

# **Recommendations for Actions from the Invasive Species Management and Restoration Working Group**

## **Introduction**

The magnitude and complexity of invasive species in the United States requires a comprehensive and thoughtful plan that can achieve reasonable objectives. A statement of clear and concise objectives will 1) provide guidelines for states, counties, and private stakeholders in developing local goals and plans consistent with national goals, and 2) provide a method of prioritizing management strategies and allocating scarce resources based upon prioritized objectives. The overall goal of this plan is to promote and implement ecologically-sound management of invasive species and to establish and/or maintain the organization, structure and function of healthy native ecosystems.

Management of invasive species requires a proactive strategy that includes six major components. These components are: 1) exclusion of invasive species from specified regions or ecosystems; 2) detection of initial or incipient infestations and rapid response to them, with the goal of eradication if feasible; 3) development of best management plans for species that are widely or generally established (where eradication is not feasible); 4) restoration or reclamation of impacted habitats; 5) monitoring and evaluation of results to measure progress towards goals and provide adjustments to methods; and, where appropriate, 6) a region-wide management approach to address the challenges of wide-spread species. Any strategy for the management of invasive species should be compatible with the overall management plan for the ecosystem.

The effective management of invasive species depend upon several underlying capabilities: 1) the establishment of priorities based upon a science-based assessment of risks, 2) ready access to current scientific and management information, 3) clarification and resolution of jurisdictional conflicts or responsibilities, 4) strengthening of laws and regulations, 5) coordination between agencies at a single level of government, between different levels of government, and between the public and private sectors, 6) the development of stable funding to sustain current programs and initiate new projects; and 7) the development of public and stakeholder awareness, support, and buy-in.

In summary, management of invasive species and restoration of habitats are critical issues. The “no-action” option is unacceptable, as it will lead to continued degradation of habitat and displacement of native biodiversity. Actions must be based upon principles and practices consistent with current science, and utilize exclusion, detection and rapid response, management and mitigation, and restoration.

## **ACTION ITEMS**

### **Exclusion & Prevention Bullets**

The recommended actions are intended to prevent the introduction of species into ecosystems where they are not native, whether the organisms are being transported across national borders or between ecosystems within the country. These recommendations are premised on a science-based analysis that identifies pathways and species of concern, and assesses the risks and priorities.

Actions to minimize the risk that organisms will be transported to ecosystems to which they are not native:

## Voluntary

- 1) Encourage protective methods to prevent introductions of species, including diseases, to ecosystems in which they are not native. Such methods include: development and use of best management practices; changes in practices or technologies (e.g., incorporation of ballast water management technologies into new vessel design); development of collaborative guidelines and codes of conduct. Industries/associations that should be encouraged to participate include those that move living organisms directly (nursery, seed, aquaculture, pet trades, biological suppliers, livestock industry, fisheries groups, etc.) as well as those that move goods that could transport living organisms (e.g., fruit, livestock, animal products, wooden crates, used tires, ships, trucks, railroad cars, airplanes).
- 2) Develop education and incentive programs to get cooperation from individuals who travel and transport property (e.g., zebra mussels on boats) or purchase and use living organisms (e.g., nursery stock, seeds, and pets).
- 3) Harmonize and use existing agreements for more effective monitoring and control of pathways.

