transfer and invasion establishment? Is there measurable change in the rate of new invasions that corresponds to management actions?

There presently exists no national program designed to collect standard, repeated, quantitative measures of marine invasions. Without a directive survey program, we are left guessing about the status and trends of invasions in the country; we cannot adequately address the core questions, invasion science or advance predictive capabilities. These shortfalls make it difficult to achieve efficient management and allocation of limited resources.

The national strategy for aquatic invasions should focus on prevention primarily through vector management. It must also include a nationwide, directed survey program providing the science both to guide and evaluate management actions.

Thank you.

Mr. PETERSON. Thank you very much.

[The prepared statement of Dr. Ruiz follows:]

Statement of Dr. Gregory M. Ruiz, Marine Ecologist, Smithsonian Environmental Research Center, Edgewater, Maryland

I am a Senior Scientist at the Smithsonian Environmental Research Center (SERC), located on the shore of Chesapeake Bay. I have studied invasions for 15 years, and I head the Marine Invasion Research Laboratory—the largest research program in the U.S. to focus on the invasion of coastal ecosystems by non-native species. This research group provides synthesis, analysis, and interpretation of invasion-related patterns on a national scale (see Appendix 1 for further details).

Today, I wish to highlight briefly the current state of knowledge surrounding invasions of marine and aquatic ecosystems. I also wish to review some key gaps in our understanding that limit efforts to reduce the risk and impacts of invasions. I will focus particular attention on the importance of tracking invasion patterns and rates—- as the fundamental building block for invasion science and management—- without which we are left guessing about (a) the status and trends of invasions in the country and (b) the effectiveness of management strategies to stem the flow of new invasions.

Current State of Knowledge

Biological invasions are a major force of change. Invasions occur when species establish self-sustaining populations beyond their historical range, usually as an unintended consequence of human-aided transfer. Once established, these non-native or nonindigenous species can spread and achieve high abundances. A subset of invasions has strong effects, driving significant ecological changes and impacting many dimensions of human society on local, regional, national, and global scales.

Nonindigenous species (NIS) affect myriad aspects of aquatic (including freshwater and marine) ecosystems throughout the world. For example, we know that over 500 NIS have become established in coastal marine habitats of North America, and hundreds of NIS can occur in a single estuary. Some coastal communities are now dominated by NIS in terms of number of organisms, biomass, and ecological processes. It is clear that invasions have caused dramatic shifts in food webs, chemical cycling, disease outbreaks, and commercial fisheries. Some invasions also directly affect human health.

Chesapeake Bay and San Francisco Bay illustrate the status of NIS in marine communities. Over 150 NIS are established in tidal waters of the Chesapeake, based upon our research, and a larger number (>200 NIS) are reported for tidal waters of San Francisco Bay. Although the impacts of many species are not known, some are well documented, underscoring the magnitude and diversity of effects.

- In the Chesapeake: The nutria, a South American mammal, is destroying salt marshes; the protistan parasite Haplosporidium nelsoni (also known as MSX),

introduced from the Pacific, has contributed to the demise—and undermines recovery efforts for—the native oyster fishery; several additional nonindigenous species, including submerged plants, hydroids, and clams, have clogged waterways and water intakes for power plants.

- In San Francisco Bay and Delta: Multiple species of Spartina, an emergent salt marsh plant, are crowding out and hybridizing with native marsh plants, affecting key habitat for many animals; the Asian clam Potamocurbula amurensis has altered the species composition and abundance of plankton communities through filter-feeding; the Chinese mitten crab Eriochir sinensis has impacted water management by pumping facilities, when high numbers of migrating crabs clog associated fish collection screens.

The rate of newly detected marine invasions has increased exponentially over the past two hundred years for North America, as well as each Chesapeake Bay and San Francisco Bay. A similar rate increase has been observed across many habitats, taxonomic groups, and global regions. This apparent increase in invasion rate—combined with observed impacts—has greatly elevated public and scientific concerns about invasions in recent years.

Each year, thousands of nonindigenous species are still transferred to U.S. waters by human activities. A variety of mechanisms (vectors) contribute to this transfer process, which is the precursor to invasions. Among these, transfer of organisms by ships is considered responsible for most marine invasions in North America—both historically and currently. However, the relative importance of different vectors is likely to vary among locations, such as particular bays and estuaries.

Left unchecked, the number, density, and rate of species transfers—primary drivers of invasions—are expected to increase. As a result of Congressional legislative action in 1990 and 1996, we have learned a great deal about the scope of the problem. Several efforts have advanced to reduce the likelihood and impacts of further invasions—implemented by multiple Federal agencies, the Aquatic Nuisance Species Task Force, and a wide range of partnerships with state, university, and private entities. However, the problem is complex, involving thousands of species and many vectors that interface with multiple dimensions of society. The door is still open for new invasions to arrive, and further steps are clearly needed.

Vector Management

One clear priority is prevention of new invasions through vector management. Although management and control of established invasions can have merit, the approach and success of such efforts are often idiosyncratic to the particular invasion. Importantly, it remains difficult to predict (a) which NIS will be delivered, of a potential species pool of literally thousands of species that can be delivered by a vector (e.g., ballast water of ships), and (b) which NIS will become "invasive" and have severe impacts. This latter is particularly problematic, due to very limited information about the biology and ecology of the majority of marine organisms. In contrast, strategies to prevent new invasions can be directed at key transfer mechanisms (or vectors), the sources for contemporary invasions. Unlike management of established invasions on a species-by-species basis, a strategy of vector management can simultaneously prevent many new invasions through interruption of the transfer process.

Vector management involves three fundamental components: Vector Strength, Vector Analysis, and Vector Disruption. First, an assessment of Vector Strength is required to identify the relative importance of various vectors. This is accomplished by analysis of data on the patterns and rates of invasion, identifying which vectors are responsible for invasions (i.e., the relative importance of different vectors in space and time). Second, Vector Analysis is needed to describe the operational aspects of how, where, when, and in what quantity a vector delivers viable organisms (propagules) to the recipient environment. Among other things, this component identifies potential targets for management action. Third, some form of Vector Disruption is designed and implemented to restrict the flow of propagules (i.e., reduce the risk of new invasions) to the recipient environment.

Management of the shipping vector is a critical first step, to reduce aquatic invasions and their impacts. This recognizes the overall dominance of shipping in the transfer and invasion by NIS. Efforts being advanced for ballast water management should reduce the rate of invasions but there are limitations and unknowns in this area:

- Among these—the reduction in invasions expected for various management actions is unknown, resulting from uncertainty about the dose-response relationship (see below). We simply don't know "how low to go" in reducing species transfer—- which complicates identification of the goal or "standards" for treatment.

Tracking invasions, through standardized field surveys, is of paramount importance to vector management, both to measure Vector Strength—- or the source of new invasions—-and to assess the long-term effect of Vector Disruption on invasion rates and patterns. I wish to focus my testimony on the role and status of contemporary surveys in vector management, and as a source of additional information for rapid response and various control measures.

Rationale for Measuring Invasion Patterns and Rates

Measuring invasion patterns and rates through regular, standardized, field-based surveys is the cornerstone of invasion science and invasion management. Without this information base, many fundamental questions in marine invasion ecology will remain unresolved, limiting advances for basic science as well as its ability to guide effective management and policy.

Only contemporary, standardized field measures can inform us about (a) the spatial patterns and tempo of invasion—- the where, when, and how of invasions—-, and (b) the efficacy of Vector Disruption to reduce new invasions. Knowledge about contemporary patterns of invasion is needed to guide efficiently and effectively our management and policy decisions. Identifying which NIS invade and their attributes are critical to development of predicative capability. Importantly, tracking invasions pattern, and especially long-term changes in invasion rate in association with Vector Disruption efforts, is essential for adaptive management—- testing for the desired effect of management action and whether further adjustments are required.

More specifically, such field-based measures are necessary to address the following questions:

- Are invasion rates changing over time?
- How does invasion risk (i.e., rates and extent of invasion) vary among regions?
- Are all regions equally susceptible to invasion?
- What factors influence susceptibility and risk of invasion?
- What characteristics are associated with successful invasions?
- Using analysis of Vector Strength (above), which vectors and geographic regions are responsible for observed invasions? How is this changing over time?
- Is there measurable change in the rate of new invasions that corresponds to management actions (i.e., Vector Disruption, above)?
- What is the quantitative relationship between species transfer (supply) and invasion rate, and what should the target or standard be for Vector Disruption (e.g., ballast water treatment)?

The latter two questions are particularly relevant to current discussion about standards or goals for Vector Disruption, such as ballast water treatment. The "dose-response" relationship—between the number of propagules (organisms) released and invasion success (establishment)—remains poorly resolved, yet understanding this relationship is key to developing effective standards and Vector Disruption. Field-based measures, combined with experiments, are necessary to understand this relationship. Moreover, only tracking of invasions through field-based measures can confirm the efficacy of Vector Disruption to reduce the rate of new invasions.

Although my primary focus is on use of field-based data for prevention, I also note the important role of such data for eradication and control efforts of established species. There has been considerable discussion in the past 2 years about development of an "early detection, rapid-response" capability in response to new invasions or outbreaks (e.g., see recent report by the General Accounting Office). Although the scope of this may vary, focusing only a subset of target NIS, any rapid-response system by definition relies upon an effective field-based detection system.

Status of Tracking Invasion Patterns and Rates

Numerous analyses now exist to describe patterns of invasion. These analyses result primarily from literature reviews, providing a synthesis of published reports. The Smithsonian Environmental Research Center (SERC) has developed the National Database of Marine and Estuarine Invasions, to summarize existing data on marine invasions. The U.S. Geological Survey (USGS) has developed a complementary national-level database for freshwater invasions. Under a Cooperative Agreement, SERC and USGS are coordinating the further development of these databases, along with analyses and electronic access of the resulting information.

Although these existing "ecological surveys" have been very instructive in highlighting the scope of invasions in aquatic and marine habitats, the specific patterns and rates must be viewed with a great deal of caution—- because the data include very strong temporal and spatial biases. This bias results especially from uneven collection effort and taxonomic expertise. In essence, the data used in these analyses are "by-catch" and have limitations, as they were not collected for this purpose. A

review of these issues is presented in a recent article entitled "Invasion of Coastal Marine Communities in North America: Apparent Patterns, Processes, and Biases" (Annual Review of Ecology and Systematics 2000, Vol. 31: 481–531).

Although existing syntheses provide useful information and apparent patterns, the information quality is insufficient to support robust conclusions about actual rates and patterns. This creates a fundamental weakness in our ability to guide and evaluate management efforts. In essence, we cannot address the questions outlined above with the existing data. For example, we cannot now estimate the rate of new invasions, or whether more invasions have occurred, at Tampa Bay (FL), Juneau (AK), Chesapeake Bay (MD/VA) or Port Arthur (TX).

The National Invasive Species Act of 1996 called for "ecological surveys" to better understand the patterns of invasion. Multiple such surveys have occurred, and these have provided some important insights about the extent of invasions. However, to date, these surveys suffer from the same issues as outlined above, because they have been primarily literature-based surveys.

At the present time, there exists no national program designed to collect the type of standard, repeated, quantitative, and contemporary measures across multiple sites that is needed to measure rates and spatial patterns of invasion. Although this has been evident for many years, and was the focus of a workshop in 1998 (sponsored by U.S. Fish and Wildlife Service and SERC, and presented to the Aquatic Nuisance Species Task Force), a program to address this gap has not emerged to date. Importantly, piecing together data from existing programs, as has been suggested, will likely suffer limitations—- similar to those that exist today—- because these programs were not designed explicitly to measure invasion patterns.

