

U.S. Department of Agriculture Report to the Invasive Species Advisory Council for the spring 2015 meeting on May 20-22, 2014

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Date: **April 28, 2015 and amended 17 May 2015**

A. USDA Progress on ISAC recommendations from the October 2003 meeting

- 1. ISAC recommendation: Increase efforts in economic analysis to make the case for investments in invasive species efforts.**

The Economic Research Service (ERS) is continuing the “Program of Research on the Economics of Invasive Species Management” (PREISM) initiated in FY03. PREISM supports economic research and the development of decision support tools that have direct implications for USDA policies and programs for protection from, control/management of, regulation concerning, or trade policy relating to invasive species. Program priorities are selected through extensive consultation with APHIS, OBPA and other agencies with responsibility for program management.

For example, ERS developed a pest-ranking decision tool for APHIS to determine which pests would be on its 2004 and 2005 Federal-State Cooperative Agricultural Pest Survey (CAPS) list, making transparent the basis for selecting the pests for which State cooperators could receive targeted pest surveillance and detections funds. Also, the rapid spread of soybean rust in South America prompted ERS, in April 2004, to publish a study of the economic and policy impacts of its windborne entry into the United States. USDA used the ERS analysis in refining rapid response strategies when APHIS confirmed the presence of soybean rust on November 10, 2004 in Louisiana. ERS extended this work to examine the value to producers of USDA’s coordinated framework to detect and

report the presence of Asian soybean rust in different producing areas and released a report in 2006.

In addition to ERS-led analyses of invasive species issues, PREISM allocated about \$6.8 million in extramural research cooperative agreements through a peer-reviewed competitive process in FY03-08. About \$1.1 million per year were allocated for extramural agreements in FY05 and FY06; \$950,000 was allocated in FY07 and \$970,000 in FY08. No funds have been allocated since FY09. The last extramural research projects were completed during FY13.

As part of its continuing work, ERS supported workshops and conducted research on the economics of managing glyphosate-resistant weeds. ERS provided financial support to the "National Summit on Strategies to Manage Herbicide-Resistant Weeds" in May 2012, conducted by the National Academy of Sciences, and conducted a workshop on the economics of glyphosate-resistant weed management at its own facilities in November 2013. ERS plans to release an Economic Research Report titled, "The Economics of Glyphosate Resistance Management in Corn and Soybean Production" in March 2015. ERS is also conducting economic research on pollinators, including completion of a Congressionally-mandated study in August 2014, "An Economic Valuation of Honeybees in the United States."

PREISM-funded researchers addressed important issues. For example, a Virginia Polytechnic Institute and State University research team collaborated with APHIS staff to analyze a rule to allow importation of avocados from Mexico, using a framework developed under a PREISM-funded agreement. The framework and economic analysis were published in the Federal Register with the APHIS rule. PREISM-funded researchers, as part of their projects, are collaborating with agencies to address invasive species issues and decisions, such as the coordination of prevention and control strategies for Brown Tree Snakes and *Miconia calvescens* in Hawaii, management of cheat grass, management of diseases transmitted between livestock and wildlife, insect resistance

management in strawberry production, responses to outbreaks of foreign animal diseases, and prioritizing invasive plant management by public agencies. At the invitation of the Council on Food, Agricultural, and Resource Economics (C-Fare) and the Weed Science Society of America (WSSA), Muniswamy Gopinath (Oregon State U.) and Bruce Maxwell (Montana State U.) briefed congressional staff about their PREISM-funded projects on May 5, 2006.

ERS organized 8 workshops from 2003 to 2011 to provide forums for dialogue on economic issues associated with agricultural invasive species.

Following are some findings from PREISM-funded research projects:

- Prevention and management resources should be allocated to species and strategies with the highest return (in terms of damage reduction over time). Ideally, marginal benefits and costs should be equal across species and strategies.
- Decision-support tools that follow sound economic principles and reveal underlying scientific assumptions and value judgments provide a basis for expert and stakeholder involvement in decision-making and promote efficient allocations of funds.
- Optimal invasive species management strategies depend upon the stage of the invasion and associated rates of growth and spread. Eradication may be optimal for small invasions; reduction to a containment level for larger invasions. If eradication is feasible, the effort will reduce discounted damages more if it occurs early when populations are small. Delays result in more damages. If total cost increases rapidly as population increases, eradication when the population is small followed by prevention may be the best strategy.
- Under-funded eradication or management efforts can be cost-ineffective or wasteful, with little or no effect on invasive species growth and total damage. Higher initial

expenditures can reduce long term damages and control costs, even if the species is not eradicated.

- For established invasive species infestations, per unit costs of removal can increase as populations decrease or become more isolated, making complete eradication difficult or cost-inefficient. In some cases, accommodation to low levels of invasion is economically preferable to the high cost of eradication. The higher is the cost of removal, the larger the residual population that will remain which will need increased surveillance and continual management.
- Higher invasive species infestation or population growth rates reduce benefit-cost ratios of control efforts, and at high enough rates, control might not be worthwhile. If population has surpassed that of maximum growth rate, the best strategy could be a pulse-like effort that drives populations below a critical population level and growth rate, followed by containment strategy.
- Probability of occurrence maps for invasive weeds based on GIS and other inventory or survey data and related population growth rates can improve weed management efficiency by reducing: 1) costs by targeting sites to monitor invasiveness, and/or 2) damage by initiating control of highly invasive populations before they spread.

Coordination of regulations across U.S.-Canada, State, and provincial boundaries could: 1) more effectively reduce the cross-border spread of exotic horticultural plants that become invasive, and 2) reduce incentives for cross-border firm relocations to take advantage of more lenient regulations.

Ecological and agronomic differences influence cross-State differences in noxious weed and weed-seed lists, but stakeholder lobbying also has significant effects.

Important PREISM outputs and accomplishments are documented in the 2003-2011 PREISM activities report (<http://www.ers.usda.gov/publications/AP/AP056/>).

Beginning in 2007, **NIFA's** National Research Initiative (NRI) Program, Biology of Weedy and Invasive Species in Agro ecosystems, has required an economic component in the integrated projects it funds. Specifically, the focus of such programs is the development, delivery, and implementation of ecologically-based, invasive species management programs (e.g. use of cover crops, grazing, tillage, and biocontrol agents) that include economic decision support tools to evaluate tradeoffs of different management strategies. A total of \$4 million was awarded such projects. This priority was continued in the Agricultural and Food Research Initiative (AFRI) grants program in FY09 with an additional priority focusing on the abundance of weedy and invasive species and the individual and/or collective impacts of these species on a broad suite of ecosystem services, both market and non-market, and that can be used to evaluate tradeoffs of different management strategies.