## Regulatory

- 4) Utilize instruments such as compliance agreements, cooperative agreements, memoranda of understanding, and partnership agreements, among regulatory agencies or with the regulated community. Such agreements, if entered into voluntarily, should be binding.
- 5) To the extent possible, negotiate and implement compliance agreements under which shipments are decontaminated or proved free of pests and diseases at the point of origin, before shipment.
- 6) Obtain the authority to control the interstate movement and sale of recognized invasive species, without the need to declare specific quarantines or eradication programs.
- 7) Develop effective quarantine regulations to prevent movement of invasive species. Provide sufficient resources and trained staff for efficient enforcement.
- 8) Identify and interrupt pathways by which non-indigenous species move during trade, travel, tourism, and transport. Implementing such protections depends, in part, on supporting and expanding inspection activities at points of entry (for example, border stations, ports, airports, packages from outside the U.S.) and appropriate measures within the country, such as the 100th meridian surveys for zebra mussel.
- 9) Develop an efficient permitting system to allow quick approval or denial of a shipment, to reduce the burden on regulated industries.
- 10) Determine priority species and areas of focus on a regional basis for the purpose of exclusion, prevention, and control. Develop priorities through area-wide discussions with groups likely to be impacted by introductions. Focus extra effort and resources on priorities. Priority areas should include high-value habitats that might be especially sensitive to non-indigenous species, areas supporting desirable species, and reserves of genetic integrity.
- 11) Develop procedures for "emergency listings" of species which could be or have been introduced.
- 12) Review Federal laws on non-indigenous species to ensure they are cohesive, effective, and that all groups of non-indigenous species are recognized and acted upon. Close gaps in authority.
- 13) Ensure that Federal agencies avoid using or recommending the use of recognized invasive species in carrying out their activities (e.g., in recommending ground cover or forage crops, or in moving managed species from one ecosystem to another).
- 14) Put in place appropriate fines, penalties or other sanctions for those responsible for incidental introductions through negligence and bad practice.
- 15) Monitor regulatory and voluntary programs to assess compliance.

Actions to reduce vulnerability of ecosystems to invasion:

- 16) Implement a proactive strategy of identifying relatively pristine or high-value habitats that support desirable species or might be especially sensitive. Protect such areas from invasion, through active monitoring for and removal of early infestations, and maintenance of healthy ecosystem function.

### **Early Detection / Rapid Response / Eradication Bullets**

- 1) Develop adequate facilities for rapid and official confirmations of identifications of suspected non-indigenous species. Examples of such facilities include the Plant Pest Diagnostic Center of the California Department of Food and Agriculture and the Center for Disease Control. Universities and other state and Federal facilities might also provide such services. Extend to pathogens and parasites.
- 2) Establish a national advisory and reporting system, to inform all stakeholders of newly detected target species and to improve coordination and targeting of research efforts. Study and incorporate the animal health model of “reportable diseases and events”.
- 3) Help identify and recruit participants (e.g., private, state, tribal, federal land managers; academic scientists; other field biologists; amateur societies whose members have relevant skills; youth groups and schools) in a network to detect introductions. Provide an Internet-based system to coordinate reporting. Develop identification tools and incentives to promote reporting of non-indigenous species by the public. Involve those who introduce species.
- 4) In order to maximize the efficiency of early detection, identify types of locations where introductions are most likely to appear. Such high-probability locations are generally susceptible habitats and destinations or corridors for long-distance travel, including ports, airports, warehouses, heavily used recreational areas, roadways, railroads, livestock dealers and sale yards, logging and construction sites, pet stores, and nurseries.
- 5) Establish teams on a local, state, or regional basis to conduct ongoing and regular surveys, and focus efforts on high-probability areas.
- 6) Identify or develop appropriate technology, such as traps and other collection devices, to increase the efficiency of surveys. Support research to improve detection methods.
- 7) In the event of an introduction of a recognized invasive species into an ecosystem, initiate available suppressive controls. Rapidly convene a panel of experts to determine if eradication is feasible, and, if so, initiate a full eradication effort, emphasizing methods recommended by the panel. To the extent possible, define beforehand species and situations where eradication is automatically initiated.
- 8) Develop interagency agreements, prior to introductions of recognized invasive species, to resolve jurisdictional and budget issues. Communicate policies to all levels. Provide ready access to policy documents for referencing.
- 9) As a matter of urgency, address the regulatory compliance of control techniques with the Clean Water Act, Endangered Species Act, and National Environmental Protection Act. Such considerations should include species that are already established as well as those which have not yet been introduced.
- 10) Establish mechanisms for the rapid resolution of compliance concerns so that emergency control efforts are not delayed by regulatory complications. Identify all State and Federal agencies that may influence the initiation of an eradication effort and identify their regulatory authorities. If

complications arise, quickly convene a review panel of the affected agencies to resolve concerns and either allow or disallow the project.