Most recently, SERC has initiated a series of quantitative surveys across 15–20 different bays in North America, focusing on sessile invertebrates. Funded by Department of Defense, National Sea Grant, and U.S. Fish and Wildlife Service, this work is intended to compare pattern of invasions among sites, using one standardized survey (in one year) at each bay. Although this is not presently a sustained effort, it moves toward developing a quantitative baseline, and could serve as a prototype for repeated, temporal measures.

Approach to Track (Monitor) Invasions

To effectively measure invasion patterns and rates, as needed to address the questions outlined above, requires the use of standardized, quantitative surveys that are replicated at many sites and repeated regularly over time. Multiple sites are necessary, because significant variation exists among sites—- such that one or a few sites cannot serve as a proxy for others—- but also because measures of such spatial variation is necessary to test for (a) spatial variation in invasibility and (b) the relationship between propagule supply and invasion. Further, repeated measures are necessary to build statistical confidence about the existing assemblage of species (or develop a baseline) with which to measure temporal changes.

Oversight and coordination of the surveys is critical to develop standardized protocols, provide continuity in taxonomic identification, and manage, analyze, and interpret the resulting cumulative data. Without such oversight, as is presently the case, measures of invasion patterns and rates will remain uneven and cannot contribute to a larger picture (beyond an individual site) or be used to address questions (as above) on a national scale.

Beyond the specifics of survey design and implementation, parallel measurements of environmental characteristics of surveyed sites is also key to understanding those factors that influence susceptibility (risk) to invasion. While direct measures of physical and chemical characteristics are necessary to provide standardization across sites, there are several existing programs that may prove valuable sources of this information. For example, the EPA is characterizing many aspects of shoreline habitats, and especially coastal wetlands, in Chesapeake Bay. NOAA and EPA have also both developed networks of coastal sites that collect data on physical and chemical environmental attributes.

Conclusions

Understanding invasion patterns and processes depends critically upon high-quality empirical measures. Current observation and theory have resulted in a conceptual framework for invasion ecology. However, the empirical data needed to rigorously test many key hypotheses, develop robust predictions, and evaluate the success of management actions lag far behind. This gap is especially conspicuous for marine systems, existing both in the quality and quantity of descriptive data. At the present time, most analyses that evaluate patterns of invasion or test specific hypotheses derive data from the existing literature, or "by-catch" data, which is extremely uneven in space and time. Quantitative field surveys, which employ stand-

ardized and repeatable measures, are critically needed to remove such bias and to substantively advance invasion science and management.

APPENDIX 1

ROLE OF THE SMITHSONIAN INSTITUTION IN COASTAL INVASION RESEARCH:

MARINE INVASION RESEARCH LABORATORY,

SMITHSONIAN ENVIRONMENTAL RESEARCH CENTER

(AUGUST 2002)

Overview

The Smithsonian Environmental Research Center (SERC), located on the shore of Chesapeake Bay, is a leading national and international center for research in the area of non-native species invasions in coastal ecosystems.

SERC has developed the largest research program in the U.S. to focus on coastal invasions.

A primary goal of SERC's Marine Invasion Research Laboratory is to provide the fundamental science that is critical to develop effective management and policy in this topic area. In short, SERC's invasion research bridges the gap between science and policy, to develop a scientific understanding that is key to guide and evaluate management strategies for invasive species.

The Marine Invasion Research Laboratory has a staff of approximately 30 biologists, who conduct research throughout the country and overseas. Since it's inception 10 years ago, the laboratory has been a nationwide training center in invasion ecology for roughly 45 technicians, 4 graduate students, 7 postdoctoral researchers, and 40 undergraduate summer interns. The students and technicians arrive from all over the country, staying for 3 months to many years. Many participants in this program have gone on to graduate training and academic or government positions in Alabama, California, Connecticut, Hawaii, Massachusetts, Tennessee, and Washington, Washington D.C.

Research Program

As a national center, SERC's Marine Invasion Research Laboratory provides synthesis, analysis, and interpretation of invasion-related patterns for the country. Under the National Invasive Species Act of 1996, the U.S. Coast Guard and SERC created the National Ballast Water Information Clearinghouse, hereafter Clearinghouse, to collect and analyze national data relevant to coastal marine invasions (see Box 1). Established at SERC in 1997, the Clearinghouse measures:

- Nationwide Patterns of Ballast Water Delivery and Management. All commercial ships arriving to all U.S. ports from overseas report information about the quantity, origin, and possible control measures for their ballast water—a primary mechanism for transfer of non-native marine species throughout the world. At present, SERC receives roughly 20,000 such reports per year. Every two years, SERC provides a detailed analysis and report to U.S. Coast Guard and Congress on the patterns of ballast water delivery by coastal state, vessel type, port of origin, and season. A key issue is the extent to which ships undertake ballast water exchange, a management technique to flush potential invaders out of the tanks prior to arrival in U.S. waters. SERC's analyses are used by U.S. Coast Guard and Congress to assess national needs with respect to ballast water management and to track program performance.
- Rates and Patterns of U.S. Coastal Invasions. SERC has developed and maintains a national database of marine and estuarine invasions to assess patterns of invasion in space and time. This database compiles a detailed invasion history of approximately 500 different species of plants, fish, invertebrates, and algae that have invaded coastal states of the North America. Among multiple uses, the database identifies which species are invading, as well as when, where, and how they invaded; it also summarizes any existing information on the ecological and economic impacts of each invader. Over the long-term, this database will help assess the effectiveness of various management strategies (such as ballast water management, above) in reducing the rate of invasions. More broadly, this information is a valuable resource for many user groups—from resource managers and scientists to policy-makers and industry groups.

Box 1

Except from the National Invasive Species Act of 1996

NATIONAL BALLAST INFORMATION CLEARINGHOUSE-

(1) IN GENERAL- The Secretary shall develop and maintain, in consultation and cooperation with the Task Force and the Smithsonian Institution (acting through the Smithsonian Environmental Research Center), a clearinghouse of national data concerning--

(A) ballasting practices;

(B) compliance with the guidelines issued pursuant to section 1101(c); and

(C) any other information obtained by the Task Force under subsection (b).

(2) REPORT- In consultation and cooperation with the Task Force and the Smithsonian Institution (acting through the Smithsonian Environmental Research Center), the Secretary shall prepare and submit to the Task Force and the Congress, on a biannual basis, a report that synthesizes and analyzes the data referred to in paragraph (1) relating to--

(A) ballast water delivery and management; and

(B) invasions of aquatic nuisance species resulting from ballast water.

SERC has further expanded the scope of Clearinghouse activities to improve the quantity and quality of data on coastal marine invasions that are used to (a) assess the rates and patterns of invasion and (b) inform key management decisions at national, regional, and local levels. Through competitive grants, we have initiated two components in this area, including:

- Nationwide Field Surveys. SERC has implemented an ambitious program of field surveys to detect new invasions, as well as measure contemporary patterns and effects of invasions, for 15–20 different bays throughout the country (see Figure 1). Our intent is to expand this program to include additional regions, providing a national baseline of information with which to evaluate invasion rates. The resulting information will contribute to the national database (above) and will be used both to document patterns of invasion and to assess the effects of management on invasion rates (as discussed above).
- Comprehensive National Database. SERC has established a formal agreement (Memorandum of Understanding) with the U.S. Geological Survey's Caribbean Research Center to develop a comprehensive database of all freshwater and marine invasions in the United States. SERC maintains a database of exotic marine species (above), and the U.S.G.S. maintains a complementary database for exotic freshwater species. Our goal is to functionally link these databases, creating web-based access to key information about each species for managers, researchers, policy-makers and the public.

In addition to the Clearinghouse role of analysis and interpretation of national data, SERC also conducts research to understand underlying mechanisms of species transfer, invasion, and ecological effects of invasions. This research serves a dual purpose of advancing our fundamental knowledge of invasion processes and using this knowledge to improve prediction and management strategies for invasions. Some selected examples of our research in these areas, funded by external grants and contracts, include:

- Measuring the Patterns and Processes of Species Transfer Associated with Shipping. The Marine Invasion Research Laboratory has measured the density and diversity of organisms in the ballast water of approximately 450 different commercial vessels, primarily oil tankers and bulk cargo carriers that arrived to Chesapeake Bay and Port Valdez, Alaska. This has been a collaborative and cooperative research program with the shipping industry, over the past 8 years, to better assess the risks of invasion and effectiveness of various management techniques to reduce that risk. We are now expanding this research to include container ships arriving to San Francisco Bay, expanding existing measures to include a different vessel type and geographic region than the previous studies.
- Assessing the Magnitude and Consequences of Pathogenic Microorganism Transfer by Ships. Very little is known about the relative risks of pathogens, both for humans and commercially important species, which are transferred in ballast water. SERC's invasion program is measuring the concentration of microorganisms and human pathogens, including Vibrio cholerea (causative agent of epidemic human cholera), discharged into U.S. waters with the ballast water of ships. In addition, we are conducting experiments to test the viability and potential significance of these transfers to result in newly established populations, or invasions, of pathogenic organisms.

- Measuring the Ecological Impacts of Non–Native Species. SERC has implemented a broad range of field-based and experimental studies to measure the effects of marine invasions in coastal ecosystems, including impacts on commercial fishery resources. Much of this work to date has focused on the European green crab (Carcinus maenas) impacts in California and New England. We have also implemented experiments in California and Virginia to test for effects of particular fouling organisms on invaded communities, and the extent to which this is exacerbated by human disturbance (e.g., pollutants, hypoxia, etc.). The overall goal of work in this area is to understand and predict impacts of invasions across a diverse array of coastal communities.
- Testing Invasibility of Communities. We have just begun manipulative laboratory and field experiments to test environmental and biological factors that influence invasibility of marine communities. Our work in this area focuses on microorganisms and invertebrates. The main objective of this research is to measure the dose-response relationship between delivery of organisms and subsequent invasion, and how this may vary across different environmental and biological conditions. This approach has direct bearing on the effect (and target) for management strategy to reduce the delivery of non-native organisms by ships or other vectors.
- Feasibility of Eradication and Control of Established Marine Invasions. SERC has also initiated work to test the feasibility of eradication and control for a non-native marine snail in San Francisco Bay. This is effectively a demonstration project to critically examine management strategies, based upon key habitat and biological characteristics, and develop the decision process (i.e., under what conditions and for which species) and capacity for eradication.

Geographic Coverage

SERC's Marine Invasion Research Laboratory, with staff based at Chesapeake Bay and San Francisco Bay, has established research sites throughout the U.S. to implement its research programs, in collaboration with researchers from approximately 25 different academic institutions and Federal or state agencies. For example, active projects and collaborations are on-going in the following states: Alaska, California, Connecticut, Florida, Maine, Maryland, Massachusetts, Michigan, New Jersey, Oregon, Rhode Island, Texas, Virginia, Washington, and Washington D.C.

Internationally, SERC has become increasingly active over the past 5 years. A primary goal of the international program is to foster information exchange and build complementary, comparative, and collaborative research programs. For example, the Marine Invasion Research Laboratory has active collaborations in many areas of invasion ecology with the Centre for Research on Introduced Marine Pests (CSIRO, Australia). This includes comparative analyses of invasion patterns and effects, as well as development of an international standard for databases on marine invasions. Another long-term collaboration exists with scientists in Israel, where we have measured changes in the ballast water communities during roughly 20 different voyages between Israel and Chesapeake Bay. SERC also has been a participant and sponsor of international conferences and workshops on marine invasion ecology.