Although the Biology of Weedy and Invasive Species in Agro ecosystems Program was discontinued in AFRI in FY10, a new grant program was offered through the AFRI Foundation Program in FY11, FY12, FY13, **FY14 and FY15 entitled "Controlling Weedy and Invasive Plants"**. This priority area supports projects that focus on compelling scientific questions underlying current issues in weed and invasive plant management in crops, managed forests and rangeland including:

- Ecological processes related to biocontrol and/or integrated pest management;
- The evolution, spread and mitigation of herbicide resistance based on an understanding of ecological fitness and gene flow; or
- Other ecological or evolutionary studies that would inform weed management strategies, including links between agronomic practices and weed problems.

USFS researchers examine current knowledge of the Economic Analysis of Biological Invasions in Forests. USFS researchers

have completed studies which develop and apply methods to assess economic values impacted several invasive species, including Emerald Ash Borer (EAB), Gypsy Moth, and Woolly Adelgid (HWA). Biological invasions of native forests by nonnative pests result from complex processes that are difficult to forecast or predict. Predictive models are limited partly because of a lack of information on economic consequences of invasive pest infestations. Forest Service researchers working with university, and private contractor colleagues described economic approaches for analyzing pre-invasion and post-invasion management of biological invasions under conditions of risk and uncertainty. All publications are available in TreeSearch (www.treesearch.fs.fed.us)

For **NRCS** the economic analysis of the benefits of providing more funds for addressing invasive species versus other natural resource priorities is the responsibility of the individual NRCS State offices in their deliberations with partners in the **individual State Technical Committees**. Each State, through the input of all members of the State Technical Committee and the use of economic analyses, determines the natural resource issues that have the highest priority, and they commit their funds accordingly.

B. USDA progress on ISAC recommendations from the March 2004 meeting

2. ISAC recommendation: What are NISC agencies doing to avoid harm?

USDA has eight agencies included in its invasive species portfolio: Forest Service (USFS), Natural Resources Conservation Service (NRCS), Animal and Plant Health Inspection Service (APHIS), Agricultural Research Service (ARS), Economic Research Service (ERS), Foreign Agricultural Service (FAS), Farm Service Agency (FSA), and National Institute of Food and Agriculture (NIFA, formerly CSREES, the Cooperative State Research, Education and Extension Service).

Securing input from the USDA agencies, the USDA Senior Invasive Species Coordinator created the USDA DO NO HARM REPORT, a report to ISAC and NISC, by fiscal year, including three categories of activities:

- a) Invasive Species Program activities USDA agencies are carrying out to do no harm;
- b) The way in which, when they do carry out other agency programs activities, they are also designed to do no harm; and
- c) A list of activities that ARE doing harm and the future actions the agency will take to change the activities so that they do no harm.

Within the above categories, agencies include their own activities as well as activities that are coordinated with other Federal agencies, per the mandate under the Invasive Species Executive Order.

The following Do No Harm reports have been presented to ISAC (meeting date in parenthesis):

- FY04 report NRCS, APHIS, ARS, CSREES & ERS (Oct. 04)
- FY04 report for US Forest Service (Feb. 05)
- FY05 report for NRCS, APHIS, CSREES, ERS & FS (Oct. 05)
- FY05 report for ARS (April 06)
- FY06 report for FS, NRCS, CSREES & ERS (May 07)
- FY06 USDA (APHIS) Do No Harm Report Part 2 (Oct. 07)
- FY07 USDA Do No Harm Report (May 08)
- FY08 USDA Do No Harm Report (May 09) for APHIS, ARS, ERS, CSREES, ERS, NRCS & USFS.
- FY09 USDA Do No Harm Report (Feb. 10) for APHIS, ARS, ERS, NIFA, ERS, NRCS & USFS.
- FY10 USDA Do No Harm Report (March 2011) for APHIS, ARS, ERS, NIFA, ERS, NRCS & USFS.
- FY 11 USDA Do No Harm report (dated February 2012) for APHIS, ARS, ERS, NIFA, NRCS & USFS.
- FY12 USDA Do No Harm report (dated 8 January 2013) for APHIS, ARS, ERS, NIFA, NRCS and USFS.
- FY13 USDA Do No Harm report (dated 6 January 2014) for APHIS, ARS, ERS, NIFA, NRCS and USFS.
- FY14 USDA DO No Harm report (dated 27 January 2015) for APHIS, ARS, ARS/NAL, ERS, NIFA, NRCS and some USFS programs. It does not include USFS/NFS.

Copies of all the USDA reports are available online at <http://www.invasivespeciesinfo.gov/resources/orgfedusda.shtml>

- 3. ISAC recommendation: NISC should request all Federal agencies to identify existing grant programs, cooperative agreements and other mechanisms that are potential sources of funds for invasive species projects.**

USDA compiled and published a comprehensive document since 2005 with grant opportunities for work on research, technical assistance or management of invasives. The document has been updated annually. The “2015 USDA Grant and Partnership Programs That Can Address Research, Technical Assistance Prevention and Control” was published on 19 November 2014. ISAC members received copies. It was distributed widely. Past reports are available at www.invasivespeciesinfo.gov

C. USDA Progress on ISAC recommendations from the October 2005 meeting

- 4. ISAC recommendation: NISC policy liaisons provide guidance to ISAC Leadership and Coordination Subcommittee regarding issues the subcommittee should address.**

USDA would appreciate ISAC’s support to (a) promote strengthening Federal collections, identifications and **systematics** efforts and capabilities; (b) promote increasing support for research (knowledge and models) and increasing the awareness of decision makers about the **economic impacts** of invasive species; and (c) **evaluating biological control programs in USFS, ARS and APHIS.**

The **USDA requested ISAC advice on the biocontrol programs (research, policy and management) within three of its agencies: APHIS, ARS and USFS.** Documents from the agencies summarizing the programs to date and their plans for the future have been prepared for the ISAC Research Subcommittee’s deliberations and potential advice. The ISAC Research Subcommittee heard presentation by APHIS during the May 2014 ISAC meeting. Additional work is expected in the future.

D. USDA Progress on ISAC recommendations from the September 2006 meeting

- 5. ISAC recommendation: That NISC support adequate and continuing funding and staffing for classical systematics research, education and operations – including the care and maintenance of systematics collections.**

Systematics clarifies the origins and movements of invasive pests, parasites and pathogens. Advances in biotechnology (including DNA sequencing, comparative genome analysis, distributed databases and high speed telecommunications) can substantially strengthen and accelerate governmental responses to these threats.

ARS Systematics Funding:

FY 2008 - \$19,439,000
FY 2009 - \$19,682,000
FY 2010 - \$20,455,000
FY 2011 - \$20,578,000
FY 2012 - \$20,398,000
FY 2013 - \$19,155,000
FY 2014 – \$20,572,000
FY 2015 Estimate – \$20,683,000

Agricultural productivity depends on access to key inputs (rich soils, fertilizers, water, and energy), the inherent genetic potential of crops and livestock, and effective defenses against diseases, pests, and environmental extremes that reduce agricultural production and producer profitability. The capacity of agricultural research effectively rests on a dynamic foundation of invaluable living animal, plant, and microbial genetic resources, and research tools in the form of scientific collections of preserved biological specimens. Such scientific collections are essential for ARS scientists, not only to advance the science of systematics, but also identify new invasive threats and to improve the success of control measures. Not all organisms respond the same way to control measures, thus it is imperative to correctly identify new pests. **In 2014, the White House Office of Science and Technology Policy issued a Memorandum calling for Federal Agencies to improve the management of their**

scientific collections, and ARS has been developing a policy to ensure the long-term preservation, maintenance, and accessibility of its systematic collections. ARS will be hiring four new insect taxonomists as soon as possible. Three replace vacancies, and one is a new position.

