

Conclusion and Recommendations: What We Can Do to Protect America's Forests

The United States is at a crossroads between facilitating international trade and protecting our natural heritage from invasions by exotic organisms. International treaties and agreements threaten APHIS' ability to prevent introductions of new damaging exotic forest pests. APHIS itself is in a quandary with a dual mission prescribed by Congress to protect our agricultural and natural resources while facilitating trade. Control of established exotic species that could damage forests falls under the responsibility of the USDA Forest Service, but this agency does not have the resources and, in some cases, personnel and infrastructure to successfully address many exotic species problems.

We can minimize damage from both established exotic forest pests and those that might enter in the future, but to do so we must make substantial, fundamental changes in policies and programs at both the international and national levels. Individual agencies' programs should be better coordinated. Furthermore, all stakeholders need to devote substantially more resources to invasive species programs. Much of the significant economic burden associated with preventing bioinvasion should be shifted from government agencies supported by taxes (that is, society generally) to industries and consumers that rely upon importations or utilize exotic species. A new balance must be struck that better sustains the integrity of our natural resources while maintaining the strong economy.

Our proposed changes would result in altering responsibilities and budgets of federal and state agencies and jurisdictions of Congressional committees, as well as amending international trade agreements. Furthermore, these changes in treaties, laws, and policies would impose significant but appropriate costs on industries that rely upon importations and industries that use exotic species. In most respects, our proposed tenets are similar to recommendations contained in earlier reports by the Office of Technology Assessment (1993), General Accounting Office (1997; 2000; 2001), National Plant Board (1999), and National Research Council (2002a), as well as the National Invasive Species Management Plan (National Invasive Species Council, 2001; <http://www.invasivespecies.gov/council/nmp.shtml>). In the area of trade policy and user fees, our proposed tenets are more strongly and specifically worded.

The establishment of a damaging exotic species is usually considered to be a rare event. Nevertheless, as shown in the preceding chapters and the Gallery of Pests, the consequences can be devastating, economically and ecologically. We feel that the sheer volume of imports now ensures that even a "rare" event will happen too often, given the present status of prevention and control efforts in this country. It is inevitable that this situation will only grow worse with increasing international trade and downgrading of phytosanitary safeguards. As discussed in the preceding chapter, the severe consequences of bioinvasion, numerous opportunities for introductions, and the many difficulties undermining the effectiveness of existing efforts demonstrate the need for a fundamentally new approach. In our view, policies to curtail new introductions must be based on the following nine tenets:

- (1) Where a conflict arises between preventing introductions and priority over facilitating international trade, priority is given to the former.
- (2) Appropriate sharing of the costs of mitigating bioinvasion threats by parties benefitting from trade and other activities that facilitate species introduction and dissemination.
- (3) Reestablishment of the "guilty until proven innocent" policy when exotic species are intercepted.
- (4) The use of a pathway sterilization approach, as opposed to a species-by-species identification and interdiction procedure, to prevent introductions.
- (5) Establishment of strong, functional "early detection/rapid response" programs to support exclusion programs.

(6) Equal priority for exotic species that threaten natural resources as compared to invasive species that threaten agriculture and other economic interests.

(7) Assumption of the responsibility by the federal government for preventing movement of established invasive species within or between states.

(8) Adequate funding for complete resolution of exotic pest problems, ranging from prevention to restoration programs that include genetic conservation of threatened species.

(9) Stakeholder access to complete, current information on bioinvasion and its impacts.

Although adoption of the above tenets and specific changes described in the next section will go a long way to reducing the threat to America's forests and other ecosystems from invasive species they alone would not bring satisfactory resolution to exotic pest problems. In the long term, we believe a more comprehensive solution is needed: creation of a National Center for Biological Invasions (as described in the section beginning on p. 10).

Specific Steps

Funding Recommendations

There is widespread recognition that funding in the war against biological invasions has been inadequate. Overall, the present federal control effort, approximately \$996.6 million in fiscal year 2001 (NISC data), is less than one percent of the \$137 billion in annual losses caused by bioinvasion, as calculated by Pimentel *et al.* (2000). To maintain effective protection and ultimately resolve biological invasions, funding must be considerably increased over current levels, even if more efficient pathway approaches are adopted. It is essential that funds also be stable, to prevent interruptions of long-term projects, as identification, testing, and application of mitigation and control measures for introduced invasive species requires years of dedicated effort.

APHIS receives the great preponderance of all federal funding on invasive species, *e.g.*, 80 percent in 2001 (\$798 million). Indeed, funding increases for APHIS from 1999 to 2001 exceeded total funding increase for all federal agencies' programs. This welcome increase in funds has, however, not been allocated in the most effective manner. For example, increasing the numbers of APHIS inspectors is not as effective as instituting stringent regulations governing introductory pathways. Furthermore, increasing funding for one agency is also not the answer, as many federal and state agencies must play a role if a pest becomes established. Strengthening one agency outside a coordinated multi-agency program will not provide the protection and resolution needed by natural ecosystems in the United States.

The increased funding needed for the full range of invasive species programs, we believe, should come in part from those who benefit from importing goods that indirectly cause the exotic invasive species problems. We suggest imposing a fee on all importers to partially cover the costs of all aspects of the exclusion program, including monitoring, research, development of control methodologies, enforcement, and eradication costs, as well as of port inspection. The fee charged should reflect the level of risk represented by the imported commodity or packaging, rising with a higher risk, as does any insurance policy. Tying the fee to risk also gives the importer an incentive to have taken the necessary steps to ensure compliance with phytosanitary regulations.

Jenkins (2002) suggested that \$200 million in additional funds could be obtained by charging a small tax or user fee (0.004 percent) on the estimated value of a certain segment of importers and travellers. Jenkins would target incoming cargo, ships, and planes, and arriving passengers that are coming from another continent (*e.g.*, not Canada, Mexico, or the Caribbean). We support the concept, although we consider an additional \$200 million annually above current funding for federal agencies to be insufficient to encompass such aspects as ecosystem

restoration, economic recovery, or other needed activities. We suggest that the fee be raised.

It may be necessary to amend the SPS Agreement and IPPC to allow this approach. The SPS Agreement [Annex C, para. 1 (f)] stipulates that “any fees imposed for the procedures on imported products [be] equitable in relation to any fees charged on like domestic products . . . and should be no higher than the actual cost of the service.” The IPPC also requires that “the cost of implementing plant health regulation should not exceed the benefit” (Dawson, 2001). Given the figures for costs and losses arising from invasive species detailed in the Pimentel *et al.* (2000) study, there should be no problem in setting user fees at a rate to fund the proposed Center for Biological Invasions and associate activities.