Although SERC programs are active at the national and international scales, a great deal of this effort has also focused on understanding invasion issues at the regional scale. In fact, this program has conducted research on invasions in nearly every coastal state in the country, producing regional understanding as well. Examples include:

- Analysis of invasion patterns for Chesapeake Bay over the past 400 years, representing the first such analysis for the Chesapeake as well as any estuary in the eastern U.S. This documents the invasion history of 160 non-native species established in this Bay.
- Analysis of extent of invasions for Prince William Sound, Alaska, providing the most detailed analysis in the world to assess the risks of invasion for a high-latitude system.

For More Information about the Marine Invasion Research Laboratory contact:

Monaca Noble, Smithsonian Environmental Research Center, P.O. Box 28, Edgewater, Maryland 21037 USA; Phone: (443)482–2414; FAX: (443)482–2380; Email: noble@serc.si.edu; website—http://invasions.si.edu/

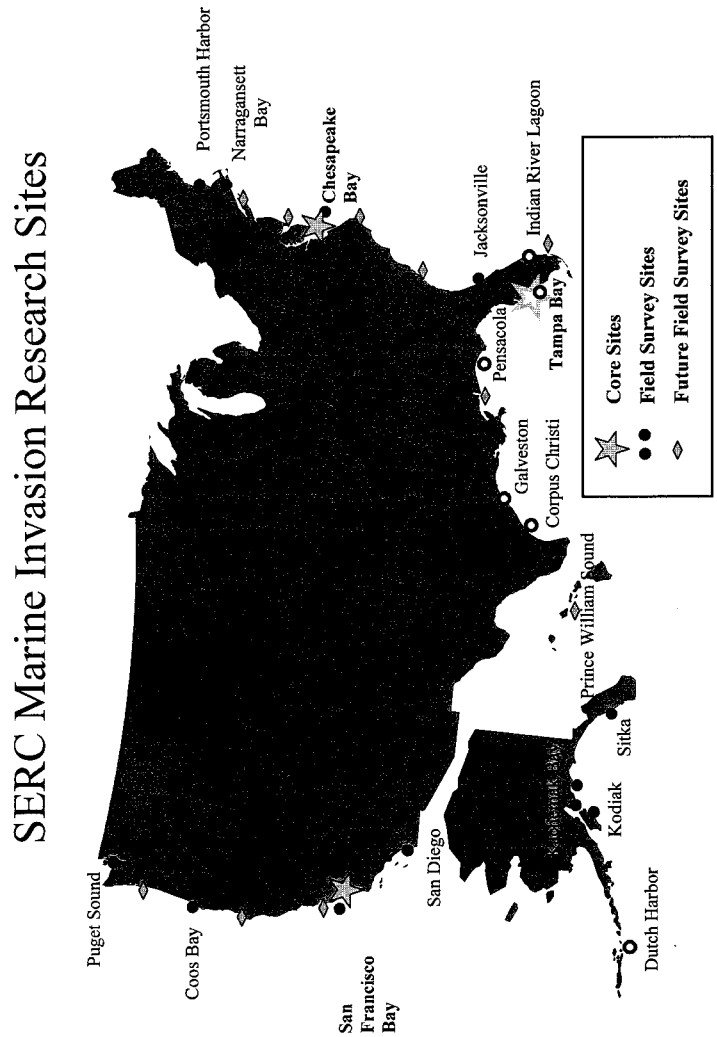

Figure 1. Distribution of field surveys to detect invasions, and measure invasion patterns, in U.S. coastal waters. Surveys completed by SERC through 2001 are shown as filled symbols (● baseline survey, ★ core sites), whereas surveys in 2002 are shown as open symbols. Symbol color refers to funding source. Future surveys planned at additional sites shown as open symbols (◊). Alaska (to the left) and Hawaii (to the right) are shown at the bottom of the figure.

Mr. PETERSON. Dr. Roger Mann, Acting Director for Research and Advisory Services, VIMS.

STATEMENT OF ROGER MANN, ACTING DIRECTOR FOR RESEARCH AND ADVISORY SERVICES, SCHOOL OF MARINE SCIENCE, VIRGINIA INSTITUTE OF MARINE SCIENCE, COLLEGE OF WILLIAM AND MARY, GLOUCESTER POINT, VIRGINIA

Dr. MANN. Mr. Chairman, members of the Committee, it is a pleasure to be here. I thank you for the invitation. Your invitation requested comments on four subjects, the scope of the invasive species problem, efforts to control or eradicate unwelcome invaders, the adequacy of existing statutory authority, and recommendations to solve the continuing problem. I will briefly contribute to each of those questions.

The scope of the problem is massive on both the national and international scale. As mentioned earlier, the Convention on Biological Diversity considers invasive species the second biggest threat, after environmental loss, to native biodiversity. Nonnative species have contributed to the decline of 42 percent of U.S. Endangered and threatened species, and the substantial annual costs of invasives to the U.S. Economy has already been addressed in quite some considerable detail.

The problem exists and continues because the U.S. Is part of a network of international trade that is also the vector to facilitating a continuing supply of invading species to our shores, mentioned by Dr. Ruiz. This will continue. The problem will not go away. We must address it aggressively in terms of both eradicating current invaders and preventing future invaders.

Following up from the last panel, a couple of comments here about Rapana. Rapa whelk is a quite remarkable softball-size welk that originates in the Orient. It was first discovered in the Chesapeake Bay in 1998. It is quietly eating its way through commercial resources, shellfish resources in the southern part of the bay, and over the past 5 years, for every year, we have seen an increasing number of these animals. Current collections are over 5,000 in total.

There is an important lesson to be learned not only from observing this, but we effect this observation through a collaboration with over 150 commercial fishermen. Public education is enormously important in following these invasions, telling us when they are arriving, how bad they are and what their impacts are. The fishermen also point out something very important: When things get out of control, they can in fact become available as commercial resources, which sets up some awkward problems in terms of regulation. But also the data that they give us shows that effectively removing this animal will also be accompanied by wanton destruction of the environment in which it lives, which has other very difficult decisions related to it.

As mentioned by many other panelists today, once the invader is here, it is very difficult to get rid of it. Efforts to control invasions and existing statutory authority to enable control are intimately linked. While the Lacey Act probably best defines the principles of control at the Federal level, an abundance of Federal statutes illustrates the continuing awareness of the invading species for well over half a century.

Something important: Lacey recognizes the role of State statutes and defaults to State statutes where they are written into State code. My home State of Virginia has such State code.

An important Federal statute in this field is the National Invasive Species Act that is currently under consideration for reauthorization, and in November of last year, I appeared before this Committee in this room to provide testimony on the draft revision. I recommended modest changes in the included ballast water treatment standard, proposing a 100 percent kill of all organisms in excess of 50 microns maximum dimension and discharge ballast, a standard I believe provides a reasonable operating goal for developing technology for treating large volumes of water.

As mentioned by Dr. Ruiz, there is a distinct problem here of how far you go and how fast you go in terms of controlling discharges. I think, as technology develops, this will become more and more within our capabilities, but we shouldn't be handcuffed at this point in time. We should move forward with that legislation and build into it capabilities for continuing revaluation and improvement.

In general, I urge reauthorization of NISA. Enabling legislation plays a central role in solving the continuing problem of wanton invasions, but that legislation must be soundly based in knowledge of how invaders arrived and why they survived. As mentioned, the scientific community has limited ability to predict the numbers and variety of invading species that will successfully become established. Current levels of research and educational—I underscore "educational"—support addressing the threats from invasive species are woefully inadequate. We must do better.

Before concluding, I would like to comment on the subject of intentional introduction, intentional introductions of nonnative species. Selective nonnative species do provide beneficial roles in the ecology and economy of our Nation. Sixteen percent of the $9 trillion gross national product of the U.S. Comes from agricultural production. European settlement of North America included the introduction of wheat, barley, rye, cattle, pigs, horses, sheep, goats and more; and indeed the majority of the U.S. Agricultural production arguably comes from species whose genetic origin was not in North America.

The draft of the National Invasive Species Act addressed intentional introductions, and I wholly applaud the inclusion in that it both recognizes a continuing pressure for introductions for commercial production, pest control and environmental restoration, and very, very importantly, it underscores the need to carefully examine and control such actions in an environment of limited understanding and potentially serious, even irreversible, ecological impact.Again, the potential introduction of a nonnative oyster in the Chesapeake Bay is a classic example of this dilemma.

However, I urge the final revision of this legislation to include text recognizing the role of State's rights in addition to the Federal responsibility and debate of this important subject.

Again, I thank you for the opportunity. This concludes my testimony.

Mr. PETERSON. Thank you very much.

[The prepared statement of Dr. Mann follows:]

Statement of Professor Roger Mann, Acting Director for Research and Advisory Services, School of Marine Science, Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, Virginia

Mr. Chairman, Members of the Committee, it is a pleasure to be here today in response to your invitation to provide testimony on problems related to non-native, invasive species to the United States of America.

My name is Roger Mann. I am a Professor of Marine Science and Acting Director for Research and Advisory Services at the School of Marine Science, Virginia Institute of Marine Science, College of William and Mary. I have been a researcher in the field of marine science for over thirty years. During that period I have maintained an active interest in the biology of non-native aquatic species, and actively participated in research and policy development related to non-native species at the state, regional, national and international levels. One of my current research projects describes the increasing destructive impacts of an invading predatory marine snail on shellfish resources in the Chesapeake Bay. The fact that this recent, unwanted invader, together with many others, arrived on our shores through ballast water vectors underscores my interest in today's discussion. The arrival of non-native species into the United States through ballast water and other vectors is widely recognized as a significant threat to the integrity of native ecosystems, and hence to the nation's economy as well as its recreational and aesthetic resources.

Your invitation requested comment on four subjects: the scope of the invasive species problem, efforts to control or eradicate unwelcome invaders, the adequacy of existing statutory authority, and recommendations to solve the continuing problem. I will address these in order.

The scope of the problem is massive on both a national and international scale. In terms of ecological impact, The Convention on Biological Diversity considers invasive species the second biggest threat, after environmental loss, to native biodiversity. Non-native species have been identified as contributors to the decline of 42% of U.S. endangered and threatened species. The financial burden to the U.S. economy is illustrated by the $550 million annual budget of just one Federal agency, the USDA, for control of unwanted invasive species. The magnitude of the problem at the state level is demonstrated by a few examples. Hawaii has 956 native plant species compared to 861 invaders. California has 83 native freshwater fish species, but an additional 52 invaders are also resident. Similar evidence of invasions is noted at the global level of view. Twenty-one of 49 resident mammal species in the United Kingdom are non-native including eight large deer or goat species. New Zealand has 1790 native plant species compared to 1570 invaders. South Africa has 176 native freshwater fish species, but is also home to 52 invading species. Even remote island systems are not immune to invasion by non-native species. Tristan de Cunha in the South Atlantic has 70 native plants but 97 invaders, and South Georgia, surrounded by the circumpolar current of the Antarctic, has 26 native plants but 54 invaders. The important "take home message" is that the United States is but a part of the network of international trade that historically built this country, and is vital to its continuing social and economic wealth, but that network is also the vector facilitating a continuing supply of invading species to our shores. In developing responses to invaders already in residence, and providing control to stop the continuing assault, we must lead the international community by example for both our and their benefit. Trade routes work in both directions, and the adoption and application of common safeguards to all routes of passage that eliminate transport and delivery of invaders beyond their native ranges will serve all by reducing this global homogenization of species distributions and the subsequent ecological and economic stress on receptor systems.

