OBAMA-BIDEN TRANSITION PROJECT

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Invasive Species Management Recommendations

DOI Transition – December 2008

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Invasive species threaten biological diversity and ecosystem functions and services. Invasive species also substantially negatively impact the quantity and quality of outdoor recreational activities, including fishing, hunting, hiking, wildlife viewing, and water recreation.[1] As such, invasive species prevention and control is central to the mission of the Department of the Interior (DOI). DOI lands and waters are threatened by many different categories of invasive species: plants, animals, insects, and pathogens. Some infamous examples include cheatgrass, zebra mussels, gypsy moths, and West Nile virus.

Global annual damage from invasive species costs $1.4 trillion, five percent of the global economy.[2] In the United States, invasive species cause billons of dollars of economic damage each year[3], pose serious risks for ecosystem health[4,5], and have contributed to one-third of species extinctions over the past 400 years. Invasive species are defined with respect to their actual or potential damage to human health, the environment, or the economy (Exec. Order 13112).

Prevention and early detection/eradication measures are far less expensive than control measures once an invasion is well-established; thus, much higher emphasis and spending should be placed on preventing invasions.[6] For example, since 1997, Australia has required that all new plant introductions be screened for likelihood of invasiveness, and this program is 90% effective at identifying and preventing potentially harmful imports of plant species. A recent study found that this program recouped its costs in only 10 years and will result in $1.8 billion in savings over 50 years.[7]

Prevention measures range from prohibiting the import, possession, or release of particular species to educating the public to prevent the inadvertent introduction of species. Early detection, control and management policies seek to eradicate newly-introduced invasive species

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[1] Eiswerth, M.E., Darden, T.D., Johnson, W.S., Agapoff, J., and T.R. Harris. 2005. Input-output modeling, outdoor recreation, and the economic impacts of weeds. *Weed Science* 53:130-137.

[2] Keller, R.P., Lodge, D.M., and D.C. Finnoff. 2007. Risk assessment for invasive species produces net bioeconomic benefits. *Proceedings of the National Academy of Sciences* 104(1):203-207.

[3] Pimentel, D., Zuniga, R., and D. Morrison. 2005. Update on the environmental and economic costs associated with alien-invasive species in the United States. *Ecological Economics* 52(3):273-288.

[4] Dukes, J.S. and H.A. Mooney (2004) Disruption of ecosystem processes in western North America by invasive species. *Revista Chilena de Historia Natural* 77:411-437.

[5] Lodge, D.M., S. Williams, H. MacIsaac, K. Hayes, B. Leung, S. Reichard, R.N. Mack, P.B. Moyle, M. Smith, D.A. Andow, J.T. Carlton, and A. McMichael. 2006. Biological invasions: recommendations for U.S. policy and management (Position Paper for the Ecological Society of America). *Ecological Applications* 16:2035-2054.

[6] Leung, B., Lodge, D.M., Finnoff, D., Shogren, J.F., Lewis, M.A., and G. Lamberti. 2002. An ounce of prevention or a pound of cure: bioeconomic risk analysis of invasive species. *Proceedings of the Royal Society of London* 02PB0566.1-02PB0566.7.

[7] Keller, R.P., Lodge, D.M., and D.C. Finnoff. 2007. Risk assessment for invasive species produces net bioeconomic benefits. *Proceedings of the National Academy of Sciences* 104(1):203-207.

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before they become established and to mitigate damage caused by established species. Once invasive species become established, policies should seek to promote native species as well as to control and contain widespread invasive species.

Existing invasive species management policies and funding resources at DOI are insufficient to comprehensively address and control this problem. Additionally, because invasive species prevention and control is included in multiple federal and state agency jurisdictions, inter-agency invasive species policies must be improved.

Federal invasive species policy also currently fails to consider climate change, jeopardizing the effectiveness of invasive species management, planning, and policy development and the ability of agencies to meet their statutory responsibilities. Consideration of global warming should be an important element of risk assessments of invasive species introduction.