- 11) Before introductions of non-indigenous species or diseases appear, develop control plans for specific, high-risk species, based upon best current knowledge and utilizing science advisory teams. Have in place sets of controls appropriate for responses in various ecosystem settings where the species might appear.
- 12) Develop a funding source for emergency response, to initiate eradication efforts against incipient infestations. In cases where eradication is feasible, have in place mechanisms whereby adequate resources will be committed to ensure eradication. Provide funding without tying it to specific pests, so agencies have needed flexibility. Funding should not be tied to specific years for large-area and emergency efforts, including restoration. Create a \$50-100 million fund for emergency eradication efforts, with annual replenishment.
- 13) Non-indigenous species coordinators should be established in all agencies involved in the Invasive Species Council and their appropriate subcabinet bureaus and offices. The Coordinator would be responsible for programmatic activities. Require such an action within one year of the issuance of the Management Plan.
- 14) For infestations and diseases that lead to economic harm, incorporate the concept of disaster recovery, as embodied in the policy of the Federal Emergency Management Agency.

### **Control and Management Bullets**

- 1) Once an invasive species has become established, prevent its incidental spread into non-infested natural areas by applying the concepts of exclusion and sanitation to the inter-regional movement of the species within the country. Examples of exclusion methods include pest-free forage and mulch, sanitation in nurseries, prohibition of trade in invasive species, decontamination of construction and recreational equipment and other vehicles, ballast water management, control of movement of contaminated soils and fill, and identification and control of infested or infected goods and materials.
- 2) Implement prohibitions on interstate movement and sale without the need for quarantines or eradication programs.
- 3) Federal agencies should implement invasive-free practices.
- 4) Use the best available science and the most appropriate technology to manage established invasive species. Analyze each case separately. Strategies include biological control, cultural control, chemical control, physical control and legal/regulatory control. Include epidemiological approaches where appropriate. Recognize that timing and frequency of control measures are important. Successful management depends on sustained, concerted effort at the ecosystem level, and at all policy and administrative levels.
- 5) Encourage areawide management, in which successful management strategies developed for a local basis are transferred to a Statewide or regional coverage, should be the long-term strategy where appropriate. Promote development of long-term ecosystem management plans. Incorporate input from public and private stakeholders in the impacted areas. Successful examples of areawide management include leafy spurge, codling moth, corn rootworm and fruit fly.
- 6) Ensure that strategies minimize effects on non-target species.
- 7) Attack satellite infestations and the edges of the core infestation with best suppressive options while developing long-term management plans.

- 8) Increase support for ecosystem-based research on managing invasive species. Key research questions include: How can we determine which ecosystems have vacant niches, and which niches are vacant, before an invasive species takes over? What is the role of habitat and niche in vulnerability to invasion? What strategies can be used to efficiently manage invasive species for the long term? How do we affect the target species of any strategy without affecting non-target species?
- 9) Develop provisions for response to invasive species and diseases after natural disasters such as fire or flood.
- 10) Develop incentives, including tax credits and cost-share programs, to encourage private property owners to participate in efforts to control or eliminate invasive species on their properties. Priority should be given to programs that address the following needs: (1) control or elimination of invasive species in cases where the invasive species pose a threat to threatened, endangered, or candidate species or the recovery of such species; (2) elimination of newly discovered invasive species that are a potential threat to agriculture, commerce, or the conservation of natural resources; and (3) control or elimination of alien species as part of a long-term program to improve or restore wildlife habitat or to restore native vegetation to a site. Design programs that are accessible at a local level, that consider local and national goals, and that include objective assessments for the purpose of quality control.
- 11) Provide new funding to support goals and objectives of the National Animal Health Emergency Management Strategic Plan.

### **Restoration Bullets**

- 1) Develop guidelines and protocols for the restoration of native species and ecosystem functions after eradication projects. Develop guidelines and protocols for the conservation of native species and ecosystem functions during suppression (control and management) projects, and for restoration after projects.
- 2) Encourage the use of native species in restorations. Clearly identify the appropriate uses of desirable non-native and native cultivars. Identify and encourage habitat management practices that promote regeneration of indigenous species.
- 3) Identify sources of propagation material for native species in the area of a restoration or reclamation, and utilize propagation material from local populations where practical.
- 4) Encourage and employ best management practices combining appropriate methods of control based on current science. Restore or reclaim individual sites according to their individual characteristics and ability to respond.
- 5) Increase efforts and funding for research related to enhancing or developing new restoration/reclamation techniques for difficult habitats (e.g. arid/desert and aquatic environments, highly eroded/disturbed sites).
- 6) Fund research on disturbance regimes to identify the most effective strategies and fund demonstrations of promising results.
- 7) Fund demonstration projects based on information gained from good research.
- 8) Address the issue of local nativeness. Provide funds for research on defining differences between emerging taxa and the consequences of admixing closely related taxa. Develop recommendations and protocols that minimize impacts on genetic diversity and the ability to move forward on restoration projects.