Efforts to control invasions and existing statutory authority to enable control are intimately linked and will be addressed together. While the Lacey Act probably best defines the principles of control at the Federal level a litany of Federal statutes illustrates the continuing and growing awareness of invasive species for well over half a century. These landmark actions include the Plant Quarantine Act, Animal Damage Control Act, Federal Seed Act, Organic Act of 1944, Federal Plant Pest Act, National Environmental Policy Act of 1970 (NEPA), Endangered Species Act (ESA), Federal Noxious Weed Act, Alien Species Prevention and Enforcement Act of 1992, Wild Bird Conservation Act of 1992, Hawaii Tropical Forest Recovery Act of 1992, and Executive Order 13112. Lacey is worthy of special note in that it recognizes the role of state statute and defaults to state level authority where it is written in state code. My home state of Virginia is such an example with the Code of Virginia designating authority over intentional introductions of non-native species to specific state agencies.

A powerful and important controlling Federal statute is the National Invasive Species Act of 1996 that provides a unifying theme to extant statutes. It is currently under revision and discussion for reauthorization. In November of 2002 I had the pleasure of appearing before this Committee to provide testimony of the draft revision in the form of House Resolution 5396. While I recommended modest changes to wording in HR 5396, I urged the Congress to move forward on reauthorization, and in doing so provide standards to reduce continuing invasions via ships' ballast water. We must become more aggressively proactive in preventing unwanted invasions, but we must do it without encumbering the process of international trade. I will briefly reiterate comment from that testimony. Innovative technologies are currently under development in the private sector for application in ballast water control. Interim standards set by this bill must provide specific targets for the technology developers, for without these their economic investment cannot be targeted at the eventual market in the shipping industry. The U.S. has the unquestioned capability to be the world leader in ballast water control technologies. I proposed adoption of a standard requiring 100% kill of all organisms in excess of 50 microns maximum dimension in discharged ballast—a standard that is both within reach of current technologies for very large volumes and that would be successful in retaining all the life history stages, including eggs, of the vast majority of aquatic vertebrates, invertebrates and macroalgae. While this standard would not insure removal of most phytoplankton and toxic dinoflagellates that cause red tide blooms—a group that may well represent a very serious challenge to any and all of the currently researched control technologies—it does represent a significant advancement of current options focused on ballast water exchange. We should not be handcuffed by the search for ultimate control tools while good, although perhaps not perfect, technology is within our grasp to address the ecological problem at hand. Incremental common sense dictates employment of the best available tools now, and better tools in due course. The draft of HR 5396 contained provision for continual review and improvement in standards as technology improves. I applaud this provision and urge its inclusion in the final draft of the reauthorization.

Identification of the avenues of invasion stimulates definition of the technical problem for control. Technical problems stimulate innovation in engineering to solve the problem when a defined goal, a discharge standard, is set in statute. Economic opportunity drives process, with preservation of native ecological complexity being the eventual benefactor.

Enabling legislation plays a central role in solving the continuing problem of environmental and economic impact of unwanted invasions. But that legislation must be soundly based in knowledge of how invaders arrived and why they survived to flourish in a novel environment. Despite numerous examples of successful invasions, and probably an even greater number of potential invasions that failed to establish, the global scientific community has very limited ability to predict with any level of certainty both the numbers and variety of invading species that will successfully become established in novel receptor environments in the near future. Future legislation must address this deficiency by providing funds for new and continuing research on a broad range of invasive species issues, and enable avenues to deliver the associated results to the regulatory process. Current levels of research and educational support are inadequate to address this expanding problem. Knowledge is a powerful tool that we must pursue and share to detect, control, and where possible, eradicate invading unwanted non-native species from both terrestrial and aquatic ecosystems of the United States. We must do better. With guidance, support, and a charge from Congress the scientific community will do better.

Before concluding I will briefly comment on one further subject area, that of intentional introductions of non-native species. While there is increasing and warranted recognition of the deleterious and often highly visible impacts of non-native invasive species in this country, it is appropriate to note that selected non-native species do provide beneficial roles in the ecology and economy of our nation. For example, recent USDA data reports that 16% of the nine trillion-dollar GNP of the United States come from agricultural production and associated activity. More than 90% of global agricultural production is based on 20 plant and six animal species with widespread distribution from intentional introductions. Production in the United States reflects this focus on non-native species—European settlement of North America included the introduction of wheat, barley, rye, cattle, pigs, horses, sheep, goats and more. Indeed, the majority of U.S. agricultural production arguably comes from species whose genetic origin was not in North America and it would be interesting to speculate on how colonization of North America would have proceeded had settlers been limited to agriculture based exclusively on native animals and plants. The draft version of House Resolution 5396 contained text addressing intentional introductions for beneficial uses. I applaud the inclusion of this in that it both

recognizes a continuing pressure for introductions for commercial production, pest control and environmental restoration purposes and the need to carefully examine and control such actions in an environment of limited understanding and potentially serious, even irreversible ecological impact. However, I urge the final version of this legislation to include text recognizing the role of state rights, in addition to Federal responsibility, in debate of this important subject.

In conclusion, I again thank the Committee for the opportunity to provide testimony. This completes my testimony.

Mr. PETERSON. Next we will hear from Dr. James Carlton, Professor of Marine Science, Williams College. Welcome.

STATEMENT OF DR. JAMES T. CARLTON, PROFESSOR OF MARINE SCIENCES, WILLIAMS COLLEGE, WILLIAMSTOWN, MASSACHUSETTS, AND DIRECTOR, WILLIAMS-MYSTIC, THE MARITIME STUDIES PROGRAM OF WILLIAMS COLLEGE AND MYSTIC SEAPORT, MYSTIC, CONNECTICUT

Dr. CARLTON. Good afternoon and thank you for the opportunity to speak before this joint oversight hearing on invasive species in America. My name is James Carlton. I am a marine biologist, and I have been working with exotic species invasions in coastal waters since 1962. I am also the founding Editor-in-Chief of the international scientific journal, Biological Invasions.

My words today are as they were when I spoke here before Congress on June 14, 1990; June 19, 1990; October 27, 1993; July 11, 1996; July 17, 1996; September 19, 1996 and July 26, 2001. My words today are the same as in my previous seven visits except for one major difference.

Since I first spoke 13 years ago before the House Subcommittee on Fisheries and Wildlife Conservation and the Environment, there are now perhaps 500 more exotic species in this country—on our lands, in our rivers and lakes and in our coastal oceans. The impact of exotic species is not imagined. It is not in doubt. It is not xenophobia.

Every element of the American hamburger—the wheat bun, the meat, the lettuce, the tomato, the pickle, the onion—consists of nonnative species. Rather, we have a cornucopia of clear, abundant, overpowering, simply walloping data that thousands of other exotic species in this country have led to vast socioeconomic, environmental and industrial impacts costing us billions and billions and billions of dollars. It is as simple as that.

We have invasive species laws and they are important ones. However, in general, they are tended to by a relatively few hard-working people with so little funding that a few kitchen ants—which, by the way, are native to Argentina—could carry the money away.

We play ecological roulette, we play economic roulette, we play industrial roulette every single minute in America with exotic species. Our activities are simply not speeding up or repeating natural vectors that transport species, such as winds and birds, by bridging all natural barriers; human-mediated dispersal transports species that would never naturally arrive in America.

We have to get serious about exotic species. They need to be on our radar and not below our radar. We have to get serious funding. We have to get serious about enacting invasive species legislation

before Congress now and not later. We have to be willing to be aggressive in addressing this absolutely fundamental economic and environmental issue.

It is clear that Americans support this effort. The annual Earth Day Gallup Poll taken 2 weeks ago found that 80 percent of the public endorsed immediate action to prevent any further major environmental disruption. By the time I come before you and we discuss the latest most kick-butt invasions in the Great Lakes, in Kansas, in the Chesapeake Bay, in San Francisco Bay, it is by and large too late.

If it is raining, we close the windows and then think about mopping up. Ladies and gentlemen, it is raining. It is raining exotics in the continental United States. It is raining exotics in Hawaii and in our territories and commonwealths such as American Samoa, Guam and Puerto Rico. And it is raining exotics in our contiguous neighbors and the windows are still open.

Mr. PETERSON. Thank you very much.

[The prepared statement of Dr. Carlton follows:]

Statement of Dr. James T. Carlton, Professor of Marine Sciences, Williams College, Williamstown, Massachusetts, and Director, Williams–Mystic, The Maritime Studies Program of Williams College and Mystic Seaport, Mystic, Connecticut

Good afternoon and thank you very much for the opportunity to speak before this joint oversight hearing on invasive species in America. My name is James Carlton. I am a marine biologist, and I have been working with exotic species invasions in our coastal waters since 1962. I am also the founding Editor-in–Chief of the international scientific journal, Biological Invasions.

My words today are as they were when I spoke here before Congress on June 14th, 1990; June 19th, 1990; October 27th, 1993; July 11th, 1996; July 17th, 1996; September 19th, 1996, and July 26th, 2001.

My words today are the same as in my previous 7 visits, except for one major difference: Since I first spoke 13 years ago before the House Subcommittee on Fisheries and Wildlife Conservation and the Environment there are now perhaps 500 more exotic species in this country—on our lands, in our rivers and lakes, and in our coastal oceans.

The impact of exotic species is not imagined. It is not in doubt. It is not xenophobia: every single element of the American hamburger—the wheat bun, the meat, the lettuce, the tomato, the pickle, the onion—consists of non-native species. Rather, we have a cornucopia of clear, abundant, overpowering, titanic, and simply walloping—data that thousands of accidentally introduced exotic species in this country have lead to vast social, economic, environmental, and industrial impacts costing us billions and billions and billions of dollars.

It is that simple.

We have invasive species laws, and they are important ones. However, in general they are tended to by a relatively few hard-working people with so little funding that a few kitchen ants—which by the way are native to Argentina—could carry the money away.

We play ecological roulette, we play economic roulette, we play industrial roulette every single minute in America with non-native animals and plants. Our activities are not simply "speeding up" or repeating natural vectors that transport species, such as winds or birds—by bridging all natural barriers, human-mediated dispersal transports species that could never naturally arrive in America.

We have to get serious about exotic species. They need to be on our radar and not below our radar. We have to get serious about serious funding. We have to get serious about enacting invasive species legislation before Congress—now and not later. We have to be willing to be aggressive in addressing this absolutely fundamental economic and environmental issue. It is clear that Americans support this effort: The annual Earth Day Gallup Poll taken two weeks ago found that 80% of the public endorse immediate action to prevent any further major environmental disruptions.

By the time I come before you and announce the latest, most kick-butt invasions in the Great Lakes, in Kansas, in the Chesapeake Bay, or in San Francisco Bay,

it is by and large too late. If it's raining we close the windows and then think about mopping up.

Ladies and gentlemen, it is raining:

- it is raining exotics in the continental United States,
- it is raining exotics in Hawaii, and in our territories and commonwealths such as American Samoa, Guam, and Puerto Rico,
- it is raining exotics on our contiguous neighbors, and the windows are still open.

Thank you.

Mr. PETERSON. Next we will here from Mr. James Beers, Science Advisor, American Land Rights Association.

Welcome and please proceed.

STATEMENT OF JAMES M. BEERS, SCIENCE ADVISOR, AMERICAN LAND RIGHTS ASSOCIATION; CENTREVILLE, VIRGINIA

Mr. BEERS. Thank you, Mr. Chairman. I represent the American Land Rights Association, an organization of small property owners in all 50 States. I worked for the Fish and Wildlife Service for 30 years in four States and Washington, D.C., as a wildlife biologist, special agent and refuge manager.

I have enforced injurious wildlife regulations and investigated endangered species cases both here and in Europe. I have worked on invasive species control programs for nutria and purple loosestrife. I have attended U.N. wildlife conferences and represented State wildlife agencies fighting a threatened European fur embargo. I currently write and speak extensively about both endangered and invasive species.