Treaties, Policies, and Regulations - What Changes Can Be Made Today?

During the period needed for establishment of a functioning national center on bioinvasion, several actions can be taken that will substantially improve protection, eradication, and control of exotic forest pests and exotic pests in general. For example, the World Trade Organization (WTO) countries have agreed to address agricultural trade issues during the next round of negotiations, which is due to be completed within three years. This agenda presents an opportunity to press for amendment of the SPS Agreement. Below are specific recommendations we have developed to correspond with the problems presented in the previous chapter.

International Policy and Regulations

The international community needs to recognize the connection between international trade and the spread of species far beyond their native ranges throughout the world, and the resulting ecological and economic costs. This spread is rapidly increasing as more intercontinental trade occurs, spurred by adoption of new trade agreements. The very real, albeit often delayed, costs of biological invasions should be factored into policy negotiations, as are other costs.

The WTO SPS Agreement and IPPC

We consider the provisions of the SPS Agreement and IPPC to be significantly flawed with respect to protection against biological invasions. We feel that critical articles in the SPS Agreement, as outlined in the previous chapter, were written with the purpose of promoting trade, rather than to ensure effective sanitary and phytosanitary protection. Thus, the Preamble, Articles 2.2, 5.4, and 5.6, and Annex C explicitly require that any phytosanitary measures have the minimal impact possible on trade. Language in other articles that places a high burden of proof for risk on the importing country has the same effect. One result has been that APHIS no longer regards a hitchhiking organism as “guilty until proven innocent”; instead, the agency now considers such inadvertent introductions to be “innocent until proven guilty.” When confronted with an organism that has not been evaluated previously, APHIS can no longer simply require treatments or other actions to block its introduction. Instead, APHIS must either carry out a burdensome risk assessment of dubious scientific value or invoke its rights under Article 5.7 to impose a provisional safeguard and then conduct the risk assessment.

As discussed in the previous chapter, we believe that it would be most effective to adopt a new approach. First, APHIS should shift the emphasis from assessing individual products to a more comprehensive look at each of the segments and components of potential invasion pathways or vectors. Currently, most risk assessments are done on a specific product coming from a specific country, *e.g.*, apples from Chile. This requires significant expenditures of time and money and probably looks at the problem too narrowly. We suggest a broader approach that looks at much larger classes of imports, pathways, and/or larger geographic regions, *e.g.*, all raw wood from South America. Second, APHIS should adopt measures intended to prevent any living organism from hitchhiking on the imported commodity. This pathway sterilization would simultaneously solve a number of common problems with an overall savings of time and money. We also suggest allowing the importing country adequate flexibility to set the level of protection that it determines to be acceptable and to specify phytosanitary measures to achieve it. Then the exporter

and exporting country would bear the burden of meeting those requirements to ensure the safety of the incoming shipment. Finally, the importing country verifies compliance to its satisfaction.

Adopting our recommended approach (basing regulation on a premise of “guilty until proven innocent” and Integrated Vector Management (Carlton and Ruiz 2002)) will require amendment of the WTO’s SPS Agreement and the IPPC. Because the SPS Agreement is linked to the enforcement mechanism of the WTO, we have focused on it first. We have drafted a set of amendments to the SPS Agreement that would achieve these goals as well as improve other aspects of international programs to minimize bioinvasion (the text of the proposed amendments is found in Appendix 3). These amendments are intended to make the SPS Agreement more flexible and more realistic in terms of bioinvasion and scientists’ current levels of knowledge, while still promoting “smart” trade. Our proposed amendments seek to:

- ! Include an explicit recognition that increasing international trade facilitates the spread of invasive species and diseases.
- ! Change the balance to ensure adequate protection while promoting trade.
- ! Recognize the necessity of preventing additional introductions of exotic species that are already established within a country, so as to curtail their spread and facilitate more effective control programs.
- ! Ensure that international standards are developed utilizing the best available science and expertise and in coordination with other international bodies active in this field.
- ! Allow greater flexibility in accommodating data gaps and scientific uncertainties that hinder efforts to predict which species will be invasive if introduced.
- ! Allow countries to put the burden of proving that an import is safe on the entity proposing the trade—either the exporting country or the importer.
- ! Allow countries to utilize pest exclusion technologies that are more effective and efficient than the traditional reliance on detecting invasive species in individual shipments through inspections.

Preamble, Articles 2.2, 5.4, 5.6 and Annex C

These Articles or sections were written to facilitate trade by explicitly requiring that any phytosanitary measures have the minimal impact possible on trade. We propose new language to afford better protection. For example, we would specify that phytosanitary measures must provide adequate protection while minimizing their avoidable negative effects on trade.

Article 2.3

Article 2.3 strictly limits countries’ ability to restrict additional introductions of exotic species that are already established on their territories. Under its provisions, a country may impose phytosanitary safeguards targeting such species only when it has instituted a parallel program within the country. The result of this requirement is that the United States will be unable to curtail additional introductions of hundreds if not thousands of exotic species already known to cause damage. We propose an amendment that would allow import restrictions targeting those exotic species that are subject to mitigation efforts carried out by natural resource agencies as well as agencies responsible for protecting human, animal, or plant health.

Articles 2 and 5

Together, Articles 2 and 5 strictly limit countries’ ability to take protective action when faced with

uncertainty about either the likelihood or magnitude of risk. We propose several amendments to these articles that would expand countries' freedom to impose phytosanitary safeguards in such circumstances. New language in Article 2.2 and Article 5.1 would reverse interpretations by the WTO dispute-resolution bodies that appear to require a level of certainty that is not achievable in many cases. We would instead allow countries to impose phytosanitary safeguards when there is a "well-considered risk of harm", as demonstrated by analogies to similar situations (*e.g.*, invasive species detected or suspected using a certain pathway) or expert opinion. For example, if insects had been introduced on logs with bark, then other forms of wood bearing bark could also be regulated. Similarly, since damaging plant diseases have been introduced on imports of horticultural stock from some countries, imports of similar horticultural stock from other countries could also be subject to phytosanitary regulations to prevent introduction of other plant diseases. Through additional changes in the language of Article 2.2, we would also allow the importing country to put the burden of proving the safety of trade in the proposed good, or using a particular form of packaging or trade route, on the exporting country.

Article 3

Article 3.2 encourages countries to base their phytosanitary safeguards on international standards adopted by certain international bodies. The efficacy and credibility of these international standards will depend on the scientific expertise consulted, integrity of the scientific input and minimization of political factors, and the transparency of the process used by these international standard-setting bodies. The SPS provides no guidance on a process for consulting outside experts, nor does it assure that the standard-setting process will be open to public scrutiny. As with all trade negotiations, decisions are subject to political pressures. The result can be adoption of standards that meet only the lowest common denominator. We believe the IPPO's standard on wood packaging demonstrates these flaws.