The following policy recommendations address making improvements at each stage of invasive species prevention, control, and management as well as addressing the cross-cutting issue of climate change. Whenever possible, these policy recommendations are directed specifically at DOI purview; however, many of the recommendations are for policies to overhaul overall federal invasive species policy, which will require the participation of DOI in larger inter-agency efforts.

Prevention – Screening Intentional Imports of Non-Native Species & Preventing Inadvertent Introductions of Invasive Species

The United States has a long history of intentionally importing non-native species for the horticultural or pet trades. Many of these imported species never become invasive; however, the need to safeguard the U.S. against new invaders is imperative as global trade continues to increase. The unintentional importation of species (e.g., through ballast water, hull fouling, packing materials, and agricultural, soil or horticultural contamination) also occurs. Adopting screening policies that effectively address the risks associated with each of these types of introductions is essential.

New invasions continue to occur but many could be prevented, and once an invasion has occurred in one part of the US, it can be prevented to spreading to other regions. A major thrust of policies to improve prevention measures must focus on identifying major pathways of introduction and develop solutions to close these pathways to new invaders. As noted above, prevention of invasions or early detection and eradication of invasive species are far less expensive than control and management after an invasion is established.

The US Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) currently serves as a frontline screening service for the importation of agricultural products to prevent the introduction of invasive plant and animal pests and pathogens. Under the Plant Protection Act of 2000, APHIS has the responsibility to protect native ecosystems and biodiversity, but APHIS' current regulatory system is outmoded, ineffective, and not keeping pace with growing imports.[8] Many of plant pests and pathogens (e.g., sudden oak death, white pine blister rust) – as well as the plant imports themselves – can be invasive in native

[8] http://www.ucsusa.org/invasive_species/solutions/usda-aphis-quarantine-37.html

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ecosystems, negatively impacting biodiversity as well as ecosystem services – and therefore are of concern to DOI. New policies should work to protect the US from plant pests and pathogens as well as from the plants themselves that are invasive or potentially so. Also problematic is the recent move of agricultural inspectors from USDA into the Department of Homeland Security where they do not have sufficient support, resulting in fewer inspectors, fewer inspections and interceptions, and lower morale.[9]

The US Fish and Wildlife Service (USFWS) currently has jurisdiction over the prevention of new vertebrate invasions under the Lacey Act which provides authority for USFWS to name groups of animals as "injurious species" and restrict their import. However, the Lacey Act does not require that animal species proposed for import is screened invasiveness or disease risk first.[10] The Lacey Act should be revised in order to become highly effective at interrupting the invasion process: currently the Act does not enable an efficient and consistently applied risk assessment procedure; does not effectively regulate the interstate transport of invasive species; and does not manage for the spread of established invasive populations.[11]

Untreated ballast water remains a major pathway for aquatic invasive species introduction, including in marine, estuarine, and freshwater ecosystems managed by DOI.

Many of the policy recommendations in this section are derived from the footnoted sources below[12, 13, 14], others are recommended by the author of this document.

DOI-Specific Policy Recommendations:

1. The Secretary of the Interior should commit to launching an interagency, coordinated, and aggressive invasive species prevention, early detection, rapid response, and control program. This program should also involve state and tribal agencies as well as private land managers where possible.
2. As part of this interagency effort, DOI should also work closely with the National Invasive Species Council (NISC) – currently co-chaired by DOI and USDA – to coordinate invasive species-related actions among departments and agencies. Since NICS's first Management Plan was released in 2001, the Council's effectiveness has been less-than-hoped-for due to a lack of statutory authority, an unclear role with respect to other federal agencies, and limited funding.
3. DOI should support revising the Lacey Act to require screening of terrestrial and aquatic animal imports for invasiveness and disease risk in order to reduce threats to native wildlife, the economy, and to human and animal health.