Mr. Chairman, it is wrong for Congress to consider passage of a law to confer Federal jurisdiction over any plant or animal occurring within the United States. Such jurisdiction was assigned to State governments by the Constitution and can only be taken from the States by a treaty or an amendment to the Constitution.

Invasive species jurisdiction seizure is being attempted with 14 bills before Congress, Federal agency proposals for new programs, and United Nations plans for a proposed treaty to either control invasive species or restore native ecosystems, which is the same thing.

Our Founding Fathers placed the jurisdiction over plants and animals at the State level for, among other reasons, the inherent responsiveness of the lowest level of government to citizen concerns.

The Endangered Species Act verifies repeatedly the wisdom of the Fathers in this regard. That Act has eliminated businesses', communities' and Fish and Wildlife management programs and their financial support. It has justified taking without compensation that which was specifically prohibited in the Constitution. It has made professors and science responsive to government grants and bureaucratic regulation. It has changed the emphasis of many Federal agencies from proactive natural resource managers to public land locksmiths who reintroduce unwanted and harmful native species on private lands.

The proposed Invasive Species program will be worse. It will start, like Endangered Species, with a modest list of a few noxious

plants like leafy spurge and yellow starthistle. Then bureaucrats and courts will add species, subspecies, populations, et cetera, to the list. Soon a court will affirm a lawsuit that claims elimination of "invasive species" is a Federal responsibility, so its natural goal is the restoration of native ecosystems.

Mr. Chairman, that goal is neither desirable nor attainable. The only beneficiaries of such a policy will be Federal agency budgets, university grant offices and nongovernmental organizations bent on restricting property rights and human uses of natural resources. Our ecosystem should be managed to reflect the needs, our needs, and our Constitution, not the socialist intentions of environmental philosophies.

There is no difference between "native" ticks transmitting disease and invasive purple loosestrife taking over wetlands. Management or eradication should be considered equally based on community needs, not the species' arrival date.

Many invasives are highly utilized food and cover for desirable wildlife. Others, like zebra mussels, clarified Lake Erie waters, which helped to recover a sport and commercial fishery. Actually, any species can be alleged by some group or scientists to harm something. Innumerable hidden agendas are poised to take advantage of Federal invasive species authority if it ever materializes.

The Federal Government should stick to managing the import, export, interstate commerce and foreign aspects of the United States plant and animal community. Federal land should be managed to minimize harmful plants and animals. Research on harmful species could be conducted and shared through land grant universities and USDA research centers. Excess Federal money could be appropriated on a formula basis to the States, much like Pittman Robertson excise tax funds that have proven so successful in managing and restoring desirable wildlife species for 70 years.

Today, the National Park Service seeks to eliminate highly desirable species like lake trout and chukars because they weren't where they are today in 1492 A.D. Likewise, the U.S. Fish and Wildlife Service is eradicating Russian olive trees that have been here over a century despite the fact that they are an important food and winter cover for pheasants, sharptails and migratory birds. The goal is elimination of the invasive pheasants and trout plus the hunters and fishermen and even hunting on refuges like Bowdoin in Montana.

Ask yourself honestly what is sacred about the year 1492. Species have been coming and going forever. The ludicrous nature of all this is illustrated by the Park Service recently forming emergency "swat teams" to find invasive plants even though they have ignored overabundant native deer herds eradicating the plant communities on national parks and neighboring lands for decades.

The Interior Department justifies eradication of invasive salt cedar trees in spite of the fact that they are a prime nest site for endangered willow flycatchers. They propose this eradication based on spurious science and questionable interpretation of law, unavailable to private property owners who have critical habitat for and endangered species designated on their land.

This is similar to the dumping of toxic sludge on an endangered sturgeon spawning area in the Potomac River. This practice, pres-

ently before the Court, involves the U.S. Army Corps of Engineers routinely flushing toxic sludge from the D.C. Water Authority under EPA permit through a national park for years.

Giving these agencies more authority over more species only invites further abuse. The Founding Fathers wisely crafted our Constitution to place that authority at the State level.

Mr. Chairman, my organization and a growing cross-section of citizens plead with you to avoid giving the Federal Government any more authority over plants and animals. For the sake of property owners, natural resource users and for the sake of our American way of life, do not go down this imaginary pre-Columbian path. Stay to the course that history and our Constitution have proven was well chosen when the United States of America was created.

Thank you.

[The prepared statement of Mr. Beers follows:]

Statement of James M. Beers, Science Advisor, American Land Rights Association

Thank you Mr. Chairman for inviting me to testify at your hearing today.

I represent the American Land Rights Association, an organization of small property owners in all 50 states.

I worked for the U.S. Fish and Wildlife Service for 30 years in four states and Washington, DC as a wildlife biologist, special agent, and refuge manager. I have enforced Injurious Wildlife regulations and investigated Endangered Species cases both here and in Europe. I have worked on Invasive Species control programs for nutria and purple loosestrife. I have attended UN Wildlife Conferences and represented state wildlife agencies fighting a threatened European fur embargo. I currently write and speak extensively about both Endangered and Invasive Species.

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The proposed Invasive Species program will be worse. It will start, like Endangered Species, with a modest list of a few noxious plants like leafy spurge and yellow starthistle. Then bureaucrats and courts will add species, subspecies, populations, etc. to the List. Soon a Court will affirm a lawsuit that claims elimination of "Invasive Species" is a Federal responsibility so its natural goal is the restoration of "Native" ecosystems.

Mr. Chairman that goal is neither desirable nor attainable. The only beneficiaries of such a policy will be Federal agency budgets, University Grant offices, and non-governmental organizations bent on restricting property rights and human uses of natural resources. Our ecosystem should be managed to reflect our needs and our Constitution, not the socialist intentions of environmental philosophies.

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The Interior Department justifies eradication of "Invasive" salt cedar trees in spite of the fact that they are prime nest sites for Endangered willow flycatchers. They propose this eradication based on spurious "science" and questionable interpretation of law unavailable to private property owners who have Critical Habitat for an Endangered Species designated on their land.

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Further explanation of these issues may be found on the American Land Rights Association website www.landrights.org

Thank you and I am ready to answer any questions you might have.

Mr. POMBO. [Presiding.] Recognize Dr. Kraus.

STATEMENT OF DR. FRED KRAUS, DEPARTMENT OF NATURAL SCIENCE, BISHOP MUSEUM, HAWAII

Dr. KRAUS. Thank you. I would like to thank the members of the Committee for the opportunity to testify today on the invasive species problem in Hawaii, just to give you a broad overview.

Hawaii is unique because of its geographic isolation, and topographic and climatic diversity have led to the creation of over 10,000 species of plants and animals found nowhere else on Earth. Similar processes lead to high diversity on other Pacific islands. The problem is that in the last 200 years, more than 5,000 alien species have become established in Hawaii and probably 300 to 500 of these create serious environmental or economic problems.

Most of the damaging alien species are those that alter community structure or ecosystem function, whether those ecosystems are

natural or man-made agrarian ecosystems. The rate of introduction in Hawaii of alien species is greater than 1 million times the natural rate of colonization of the island, and this has led to scores of species becoming extinct, hundreds of species becoming endangered, and wholesale replacement of native vegetation cover across many of the islands. It has also led to wave after wave of damage to agricultural interests in the State.

Current limitations for dealing with the invasive species problem in Hawaii and elsewhere in the Pacific are numerous. You have heard much already about insufficient personnel, insufficient funding, divided and incomplete authorities and, sometimes, insufficient scientific knowledge, so I am not going to dwell on those. I would like to make remarks though on three other limitations that you have probably heard less about.

The first is what I call the mainland mind-set. This is the failure of mainland decisionmakers often to recognize the unique biological diversity or unique biological situation and heightened susceptibility of Hawaii and other Pacific islands to invasive species. As a consequence, oftentimes invasives arrive in Hawaii that should have been excluded at the national borders, but were not because they were deemed unimportant to temperate ecologies.

The second limitation is the historical reliance on blacklists, such as is done in the Lacey Act. Blacklists, a listing of those species deemed especially harmful, that are banned import into the United States. This approach suffers from two limitations.

One, there are hundreds of thousands or millions of potentially invasive species and you cannot list them all. The second limitation is that it relies on a doomed logic, which is that almost always you need a train wreck, an invasion disaster somewhere, before a species will become listed.

The third limitation that we have in Hawaii, as elsewhere, is that historically the costs of alien species invasions have been externalized across society as a whole. And I would suggest that we need to internalize those costs to the industries that benefit from the importing activities.

A number of successful actions have been taken in the past few years for dealing with the invasive species problem in the Pacific. In the realm of prevention, there is a highly successful program protecting California and the rest of the mainland from three species of invasive fruit flies that became established in Hawaii a number of years ago. What we need, though, is protection of Hawaii from pests on the mainland, too, i.e. we need a reciprocal quarantine program.

In terms of screening, which is the best means of keeping out potentially invasive intentional introductions, the best screening system devised so far is the weed risk assessment devised by the Australia Quarantine and Inspection Service. It has been used successfully in that nation and in New Zealand for a number of years. It has been tested in Fiji and Hawaii and found predictive of invasiveness of plants we already have in the State; and it is currently being modified for voluntary use in Hawaii.

In terms of rapid response—that is, what we do with species once they escape the prevention system and become established already—in Hawaii, we have made considerable progress in the last

several years with so-called "invasive species Committees" based on each of the four main islands, which identify and target for eradication incipient invasive species.

Interagency coordination is best shown perhaps by the Brown Tree Snake program in the Pacific, an interagency cooperative effort that has resulted in dramatic declines of Brown Tree Snake shipment from Guam to other islands. Long-term management has been best done by the National Park Service in the Hawaiian Islands and has provided models for jurisdictions elsewhere.

Resources needed to protect Hawaii in a comprehensive fashion from invasives are probably on the order of about 100 million per year, and that is based on identification of State resources needed, done by Coordinating Group on Alien Pest Species, an interagency group in Hawaii.

In addition, as I mentioned earlier, we need Federal quarantine of mainland pest species arriving in Hawaii. We need screening systems implemented to keep out invasive intentional introductions, and we need authorities or incentives to promote eradications of incipient invasive species on private lands and the ability to tap contingency funds to meet those needs.

In summary, why does any of this matter? Hawaii and the Pacific are among the hardest hit areas in the world by invasive species. We have lost scores of species to extinction and much of our native lands have been converted to alien cover. Many people interpret this as a statement that the situation in Hawaii and in the Pacific is lost, but it is not. Many thousands of unique species still remain. Many thousands, or hundreds of thousands, of additional alien invasive species could be established in Hawaii making life for people there much worse. Serious efforts to deal with invasive species problems in Hawaii and the Pacific have only begun in the past few years, but by providing the dedicated support and programs needed, the remaining rich patrimony of biological wealth in these islands could be preserved for future generations.

Thank you for your attention.

Mr. POMBO. Thank you.

[The prepared statement of Dr. Kraus follows:]

Statement of Dr. Fred Kraus, Department of Natural Science, Bishop Museum, Hawaii

Mr. Chairman and Members of the Committee:

Thank you for the opportunity to present testimony today on invasive alien species problems in Hawaii and the Pacific.

I am Dr. Fred Kraus and am employed as a research scientist with the Bishop Museum in Honolulu. I have been involved with research and/or control work with invasive alien species since 1991, when I initiated and implemented control work for feral ungulates and invasive plants on a privately owned island in the British Virgin Islands. From 1996 to 2001, I worked on a large variety of invasive-species policy and programmatic efforts for the Hawaii Department of Land and Natural Resources and was active in coordinating a number of inter-agency coalitions dedicated to addressing various aspects of the invasive-species problem in Hawaii. For the past two years I have worked for the Bishop Museum and have continued research into problems involving alien vertebrates.