Our amendments propose a partial solution; we would add several international organizations which have expertise in evaluating and managing invasive species to the list of standard-setting bodies recognized by the WTO countries. These organizations include the Convention on Biological Diversity and the World Conservation Union. The IPPO is currently developing environmental criteria to be incorporated into invasive species risk-analysis standards, but we remain skeptical whether this body has sufficient expertise and commitment to natural ecosystems to develop and apply reasonable, adequate provisions for balancing trade and invasive species concerns.

Articles 3 and 5

A critical element in tightening protective safeguards is setting a high "level of protection." We suggest several amendments in these two interrelated articles to allow countries greater flexibility in determining the "level of protection" that they consider to be "appropriate". First, we eliminate the specific requirement in Article 3.3 that a country use the risk assessment process laid out in Article 5 in setting its "level of protection". Our goal is to accommodate the role that societal values play in these decisions (above and beyond strictly scientific factors). Second, we amend Article 5.5 to deny use of "inconsistency" as the sole grounds for overturning a country's phytosanitary measure. We would allow countries greater flexibility and time to reconcile differences between the "levels of protection" applied in varying circumstances. Under our amendment, countries would still have to comply with other provisions of the SPS Agreement intended to prevent an unjustifiable safeguard, *e.g.*, one that lacks scientific justification.

Article 5.6

We propose adding a sentence to this article that explicitly recognizes countries' obligations to reconcile WTO commitments with duties accepted under other international agreements, *e.g.*, the Montreal Protocol on Ozone-Depleting Substances. Under the Montreal Protocol, countries have pledged to work toward ending use of methyl bromide. However, under the WTO and other trade agreements, continued use of this chemical is favored because it is relatively inexpensive and more accessible than alternative treatments.

Article 5.7

We propose amendments that would allow countries to adopt permanent (rather than provisional or temporary) phytosanitary measures based on available information, even when that information is inadequate to resolve uncertainties about either the likelihood or magnitude of risk associated with an imported commodity or pathway. Our goal is to avoid forcing countries to waste scarce resources by seeking information that does not exist when they should, instead, be focused on closing other, still unregulated, introductory pathways.

Agreement to Establish A Free Trade Area of the Americas

In Chapter 3, we raised a number of concerns with the draft language under consideration for the agreement that would create a Free Trade Area of the Americas. At this time, it is difficult to further comment on specific articles in this agreement as it is still under negotiation and proposals may be incorporated into the draft which resolve our concerns. To protect the United States' natural resources, we do feel that the agreement should contain wording to ensure the following goals:

- ! Thwart political pressure for accepting shipments that do not meet a country's level of protection. Special dispensations should not be granted to developing countries, which are just as likely to export invasive species as are more developed countries;
- ! Protect importing countries' right to establish highly protective standards rather than accept less stringent standards developed through negotiations with other countries;
- ! Eliminate hard time deadlines within which countries must decide whether to allow imports of new commodities. Instead, adopt language that would provide a reasonable time for risk assessments with an appeals process to ensure the risk-assessment process will not be used as a barrier to trade.
- ! Prevent any restraints on phytosanitary measures that are more restrictive than the current wording of the SPS Agreement.

National Policy and Regulation

While pursuing needed modifications to international treaties and agreements, policy makers and stakeholders can act now to adopt more effective approaches to prevention and control allowed by existing international agreements. The previous chapter described a number of concerns about the ability of APHIS to give the Nation's natural resources appropriate protection in the increasingly seamless world of international and national trade. These concerns can be grouped into four general areas: 1) trade-promotion pressures that conflict with the pest-exclusion responsibilities of the agency; 2) the agency's approach to prevention; 3) the agency's approach to risk assessment; and 4) the breadth of APHIS' interception data base. In each area, there is latitude for change that would make APHIS more effective at preventing introductions and rapidly addressing newly established invasive species.

Focusing APHIS on Prevention

Expectations that APHIS will both prevent biological invasions and facilitate trade place the agency in an impossible position. Especially given the widespread lack of awareness about bioinvasion, pressure to facilitate broader trade results in APHIS accepting substandard levels of protection when evaluating either individual shipments or pathways. To correct this imbalance, we suggest that the Department of Agriculture adopt a "0 risk"

“level of protection.” This mandate would serve as a goal, that is, a target that we recognize cannot be achieved. Its adoption, however, would affirm the importance of preventing introductions and lead to more protective exclusion strategies and programs. This goal could be adopted either by the USDA through administrative action, or by the Congress through amendment of the Plant Protection Act.

APHIS gives higher priority to protecting crop species, due in part to the oversight of Congressional committees that also focus on agricultural issues and not natural resources. These are the House and Senate Agriculture committees and Agriculture appropriations subcommittees. We believe that our country would best be served by granting joint jurisdiction over APHIS to Congressional committees with responsibilities for natural resources, *e.g.*, the Senate Committee on Energy and Natural Resources and the House Committee on Resources and Subcommittee on Forests and Forest Health. In addition, we believe APHIS can benefit from establishing an advisory panel of scientists, resource managers, and stakeholders concerned about introduced forest pests.

To assist the agency in adopting maximally effective pest-exclusion strategies, we suggest periodic review of APHIS’ procedures and decisions by a responsible, scientifically qualified, and independent organization or body. Although different options exist for oversight, we believe that the National Research Council should be charged with this task. The National Research Council has access to sufficient expertise to conduct proper oversight and prestige enough to overcome political and business challenges to APHIS’ authority that are sure to occur. The National Research Council has frequently provided advice on natural resource issues (we cite three such studies in this report—one in 1975 and two in 2002). The historical precedent is actually a century old: in 1896, President Grover Cleveland asked the National Academy of Sciences to study the use of the National Reserves, the precursor of the National Forests.

Approaches to Prevention and Risk Assessment

Prevention

We recommend that APHIS expeditiously diminish its reliance on inspection and detection and instead begin to regulate introductions using “Integrated Vector Management” (Carlton and Ruiz 2002). Scientists consider both the detection and evaluation processes to be error-prone (Carroll, 1998). Past and projected increases in international trade will undoubtedly increase the probability of more invasive species entering this country. Furthermore, APHIS cannot possibly inspect the increasing volumes of imports (USDA APHIS and Forest Service, 2000; National Plant Board, 1999; Powell *et al.*, 1984; comments by the American Nursery and Landscape Association and Society of American Florists on Docket No. 00-042-1). Under the “Integrated Vector Management” approach, the agency uses all available control and management techniques at the appropriate times and places to virtually eliminate hitchhiking organisms (Carlton and Ruiz 2002). In other words, APHIS would apply several independently effective phytosanitary safeguards in order to sterilize the pathway, so that no living organism could hitchhike or stow away on the shipment. Inspection and detection would serve as a check on the efficacy of the pathway sterilization measures, rather than as the first line of defense.