- 9) Fund research and demonstration projects on the technique of "coordinated propagule swamping", where plantings of competitive native species are used to displace non-indigenous invasive species. If proven successful, develop a program to produce the volumes of propagative material needed to treat wide areas.
- 10) Increase funding for research on the control of invasive species on rangelands, wildlands, and other lands where management inputs are usually limited. Emphasize the development of methods that exploit the ecological weaknesses of control targets or bolster the resistance of native assemblages.

## **General Issues**

Several issues of concern to the Working Group affected many or all of the categories of action items, and it seemed most reasonable to cover them once under a separate heading. Further, some of these issues, such as risk analysis, were designated as the major focus of other Working Groups, but they are fundamental to the entire effort of the Management and Restoration Working Group. The Working Group felt compelled to stress the importance of these points.

### **I. Role of State Governments**

- A. State government should provide the link between goals, actions, and policies at the Federal level and goals, actions, and policies at the local levels. States need to identify lead agencies to take responsibility for invasive species in different categories and ensure that these agencies communicate and cooperate with their Federal and local counterparts. States need to consider invasive species as seriously as the Federal government, so the levels of government are not working at cross-purposes unintentionally.
- B. Another role of the states is to ensure that actions are coordinated at regional (multi-state) and local level.

### **II. Funding**

- A. Develop stable sources of long-term funding, so on-going projects are not susceptible to rapidly changing agency priorities. There should be a strategic plan and an contingency plan to accommodate fluctuations in funding and to take advantage of treatment opportunities, such as accidental burns.
- B. Explore innovative funding options and sources: a) Trust Funds that are not tied to fiscal years, as government funding may be released at the wrong time in the biological cycle for a desired control method to be most effective; b) Mitigation Banks and Pest Compacts; c) "user fees" from organizations that trade in non-indigenous species or move goods and people between ecosystems; d) fines; e) tax incentives for restoration with natives; f) Federal highway construction funds should also be applied to management of non-indigenous species and planting with native species; g) Federally supported state grant programs for control (make the non-federal match lower for interstate projects in order to boost interstate cooperation); h) a fee system to recover from importers the cost to evaluate a candidate for introduction for its invasiveness; i) industry funding of projects or programs that primarily benefit a single industry; j) Use the tort system and pressure from insurance companies to drive good private sector behavior; k) investigate partnerships with FEMA and state emergency management agencies with expertise in obtaining funding in cases where infestations or diseases lead to economic harm.

### **III. Adaptive Management**

- A. Adopt adaptive management techniques. Implement a monitoring and evaluation component as part of all management strategies. Evaluate the effectiveness and impacts of control efforts or other management techniques and alter them as indicated by results or by improvements in knowledge and methods.
- B. Promote the sharing of successful management methods, so that land managers all across the country can learn from one another.

**IV. Risk management**

- A. Perform a science-based analysis that identifies pathways and species of concern, assesses the risks, estimates economic and environmental impact, and identifies priorities.
- B. Base intentional introduction of species on a scientifically-based assessment of risk and benefits. Any introduced species should not have any likely negative impacts, or its benefits should overwhelmingly outweigh its threat.
- C. Within one year, each Federal agency with regulatory authority over invasive species or responsibility for resource management should identify and rank introduction pathways for areas and activities under its jurisdiction. Based on the ranking of pathways, each Federal agency should develop and implement recommendations to reduce the risk of introductions.

**V. Public awareness / support / information**

- A. Increase education of the general public, industry, and legislators; of persons involved in movement of organisms, and especially increase efforts in transportation corridors.
- B. Provide staff to provide education in invasive species, including site visits and work days. Pass on lessons learned regionally and nationally. Emphasis would be placed on success with less toxic chemicals, successful management practices, methods of disposal, how to maintain morale and "tricks of the trade" not typically published.
- C. Provide easy access to good information for people out in the field, for all aspects of addressing non-indigenous species: identification, policy, control methods, reporting. Take advantage of the World Wide Web. A national and international information system is desperately needed, especially on notorious invaders and pathways of movement. A clearinghouse on all aspects of information on non-indigenous species, including animal health emergency management, is needed.
- D. Encourage development and marketing of species that can "substitute" for non-indigenous species now being used.
- E. Promote regional coordination and efforts.