The uniqueness of Hawaii and other Pacific islands lies in their isolation from continental landmasses and their great topographic and climatic diversity. As a result, natural colonization of these islands has been very infrequent and has often led to the generation of species unique to particular islands and archipelagos. In the case of Hawaii, this isolation has resulted in the evolution of approximately 10,000 species found nowhere else on Earth, out of a total biota of approximately 18,000

native species. Topographic and soil variability have also resulted in a mix of habitats that can place tropical rainforests within a few miles of baked desert-like conditions, creating climatological transects that would occur over much greater distances in continental situations. For these reasons, Hawaii holds a significant portion of the United States' patrimony of biological wealth.

However, with the breaking of natural geographic isolation by human activities, these native biota and ecosystems have been overwhelmed by the establishment of more than 5000 species of alien plants and animals in Hawaii in the past 200 years. This represents a rate of successful colonization of new species that is more than one million times the natural rate. This pattern shows no sign of abatement, and in the past five years, the Hawaii Biological Survey has documented an average of 177 additional alien species in Hawaii each year. Under these circumstances Hawaii's ecological meltdown is not unexpected and can be represented in a number of ways. As one example, Hawaii has lost hundreds of species to extinction, currently has 322 species recognized as endangered or threatened by the USFWS (26% of the U.S. total), and has hundreds more that are deserving of protection but unlisted. In this latter category, at least 50 species have populations smaller than 50 known individuals. Virtually all of these endangered species, except for the marine forms, are endangered primarily or in large part by invasive aliens. Alternatively, if one looks at the landscape scale, Hawaii has lost a massive percentage of its native habitats (Fig. 1). The large majority of this habitat loss is due to replacement of native vegetation by invasive plants—often mediated by past human habitat clearance—or due to total removal of native plant cover by alien ungulates, leaving large expanses of bare soil. Losses elsewhere in the Pacific are frequently in the same range, although some islands have fared better. Economic effects of invasives have been poorly quantified in the Pacific but losses greater than $150 million/yr are ascribed to one species of termite in Hawaii alone and economic and health costs of brown treesnakes in Guam have been discussed, and Hawaii's agriculture has been buffeted by a succession of alien pests. Despite this lack of research, economic costs of invasives in the Pacific are likely to be large in many cases.

No well-researched effort has been undertaken to address the question, but a reasonable estimate is that approximately 300–500 of Hawaii's 5200 established alien species are ecologically damaging. This includes approximately 20–40 vertebrates, 150–200 plants, and an unknown, but large, number of invertebrates and pathogens. Areas invaded by individual species range from a few acres to hundreds of thousands of acres and the damage created by them spans a similar continuum, with the most damaging forms including many with the largest ranges. Generally, taxa that are able to alter ecosystem function or community structure have been especially detrimental, and prominent examples across the Pacific include trees, grasses, feral ungulates, mammalian predators, rats, and social insects like ants and wasps. These species are especially notorious because their effects are often so great as to be obvious to large segments of society. As just one example among many, the Neotropical tree Miconia calvescens has spread to cover two-thirds of Tahiti's forests in the past 70 years. As a result, landslides have become more common, watershed values are degraded, and 40–50 species now face extinction. This tree has large populations on the islands of Maui and Hawaii and threatens to inflict similar damage there should control efforts falter. Similar examples from the Pacific could be multiplied to the point of tedium but I will eschew that exercise. It is critical to remember, however, that not all damage is created by well-known villains. As one example, the brown treesnake, now widely recognized as the reason for Guam's near-total loss of native forest birds, was originally rejected by many as the cause of this loss because few could imagine a mere snake having such devastating ecological consequences. Similarly, concerns raised in 1997 that coqui frogs would create problems in Hawaii were greeted with derision; however, these same problems have blossomed and received national media attention in the past few years. In many cases, ecological degradation in the Pacific results not from just one or a few key species but from the "death by a thousand cuts" inflicted by the composite magnitude of the invasion.

The species comprising the alien invasion arrive through a variety of pathways, but this variety may be grouped into two major categories: intentional and unintentional introductions. Examples of the former include released pets, garden escapes, and biocontrol organisms; examples of the latter include hull-fouling organisms, ballast water, and seed contaminants. The important point to note is that pathway importance varies by taxon. Some groups, such as fish, mammals, birds, and vascular plants, are primarily introduced purposely because someone perceives a value for the species. Others, such as marine algae, landsnails, insects, and pathogens are usually unintentional, and unwanted, introductions. Efforts to address invasive-spe-

cies problems often focus on only one or a few pathways but a comprehensive program will require that all important pathways be addressed.

A number of factors has limited the effectiveness of our responses to invasive aliens in Hawaii and across the Pacific. A few of these, such as rugged terrain and small tax bases, are inherent to the region and cannot be changed. But most historical limitations are theoretically correctable by human action. One of the greatest current shortfalls in invasive-species programs in Hawaii is lack of dedicated personnel to do the work. Consequently, otherwise promising initiatives against invasives continually founder for lack of personnel to carry out the tasks. Responsibilities for invasives are often divided among a number of agencies, often saddling agencies with insufficient authorities and making response coordination among agencies unused to cooperation difficult. For example, within the State of Hawaii, responsibility for border inspection and quarantine lies with the Hawaii Department of Agriculture; responsibility for controlling infestations on State lands lies with the Department of Land and Natural Resources. But no agency has authority over most pests in the urban interface or other private lands, where most alien invasions begin. Hence, by the time invasions progress to State lands it is usually too late to implement effective control. Identical problems plague the Federal agencies. In many cases, even when these hurdles have been overcome, we lack the requisite ecological or control-methodology knowledge to respond effectively. There are a large number of invasive species for which we lack even basic knowledge of their biological susceptibilities or potentially effective control methods. This includes most marine invertebrates, many plants, and a wide array of vertebrates. Furthermore, when successful cooperative inter-agency control or prevention programs have been implemented, such as the brown treesnake control program in Guam, CNMI, and Hawaii, there has been a failure to learn from these successes and systematize their approaches to address other invasive pest problems. For example, fire ants and West Nile virus are poised to invade the Pacific. The success of the brown treesnake interdiction program could serve as a model for proactively stopping the spread of these pests before they arrive in the Pacific but the opportunity is not being grasped. Finally, one severe limitation is unique to Hawaii and the Pacific and that is the failure of mainland policy-makers to recognize the biological uniqueness and heightened susceptibility of this region to pests that are no cause for concern on the mainland. As a result, Hawaii has often received via the mainland U.S. severely damaging pests that the USDA refused to prohibit U.S. entry because the pests were tropical in nature and would not affect mainland interests. Under these circumstances, it is a simple matter for a tropical country to ship goods to the mainland for immediate reshipment to Hawaii—goods that if shipped directly to Hawaii would be barred entry by the State. This practice has made Hawaii especially liable to decisions appropriate for temperate decision-makers but irrelevant to our tropical situation. And invasion in Hawaii often leads to pest expansion farther west in the Pacific because Hawaii serves as the economic gateway for much of the region.

To stem the flood of invasive species, a multi-tiered approach to prevention and control must be implemented so as to capitalize on the multiplicative protection afforded by each component. Obviously, the most effective and efficient means of mitigating additional alien-species problems is to prevent their introduction in the first place. Hence, comprehensive quarantine and screening systems should form the foundation for any alien-species mitigation program. Should alien pest species breach the quarantine barrier, the most cost-effective means of mitigation is to discover and eradicate newly established alien species prior to population entrenchment. If successful, this avoids the large costs of perpetual control. Lastly, for those species that have become firmly established, long-term control to mitigate their worst effects is usually the only remaining option, but this is typically expensive and must occur in perpetuity to be effective. Each of these approaches ideally should be coordinated with the others to provide a functional system of protections. Progress has been made in each of these areas in the Pacific region although successful programs have been somewhat ad hoc and are not yet united to form a comprehensive system of protection at any one locality, except in New Zealand and, to a lesser extent, Australia.

Prevention includes both quarantine efforts to intercept hitch-hiking pests in cargo and packing materials as well as screening systems to evaluate the potential invasiveness of species proposed for intentional introduction. The USDA's longstanding inspection service at designated ports of entry illustrates one partially successful means of conducting a quarantine program, although that program suffers from a narrow focus on only agricultural pests. The same agency's quarantine and inspection program protecting California agriculture from alien fruit flies invasive in Hawaii is a model of how effective protection may be afforded by a comprehensive inspection program. In this program, all passengers flying from Hawaii to the U.S.

mainland must have their luggage screened by X-ray machines and certified free of produce. This has kept California relatively free of three species of pestiferous fruit flies for a number of years. A reciprocal program is needed, however, to protect Hawaii from the host of invasive aliens it receives from the U.S. mainland.

The most effective screening system yet developed to halt the intentional spread of invasive aliens is the Weed Risk Assessment devised by the Australian Quarantine and Inspection Service. This quick, transparent evaluation system has been used successfully in that country and in New Zealand to exclude importation of invasive plants for the past several years. Preliminary tests have shown its efficacy at predicting invasiveness of alien plants in Hawaii and Fiji too and efforts are underway in Hawaii to get a modification of this system implemented on a voluntary basis to reduce the rate of importation of new invasive species.

There has been success in Hawaii at implementing some level of rapid-response protection that involves the formation, on each major island, of a coalition of interested agency and non-governmental personnel dedicated to removing incipient populations of known invasive species before they become well-established and ineradicable. These so-called invasive species committees have had considerable success in reducing or eradicating an array of invasive species (mostly plants) but efforts to date cannot be viewed as comprehensive because of the large standing crop of incipient invasives in Hawaii. Cessation of control activities for even a short period could negate many of the gains made in recent years. These committees also serve as successful local models of cooperation among a variety of agency and private partners to address the invasive-species threat in Hawaii. The same is true for the Coordinating Group on Alien Pest Species (CGAPS), which serves to coordinate policy actions at a statewide scale, again involving a wide array of government and non-governmental parties.

Perhaps the most successful example of an integrated prevention/rapid-response/research system protecting Hawaii and the Pacific is the inter-agency brown treesnake prevention program based on Guam and its supportive research program based in Fort Collins, Colorado. This program consists of comprehensive inspection on Guam of outbound cargo and vessels and population reduction of snake populations in port areas. Since implementation in 1995, the incidence of brown treesnake appearance in other jurisdictions has declined dramatically. This program could serve as a model for other species-specific prevention programs throughout the Pacific but despite its demonstrable success it continues to struggle for year-to-year funding, making its long-term stability uncertain. Despite this lack of base funding, this program does indicate one direction that a comprehensive, coordinated response to other invasive-species threats could successfully take.

For the large number of invasive species that are already widespread and wreaking ecological havoc in Hawaii, the best model for long-term mitigation has been provided by the National Park Service. Through efforts extending over the past two decades or so, park managers have removed or seriously reduced several of the most destructive invasive pests—including ungulates, mammalian predators, and a wide array of plants—over large areas of Haleakala and Hawaii Volcanoes National Parks. These efforts have served as models used by other agencies in Hawaii and elsewhere in the Pacific. However, these impressive gains may be mooted in the future if the current trends in alien invasion convert these parks to postage stamps of native habitat with an ever-larger tide of invasives lapping at their borders. In this respect, should miconia, brown treesnakes, fire ants, West Nile virus, or other especially severe invasives arrive at park boundaries, there would be little hope of sustaining natural resource values within the parks themselves. In recognition of this, it makes sense for natural resource agencies to become more proactive in addressing invasive species threats before they reach their lands.