The use of Integrated Vector Management will allow APHIS to utilize its staff and resources more efficiently and to focus on the following important components of a prevention program that are now neglected:

- ! Enforcing phytosanitary rules aggressively.
- ! Reducing the backlog of 400 risk assessments needed to support pre-WTO regulations governing imports of various commodities.
- ! Devoting increased staff and funding to preventing introductions of organisms that threaten forests and natural areas compared to those that imperil agricultural and horticultural crops.
- ! Expanding coordination efforts with other agencies and a wider variety of “stakeholders,” *e.g.*,

private-citizen groups concerned about natural resources.

- ! Carrying out the research recommended by the National Research Council (2002a) to improve the scientific foundation for risk assessment, including researching, developing, and testing integrated prevention approaches.
- ! Collecting and evaluating more complete data on invasive species interceptions and actively searching for early evidence of new outbreaks.
- ! Responding rapidly to newly detected outbreaks.

Switching from inspection/detection to regulating pathways and vectors will not occur quickly, due to the magnitude of the change. APHIS should focus initially on the most dangerous of pathways, specifically the three pathways which pose the highest risk of transporting pests that threaten forests: nursery stock, raw wood, and wood packaging (SWPM).

Nursery Stock

We feel that importations of whole plants and portions of plants intended for propagation, *e.g.*, budwood for grafting, should be prohibited. Descriptions in previous chapters and the Gallery of Pests demonstrate that highly destructive exotic species still enter via this pathway. We feel that the safest option for introduction of exotic plants is through allowing imports of only small lots of seed or clones grown *in vitro* (grown in aseptic conditions free of contaminating agents such as bacteria or fungi) in compliance with existing importation regulations.

Seeds and *in vitro* materials can harbor invasive species, but these problems are more easily solved than the risks arising from imports of whole plants. Existing regulations focus protective safeguards on seeds that have a high probability of harboring insects, *e.g.*, acorns, and methodologies, *e.g.*, x-rays, can be used to check for seedlots with high insect damage. Pathogenic fungi pose a greater challenge. Several fungi have been reported in the scientific literature as transported on seeds (Elmer, 2001), including such forest pests as Diplodia shoot blight (Wingfield, 2002) and pine pitch canker (Gordon, 2002). Elmer (2001) goes so far as to say, "In fact, most plant pathologists would agree that any pathogen might be seedborne on at least one host." Infested seeds are often asymptomatic, so the infection is hard to detect by inspection. Seeds also provide an environment conducive to long-term persistence of the pathogen (Elmer, 2001). Until APHIS has developed rigorous systems approaches that have a high probability of success in ensuring that seeds intended for importation into the United States are free of pathogens, the agency must strictly limit the size of seed shipments in order to subject them to stringent inspection and post-importation quarantine with assessments of the germinated seedlots for disease.

Exporters of *in vitro materials* must be held responsible for periodic testing of parent stocks to ensure that they are free of pathogens (National Plant Board, 2002). There remains the problem that these tests are usually applicable only to a limited number of pathogens known to pose a threat and are likely to miss species that are "unknown" or are mistakenly thought to be benign. Exporters and importers must then ensure production occurs in a pathogen-free environment (National Plant Board, 2002). *In vitro* clones should come from certified laboratories that can attest that the plantlets are products of an *in vitro* process. Otherwise, shippers might try to substitute branches that have not been produced *in vitro*, etc., that can be propagated by rooting, and that could contain invasive species. Once the shipments arrive at the United States border, inspections would have to be expedited, since cultured material can die if it is not maintained in precisely defined conditions. As a final safeguard, post-quarantine inspections and regulation of *in vitro* plant materials during the growing-out period should be required.

Fairness Development of new types of cultivated plants for landscaping and floral use is the lifeblood of the nursery, and to a certain extent, floral industries. Limiting nursery and floral stock importations to seeds and *in vitro* clones will significantly impact these industries. There are viable alternatives, however, to maintain a flow of new cultivars to support these industries. For cultivars that have been developed overseas, importation of *in vitro* clones of cultivars is an option for species that can be propagated in that manner. Another option is to promote

exotic, non-invasive plant materials that are already in the country. Collectively, Plant Introduction Stations, National Germplasm Repositories, the National Arboretum, and various state and private botanical gardens and arboreta have a considerable amount of materials that could be evaluated and developed for horticultural uses. Utilization and development of native species that show landscaping/floral potential is another avenue for providing new materials. In the long term, development of native species may better fit with a more populous country that will be placing more demand on water resources.

With respect to the above alternatives, we feel that the USDA should provide leadership in developing trees and shrubs through Cooperative State Research, Education and Extension Service (CSREES) programs, such as regional projects, that could provide funding for cultivar development to the universities. In addition, the USDA could redirect certain USDA Agricultural Research Service project emphasis, and develop program areas in the National Research Initiative for competitive grants relating to woody ornamental development.

There is another alternative: importation of plant materials exclusively through the existing federal infrastructure. Importing plant materials exclusively through the National Plant Germplasm System, in conjunction with the Plant Introduction Stations, may be the best and least disruptive option. Under this alternative, private importers would be restricted as above, but different types of materials, *e.g.*, scion wood, bulbs etc., could be imported through this System, with post importation quarantine and inspections occurring on the Plant Introduction Stations. The National Plant Germplasm System routinely sponsors trips to different parts of the world to collect seeds/clones of potentially valuable species and cultivars, and growers could target collections for certain species or cultivars. The germplasm would be grown under the oversight of a Plant Introduction Station, which could evaluate the material over time for hitchhiking pests and invasiveness. Germplasm harboring pests or with invasive characteristics could be treated or destroyed. This would slow germplasm release due to the quarantine/evaluation period, but the released germplasm would not harbor exotic pests nor be invasive. Additionally, released materials could be deposited in National Plant Germplasm Repositories to ensure perpetuity. Additional Plant Introduction Stations would be needed under this alternative, as their numbers have dwindled to four (4) nationwide.