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[9] http://www.ucsusa.org/invasive_species/solutions/usda-aphis-quarantine-37.html
[10] National Environmental Coalition on Invasive Species. 2008. An action plan on invasive species for President Obama and the 111th Congress.
[11] Fowler, A.J., Lodge, D.M., and J.F. Hsia. 2007. Failure of the Lacey Act to protect US ecosystems against animal invasions. *Frontiers in Ecology and the Environment* 5(7):353-359.
[12] National Environmental Coalition on Invasive Species. 2008. An action plan on invasive species for President Obama and the 111th Congress.
[13] Personal communication, John Randall, Wildland Invasive Species Team Director, The Nature Conservancy
[14] Lodge, D.M., S. Williams, H. MacIsaac, K. Hayes, B. Leung, S. Reichard, R.N. Mack, P.B. Moyle, M. Smith, D.A. Andow, J.T. Carlton, and A. McMichael. 2006. Biological invasions: recommendations for U.S. policy and management (Position Paper for the Ecological Society of America). *Ecological Applications* 16:2035-2054.

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4. DOI should adopt agency-wide regulations prohibiting the use of invasive plants on its lands or in its waters; the stocking of invasive fish and mammal species for fishing or hunting; and the importation of firewood from distances over 50 miles.
5. DOI should increase efforts to educate public lands visitors about invasive species and how visitors can work to help in prevention and early detection efforts.

Federal Government-Wide Policy Recommendations:

1. Clarify APHIS' regulatory authority and mandate to adopt risk screening protocols to prevent introduction of invasive plant imports, under Quarantine 37. APHIS announced a tentative screening proposal in 2004, but the effort is moving very slowly and needs improvements. Other nations such as Australia have adopted effective and economically-beneficial screening programs that the US can learn from.
2. Revise Quarantine 37 regulations to strengthen measures to prevent further introductions of devastating insects, other plant pests, and plant pathogens.
3. Pass a Ballast Water Management Act to require all ships to treat their ballast water before it is discharged and to use specific "best management practices" to stop the continued introduction of aquatic invasive species.
4. Climate change may also alter the effectiveness of control techniques like biological control and habitat restoration. Therefore global warming should be included in risk assessment screening protocols for intentional introductions of non-native species into the US.
5. Reauthorize the National Invasive Species Act.
6. Use a combination of existing and new technologies, education strategies, industry codes of conduct and government oversight to prevent invasive species introductions from pathways that are already well known to be sources of nonnative species and to monitor other pathways into the US to better assess the degree of risk they pose. This will require inter-governmental collaboration between lead Environmental Agencies, the World Trade Organization, regional cooperatives of state governments, universities, and the private sector.

Early Detection and Rapid Response/Eradication

The United States must improve its early detection and rapid response capabilities – finding new invaders quickly and rapidly responding to address these invasions is critical to limiting costs and impacts of invasions when prevention fails. However, federal agencies, including DOI, often lack resources for rapid response which allows time for invasions to spread and undermines eradication and control efforts.

Many of the policy recommendations in this section are derived from the footnoted sources below,[15,16] others are recommended by the author of this document.

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[15] National Environmental Coalition on Invasive Species. 2008. An action plan on invasive species for President Obama and the 111th Congress.

[16] Lodge, D.M., S. Williams, H. MacIsaac, K. Hayes, B. Leung, S. Reichard, R.N. Mack, P.B. Moyle, M. Smith, D.A. Andow, J.T. Carlton, and A. McMichael. 2006. Biological invasions: recommendations for U.S. policy and management (Position Paper for the Ecological Society of America). *Ecological Applications* 16:2035-2054.

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1. DOI should support the establishment of an Inter-agency Invasive Species Emergency Fund. Setting aside special funds would permit agencies to respond rapidly, and in a comprehensive inter-agency fashion – to new invasions when they are first detected in the country when they can be most easily and inexpensively addressed.
2. DOI should prioritize funding and authority directed at strategic regional eradication efforts. If invasive species are not eliminated immediately, funding for major efforts is essential before they spread beyond their initial point of introduction to other areas in the US.
3. DOI should support the establishment and funding of a national network of regional invasive plant centers. Regional centers on invasive plant species have developed in many parts of the country, serving as information hubs for natural resource managers on the ground. Networking these centers into a virtual national center will strengthen the nation's ability to identify and respond to new invasions.
4. DOI should increase resources directed at monitoring for early invasions in its lands and waters. This would include cooperation with other federal agencies, universities, state agencies, and citizen scientists.
5. DOI should prioritize funding for research and application of new control techniques and measures.