Addressing systematics shortfalls in the area of operations, APHIS has procured funding and began hiring in FY2014 for 24 new pest identification personnel to be located at ports of entry across the U.S. APHIS will also hire five new national taxonomists who will aid in curating and will be colocated with major research specimen collections. These 29 positions will increase efficiency in identifying exotic species arriving from foreign origins and potential new introductions of invasive plant pests detected in the U.S. by domestic surveys.

E. USDA Progress on ISAC recommendations from the May 2009 meeting

6. ISAC Recommendation: Establish the Sentinel Plant Network. Support and facilitate the establishment of the Sentinel Plant Network to facilitate the early detection reporting and prevention of pests and pathogens.

USFS R&D led the development of **Sentinel Plant Network (SPN)** which now includes over 160 member gardens in 43 states, the District of Columbia, three Canadian provinces and Mexico. It has now been turned over to the American Public Gardens Association (APGA) for administration and future development. The SPN is continuing to recruit American Public Gardens Association (APGA) gardens and other stakeholders in the remaining states so that the program has some representation throughout the country.

SPN completed three more Regional Workshops in FY14. Collectively, these workshops have served over 140 participants from more than 69 public gardens and several other stakeholder organizations that include cooperative extension, diagnostic labs, regulatory officials and the green industry. Through a combination of lecture presentations and breakout sessions, each workshop:

- provided attendees with an overview of how to access the diagnostic expertise of NPDN
- put SPN's educational outreach materials to work in their gardens' interpretation and programming
- promoted the use of SPN's train-the-trainer curriculum to introduce their communities to the First Detector Network
- dedicated time to a hands-on activity about the best practices of pest / pathogen scouting and the fundamentals of diagnostic triage

Customizing phytosanitary standards e-learning courses to North America *Achievements*

The Food and Agriculture Organization's (FAO) developed two interactive e-learning courses – *Good practices for forest health protection* and *Trade in forest commodities and the role of phytosanitary measures* – for anyone wishing to learn about the importance and relevance of phytosanitary measures and to make the key messages of the *Guide to implementation of phytosanitary standards in forestry* even more accessible and useful. The project was completed in March 2014 with the help of input from subject matter experts from Canadian Forest Service, and US Forest Service. The courses are now available in both English and French. The FAO has approved the North American versions of the two e-learning courses and is prepared to post them on their website.

<http://www.fao.org/forestry/foresthealthguide/76169/en/>

7. ISAC Recommendation: Revise and draft NEPA guidance. ISAC recommends that NISC and the Council on Environmental Quality (CEQ) revise and draft guidance under the National Environmental Policy Act (NEPA), and make it available for public comment by October 1, 2009.

USDA and APHIS participated in the latest review by NISC of the proposed invasive species guidance in 2009. The NISC staff has sent the report to CEQ and is awaiting CEQ action.

8. ISAC Recommendation: Provide data on NISC member agencies' invasive species budgets. ISAC recommends that NISC member agencies annually

provide in writing at the fall ISAC meeting their invasive species budgets for the preceding fiscal year in actual dollars and the budget for the current fiscal year (requested and enacted). The budget document should be divided into seven categories: Prevention, EDRR, Control and Management, Restoration, Research, Education and Public Awareness, and Leadership/International Coordination.

Please see the updated budget report starting on Page 48 of this document with current information up to the FY16 budget.

F. USDA Progress on ISAC recommendations from the June 2010 meeting

9. ISAC Recommendation: That agency partners submit their annual reports according to the deadlines specified in Performance Element OC.7.1.1 of the NISC 2008-2012 National Invasive Species Management Plan, which reads: *“Each NISC member submits one formal (draft and final) report per fiscal year, tracking the implementation of the NISC 2008 Plan. NISC Staff will complete a streamlined reporting template within three months. Annual summary report by NISC is available on its website by February 28 of each year along with the individual NISC member reports.”*

USDA agencies submitted to NISC their reports related to their implementation of activities in the National Invasive Species Management Plan of 2008. ARS, NIFA and ERS have submitted their report for FY14. At present, the other USDA agencies are currently compiling their accomplishments of activities for the FY14 report. NISC has not published the report tracking all NISC agencies accomplishments implementing the Plan.

10. ISAC Recommendation: That NISC adopts the Invasive Species and the Green Economy paper and recommendations within (see below).

We (ISAC) call on the member Departments and Agencies of the National Invasive Species Council (NISC) and potential partners to:

□ Establish a national survey of invasive species, to be administered at the state-level. Support this program by substantially increasing Federal and state jobs at all technical levels to survey, identify, map, catalog, and model patterns/trends of invasive plants and animals. Include the existing state and regional invasive species committees/councils in the development and implementation process. Place priority on invasive species known or projected to have substantial impacts.

APHIS assists state partners via its National Cooperative Agricultural Pest Survey Program which uses appropriated funds and with funds from Section 10007 of the 2014 Farm Bill.

The Cooperative Agricultural Pest Survey (CAPS) Pest Detection program **strengthens APHIS' emergency preparedness efforts through the early detection of exotic, harmful, or economically significant plant pests, pathogens, and noxious weeds.** Discovering these pests before they spread can prevent small outbreaks from becoming emergencies. APHIS and its State cooperators carry out surveys for pests of regulatory significance through the CAPS program. The CAPS Program enables APHIS to maintain a comprehensive network of cooperators and stakeholders to facilitate its mission of safeguarding America's plant resources.

In FY 2014, APHIS and cooperators conducted a total of 253 commodity- and taxon-based surveys in 50 States and 2 territories (with 116 surveys conducted by States and 137 by APHIS). The program targeted 117 high-risk pests of national concern for survey in corn, oak, pine, small grains, soybean, and nursery crop commodities, as well as exotic wood boring bark beetles and cyst nematodes, among others, representing 85.5 percent of the target pests suggested for survey in the 2014 CAPS Survey Guidelines. Including pests of State priority, the Program targeted 247 unique

pests for survey in FY 2014, surpassing its performance target of 200. Surveys consisted of multiple pests for efficiency and economy of survey, with an average of five to six pests per survey and two to three surveys per State.