Raw Wood: Logs, Lumber and Chips

Current regulations governing importation of raw wood into this country have inconsistencies and loopholes, and treatments have been challenged by experts, as described in Chapter 3. Correspondingly, we believe that the importation of raw wood poses too great a risk. To ensure protection of United States' forests, the sanitation process should be conducted prior to the raw wood reaching the United States from other countries (with the exception of Canada, given that wood from our northern neighbor poses a minimal risk). Bringing unprocessed wood into the country, even into an APHIS-approved facility for sanitation, still affords invasive species opportunities to escape the unprocessed product during the inevitable delay until sanitation. Wood that has been processed in a manner to eliminate all invasive species, including deep wood invasive species, would be approved for import but under an incorruptible system that provides certification of correct processing.

Solid Wood Packing Material

The recent importations of Asian longhorned beetle and other insects on SWPM clearly demonstrate the need to rapidly phase out unprocessed wood as packing materials. APHIS should consult with shipping- and packaging-industry representatives and other interested parties, then issue regulations specifying the earliest possible deadline for switching from packaging made from solid wood to packaging made from various composites, metal, plastic, rubber, fiberglass, or other durable, more easily re-usable materials. In some cases, inflatable air bags can replace dunnage. During the transition period, APHIS should require that all SWPM be fumigated and institute secure systems to verify treatment. Enactment of a bar code system or equivalent such as those placed on railroad cars could be used for easy identification, tracking, and history of the movement of packaging.

APHIS should also seek outside expertise in helping it re-evaluate the risk associated with wood wool, chips, and strips used as cushioning. The agency should then either initiate a rulemaking requiring phase-out or treatment of these loose packing materials or publish a report that explains its decision not to take this step.

Risk Assessment

As noted in the previous chapter, APHIS does not now strive for complete effectiveness in excluding potential invasive species but opts for a “negligible” risk. While APHIS rarely specifies what it considers to be “negligible” risk, in the cases of logs and lumber imported from New Zealand and Chile, and wood packaging from China, it accepted a risk of 3 to 5 percent. However, a risk of 3 - 5 percent is actually quite high. We feel that APHIS should specify a much lower risk level for all types of importations and pathways and correspondingly re-evaluate its current phytosanitary measures. To spur the agency, we suggest that the Congress should amend the Plant Protection Act to establish “0 risk” as the nation’s official level of protection. As we stated earlier, setting a target of “0 risk” would demonstrate the importance of this problem and the resolve of the federal government to address it.

We also reviewed the widespread criticism of APHIS’ risk-assessment process. In a recent study, a National Research Council (2002a) panel reviewed this process and recommended that APHIS better document the basis for its risk assessments. The agency should list and explain its underlying assumptions, so that independent experts can evaluate the agency’s conclusions about an organism’s likelihood of arrival, establishment, and impact. The risk-assessment procedure should be transparent, repeatable, peer-reviewed, and updated to capture new information and enhance expert judgment. We concur with these suggestions and believe that adherence to these points will significantly strengthen the risk-assessment process.

Improving APHIS’ Data Base

APHIS’ ability to set priorities is hampered by inadequacies in the interception database, as noted in the previous chapter. We support the following recommendations by the National Research Council (2002a):

- ! Adopt statistically designed sampling methodology.
- ! Re-evaluate and revise port sampling protocols to ensure data are accurate and meaningful.
- ! Expand data collection to include vascular plants, in addition to those listed as noxious.
- ! Monitor data on a regular basis to detect and correct problems in data entry and maintenance.
- ! Make the data base accessible for analysis by external experts.
- ! Increase efforts to detect and identify pathogens.
- ! Include additional variables, such as
 - ! Number of inspections that detect no invasive species,
 - ! Some measure of abundance of invasive species,
 - ! Interception of nonquarantine invasive species.

We again recognize the need for additional resources in APHIS to institute many of these changes.

National Invasive Species Council (NISC)

At least 23 federal agencies in seven departments are responsible for some aspect of the federal government’s invasive species program. Other important players are state, local, and tribal governments, a wide range of businesses, associations, and individual citizens. Through Executive Order 13112, the federal government

has created a body to coordinate the many agencies' efforts, the National Invasive Species Council (NISC). The Council is composed of the leadership of government agencies bearing responsibility for invasive-species management: the Secretaries of Interior, Agriculture, Commerce, State, Defense, Treasury, Transportation, and Health and Human Services; and the Administrators of the Environmental Protection Agency and Agency for International Development. All the agencies have appointed liaisons to represent them on a daily basis, although only the liaison staffs from the Departments of Agriculture, Interior, and Commerce actually work full time on these issues and are based in the Council's office.

The NISC and associated Invasive Species Advisory Committee have a disappointing record to date. One reason is that the Council has no authority over any agency, but can only seek to persuade the departments to cooperate. For example, if the Council feels that APHIS has not taken the appropriate steps to prevent an invasive species from spreading, it has no power to direct APHIS to modify its approach. A second reason is the decision to try to expand invasive species programs without providing additional resources. The NISC is hampered by its small staff, which consists of just five people plus liaisons to the three key departments. Partially for this reason, the NISC has lagged in carrying out its responsibilities under the national invasive species management plan. The individual agencies have also received no new staff or funds to implement the many tasks assigned to them by the Plan.

A third reason for slow progress has been unfortunate timing of Council activities relative to political events. The invasive species management plan was issued just when presidential administrations were changing; the new political leadership had to take office and decide its own priorities. When the policy makers made a commitment to continuing the coordinated invasive species effort, it was time to appoint a new advisory committee. Therefore, it was not until mid-2002 that the new advisors began conferring with federal agency staffs on developing detailed implementation strategies for each recommendation in the plan.

The National Invasive Species Management Plan developed by the Council and Advisory Committee has many strengths, but it is disappointing in its approach to international trade treaties and agreements. It foresees heavy reliance on cooperative and educational projects being carried out by the Global Invasive Species Programme (<http://jasper.stanford.edu/gisp/home.htm>). Such coordination will undoubtedly be useful, but it is not sufficient. The potential impact of effective invasive-species management programs on trade and important economic interests is too great to rely on cooperation and education alone. The National Plan does not mention other opportunities for developing a more cohesive approach to invasive-species issues, such as involving resource agencies in the on-going development of international standards that will determine what procedures agencies such as APHIS can follow to prevent additional introductions. Additionally, the National Plan has not proposed a fundamentally new approach to preventing introductions and minimizing impacts of established alien species. On the positive side, it has called for a collaborative effort with stakeholders to set priorities among introductory pathways. However, the Plan did not address such fundamental issues as constraints imposed by trade policies and eschewing regulations. The Plan does not address the conundrum of APHIS' longstanding emphasis on protecting crop species to the neglect of invasive species and weeds that damage natural ecosystems. Moreover, the Plan does not address APHIS' slow response to aggressively combatting newly detected introductions, particularly those that primarily damage natural systems.