Despite these successes, efforts to address invasive-species threats in Hawaii and the Pacific in a comprehensive fashion are still in the early stages of development and it is clear from experience that a number of unsuccessful approaches to the problem need to be avoided. First, it is clear that adoption of a "black list" approach that bars entry to a handful of species deemed especially harmful (an approach taken by the Federal Lacey Act) is doomed to failure. This is because it is impossible to evaluate and list more than a small percentage of the millions of species estimated to inhabit the planet, so large numbers of invasives will always pass through a screen having such large holes. More importantly, the irreversible nature of alien-species invasions logically necessitates adoption of the precautionary principle in order to successfully meet a reasonable standard of risk-aversion. A black list approach does just the opposite, allowing entry to any species unless demonstrably shown to be harmful. The problem with this approach, of course, is that it logically requires that an ecological disaster be in place before action is taken. The screening systems used in Australia and New Zealand have successfully taken the opposite

approach. Second, eradication efforts that fail to secure long-term support to ensure completion of the action should not be undertaken. Numerous attempts at eradicating incipient pests have failed because of underestimation of population resiliency and consequent under-commitment of needed resources. The effort to control miconia in Hawaii could easily meet this same fate. Third, the historically piecemeal approach taken by Federal and state governments in the U.S., with authorities uncoordinated among a diversity of agencies, cannot successfully meet the challenges posed by the magnitude of the invasive-species problems in this country. In Hawaii, we have had some success in achieving better coordination among this host of agencies but it is not clear if that alone will be sufficient to meet the challenge. Serious consideration needs to be given to the idea of unifying all invasive-species prevention and control efforts under a single biosecurity agency. Lastly, the costs of allowing invasive species into the U.S. have, in most instances, been externalized across society. These costs need to be internalized so that those who benefit by the importation activities have incentives to reduce the danger of the activities by which they benefit. The invasive-species problem is of such magnitude that government action alone, without adoption of some market incentives, will be insufficient to provide a complete solution.

Resources needed to protect Hawaii and the Pacific from further invasive-species incursions largely fall into the categories of increased capacities and increased authorities. Capacity needs for prevention, rapid-response, and long-term control of invasive species in Hawaii were comprehensively estimated by CGAPS two years ago to be $53 million/yr in State funds (Table 1). Current total State spending is perhaps 10% of that. Improving Federal roles in quarantine inspection, research, and control would add several tens of millions of dollars to this figure. Hawaii and the Pacific need a Federal quarantine program—reciprocal to that provided the mainland—to protect these islands from mainland goods and passengers, which have been the source of innumerable invasive pests over the years. For preventing intentional introduction of invasives, we need functional plant-screening systems in place as well as research to develop similar screening systems for animals. To provide for effective early-detection and rapid-response programs we need expanded authorities to facilitate operations on private lands and the ability to tap contingency funds to eradicate pests before they explode in numbers. For this and long-term control programs we also need considerably more research into developing effective control methodologies.

In meeting these requirements, it is important to emphasize that money spent earlier in the invasion process is more cost-effective than that spent later. Hence, priority should be given to establishing effective prevention programs that involve inspection and quarantine for unintentional introductions and screening systems for intentional introductions. These prevention programs should abandon the black-list approach for a more proactive white-list approach and should internalize programmatic costs to those benefitting from the importation activity.

Thank you, Mr. Chairman and Members of the Committee.

[An attachment to Dr. Kraus' statement follows:]

Summary of State of Hawaii Resources Needed for Comprehensive Invasive-Species Prevention and Control
produced by Coordinating Group on Alien Pest Species (CGAPS), 2001

	#FTE's	FTE $	Operations	Subtotal
Prevention	144	$8,640,000	$820,000	$9,460,000
Early Detection	31.5	$1,890,000	$789,000	$2,679,000
Rapid Response	68.25	$4,095,000	$539,000	$4,634,000
Control	292	$17,520,000	$12,732,000	$30,252,000
Enforcement	6	$360,000	$410,000	$770,000
Public Outreach	50.25	$3,015,000	$1,787,000	$4,802,000
Totals	**515**	**$35,520,000**	**$14,003,000**	**$52,597,000**

Assumptions:
FTE $= projected at $60,000 per position to cover salary, fringe and support
Helicopter time= $640/hr

Mr. POMBO. Dr. Kraus, I would like to start with you. In your testimony, you talked about the possibility that there were millions

of species, invasive species, thousands or millions of invasive species.

If we were to adopt legislation like this, where would you draw the line? Where would you say this is invasive and we have to stop it because it is nonnative? As previous testimony has said, there are a lot of different species that would be considered invasive, so where do you draw the line? Where do you say this is OK and this is not?

Dr. KRAUS. You have to test for invasiveness. You have to distinguish between alien species, those that are not native in the area and those that are invasive, which is a small subset of alien species that actually create economic or ecological problems.

So far, work to predict which species will become invasive has largely been restricted to plants. That is the weed risk assessment system. In that case, the system, at least from a Pacific perspective, has been sufficiently well worked out as to be worth implementing immediately. In the case of animals, far less work has been done for predicting invasiveness; and so, frankly, to address that aspect of the question, we need to invest in further research because we don't know how to predict invasiveness in most animal groups yet.

Mr. POMBO. Let me just follow that up with—I guess the question I have in my mind is, invasiveness is somewhat in the eye of the beholder, and I think that is the concern that Mr. Beers and others have is that you can make a determination that the introduction of cattle into a certain ecosystem endangers the native plants that exist there. In fact there was a report that came out of the State fish and game in California on Mount Diablo, which is a State park, and they referred to the "nonnative, exotic game species from Europe" which inhabited the park, and they were referring to the cattle that they never—anywhere in it, they never said anything about cattle. They always referred to them as a nonnative, exotic game species. And I think one of the concerns that a lot of people have is that we can go—by introducing something like this into law, we end up opening up to the bureaucracy and whatever agenda they may hold. So I think that is a concern.

Dr. KRAUS. I think it is a valid concern. If you are talking about control programs to deal with species that are already established, much of that work, perhaps most of it, has to be done at a local level and perhaps should be based on local desires.

I think the largest role for the Federal Government has to be in preventing new species from getting into the United States in the first place. And in that case there are such largely opposing current authorities that I think additional legislation is needed, additional direction is needed. The Federal Government can help with funding because, like in the case of the Pacific islands, most of the populations are small, tax bases are small and that sort of thing.

When it comes to actual control work on private property, perhaps it is not an appropriate place for the Federal Government to get very heavily involved, but I would want them as partners because in many States, Federal property often lies next door and you do need a coordinated response to deal with these problems.

Mr. POMBO. Dr. Mann, would you like to respond to that as well?

Dr. MANN. I agree there is a role here for the Federal Government and the prime role that I see is the prevention of new introductions. And as I think was eloquently stated by Dr. Ruiz, you have this open corridor of major vectors and they are desperately in need of some attention.

Animal and plant species that are already here represent problems that may be insurmountable in terms of their control, depending upon the nature of the individual species. But stopping everything else at the gate is something I think the Federal Government should and can take the lead on.

Mr. POMBO. Mr. Beers, we have talked a lot about this over the years and what role the Federal Government should play or can play. In 1993, I authored an amendment on the national biological survey bill that required the Federal officials to obtain written consent from private landowners before they inventory species on private property.

How far would that go in alleviating what some of your fears are in terms of going forward with this?

Mr. BEERS. Mr. Chairman, I don't think it would relieve them at all. Most of these species can be seen from the road, can be seen on the neighboring lands, and the assumption can be that they are there.

The Federal control, although you may not want it here in Congress and although the agencies will say they certainly don't want to expand it, will be placed there and caused to be created by courts due to lawsuits by people who have other agendas in mind. Those agendas are to interfere with the private property owner's rights on his own property, as well as to take public lands and make them less accessible to people.

So there is a whole range of agendas there that I really don't think telling a Federal Government employee that they have to have authorization to go on private land would help. Find it in the neighborhood or nearby or something gives you carte blanche to say, it must be there, we can see it; and you are off to the races again either with the agency claiming they have to do something or one of these nongovernmental organizations going to court with a suit.

Mr. POMBO. Well, unfortunately, I think your argument has a lot of validity to it and we have seen it over the years with the Endangered Species Act and other Federal laws that were started with good intentions and general agreement to do something, but when that hits the bureaucracy and the courts sometimes it gets interpreted very differently from that; and I think your argument holds a lot of water in that respect.

Mr. BEERS. Mr. Chairman, I would like to take the opportunity, if you have a moment, to answer a question that was asked of the other panel, which is, the Chairman at that time asked the question, what is—the willow flycatcher nesting in the tamarisk or salt cedar, what is the reason or how can the Federal Government eradicate or call it an invasive species when it is a nesting tree for an endangered species?

I was at a briefing about a month ago where a high Interior official explained that they had looked into the fact that possibly those birds would do better in native plants so it is OK for the Federal

Government to go in and eradicate the tree that they now use to nest in. And I would suggest to Congress it probably was never your intention nor did anyone ever imagine that you might take certain facets of a critical habitat and because you wanted to use it—in this case, the Federal Government—to eradicate it, that you could say that other alternatives are available that they should use.

I suggest to you that that has never been made available to private property owners nor will it ever be. And carrying that activity forward in this invasive species area, I think it addresses what you just asked, which is the way in which the Federal Government may in fact may be doing it 5 or 10 years from now.

Mr. POMBO. Mr. Grijalva.

Mr. GRIJALVA. Thank you, Mr. Chairman. If I may, with your concurrence, enter into the record a statement of my colleague, our colleague, Mr. Ortiz, relative to this meeting.

Mr. POMBO. Without objection.

[The prepared statement of Mr. Ortiz follows:]

Statement of The Honorable Solomon P. Ortiz, a Representative in Congress from the State of Texas

Mr. Chairman, I want to thank you for holding this important oversight hearing today. As everyone here today knows so well, the ever-increasing problem of invasive species hits many of the different regions of the country.

In my congressional district in South Texas, the mighty Rio Grande River has failed to reach the Gulf of Mexico and much can be attributed to the hydrilla in the river. Along several stretches of the River you can see patches of this weed holding up water that many municipalities along the border depend on.

There is lots of work, money, and coordination being done to eradicate and control these weeds. But not enough has been done.

I look forward to hearing from the panel of witnesses as we continue to find ways to solve this problem.

Mr. GRIJALVA. And the other request would be if we could leave the record open for follow-up questions that might be generated at a later time.

Mr. POMBO. As is customary, the record will be held open for questions that would be submitted in writing to the panelists and give them enough time to answer those questions so it will be included in the record.

Mr. GRIJALVA. Just very general questions, Mr. Chairman.

And if I may, I would like to begin with Dr. Mann, based on your comments. But the question is, what is the most pressing policy need for managing invasive species? From the statements you made previously, I think in the last question, I think it would be the issue of prevention.

But if you could elaborate on that, Dr. Ruiz or Dr. Carlton.

Dr. MANN. I would welcome comments from my colleagues. As I see it, we have a broad spectrum of available statutes that are available as tools to address this issue. What I think is one of the more difficult situations, as you develop and watch these pieces evolve, is how you actually enforce them.

The National Invasive Species Act and the ballast water piece of that I think is a classic example of the problem we face. We know there is a problem. How do we treat ballast water? How do we set

a standard? Amongst the academics at this table we can debate all day what the appropriate standard should be.