With sequestration and no increases in funding to the line item, the Pest Detection program leveraged funding in the Farm Bill Plant Pest and Disease Management and Disaster Prevention (Section 10007) Program to enhance survey efforts. Specialty-crop surveys in apple, citrus, grape, orchard crops, palm, solanaceous crops, and stone fruits, in addition to mollusk and Khapra beetle surveys and others, were conducted. The addition of these surveys to the Pest Detection effort enhanced the overall performance of the Program by adding 108 additional surveys in commodities that were not able to be funded through the CAPS Program. The enhanced Farm Bill funding allowed the Program to increase the number of high-risk pests of national concern that were targeted for survey to 124, now representing 86% of national priority pests suggested for survey in the 2014 CAPS Survey Guidelines. The number of unique pests that were targeted in FY14 increased to 334 with the enhanced effort.

A total of 17 new species in the United States were detected and confirmed through Pest Detection surveys or otherwise reported to APHIS through entry in the National Agricultural Pest Information System database as new or re-introduced to the United States. All 17 new plant pests were significant and listed as reportable/actionable and as quarantine pests where action would be taken if detected on conveyance at a port of entry. Examples include *Syricoris launana* (Dark strawberry tortrix) in Oregon, *Podosphaera caricae-papayae* (a powdery mildew fungus) and *Orobanche aegyptiaca* (Egyptian broomrape) in California, *Eriococcus lagerstroemiae* (Crepemyrtle scale) in Texas, *Lycorma delicatula* (Spotted lantern fly) in Pennsylvania, *Helicoverpa armigera* (Old world bollworm) in Puerto Rico, and *Aceria tounefortiae* (an eriophyid mite) in Florida. The Program detected 88% of the significant pest

introductions before they spread from the area of original colonization and caused significant economic or environmental damage. Only one of these pests (*Helicoverpa armigera* in Puerto Rico) were high-risk pests of national concern specifically targeted for survey through the two programs; in effect, demonstrating freedom from high-risk pests nationally.

2014 Farm Bill Section 10007

Section 10007 of the Farm Bill combined the National Clean Plant Network (NCPN), formally Section 10202, with the Plant Pest and Disease Management and Disaster Prevention (PPDMDP) program, formally Section 10201, and provided additional funding for these two programs. The Farm Bill made the NCPN a permanent program with dedicated funding. The NCPN provides reliable sources of pathogen-free planting stock of high-value specialty crops such as fruit trees, grapes, citrus, berries, hops, roses and sweet potato. Through Section 10007, APHIS also provides Commodity Credit Corporation funding to cooperators who suggest projects aimed at strengthening the Nation's infrastructure for pest detection and surveillance, identification, and threat mitigation, as well as safeguarding nursery production. The 2014 Farm Bill increased the combined funding for these two programs to \$62.5 million through fiscal year (FY) 2017, and to \$75 million in FY 2018 and beyond. After sequestration, \$57.9 million is available for FY 2015. At least \$5 million must go towards the NCPN.

In FY13, under the 2008 Farm Bill Section 10201, APHIS funded 398 projects with hundreds of cooperators in 50 state departments of agriculture, universities, other agencies in USDA, and non-profit organizations. Of the many projects funded, examples include: surveys for pests of national significance such as *Phytophthora ramorum*, grape pests (including the European grapevine moth), and honey bee pests; training canine teams for domestic survey detection activities in California and Florida, and for detecting snails in cargo and rail yards; developing, provide training for, and deploying survey procedures and tools that improve our ability to rapidly detect and accurately identify pests of regulatory significance, and development

and implementation of a National Survey Supply Program to oversee timely procurement and delivery of quality survey supplies to APHIS field personnel and State cooperators; developing science-based, best-management, and risk-mitigation practices that exclude, contain, and control regulated plant pests from the nursery production chain as well as developing and harmonizing audit-based nursery certification programs; developing formal volunteer programs for exotic pest surveillance through outreach and education, and Tribal Nations engagement and involvement dealing with plant pest issues across the U.S.; and rapidly responding to plant health emergencies, such as Mexican Fruit Fly in TX, European Grape Vine Moth eradication efforts in CA, Citrus Canker in LA, Oriental Fruit Fly in CA, and the detection of Cucumber Green Mottle Mosaic Virus in CA.

Over the last several years, Section 10201 projects such as these have played a significant role in many USDA successes in protecting American agriculture and educating the public about the threat of invasive species. Section 10201 funding directly strengthens and protects agriculture production and protection in all 50 States. This Farm Bill provision truly supports and enhances the Federal and State partnership in safeguarding the agriculture production capacity of the United States.

Though unfunded in FY 2013, the **National Clean Plant Network (NCPN)** continued operations and support by revising and extending FY 2012 cooperative agreements. NCPN centers continued to provide introduction, diagnostic, therapeutic, and foundation plant services to industry for specialty crops including fruit trees, grapes, berries, citrus and hops; including continued education/outreach initiatives as well as economic studies to assess the value of using clean plant materials. Since starting activities in FY 2009, NCPN has networked and **supported 23 clean plant centers or programs at 20 universities or governmental entities in 15 States.**

Nonnative plant species have invaded over 24 States. US Forest Service researchers found introduced plant species on two-thirds of

forest inventory plots across 24 states in the northeast and Midwestern U.S. Vegetation data from 1,302 forest inventory plots revealed 305 introduced species, with multiflora rose being the most common species. Sixty-six percent of all forested plots had at least one introduced species. <http://www.nrs.fs.fed.us/pubs/gtr/gtr-nrs-p-105papers/42schulz-p-105.pdf>

The **National Resource Planning Act Assessment** was released, which every ten years outlines the state of the nation's forest resources and trends in forest resource use. The report can be accessed at: <http://www.treesearch.fs.fed.us/pubs/41976/>

The NRCS maintains, through its National Plant Data Center in Greensboro, NC, the **PLANTS database** (<http://plants.usda.gov>) which, in addition to providing up-to-date descriptive and distribution information for plants of the U.S., provides invasive species lists for all States and references for more information about each of the invasive species. The PLANTS data is used as an authoritative source for the invasive plants in the U.S. by the global Invasive Species Compendium.

□ Supplement the Federal and state workforce by creating contract jobs in the private sector and offering grants to encourage business innovation and entrepreneurship (e.g., native plant and seed companies, ecosystem restoration, invasive species mapping and control services, and education/outreach programs).

USFS-National Forest System has outlined a national approach to create job opportunities in the private sector to detect, prevent, control, and eradicate aquatic and terrestrial invasive species across the National Forest System. This approach capitalizes on the growth of the invasive species management industry and the large amount of work that is not inherently governmental. It also built job-creating partnerships to help raise awareness in the communities about the threat of invasive species to the national economy. In addition, over \$1 million in grants were awarded by the National Forest System invasive species program in cooperation with the National Fish and Wildlife Foundation's Pulling Together program for the establishment and support of Cooperative Weed Management Areas. Each of

these grants provide funding for hiring personnel in the local communities to manage invasive plants and build cooperative efforts in the community.

The NRCS, with funding through its Environmental Quality Incentives Program (EQIP), provides support for Technical Service Providers (TSPs). TSPs are individuals or businesses that have technical expertise in conservation planning and design for a variety of conservation activities, including management of invasive species. TSPs are hired by farmers, ranchers, private businesses, nonprofit organizations, or public agencies to provide these services on behalf of the Natural Resources Conservation Service (NRCS). Each certified TSP is listed on the NRCS TSP online registry, TechReg. The TSP registration and approval process involves required training and verification of essential education, knowledge, skills and abilities.