Even after creation of a Center for Biological Invasion, personnel/offices in each of these agencies will continue to have responsibilities connected with biological invasions, and coordination will continue to be needed to improve efficiency and avoid duplication. If important responsibilities are transferred to a new Department of Homeland Security, the Executive Order should be amended to reflect those changes.

Homeland Security and APHIS

The nation's efforts to prevent renewed terrorist attacks could fundamentally change the way APHIS and other border agencies operate. President Bush has proposed combining APHIS, U.S. Customs Bureau, Immigration and Naturalization Service, and other border agencies into one agency (J. Sarasohn, "Agricultural Lobbyists Bend

Tom Ridge's Ear," *The Washington Post*, July 4, 2002, p. A21). It is difficult to predict how such a change might affect APHIS' ability to prevent introductions of biological organisms that might threaten natural resources. The reorganization process may open opportunities to address some of our concerns about APHIS. For example, Congressional action to create the new agency could provide an opportunity to broaden the range of Congressional committees overseeing APHIS' program. Furthermore, the new Department, in contrast to the USDA, would presumably place a low priority on facilitating international trade. On the other hand, preventing introductions that could harm natural systems might have to compete for funding and attention against an even greater number of concerns in an expanded agency and possibly slip to an even lower priority. In addition, the secrecy appropriate to an anti-terrorism campaign is counter to the open and rapid flow of information needed to improve invasive-species programs. While we support President Bush's determination to protect our country from attack, we respectfully believe that APHIS belongs in a CBI-type agency, rather than being combined with agencies such as the Immigration and Naturalization Service. It would be possible to create a division within APHIS that would have the necessary technical expertise to detect and address biological weapons and the appropriately trained law enforcement personnel to address criminal actions. This division could still work closely with external agencies and be readily available if traditional APHIS officers suspect a national security problem.

The Need for a National Center on Bioinvasion

Invasive exotic species issues affect vastly different constituencies, ranging from corporations to non-affiliated individuals concerned with the long-lasting health of natural ecosystems. As discussed, biologically-based decisions to address exotic invasive species have ramifications for natural ecosystems as well as international and interstate trade. The current and future demands on forest resources for multiple uses make it essential that a national program be developed and funded to encompass prevention, rapid detection and eradication of newly discovered introduced organisms, integrated invasive species management, and forest ecosystem restoration. Components of this program currently exist in individual agencies, as do several coordinating mechanisms. Demonstrably, neither individually or collectively is this effort accorded appropriate priority or adequate funds and staff, nor are the programs satisfactorily integrated into a coordinated effort. In addition to forested lands, natural, agricultural, and urban areas and waterways in this country have been impacted by biological invasions. Clearly there is a need for national leadership to prioritize and coordinate activities among the different federal and state agencies. A stable, permanent entity with broad responsibilities and authority to meet biological invasion challenges is needed that will transcend different Administrations and provide protection for our natural resources.

In *Fading Forests I* (1994), we called for a comprehensive national program that would promote interagency cooperation at the federal level and cooperation between the federal and state governments. At the time, we did not believe that a new federal entity would be necessary to address biological invasions. We now re-evaluate this recommendation because of the rising danger from changes in international trade agreements and rapid increase in international trade, exacerbated by domestic policies explicitly favoring trade over protection and the continuing low priority to combatting forest pests. Furthermore, the experience of the NISC causes us to doubt that the needed comprehensive national strategy can be effected through cooperation among existing agencies alone. We now believe that a Center for Biological Invasions (CBI), a concept first proposed by Schmitz and Simberloff (2001), needs to be created that will address exotic forest invasive species as well as established and potential invaders of other systems. We believe that APHIS should be an integral part of the CBI, but units addressing exotic invasive species issues from other agencies would generally be maintained in their home agency and would coordinate with the CBI, *e.g.*, research and Forest Health Protection in the USDA Forest Service. We further recommend that the National Research Council be charged with conducting periodic reviews of the CBI's performance, as it can assemble the necessary expertise to properly evaluate CBI activities and is the most respected, nonpolitical group of scientists in the country. The CBI would implement the national invasive species management plan adopted and periodically revised pursuant to Executive Order 13112.

We envision the CBI to have five major divisions: (1) Prevention, (2) Research, (3) Ecosystem Protection and Restoration, (4) Economic Recovery, and (5) Information. Within each major division, subdivisions of specialties would exist as follows:

(1) Prevention

Prevention efforts can be successful only if the responsible agency has a mandate to focus solely on preventing introductions through a combination of exclusion and rapid eradication. CBI-Prevention would have such a clear mandate. It would be comprised of regulatory staff from APHIS and other agencies now responsible for regulating introductions of organisms other than plants, plant pests, or animal diseases. This division would be charged with preventing exotic organisms from entering the country, spreading within the country, and early detection and rapid eradication of new introductions as below.

Preventing exotic organisms from entering the United States – CBI-Prevention would retain its emphasis on exclusion using a combination of integrated vector management and aggressive rapid response strategies to newly detected introductions. CBI-Prevention would use **improved** risk assessment analysis to set priorities and evaluate proposed deliberate introductions, *e.g.*, horticultural plants, and some reasonable number of other specific imports for which adequate information is available and amenable to species-specific exclusion efforts. Traditional inspections by visual or other techniques would remain largely as verification and back-up, although these procedures might still be the principal strategy for some pathways, *e.g.*, incoming passengers' luggage. While CBI would presumably have the lead in these areas, it would consult closely with the Forest Service and other agencies responsible for maintaining the health and productivity of natural resources within the country.

Preventing the spread of exotic organisms within the United States – Movement of established exotic organisms within the United States, either deliberately or as hitchhikers on commodities and vehicles, is a significant contributor to their spread to new areas. State animal and plant inspectors are charged with ensuring organisms are pest-free prior to interstate shipments; however, those inspectors are under tremendous pressure from in-state industries to avoid interfering with their shipments. We believe that this system should be entirely federalized and become part of the CBI in order to offer better protection to both natural resources and the inspectors. This should provide for more consistent enforcement of State and federal laws and regulations among the states and allow for implementation of quarantines where appropriate.

Early Detection and Rapid Eradication – The CBI-Prevention would provide leadership for a greatly expanded effort to detect quickly incipient infestations and rapidly implement eradication programs. Natural resource agencies, such as the Forest Service, would have a formal role in advising and cooperating with the CBI in these matters. Information from non-governmental scientists and knowledgeable amateurs should be sought and evaluated.