**VI. Other**

- A. Develop a comprehensive "Invasive Alien Species Act" that clarifies, unifies, improves, and strengthens existing authorities, programs, funding, and responsibilities.
- B. Designate non-indigenous species as a priority management and scientific issue for all federal resource management and science agencies.
- C. Develop methods to prevent US organisms from unintentionally escaping to other countries.

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## **Points of Discussion**

The following points are meant to provide an overview of the discussion of important topics or observations by the panel, which were used as background or rationale in the development of the action (bullet) items. They also include points on which there was disagreement among the participants. Further information and views on these topics may be found at the Working Groups QuickPlace Website (159.189.176.31/invasivespecies), in the documents in the bibliography, and in the citations therein. The points are roughly grouped and ordered in the same organization as the main document.

## **Prevention and Exclusion**

- 1) The prevention, exclusion, detection, rapid response, and eradication topics depend heavily upon a thorough and thoughtful risk assessment of species and pathways. Without such an assessment, prioritization and planning are inefficient or inaccurate.
- 2) Base assessment of any intentional introductions -- whether from abroad or across biological barriers within the U.S. -- on the precautionary principle. In the context of alien species, unless there is a reasonable likelihood that an introduction will be harmless, it should be treated as likely to be harmful.
- 3) The intentional introduction of an alien species should not be permitted if experience elsewhere indicates that the probable result will be extinction of species or significant loss of biological diversity. Require the intending importer to provide the burden of proof that a proposed introduction will not adversely affect biological diversity. Where relevant, require that specific experimental trials (e.g. to test the food preferences or infectivity of alien species) be conducted as part of the assessment process. Such trials are often required for biological control proposals and appropriate protocols for such trials should be developed and followed.
- 4) Important pathways of unintentional introductions include: national and international trade, tourism, shipping, ballast water, fisheries, agriculture, construction projects, ground and air transport, forestry, horticulture, landscaping, pet trade and aquaculture.
- 5) Exclusion should be premised on the Precautionary Principle: non-natives should be imported only after demonstration -- by the person moving them -- that they are not harmful.
- 6) Authorize agencies to review and approve intentional introductions of species to ecosystems to which they are not native (agency jurisdiction should explicitly include the interstate movement and sale of invasive species, without the need to declare specific quarantines or eradication programs). Approval should require comprehensive evaluations based on biodiversity considerations (ecosystem, species, genome).
- 7) There is disagreement as to whether the World Trade Organization's Agreement on the Application of Sanitary and Phytosanitary Standards and the 1997 amendments to the International Plant Protection allow countries to adopt exclusion policies reflecting these recommendations.
- 8) Gradually remove livestock from federal Wilderness areas or National parks.
- 9) In project assessments made under the National Environmental Policy Act and other planning tools, evaluate the introduction or exacerbation of problems with non-indigenous species. Develop additional evaluation tools to cover non-federal activities not subject to NEPA.
- 10) Identify ecosystems that are the most resistant to invasion when left undisturbed and protect them from disturbance.
- 11) Buffer un-invaded sites from immigration by non-indigenous species.
- 12) Restore natural disturbance regimes whenever possible.

- 13) Identify, protect, and enhance the habitats that are essential to ensuring the viability of native populations of species.

### **Detection and Rapid Response**

- 9) The eradication option applies to an introduction where there are a few small, incipient infestations. The definition of “few” and “small” depends on an assessment of the actual extent of infestations, the availability of effective controls, the accessibility of the infestations, the perceived threat from the species, and the available resources, among other considerations.
- 10) Develop legislation that recognizes that early infestations of recognized invasive species constitute emergency situations, that the establishment of an invasive species is a form of pollution as or more detrimental than other forms of pollution, and that eradication of an early infestation is a means to avoid the need to manage the species into the indefinite future, with all its attendant pesticide use or other environmental disruption. Authorize early suppressive actions using any treatment on a site legal under FIFRA, until the convening of the expert panel and its determination of control strategy. Accept the control recommendations of the expert advisory panel as NEPA equivalent, as long as treatments are in compliance with FIFRA.
- 11) Address the need to work on private property during eradication projects. Provide incentives for cooperation (such as full coverage for cost of treatments) and disincentives for opposition (such as quarantine of the property).
- 12) Susceptible life stages of non-indigenous species need identification.