□ In order to counter the dramatic decline in taxonomic capacity (i.e. the decrease in the number of people trained to identify specific species), provide grants to support research/education/training in taxonomy as well as job creation for taxonomists and parataxonomists (people who lack formal higher-level education, but who are trained to undertake species identification tasks).

In FY13, the following web-based identification tools were designed, developed, and delivered to APHIS PPQ's programs and external partners by PPQ's Identification Technology Program (ITP): *Antkey* [<http://antkey.org/>], *Hispines of the World* [<http://idtools.org/id/beetles/hispines/>], *Diabrotica ID* [<http://idtools.org/id/beetles/diabrotica/>], *Flat Mites of the World, Edition 2* [<http://idtools.org/id/mites/flatmites/>], and *Microlepidoptera on Solanaceae* [<http://idtools.org/id/leps/micro/>].

In FY14, PPQ's Identification Technology Program (ITP) delivered to APHIS PPQ's programs and external partners:

- two new web-based identification tools [*Microlepidoptera on Solanaceae* <<http://idtools.org/id/leps/micro/>> and *LepIntercept* –

An identification resource for intercepted Lepidoptera larvae <<http://idtools.org/id/leps/lepintercept/>>;

- significant updates to four web-based identification tools [*Longicorn ID* <<http://cerambycids.com/longicornid>>, *Hispines of the World* <<http://idtools.org/id/beetles/hispines/>>, *Scale Insects* <<http://idtools.org/id/scales/>>, and *Antkey* <<http://antkey.org/>>]
- ten identification mobile apps [Android <[ITP's Lucid Mobile Keys for Android devices](#)> and iOS <[ITP's Lucid Mobile Keys for iPhone](#)>]; and
- twelve screening aids covering 17 species of Lepidoptera [CAPS web site <<https://caps.ceris.purdue.edu/node/34>>].

APHIS International Services organized **capacity building trainings and workshops to train international National Plant Protection Organization (NPPO) inspectors and identifiers**, to enable them to identify new pests entering their countries or to identify indigenous pests in phytosanitary export inspections (prior to export to the U.S.).

Examples:

AFRICA

Zambia - Strengthening Zambia's capacity to safeguard plants and plant products from damaging pest introductions took place in Zambia at three ports of entry with high traffic of plants and plant products imported into Zambia; and to strengthen critical collaboration with other border agencies and stakeholders as an alternative, cost-effective approach to increase the Zambia NPPOs' capacity for pest detection. The design of this project was aimed at bringing in all these agents to be well informed of the mission of the NPPO as it pertains to phytosanitary border safeguarding. In total 30 individuals participated in the workshops.

The capacity building training was organized into 3 teams to run concurrent workshops with a facilitator team consisting of 2 plant protection officers, one entomologist and one plant pathologist. Although the main participants are Plant Health Inspectors, it was critical to include port Veterinary Officers, Agribusiness Officers, Extension Agents, Customs officers, Immigration officers, Port Health officials, and Clearing Agents/brokers who can assist the NPPO

personnel to have a better coordination in intercepting and detecting plant pests at the borders.

Each workshop included:

- Presentations of ISPM #23: Guidelines for Inspection; ISPM #32: Categorization of Commodities According to their Pest Risk; ISPM #31: Methodologies for Sampling of Consignment.
- Group discussions on development of inspection schemes and improvement of inspection and sampling Regulations, Protocols, and Manuals.
- Basic training on entomology and plant pathology of targeted pests and disease.
- Basic training on use of inspectional tools.

The Capacity Building activity is in support of International Services Goal to enhance global health and U.S. biosecurity through the development of science-based regulatory systems and policies around the world. A key activity is to enhance developing countries' capacity to implement science-based regulatory approaches and policies to implement WTO-related concepts and requirements such as risk analysis, inspection and certification to prevent the spread of invasive species.

Caribbean - Pest Diagnostic Network, Technical Working Group in Tobago - The Caribbean Pest Diagnostic Network (CPDN) is a major component of the Caribbean Invasive Species Surveillance and Information Project (CISSIP), which operationalizes the Caribbean Regional Invasive Species Intervention Strategy (CRISIS) an output of the Caribbean Invasive Species Working Group (CISWG). The objective of the CPDN is to provide a coordinated Regional safeguarding mechanism, designed to protect the Region from invasive pests, and help Member States meet international sanitary and phytosanitary reporting requirements. The CPDN's working group currently comprises key plant health personnel from Barbados, the Cayman Islands, Dominican Republic, Guyana, Haiti, Jamaica, Martinique and Trinidad and Tobago, together with representatives of the partner organizations, namely the Centre for Agricultural Biosciences International (CABI), Caribbean Agricultural Research and Development Institute (CARDI), Caribbean Community (CARICOM) Secretariat, Inter- American Institute for Cooperation on

Agriculture (IICA), USDA – APHIS, and the University of Florida Institute of Food and Agricultural Sciences (UF IFAS).

The CPDN is a network and an internet based Lab Information Management System (LIMS), which facilitates the digital upload of samples obtained in the field for rapid diagnosis and pest identification. Diagnoses are made online through interactions between extension officers and plant protection experts, and the problems presented are quickly assessed and the results and solutions communicated.

Since 2007, USDA - APHIS strengthened the Network by training plant health personnel, and supplying diagnostic equipment to Barbados, CARDI Dominica, Cayman Islands, Guyana, Jamaica and Trinidad and Tobago.

Tobago - A Small Technical Committee was established to develop a Regional Pest List – USDA APHIS, in collaboration with CABI, CARICOM Secretariat, and the CARDI hosted a technical committee to formulate and prioritize a regional pest list. The technical committee is comprised of the following specialists: economist, weed scientist, malacologist, entomologist, pathologist, and epidemiologist; along with the chairperson of the CPHDs and the chairperson of the Emergency Preparedness Plans and Mechanisms for Response TWG. It was established to create a prioritized pest list for the region.

The formulation of the Regional Priority Pest List (RPPL) encompassed a series of steps, which involved pairwise comparison of criteria, the determination of a short list of the top ten high risk pests for the Region, and pairwise comparison of the short listed pests to determine their order of priority.

Japan - Asian Gypsy Moth (AGM) Port Outreach – An on-going collaboration and outreach program, established with U.S.-Canada-Japan AGM offshore summer ship inspection and certification operations continued to strengthen safeguards of North American forests from the introduction of AGM from Japan from the pathways of ships' superstructure and bulk or container cargo carrying life-forms of AGM into urban and rural parks and forests. There were two

project objectives: 1) conduct outreach interviews in key ports in each of the (5) AGM risk zones with ship's agents and Japan's 3rd-party inspection companies to improve the percentage of ships arriving to U.S. ports with no certification, and 2) survey the same important ports for key contacts to build an AGM Forest Ecology network of interested AGM scientists and naturalists.