Monitoring – CBI-Prevention would establish and coordinate a nationwide monitoring system for biological invasions to detect species that cryptically enter the country, monitor the spread of newly established and resident species, and evaluate the effectiveness of eradication and control mechanisms. We believe the actual monitoring should be done by federal and state agencies, supplemented by information from non-governmental scientists and knowledgeable amateurs. The CBI would also evaluate and disseminate the information.

(2) Research

The need for research to address biological invasions is recognized in the National Plan (National Invasive Species Council, 2001; <http://www.invasivespecies.gov/council/nmp.shtml>). Six different research areas are identified: (1) Identification, prevention and early detection; (2) Monitoring; (3) Invasion biology and impacts; (4) Control; (5) Ecosystem restoration; and (6) Research Infrastructure. Different components of these research areas lie scattered across various government agencies, universities, and the private sector. Nationwide the emphasis on these research areas is variable. Generally, research in response to a problem, *e.g.*, control, is more prevalent than prevention research, *e.g.*, policy. We propose that the CBI Research Division be charged with addressing:

- (1) Research needed to address all phases of a biological invasion ranging from prevention to restoration.
- (2) Critical expertise needed in the Risk Assessment Analyses process.
- (3) Integrating existing research in state (including universities) and federal governments and the private sector.
- (4) Research that can be conducted by external experts through a directed grant program.

The CBI Research Division should provide a stable base, i.e., long-term research, to identify and address the varied and changing challenges of biological invasions where a solution is needed. In-house research should be coordinated with external programs and when additional expertise is needed, direct funding to scientists through contracts and grants that are administered by the CBI. Personnel would be drawn from APHIS and other agencies as appropriate to staff three functional units: biology, economics, and policy.

Biology. Provide biological information on exotic species, including taxonomy and invasion biology; impacts on rural and urban ecosystems; strategies for ecosystem restoration; characterization of genetic diversity in host or displaced species and corresponding germplasm collections; and detection, eradication, and control research.

Economics. Economic analyses of the impacts of currently established invasive exotic species; and species that could be introduced in the course of existing or proposed new trade relationships or as a result of changes in international treaties and accords and federal and state laws; and changes in regulations and policies that affect the ability to prevent, eradicate, and/or control exotic invasive species.

Policy. Examination of international, federal, state, and local laws, regulations, and policies that affect the ability to prevent, eradicate, and/or control exotic invasive species; recommend changes based on biological information and economic analyses of invasive species impact.

(3) Ecosystem Protection and Restoration

Ecosystem protection against newly detected invasive species, resident exotic invasive species that suddenly emerge as significant problems, and well established exotic invasive species should be an integrated effort between federal, State and private organizations and agencies, when applicable.

Control of Established Forest Invasive Species

The Forest Service would continue to lead research and application of control measures in the United States. Control measures can range from short-term mitigation procedures such as spraying GypChek® to suppress gypsy moth populations to long-term approaches such as breeding to incorporate resistance into host plants. As a federal agency, the Forest Service can provide the stability needed to develop the long-term solutions needed for resident exotic invasive species. The work should be in active collaboration with other federal agencies, e.g., the National Park Service, state forestry divisions, and universities. Other interest groups that are affected by the decline of America's forests or contribute to the threat by importing items which could carry invasive species organisms should contribute knowledge, funds, public education efforts, and other resources to improving our understanding of and efforts to contain exotic invasive species of trees. These interest groups would include the nursery, wood products, shipping, and recreational industries; universities, state and federal natural resource and conservation organizations.

Unfortunately, the financial and staffing shortfalls for the Forest Service that we decried in our earlier report have grown worse. The Forest Service received only \$35.5 million for invasive species programs in FY 2001 (NISC data). Funding for the Forest Service Research Branch, which examines questions ranging from basic investigations with broad application to highly targeted applied studies, has stagnated at \$8.6 million for more than five years. Forest Service staff have documented funding needs of \$30 million, almost four times as much. The effects of the funding shortfall are exacerbated by increasing costs, shifts in emphasis, and Congressional earmarking of the funds to specific projects. In constant dollars, Forest Service research funding has fallen 8.4 percent compared to 1980. Forest-protection research fell by 56 percent during this period (NRC 2002b).

Perhaps even more critical than a stagnant budget is the loss of expertise from Forest Service Research. Between 1985 and 1999, the number of entomologists has fallen from 70 to 31; the number of plant pathologists from 50 to 22. Similar trends are present in university forestry schools, thereby creating a shortage of trained personnel to replace retiring Forest Service entomologists or pathologists. This trend is further augmented by filling the open positions with scientists in more basic research, *e.g.*, molecular biology, in an effort to attract more funding from outside sources. We support the NRC's (2002b) recommendation that the Forest Service restore its expertise in the core areas/foundation disciplines of traditional biology.

The Forest Service also needs adequate funding to allow the agency to quickly research newly detected forest-invasive species. At present, the Forest Service's vital work targeting Sudden Oak Death and control measures for the Asian longhorned beetle are enabled by "emergency" funds, which are uncertain from year to year. Developing methods of eradication or control for newly emerging forest invasive species can take years of research. To end prematurely the necessary research that would lead to eradication/control of an exotic invasive species in an early stage of establishment will only exponentially increase the inevitable economic costs and ecosystem disruption. A strong Forest Service research presence in these areas is needed to assist the National Forests in addressing exotic invasive species and to transfer technology to state and private forestry and forest health protection personnel who assist state agencies; private industry and organizations; and individuals with exotic-invasive-species problems.

In testing and adopting control methods, all parties must balance the methods against the environmental impact(s) of the exotic pest. It is important to emphasize that environmental and financial costs are associated with both control measures and non-response to exotic pest damage. For example, biological control using an exotic organism may have an environmental impact greater than damage caused by the offending exotic pest. A difficult, careful balancing of these countervailing environmental costs should be inherent in any exotic pest strategy.

Ecosystem Restoration

Ecosystem restoration after an exotic-based disturbance usually receives little attention, in comparison to eradication and control actions (Schlarbaum *et al.*, 1999). Landscapes are resilient, so when trees die as a result of attack by invasive species, new vegetation quickly fills the gaps. Restoring areas damaged by invasive species to their natural state begins with management of the invading non-natural vegetation, management of natural regeneration of desired vegetation, and augmentation of desired species to the correct proportion in the landscape through planting or reintroducing the host species if completely decimated by a host-specific invasive species. If planting is necessary, it is desirable to use genotypes that are from the same locality to restore the local genetic architecture. This is particularly true if the affected land base is within a national park. Utilization of local genotypes is more difficult when a host-specific invasive species has extirpated the tree species from the landscape, and there are few surviving pockets of local genotypes.