I think out in the real world there are people who are working with technologies who can address various options that are available. Should we wait until the academics here decide on the perfect standard and then develop the perfect technology? And the answer is no. But somewhere in the midst of it, we need to move forward with getting people who are developing technologies into the situation where we can apply. And even though they may not be perfect at this point in time they will assist in the process of prevention. And prevention here is the major issue.

So we are going to be dealing with continual evolution and evaluation and reevaluation of useful pieces of legislation that will assist in the prevention cause. That is one part of the role that I think the Federal statutes can play a leading role in. And even though we may disagree on some details, I think that is a consensus all would agree to.

The other part of that in terms of how we deal with things that are perhaps already here, all things that might be intended to be brought here—and the reason why I mentioned State's rights and Lacey in this—is that there are some clear divergent opinions between the panelists who have been here as to what the Federal and the State roles are.

I think the real point is that the Federal, the State, the local and the academic communities all have something to contribute to this, and that is very important when we look at any of the questions of either prevention at the local level, or potential threats. Clearly threats in Alaska are different from threats in Hawaii and different from threats in Virginia.

There is a lot of expertise that can help if we can somehow round them all up and focus in on the issue. And that is something that we need to do no matter whether we are looking at prevention of potential introductions, whether we are looking at eradication of things that are locally acknowledged at this point; and this is why I say education is so important.

The public citizenry are really our first line of defense. If you look at the public education that went along with zebra mussel invasions, it was an immense and very important event. People became enjoined. I think we need to do that in a broader sense because they are our first line of defense in telling us, hey, something is wrong out there.

We need to get those involved and we need to do it at all levels. I think if what we are working with at the Federal level can try to wrap some arms around what is available at the State level and bring them together as a marriage rather than as an adversarial potential divorce, I think we will be doing a lot of good things. The pieces are there to do that. I'm not quite sure how to construct it.

Mr. GRIJALVA. Thank you.

If I may, Mr. Chairman, in your comments, Dr. Carlton, you talked about the many times that you have come before Congress and as follow-up to that, maybe the question as to what extent is the damage we are talking about now in invasive organisms to our natural resource base permanent versus restorable?

Dr. CARLTON. It is in general hard to reverse much of what we have done in terms of the species that have arrived, that have caused some of the most severe economic or industrial or social or recreational impacts. By the time that we have engaged a lot of our concern, many of these species are extraordinarily widespread and would require an investment of money that would far exceed anything that we have ever been willing so far to attempt. That has all led us, again and again and again, to prevention, which is that the history of the invasions that we have seen which have changed quality of life and many other aspects in this country of environmental and social conditions lead us to consider that one of the best solutions is to prevent future unwanted invasions in a roulette-type manner. That is, species that come in through many, many different vectors, which we cannot predict when and where they will arrive, nor very often whether or not if they are benign in their country of origin, they would have become a nuisance species or pestiferous in this country. So with the history of exotics, the history of our inability really to reverse major damages, that bring us very much to this table of wanting to prevent future invasions.

Mr. GRIJALVA. Thank you.

Mr. Chairman, I think for Mr. Grau or Mr. Beers, either/or or both, you both made the comments that many introduced species have beneficial attributes. The question is how do you propose managing the distribution of a species that, say for instance, has beneficial attributes in one habitat but devastating and harmful attributes in another? How do we manage that?

Mr. GRAU. I think one of the key issues there, you mentioned devastating effects. Part of the problem here is who makes the definitions. Some of these things, I think, like the brown tree snake, I don't think you get any opposition to. But defining these things is part of the problem. I guess to me it is kind of a hard question to answer. However, the free market system that has been in effect for as long as we have been here, at least for the most part, has pretty much worked. We don't really have a whole lot of—and of course my area is more terrestrial plants. But when you look at all the importations, intentional and unintentional, and look at what American agriculture is today, where you are fed by February 2nd now, the average person's income, you are fed by February 2nd. So largely because of introduced species—yes, you have some things like yellow starthistle and nap weed particularly affecting the West, but, No. 1, these were unintentional.

So I think if I understand your question correctly, it is the marketing system of these things that could be good in one place and devastating in another. And I would have to think pretty hard to find a species that is on the commercial market today, at least with plants, that would fit your description.

Mr. GRIJALVA. Let me just follow up if I may, Mr. Chairman. In a partial answer to your question and my question, how do you determine? Would developing better—given the importance of the State role—State assessment tools for early detection and rapid response to help determine whether a plant or animal will have different invasive capabilities depending on the surrounding ecosystem, to test that benefit or test that harm. Therefore, those as-

sessment tools are within the State and that empowerment that we talked about.

Mr. GRAU. I don't know. I've seen some of these predictive models that just flat wouldn't work. One of the things I have thought about is if everybody would agree that food production is of primary importance that perhaps the Secretary of Agriculture would have veto power. Some of these things get pretty bizarre when you get right down to it. I mean, orchard grass is one that is on a lot of eastern lists.

I know I am getting back to terrestrial plants which maybe isn't your area, but it is a good example. Here is something that is integral in eastern beef and milk production. Yet it is on a lot of lists. If the ag sector, maybe under the Secretary of Agriculture or something like that could have veto power, maybe that would help. Because when you look at the people that are making these decisions, it is very weighted toward one side. Take any of these State or Federal councils or whatever, and just go down who these people are that are on these Committees. Often there is not even anybody from the private sector. If it is, it is like a 10-to-1 ratio.

I guess I have probably taken enough time. Sorry.

Mr. GRIJALVA. I don't have anything else, Mr. Chairman. Thank you.

Mr. POMBO. Thank you. I want to thank this panel for their testimony. Before I excuse you, I want to apologize to those of you, I didn't hear all of your oral testimony in the previous panels, but I want to tell you, I appreciate your testimony in answering the questions as was asked.

The record will be held open for members to submit written questions that will be given to you, and if you could respond to those in writing in a timely fashion so that they may be included in the hearing record.

Mr. POMBO. I would also like to ask unanimous consent that a statement from Pacific Ballast Water Group also be included in the record.

[The statement from Pacific Ballast Water Group follows:]

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ELINOR SCHWARTZ, WASHINGTON REPRESENTATIVE
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TO:	Harry Burroughs & Rob Howarth
SUBJECTS:	**Invasive Species – Ballast Water**
DATE:	4/29/03
PAGES:	4

You may find the attached statement useful, even though the focus of today's hearing on *The Growing Problem of Invasive Species* goes beyond ballast water funding concerns.

This statement from the Pacific Ballast Water Group representing the shipping industry, government, environmental organizations and researchers stresses the need for a strong federal program that:

- Stresses prevention.
- Increases funding for state aquatic invasive species plans.
- Coordinates with and is supported by State and regional efforts.
- Increases funds for ballast research and management, particularly

  (1) On open coastal and estuarine biology and hydrology to measure the effect of coastal ballast water transfer and exchange.

  (2) To develop a coordinated coastal ballast water exchange program and move forward on future alternatives to ballast water exchange.

  (3) For regionally significant, coastal shipping-related aquatic invasive species management research on the West Coast.

Thanks for your consideration.

February 12, 2003

LETTER SUPPORTING APPROPRIATION OF FUNDS UNDER THE NATIONAL AQUATIC INVASIVE SPECIES ACT OF 2002 (NAISA, HR 5396) FOR BALLAST WATER AND AIS RESEARCH ON THE WEST COAST

Dear Senator or Representative:

The Pacific Ballast Water Group (PBWG) was formed in 1998 by representatives from the shipping industry, state and federal agencies, environmental organizations, academic researchers, and others to promote dialogue on the development and implementation of safe, economical, and effective management of aquatic invasive species associated with West Coast shipping. Members of the PBWG include representatives from all West Coast states, including Alaska, and Canada. Additional information on the PBWG can be found on the internet at www.clr.pdx.edu.

The PBWG believes that the National Aquatic Invasive Species Act (NAISA, HR 5396), as introduced in the 107th Congress, represents an important step in the management of aquatic invasive species. We understand that this bill will be re-introduced in the 108th Congress in substantially the same form. The PBWG supports many of the provisions of NAISA and the appropriation of funds to support its implementation. The focus of the bill on prevention and increased authorization for funding state aquatic invasive species plans would be particularly helpful in managing aquatic nuisance species (ANS).

A strong federal ballast water management program that is coordinated with, and supported by, state and regional efforts is needed. We are following the actions of the International Maritime Organization and the U.S. Coast Guard closely and we are working to ensure state and regional efforts are appropriately aligned while the international and federal regimes mature. While individual members of PBWG may relay their thoughts on specific provisions of NAISA, we all strongly concur that the level of funding available to focus on ballast research and management is grossly inadequate, particularly on the West Coast. The level of funding for research and management of ballast water should be sharply increased and geographic limitations should be lifted on existing ballast-related funding sources (e.g., National Oceanographic and Atmospheric Administration funds under the Ballast Water Technology Demonstration Program).

One of the major concerns on the West Coast is the lack of coordinated management of ballast water on coastal voyages. Currently, the four West Coast states have significantly different requirements for ballast water management on coastal voyages. All states recognize that treatment of ballast water is the ultimate solution. However, ballast water exchange is likely to remain the most widely used management technique for several years while ballast water treatment technology develops. Many organizations are working on solutions for the West Coast, and state programs and vessel operational adjustments have indeed mitigated some risk; but the lack of available funds for this

region has slowed the development and implementation of regionally consistent, effective ballast water management strategies.

In March 2002, the PBWG hosted a technical workshop on nearshore physical oceanography to identify processes that could influence the effectiveness of ballast water exchange in coastal shipping. In January 2003, a follow-up meeting was held in cooperation with California Sea Grant to consider the results of the physical oceanography workshop and further identify potential coastal ballast water exchange zones or ballast management strategies that could provide a basis for a uniform coastwide approach to ballast water management along the West Coast of North America.

The clearest results of the workshop and meeting were that: a) coastal exchange may be a useful ballast management tool to reduce the risks associated with ANS discharges, b) research on both open coastal and estuarine biology and hydrology is critically needed to measure the effect of coastal ballast water transfer and exchange on the West Coast, and c) continued research will be needed to develop, implement and refine a coordinated coastal ballast water exchange program and to move forward on alternatives to exchange.

To address these needs the individuals and organizations who have signed below, as participants in the PBWG, request an additional Congressional appropriation in the NOAA budget of at least $3 million for regionally significant, coastal shipping-related aquatic invasive species management research on the West Coast. We believe these funds should be in addition to the NOAA funds mentioned previously. One potential administrative mechanism would be for these funds to be allocated to the Pacific States Marine Fisheries Commission, or other regional entity, for dispersal to West Coast aquatic invasive species researchers and managers through a competitive, peer-reviewed process.

Thank you for your attention to this issue.

Sincerely,

Bill Wyatt, Executive Director
Port of Portland
Portland, Oregon
Columbia River Aquatic Nuisance Species Initiative (CRANSI) Member

Dr. Jeff Koenings, Director
Washington Department of Fish and Wildlife
Olympia, Washington

James R. Townley, Jr.
Executive Director
Columbia River Steamship Operators Association
Portland, Oregon

Linda Sheehan, Director
Pacific Regional Office
The Ocean Conservancy
Pacific Regional Office
San Francisco, California

Randy Fisher
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Pacific States Marine Fisheries Commission
Gladstone, Oregon

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Center for Lakes and Reservoirs
Portland State University
Portland, Oregon
CRANSI Member

Scott Redman, Acting Chair
Puget Sound Action Team
Olympia, Washington

Mr. POMBO. Seeing no further business, this hearing is adjourned.

[Whereupon, at 4:05 p.m., the joint Subcommittee was adjourned.]

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