Europe – APHIS International Services furthers global capacity to strengthen trade and safeguard plant health. International Services represents the North American Region at the International Plant Protection Convention (IPPC), Capacity Development Committee (CDC). The CDC is comprised of technical representatives from all global regions who oversee the development of tools to strengthen global capacity to trade efficiently while safeguarding plant resources from the threat of pests. The CDC has approved 285 technical resources (such as Pest Risk Analysis Awareness Materials and a Market Access Guide) to further member countries' capacity development that are publicly available on the IPPC's Web site. In addition, the CDC members determined capacity development priorities to combat invasive pest threats. The priorities include supporting a harmonized approach to the electronic phytosanitary certification (ePhyto) process, increasing the pool of trained facilitators to administer the phytosanitary capacity evaluation (PCE) tool, and analyzing the effectiveness of the regulation of wood packaging material in international trade (ISPM 15).

Europe – APHIS International Services in Europe plays a key role in coordinating and facilitating sterile insect techniques-related projects (SIT) in fruit flies between FAO/IAEA and PPQ. The overall goal of these projects is to reduce the threat of invasive exotic fruit flies and especially the Mediterranean fruit fly of negatively impacting food production and trade between the U.S., Mexico and Central America.

IS Europe has secured funding to support a site visit to Croatia's "Mandarin Pilot Project" that employs the Sterile Insect Technique to address the spread of the Mediterranean Fruit Fly; thus strengthening the capacity of Trading Partners' to address the threat at the origin. The visit was conducted in summer of 2014.

In FY15: IS Europe has secured funds for a Regional training course on plant pest risk assessment and management with emphasis on

fruit flies for Eastern European countries and for the purchase of fruit fly traps and attractants to those countries to expand the monitoring area in the region. In addition funds were secured for the participation of ministry officials from Eastern Europe in a regional training course on early detection of animal diseases in post flooding environment, with emphasis on vector borne diseases.

IS Europe provides subject-matter expertise to UNVIE (US Embassy to the United Nations in Vienna) for FAO/IAEA plants and animal health projects to be considered for funding under Peaceful Uses Initiatives (PUI). Below are the current projects funded by PUI:

- Improving animal disease diagnostic capacities of veterinary laboratories at the regional level in Africa and Asia by transfer of nuclear and nuclear-related techniques.
- Contributing to sustainable agricultural development in the Balkans through environmentally-friendly pest suppression to facilitate fruit exports.
- Feasibility study and capacity building for control of fruit flies of economic significance in West Africa.
- Supporting fruit fly pest prevention and management in the Balkans and the Eastern Mediterranean area.

□ Capitalize invasive species prevention and management needs (e.g., along roadways and on government lands) to create entry-mid level, high impact social development programs for youth and persons at risk (e.g., minimum security prison population). Establish Federal initiatives and/or offer grants to states and tribes.

NRCS district offices (one office in almost every US county) work closely with the local community to address natural resource issues of the area, including invasive species. Opportunities for social development at the local level also exists through the NRCS “Earth Team” volunteer program (see <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/people/volunteers>).

Also, through the Conservation Innovation Grants (a program within the Environmental Quality Incentives Program (EQIP)), state or

county organizations and others may propose social development programs as long as EQIP-eligible landowners are involved.

USFS-National Forest System is building new directives which require proactive management of invasive species in the National Forest System, and across the broader landscape, with the goal of restoring the condition of degraded watersheds. The new Forest Service Manual and accompanying Handbook will provide the policy foundation on which to build long lasting opportunities to engage with youth and other external workforce groups.

Although funding levels have decreased, State and Private Forestry matching funds for invasive plants control provide employment opportunities through a variety of local programs, such as those administered by cooperative weed management organizations.

□ Substantially increase Federal and state agency staffing in the areas of import/border inspection for agriculture and wildlife, specimen identification, pest risk analysis (including pre-import screening), and invasive species program management (especially public education/outreach, regulatory enforcement, and early detection/rapid response).

DHS Customs and Border Protection (CBP) worked directly and closely with APHIS PPQ on emerging pests of concern that threaten US agriculture. Both agencies have provided specific information and outreach material to the traveling and importing communities, with regards to these agriculture threats. The partnership includes local and national operations to exclude and detect pests while facilitating legitimate travel and trade.

APHIS PPQ SITC (Smuggling Interdiction and Trade Compliance) continues to increase collaboration with CBP to conduct special operations on international cargo at ports of entry. SITC also works very closely with CBP to target prohibited high risk agriculture commodities that have been found in commerce.

APHIS implemented Risk Based Sampling at all PPQ plant inspection stations. This method of sampling will enhance APHIS' ability to

evaluate risk levels of country/commodity combinations and target inspections appropriately based on that level.

Since APHIS developed its predictive weed risk assessment (WRA) model in 2010, it has evaluated 92 species that represent either new US detections, proposed plant imports, or other species that pose a weed or invasive plant threat. APHIS' WRAs are used to support management decisions concerning the import of propagative material and the potential regulation of plants as Federal Noxious Weeds. However, the WRAs can also be used by APHIS stakeholders to support decisions or actions at a regional or local level. Because the majority of plant species are generally admissible into the United States, it is critical that APHIS proactively identifies potential weed threats that should be more closely evaluated with a WRA. In 2012, APHIS developed a quick screening tool that it uses to identify such potential threats. Since then, weed experts have screened about 975 species. While many of these are species that are either native, or too widely distributed for regulatory action by APHIS, others are good candidates for full evaluations with its weed risk assessment process.

Establishment of NAPPRA plants for planting category– In May 2011, PPQ established a new regulatory category called NAPPRA (not authorized pending pest risk analysis) for plants for planting (nursery stock) that pose a quarantine pest risk; these plants may no longer be imported unless PPQ first conducts a pest risk analysis (PRA). NAPPRA is a huge shift in plants for planting policy for the USDA. It allows PPQ to quickly take action to regulate the importation of plants that could pose a pest risk to the U.S. and then conduct a PRA to ensure that all pest risks are addressed before the plants are brought into the country. Few plants for planting PRAs have been conducted in the past. NAPPRA makes plants for planting restrictions more similar to current requirements for fruit and vegetables. Also in 2011, PPQ made available for public comment the first round of NAPPRA taxa: 41 taxa of plants for planting as quarantine pests and 107 as hosts of quarantine pests. From these proposed candidates PPQ published in the Federal Register, **31 new quarantine pest plant taxa and 107 new host taxa of quarantine pests were added to the NAPPRA list.**

Simultaneously, APHIS-PPQ published a second round of approximately 20 additional quarantine pest plants and approximately 30 hosts of quarantine pest plants as proposed candidates for NAPPRA listing. Public comments on these proposed candidates are being evaluated. A final notice will be published in the Federal Register placing these pests on NAPPRA list. APHIS-PPQ is preparing to propose yet another group of quarantine pest plants and hosts of quarantine pest candidates for NAPPRA listing.