### **Management and Control**

- 13) Employ an integrated management approach to control, based on the current knowledge of the biology of the species in question and the characteristics of the invaded habitat. Integrated management considers all possible control methods—physical, cultural, biological, chemical. In a case of eradication, do not allow a lack of a full understanding of the pest biology or management to be an excuse for lack of action.
- 14) Recommend grants be made available for integrated control programs, not just for one tool at a time. Managers need information on how the combination of tools works so that each tool is used in its optimal way.
- 15) Economic incentives should be used to encourage private property owners to participate in efforts to eliminate or control invasive species on their property. Such incentives can take several forms, including tax credits and cost-share payments. In some cases, incentive programs are best administered by federal agencies; in other cases, they are best administered by state, county, or municipal governments. Because funding is limited and the problem of invasive species is ubiquitous, priority should be given to incentive programs that address the following needs: (1) control or elimination of invasive species on private properties in cases where the invasive species pose a threat to threatened, endangered, or candidate species or the recovery of such species; (2) elimination of newly discovered invasive species that are a potential threat to agriculture, commerce, or the conservation of natural resources; and (3) control or elimination of alien species as part of a long-term program to improve or restore wildlife habitat or to restore native vegetation to a site.
- 16) **IPM Strategies:**

**Biological control** is the use of safe, living natural enemies of pest species. There has been a lot of misinformation and negative reporting about biological control recently in the media. In fact, biological control has a 100+ year record of safely managing invasive species, with very little documented non-target damage, and many successfully controlled species. Very often, biological control is the only safe,

affordable, sustainable strategy available for management of established invasive species. The USDA policy is to use biologically based IPM whenever possible. In all cases, the costs and risks vs. benefits of using biological control should be considered for established invasive species, and biological control should be implemented if warranted.

**Cultural control** is the use of fire, flooding, cover crops, suppressive mulches, pheromones, sterilized male technique, immunocontraception, sterilization of animals, restoration/reclamation, and similar techniques. Management and restoration often go hand-in-hand. Restoration with appropriate species can help prevent recolonization by a second invasive species after successful control of the first invasive species.

**Chemical control** is the use of pesticides (herbicides, insecticides, fungicides, rodenticides, acaricides). There are times when chemical control is the best strategy, and more research is needed to demonstrate where chemical, cultural and biological control can be used together in IPM systems. Chemical control should always be done or overseen by a certified applicator. Risk vs. benefit studies should be conducted before using any of the IPM strategies.

**Physical control** involves hoeing, dredging, hand-pulling, trapping animals, physical/chemical barriers to expansion, and similar techniques. Following physical removal, invasive species should be disposed of properly.

**Legal/regulatory control** is the use of laws, regulations, fines, etc. State and Federal action agencies may need additional legal support to effectively manage invasive species. For example, authority is needed to control the interstate movement and sale of invasive species, without the need to declare specific quarantines or eradication programs. The use of invasive-free techniques, such as weed-free forage, sanitation, decontamination, zones, etc., should be encouraged or required. Authorizing legislation is needed to manage invasive species similar to that which enables groups to fight wild fires.

**Education** is needed on invasive species, using websites, pamphlets, television and radio presentations, publications, school visits, etc.. Education is a key companion strategy to management of invasive species. Positive, science-based documents promoting biological diversity should be emphasized. A shift in the social priorities should be the goal of educational materials, not focusing on the invasive species as enemies.

### **Restoration**

- 17) Restoration planning should be intimately tied to all invasive species management activities, especially when native species loss or displacement has occurred.
- 18) Develop guidance and encourage the performance of detailed site assessments prior to implementing invasive species management actions. Results of detailed site assessments will assist in identifying (1) specific restoration goals and objectives (including the scale at which restoration should take place), (2) limiting factors that can affect the success of management/restoration actions (e.g. alteration or loss of natural processes, continuing disturbances), and (3) selection of proper management/restoration techniques.
- 19) Identify and fully fund important projects across the nation to include somewhat more disturbed areas where there is still time to protect and restore important natural features. Proposed budgets have been identified including one for plants in federal and state natural areas that assumes focused, effective work maximizing the assistance of volunteers and civilian conservation corps at \$1,080 million/year.
- 20) For very large, generally disturbed areas identify remnant patches of native vegetation for sensitive control followed by aggressive treatments of the monocultures, including revegetation with native species, biocontrols, and extensive spraying.