Germplasm preservation of local genotypes through *in situ* preservation (preferred when possible), long-term seed storage, or establishment of an *ex situ* planting to bear seed is the answer to this problem, but unfortunately it is rarely incorporated into an exotic-invasive-species strategy. Actions toward ecosystem restoration should begin when eradication procedures fail to eliminate a newly emerging exotic invasive species that has the capability of reducing or destroying the genetic diversity in a species. The CBI Research Division should monitor all biological invasions, determine the genetic diversity in host species or organisms and recommend germplasm preservation when local gene pools are at risk. The traditional home of such activities for forest species has been within the Forest Service. The CBI should coordinate with Forest Service and local officials to ensure that collection of germplasm for storage is made to provide locally adapted genotypes for restoration when controls are developed or for use in developing host-plant resistance (*cf.* Schlarbaum *et al.*, 1999). Through collaboration with the National Center for Genetic Resources Preservation, seed storage can be made in the National Seed Storage Laboratory at Ft. Collins, Colorado. If storage is not feasible, *ex situ* or *in situ* seed production areas should be created. The same activities should be conducted for gene pools endangered by resident exotic invasive species, if the germplasm is still present. Creation of a land base for seed production is best tied to state or federal programs

that can reserve land for this purpose and will work cooperatively with the CBI. Creation and management of seed production areas are expensive, long-term investments and should be funded as a line-item in the agency's budget supplemented by a CBI long-term grant.

Unfortunately, support for the Forest Service's Genetic Resources Programs has been deteriorating since 1992 (Schlarbaum, 1999) and some programs have closed. As the Forest Service shifted emphasis from timber management to ecosystem management, planting significantly decreased, and administrators and planners failed to recognize the significant role of the Genetic Resources Programs in responding to exotic forest pests.

Without strong Forest Service Genetic Resource Programs, ecosystem restoration will be difficult and very expensive. Essentially, there is no reliable fallback for this type of work in state and federal governments. Only approximately one-half of the states have tree improvement programs, and they vary in size and capabilities according to fluctuating state budgets (Schlarbaum, 1999). Thirty years ago, many land grant universities had tree improvement programs, but these have shrunk to only a handful of programs actively involved in traditional selection, breeding, and field-testing programs. There are several university-industrial tree improvement cooperatives, but they usually work only with a narrow range of timber species commercially important to the cooperators. Private industry is not a realistic option, as a number of species are not valuable for timber.

(4) Economic Recovery

Within the external grants program, the CBI should have the funds to make grants available to communities and organizations to help recover from losses due to exotic invasive species problems. Economic stimulus packages meeting criteria set by the CBI should be available to respond to such problems as changes in hydrology, watersheds, agricultural use, pastures, and loss of biodiversity. The packages should also encompass restoration of ecosystems if appropriate. The focus should be on a problem or problems at the county level or small, multi-county areas that will ensure involvement by the general public and thereby serve a dual purpose of problem resolution and public education. Communities could hire coordinators to assist private landowners in cost-share programs that would ultimately lead to restored ecosystems.

(5) Information

A significant responsibility of the CBI should be assembling and maintaining data bases related to exotic invasive species and linking them to a federally sponsored grid of information centers around the country. The data should be open and accessible to non-governmental scientists and the public. It should utilize information from the "gray" literature as well as peer-reviewed sources (National Research Council, 2002a). Following some of the suggestions of National Research Council (2002a), we feel that the data base(s) should include:

1. A central repository of information on resident North American exotic species and exotic species that could potentially cause problems if established, *e.g.*, species designated by risk assessments or other research.
2. Information and maps to show the distribution and progressive invasion of new and resident exotic invasive species.
3. A standardized literature synthesis on the natural history of resident and potential exotic invasive species.

We feel that new information should be summarized in the forms of news alerts and a periodic newsletter sent electronically to federal information centers; Agricultural Extension Service offices; appropriate offices in federal and state agencies; and private industry, organizations, and individuals who request the service.

Closing Statement

North American forests have suffered enormous damage caused by insects and diseases introduced from abroad. Already, several tree species have been virtually eliminated as integral components of the forest, and numerous others are suffering severe declines. Losses from introduced pests identified in the past decade could dwarf currently perceived impacts: the Asian longhorned beetle could cause more than \$600 billion in damage over the next 30 years. Ongoing and projected expansions in trade greatly increase the risk that additional exotic insects and disease pathogens will be introduced. This danger is heightened by international trade agreements and national trade promotion policies that restrict application of effective phytosanitary safeguards.

Minimizing damage from exotic forest pests is already a great challenge, but it will become significantly more difficult and expensive unless steps are taken now to address both short- and long-term solutions. Relatively minor changes in specific APHIS regulations in the short term, can substantially reduce the risks of new introductions. Opportunities also exist for amending restrictive international trade agreements. American policy makers and other stakeholders should focus immediately on rectifying these flawed policies.

In the longer term, responsible agencies and the Congress must accept the importance of ensuring the health of our forests by adopting a much higher level of protection than APHIS' current target of "negligible" risk. Furthermore, the national effort needs to be expanded and better coordinated. For these reasons, we support not only an invigorated National Invasive Species Council,¹ but also creation of a National Center on Biological Invasion.

Finally, programs to prevent the introduction of forest pests and to respond once pests are introduced require increased funding; they should be on a par with the funds now allocated to protecting agriculture from introduced pests.

Bringing about the needed changes, both amending specific measures and changing underlying policies and governmental agencies deserve the support of natural-resource professionals, industries that rely upon natural resources, and private-citizen groups concerned with the environment. As Gifford Pinchot, architect of the Forest Service, recognized a century ago,

"[The USDA Forest Service] . . . rests upon the fact that in a government such as ours no movement can be permanently successful unless it is based on a general public recognition of its importance and utility".

Proceedings of the American Forest Congress (1905)

America's forests provide a myriad of natural, economic, cultural, and philosophical values. We believe that ensuring continued healthy forests for the future deserves the support of all who value the forests, whatever their specific motivation. We urge our readers to support the changes that we propose in relevant laws, policies, and treaties.

In coming months and years, the American public has unparalleled opportunities to influence both international and national policies. Negotiators are still developing the text for the Free Trade Agreement of the Americas. Negotiations over new terms for agricultural trade could provide an opportunity to explore amendment of the World Trade Organization's SPS Agreement. The USDA Animal and Plant Health Inspection Service is strengthening its regulations of two of the most important pathways, imports of wood packaging and living plants. Individuals, associations, and natural-resource based industries should seize these opportunities to influence policies that will shape the future of our forests for generations to come.