The Restructuring of the Plants for Planting Regulations – In April 2013, APHIS published a plants for planting proposed rule which would restructure the regulations governing the importation of plants for planting. The main changes include:

- 1) moving restrictions in the CFR concerning specific types of plants for planting to the online Plants for Planting Manual, thereby utilizing the notice and comment rule making process which will improve speed and efficiency of changing import restriction;
- 2) consolidating all restrictions involving plants for planting into Subpart – Plants for Planting in the CFR: and
- 3) adding general requirements for the development of integrated pest risk management measures for specific types of plants for planting. The final rule will be in the Federal Register.

The APHIS VS re-organization emphasizes imports and port activities, and with the recent modest increase in budgets, filling of 'field vacancies' will be emphasized.

APHIS work in exporting countries to prevent introductions of invasive species to the U.S. - APHIS IS works with foreign counterparts to strengthen their ability to inspect shipments prior to export and phytosanitary certification. In Mexico, APHIS International Services (IS) coordinates monitoring and suppression activities of *huanglongbing* (citrus greening or HLB) to prevent the spread of the disease caused by the Asian citrus psyllid, a small insect that feeds on the leaves and stems of citrus trees. IS tracks Asian citrus psyllid populations in northern Mexico that could threaten California's citrus industry. The focus and surveillance operations are similar to California's HLB Multi-Agency Coordination Group and USDA's Citrus Health Program.

USDA APHIS PPQ POP (Preclearance and Offshore Programs) conducts commodity preclearance programs in exporting countries to reduce the risk of plant pests and diseases entering the U.S. on fruit, vegetable, and nursery stock shipments. In the Netherlands, POP collaborates with the Dutch Ministry and the growers to inspect and certify pest-free bulbs and perennial plants for export to the United States. POP also partners with the Department of Defense to conduct military preclearance programs in Africa, Asia, and Europe. This inspection and certification program prevents the entry of harmful agricultural pests and diseases into the U.S. on returning military equipment, cargo, and service members' household effects. In addition, POP conducts offshore activities for pests such as the Asian gypsy moth (AGM). POP collaborates with the Canadian Food Inspection Agency and the shipping industry in Asia to reduce the number of maritime vessels arriving into North America with AGM egg masses.

FS R&D develops a new method that assesses the suitability of preemptive quarantine measures at the level of small geographical subdivisions (U.S. counties). In pest risk assessment it is frequently necessary to make time-critical decisions regarding management of expanding pest populations. When an invasive pest outbreak is expanding rapidly, preemptive quarantine of areas that are under imminent threat of infestation is one of only a few available management tools that can be implemented quickly to help control the expansion. The preemptive quarantine of locations that surround an infested area also acts as a safeguard to counteract the risk of failed detections of the pest in field surveys. The cost of a preemptive quarantine in a given county is weighed against the protective benefit of delaying the spread of an outbreak to other neighboring counties. FS researchers demonstrate the approach with a decision support model that estimates the suitability of preemptive quarantine across multiple counties that surround areas infested with the emerald ash borer (*Agrilus planipennis* Fairmaire (EAB), Coleoptera: Buprestidae), an emerging major threat to ash tree species (*Fraxinus* spp.) in North America. The model identifies the U.S. counties where the installation of preemptive quarantine would most effectively slow the spread of EAB populations and reduce risk to high-value areas. <http://www.treesearch.fs.fed.us/pubs/47726>

□ Establish/strengthen internships in invasive species identification, control/eradication, mapping, and monitoring for high school and college students. Support comparable Federal, state, tribal, and non-profit initiatives.

Many ARS laboratories employ and train students at various levels of their education in current technologies used in research. In addition, ARS has numerous cooperative agreements with university scientists who employ and train students at the undergraduate and graduate level in various areas of research that utilize modern technologies applicable to solving issues related to the identification and control of invasive species. For example, the 2014 ARS Areawide Pest Control Program provided funding for the development of region-wide pest control programs for several different invasive pests, including the coffee berry borer in Hawaii and Puerto Rico and invasive weeds in the San Joaquin Delta region of California. These projects involve universities, local governments, and public educational programs to strengthen our capacity to identify, control, map and monitor invasive pests.

□ Develop stronger relationships between the Federal government and green industries potentially impacted by and/or managing invasive species. For example, work with the Invasive Species Advisory Committee (ISAC) and/or NISAW to organize an Invasive Species & Green Industries Summit.

USDA and NRCS are members of the Wildlife Habitat Council's (WHC) Invasive Species Advisory Group. The Group assisted WHC to develop their strategic plan so their corporate clients are more effective addressing invasive species in their land management projects.

□ Mandate that, prior to receiving Federal support: 1) renewable energy projects (esp. solar, wind, and biofuel) have adequate invasive species mitigation plans in place and 2) biofuel developers/producers demonstrate that nonnative species are of low invasion risk (to the propagation site, area of potential dispersal, and along transport pathways) based on a competent invasive species risk analysis.

Any funding provided to private landowners by NRCS includes the requirement for conservation plans, a part of which is an assessment of the risk of invasive species and a plan for mitigating negative impacts from invasive species.

USFS has issued invasive species management policy for the National Forest System (Forest Service Manual 2900), requiring invasive species management considerations to be part of all planning and implementation of energy development and transmission programs, transportation, and other land management activities conducted on the National Forest System. The new policy prohibits the use of invasive species for bio-fuels production on National Forests and Grasslands.

APHIS leads a team of eight USDA agencies to consider and determine whether plantings of two invasive species, *Arundo donax* and *Pennisetum purpureum*, either inherently or with planned mitigations, do or do not present a significant likelihood of spread beyond the planting area. This USDA-led activity is required under an EPA regulation published in July 2013.

G. USDA Progress on ISAC recommendations from the December 2010 meeting

11. ISAC Recommendation: That NISC member agencies such as the Army Corps of Engineers, the Department of Agriculture (ARS and APHIS), and others, expand biological control efforts for invasive species, and in particular those in aquatic systems, which tend to have limited options that are often very costly. These efforts are justified based on economic analyses that suggest an average beneficial return of 10-17 fold for each dollar spent on biological control.

APHIS' Biological Control program has provided funding in FY11 - 13 to the U.S. Army Engineer Research and Development Center (ERDC) unit for the management of the invasive aquatic weed, *Hydrilla verticillata*, in the St. Johns River Water Management District (SJRWMD), Florida. The main objective of this cooperative effort is to implement a holistic, ecosystem-based, integrated approach for the

management of hydrilla at several sites in the SJRWMD. This effort includes the use of a host-specific biological control agent to reduce the invasive characteristics of hydrilla. It also includes a re-vegetation program that will reduce the occurrence of empty niches, act as nutrient sinks, and increase competitive pressure on hydrilla in order to produce a long-term self-sustaining management approach.

APHIS IS Mexico has worked closely with the Mexican Ministry of Agriculture to eradicate Hydrilla from the Mexican side of the border (1985-2010) in irrigation canals. The program was closed with successful eradication.