- 21) For areas undergoing ecosystem restoration of nutrient depleted eroded areas, natural mosaic pattern of fire, plantations to natural systems, and hydrological or wetland restoration remove alien invasive species that benefit from the restoration before it actually begins.
- 22) National priority requirement. Aggressive timely regional campaigns against particularly aggressive species in areas undergoing rapid conversions to monocultures
- 23) Restoration and reclamation are not the same thing. Be clear in distinguishing between the two. Encourage full restoration whenever feasible, but include guidance on reclamation when full restoration of a site cannot be achieved.
- 24) Examples of restoration / reclamation protocols: Retain all possible desirable species in any given site during a restoration or reclamation project. When possible, selectively remove undesirable species and restore with desirable species already on the site. Restore with native species where local regeneration is not available
- 25) Use the National Environmental Policy Act and other planning tools to identify resource uses and other activities that facilitate introduction or exacerbate the spread of invasive species; ensure full evaluation of the benefits and costs of those activities, including exacerbated invasions.
- 26) Protection of Ecosystems: Recognizing that undisturbed, healthy, diverse natural habitats are generally more resistant to biological invasions, and recognizing that exclusionary precautions will not be 100% successful, seek protection from anthropogenic disturbance for intact ecosystems by: enacting national legislation that will modify land use planning at every level, from local county planning departments to federal lands, in order to prevent invasions by protection of intact green space at every level of land planning; identifying areas that are the most resistant or less invasible (e.g., old-growth temperate coniferous forests in the west, old-growth mangrove swamps in the southeast) and protect them from extractive industries or development as priceless reservoirs of genetic integrity; buffer un-invaded sites from propagule rain from populations of invasives; restore natural disturbance regimes whenever possible; gradually remove livestock from federal Wilderness areas or National parks.
- 27) Recognize that eradication or absence of non-indigenous species is only one-half of the equation; the other half is the presence of native biota. Promote and enhance the habitats that are essential to ensure the viability of native populations of species. Thus, preservation and restoration of habitats are critical elements of prevention.
- 28) The role of anthropomorphic disturbance as a precursor to invasions must be analyzed in any restoration management plan. Restoration must include an element for protection of natural areas from the kinds of human-induced disturbances that have facilitated the invasion.
- 29) Restoration planning is rooted in a foundation of stewardship cultural consciousness-- "caring for the environment"
- 30) Eradication funding must always include a restoration component; realizing that absence of non-indigenous species is only half of the equation; the other half is presence of natives. Restoring native species is sometimes expensive but is essential. If native seed banks have been exhausted, then eradication of one non-indigenous species will be followed by colonization of the site by another invasive species.
- 31) Requirements for genetically local sources for disseminules or propagules should be realistic. With landscapes awash in non-indigenous species, we should not tie the hands of restoration efforts by being too restrictive. For early seral species, for example, if a seed source is the same species, its origin from the same latitude, and the same biogeographical province, then this should be sufficiently local. And, if this degree of specificity is not available, then utilize the same species

even if it is not local. The exception is for long lived, older sere species that must be genetically local (ie., trees) because of their longer time to reproduction/maturity

- 32) Utilize "coordinated propagule swamping" with native species as a restoration technique. Promote agricultural university grants to grow these in volume to provide the necessary seed crops. Give natives a boost and they will make our work so much easier.
- 33) Work towards long-term, sustainable solutions. Recognize that without suitable habitat, native species cannot survive, and eradication efforts will be futile over the long term.

### **General**

- 34) Instead of starting with writing a federal law, let's start with defining how we would ideally want things to work. Then we can decide what the federal role is in that regime, and what new federal law, if any, we need.
- 35) Regional entities (like River Basin commissions), State, local, and tribal government, private sector companies and trade associations are all part of the solution, and it is a mistake to focus exclusively on the federal part of the equation.
- 36) Educate public that management programs are run by professional who care about the environment. And educate them that the control of invasive species is not in vain.