Management of Large-Scale Invasions – Identification of Top-Priority Invaders and Top-Priority Sites to Control and/or Contain

Identifying top invaders to control or top priority sites to manage for invasion is key to maximize limited resources for management of existing invasions.

Some of the policy recommendations in this section are derived from the footnoted sources below[17], others are recommended by the author of this document.

1. DOI should improve policies to help prioritize top-priority invaders and top-priority sites to control and contain invasive species. This prioritization should be conducted within DOI and also as part of the interagency invasive species prevention, early detection, rapid response, and control program recommended above.
2. DOI should prioritize "slow the spread" programs in cooperation with states, tribes, and private landowners.
3. DOI should prioritize funding for research and application of new monitoring and control techniques and measures.

Management to Promote Native Species in the Face of Widespread Invasion

In ecosystems that have been invaded by species for which we currently have no effective landscape-scale control methods (such as for cheatgrass in the western US), policies must be put in place to promote the survival of desired native species as well as to maintain and/or restore ecosystem process – including ecosystem services and economic value.

The policy recommendations in this section are derived from the footnoted sources below.[18],[19]

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[17] Lodge, D.M., S. Williams, H. MacIsaac, K. Hayes, B. Leung, S. Reichard, R.N. Mack, P.B. Moyle, M. Smith, D.A. Andow, J.T. Carlton, and A. McMichael. 2006. Biological invasions: recommendations for U.S. policy and management (Position Paper for the Ecological Society of America). *Ecological Applications* 16:2035-2054.

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1. DOI should prioritize the research and application of the following management practices on Interior lands and waters that already are infested with significant invasive species populations which are uncontrollable.
    a. Provide native species with refugia from invasive species or otherwise mitigate invasive species' harmful effect on native species (e.g., predation, competition, or disease). Examples of this type of management include providing birdhouses with entry size or other features designed to encourage native species and prevent use by invasive species; increasing native habitat; and providing refuges from predation.
    b. Manage and restore ecosystem processes that favor native species (e.g., restoration of fire via prescribed burning, and restoration of other disturbance regimes such as seasonality of freshwater flows).
    c. Identify individuals and populations of native species with increased abilities to compete with or persist alongside invasive species, and prioritize the use of these resistant species in restoration efforts.
    d. Change the conservation goal from restoration of a pre-existing community to the "rehabilitation" of a portion of that community or a "new mixed community" of native and non-native species with desirable ecosystem functions and properties.

Climate Change and Invasive Species

Climate change and invasive species are often treated as important, but independent, issues.[20] However, global warming may exacerbate the impacts of invasive species, and invasive species may affect the magnitude and rate of climate change. Federal, state, and local agencies are currently working under a number of different mandates to prevent the introduction of invasive species and to manage and control established invasive species. The failure to consider climate change in agency invasive species policy jeopardizes the effectiveness of invasive species management programs.

In some cases climate change is likely to make it easier for some invasive species to survive and establish, and may accelerate the spread of successfully established invasive species by disrupting native communities and ecosystems.[21] Management of invasive species could also increase the resilience of ecosystems and the impact of climate change in some cases. Climate change may also alter the effectiveness of control techniques like biological control and habitat restoration. Therefore global warming should be included in risk assessment screening protocols for intentional introductions of non-native species into the US.

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[18] Personal communication, John Randall, Wildland Invasive Species Team Director, The Nature Conservancy.
[19] Leger, E.A. 2008. The adaptive value of remnant native plants in invaded communities: an example from the Great Basin. *Ecological Applications* 18(5):1226-1235.
[20] Pyke, C.P., Thomas, R., Porter, R.D., Hellmann, J.J., Dukes, J.S., Lodge, D.M., and Chavarria, G. 2008. Current Practices and Future Opportunities for Policy on Climate Change and Invasive Species. *Conservation Biology* 22(3): 585-592.
[21] Pyke, C.P., Thomas, R., Porter, R.D., Hellmann, J.J., Dukes, J.S., Lodge, D.M., and Chavarria, G. 2008. Current Practices and Future Opportunities for Policy on Climate Change and Invasive Species. *Conservation Biology* 22(3): 585-592.

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In other cases, invasive species may exacerbate global warming emissions or the impacts of climate change. For example, in cheatgrass-invaded areas of the Great Basin, the fire cycle has changed dramatically, from an infrequent to a frequent cycle, dramatically changing ecosystem processes, including carbon dynamics. Because of its influence on the fire cycle, cheatgrass has changed some 20 million acres from a net carbon sink to a net carbon source: frequent fires release carbon dioxide otherwise stored in these ecosystems into the atmosphere. Other invasive species change water dynamics. For example the invasion of riparian areas in the west by the invasive ornamental shrub Tamarix reduced regional water supplies. In the west where water resources are only growing increasingly scarce due to population growth and global warming, invasive species such as Tamarix can exacerbate water resource issues.

Additionally, there is interest in the use of forestry, wetland, agricultural and other management practices to accelerate carbon sequestration in ecosystems. These efforts may be tempted to select hardy, fast-growing plant species to accelerate sequestration that, in some cases, may be invasive.[22] Efforts to grow feedstocks for alternative low-carbon fuels or to promote sequestration on federal lands should be carefully evaluated against the risks of creating serious impacts associated with invasive species.[23]

Some of the policy recommendations in this section are derived from the footnoted source below,[24] others are recommended by the author of this document.

DOI-Specific Policy Recommendations:

1. DOI should prioritize coordinating research, planning, monitoring, information technology, and management efforts for both climate change and invasive species. Coordination efforts within each area are often criticized as incomplete and inadequate, and climate change seems likely to compound these problems. Coordination activities should involve other federal, state, tribal, and local government agencies as well as provide substantial roles for motivated academics and non-governmental organizations.
2. DOI should convene an inter-agency task force to identify and prioritize actions to realize the potential of existing rules and regulations and to implement recommended actions in existing programs with respect to interactions between climate change and invasive species. This would reduce the likelihood that:
    a. Efforts to mitigate climate change do not exacerbate invasive species problems.
    b. Efforts to manage invasive species are designed with consideration for changing climatic conditions.
    c. Efforts to adapt to climate change are designed to contribute to invasive species management.

Federal Government-Wide Policy Recommendations:

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[22] de Wit, M.P., Crookers, D.J., and van Wilgen, B.W. 2001. Conflicts of interest in environmental management: estimating the costs and benefits of a tree invasion. *Biological Invasions* 3(2):167-178.
[23] Pyke, C.P., Thomas, R., Porter, R.D., Hellmann, J.J., Dukes, J.S., Lodge, D.M., and Chavarria, G. 2008. Current Practices and Future Opportunities for Policy on Climate Change and Invasive Species. *Conservation Biology* 22(3): 585-592.
[24] Pyke, C.P., Thomas, R., Porter, R.D., Hellmann, J.J., Dukes, J.S., Lodge, D.M., and Chavarria, G. 2008. Current Practices and Future Opportunities for Policy on Climate Change and Invasive Species. *Conservation Biology* 22(3): 585-592.

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1. Federal biofuel policy should direct suppliers to avoid (or at a minimum disclose) the use of invasive or potentially invasive species. To be effective, such domestic efforts would need to be complemented with actions to achieve similar practices from international biofuel producers.
2. The development of long-term global warming adaptation policies must incorporate information on invasive species pathways. For example, The World Wildlife Fund is investigating the restoration of mangroves and their role in increasing coastal resilience to rising sea level and storm surge. Future adaptation policy could require resource managers to examine similar impacts in the invasive species context.
3. Federal scientific and economic risk assessment efforts should evaluate the joint consequences of changes in invasive species and climate, invasive species pathways analysis must examine emerging or modified pathways under climate change scenarios, and the financial costs and consequences of climate change on invasive species management efforts should be identified.