New Biocontrol Agent for Yellow Toadflax: USFS researchers have been integral in the proposal to APHIS a new biocontrol agent for Yellow Toadflax (*Linaria vulgaris*) including the developing of the test plant list, host specificity tests, gaining funding and collaborators to support foreign exploration and overseas Host specificity testing. The availability of a new biocontrol agents such as *Rhiosa pilosa* will increase opportunities for integrated weed management, and provide a sustainable, self-dispersing management tool to the wide range of North American stakeholders affected by Yellow Toadflax.

Researchers find a way to control invasive leafy spurge using an insect: USFS researchers developed an innovative biological control method, which releases large numbers of a species of flea beetle—a natural predator of leafy spurge. Their efforts resulted in a 60 to 80 percent reduction in leafy spurge in one year. This technique has reaped substantial benefits for the “Hold the Line” program, a collaboration of county, state, and federal agencies as well as school districts and nonprofit organizations that has united to control leafy spurge. <http://www.treesearch.fs.fed.us/pubs/44757>

Biological control Agent for Chinese Privet Looks Promising: Biological control of Chinese privet, *Ligustrum sinense*, is the best long-term option for control of this widespread invasive plant in the southeastern USA. USFS researchers conducted a pre-release efficacy assessment by testing the effects of damage caused by a lace bug, *Leptoypha hospita*, on potted privet plants in the laboratory. Inoculating 15 pairs of lace bug adults on plants resulted in a significantly high defoliation rate, and reduced leaf biomass by more

than 59% compared to 0 and 3 lace bug pairs. Leaf biomass of plants inoculated with 3 and 9 pairs of lace bug did not differ significantly from control plants. <http://www.treearch.fs.fed.us/pubs/45498>

12. ISAC Recommendation: NISC member agencies continue to support and encourage participation in National Invasive Species Awareness Week (NISAW).

USDA, NRCS, USFS, ARS and APHIS were active participants in the 2015 NISAW activities. USDA participated in the planning team for NISAW 2015, hosted the NISAW Awards Ceremony and the NISAW Invasive Species Fair at the Whitten Building Patio. USDA will continue participating in NISAW in the future.

13. ISAC Recommendation: That NISC adopts the Invasive Species and the Climate Change paper and recommendations within.

Invasive Species and Climate Change

Approved by ISAC on December 9, 2010

Issue

Climate change interacts with and can often amplify the negative impacts of invasive species. These interactions are not fully appreciated or understood. They can result in threats to critical ecosystem functions on which our food system and other essential provisions and services depend as well as increase threats to human health. The Invasive Species Advisory Committee to the National Invasive Species Council recognizes the Administration's commitment to dealing proactively with global climate change. However, unless we recognize and act on the impact of climate change and its interaction with ecosystems and invasive species, we will fall further behind in our effort to prevent, eradicate and manage invasive species. We are already seeing such climate change impacts and need to act now.

Decisive Action is Required

Policy makers at all levels of government must integrate invasive species considerations into climate change policies. The strong interrelationships between climate change and the dynamic nature of invasive species, changing ecosystems, and human activities necessitate such integration. It is critical that practices be developed that strengthen environmental monitoring, management and control of invasive species to minimize impacts on the broad range of ecosystem resources upon which humans depend. The physical process of climate change interacts with the biological and physical processes of the earth's ecosystems, and these are, in turn, linked to the socio-economics of human activities.

Background

Climate change and biological invasions are dynamic, interconnected and interdependent phenomena. They affect human health and well-being through their

impact on resources, goods and services provided by ecosystems. These ecosystems are critical to agriculture and forests, food security, water supplies and other natural resources. They affect wildlife, recreation, and public health and safety nationwide. Even without climate change, invasive species have repeatedly and rapidly disrupted many ecosystems in the US. While climate change may have either a positive or negative effect on individual invasive species, which can be projected in various models, it is likely to have a negative effect on many specialist native species that are more restricted in their ranges. Invasive species often show higher ability to acclimate to environmental change compared to related native species. Thus, invasive species that tend to be more adaptable are expected to expand and further compromise sensitive native plant and animal communities.

The ongoing change in climate and the expected speed of this change are likely to exacerbate problems by increasing the ability of invasive species to become established, spread through, and disrupt ecosystems. At a minimum, invasive species can reshuffle the landscape for agricultural services and resources including food, fuel, feed, fiber and forests along with quickly changing land use decision pressures. As a parallel, in marine and/or aquatic ecosystems, climate change can induce fisheries collapse as mid-trophic structure species are lost opening new potential niches for tolerant invasive species. Finally, climate induced shifts in invasive disease vectors, such as those for malaria or avian flu, are of increasing concern.

Evidence indicates that climate change may alter the efficacy of management strategies for invasive species. Furthermore, changes in land cover caused by invasive plants can influence weather and climate. In some regions, both climate change and invasive species are likely to increase the frequency of wildfires which in turn will further facilitate the establishment of fire adapted invasive species leading to even more frequent and intensive fires.

Recommendations

Policy and Legal Responsibilities

We applaud the U.S. Department of Interior's establishment of a Climate Change Response Council to synthesize data and coordinate appropriate management of our nation's lands and waters. We acknowledge the U.S. Department of Agriculture's (USDA) recent presentation of the impact of climate change in its publication: "*Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States.*" We fully support the Department of Commerce's National Oceanographic and Atmospheric Administration's (NOAA) proposal to establish the NOAA Climate Service to meet essential national needs.

Executive Order 13112 requires Federal agencies to address invasive species and establishes the National Invasive Species Council to coordinate planning and response. The International Plant Protection Convention requires analyses of pest risk. Agencies may be able to integrate climate change considerations into their existing risk-assessment protocols and procedures. Environmental laws such as the Endangered Species Act and the National Environmental Protection Act (NEPA) can be used more powerfully to address invasive species.

Opportunities for Action

We call on the member Departments and Agencies of the National Invasive Species Council and potential partners to:

ISAC Recommendation: Use the Global Change Research Act of 1990 (GCRA)48 (PL 101-606) to aggregate information about the implications of a changing climate for invasive species spread so scientific data may be synthesized through existing authorities to inform policy-makers.

ARS includes invasive species as part of its climate change research program. ARS conducts basic and applied research on the interacting effects of climate change on endemic and exotic pests, weeds and diseases. Resistance to management actions designed to control these types of species is also addressed. The ARS climate change research program includes synthesis activities specifically designed to inform policy-makers.

Climate Change Adaptation and Mitigation Management Options: A Guide for Natural Resource Managers in Southern Forest Ecosystems provides a comprehensive analysis of forest management options to guide natural resource management in the face of future climate change. Forest land managers face the challenges of preparing their forests for the impacts of climate change. However, climate change adds a new dimension to the task of developing and testing science-based management options to deal with the effects of invasive species and other stressors on forest ecosystems in the southern United States. The large spatial scale and complex interactions make traditional experimental approaches difficult. Yet, the current progression of climate change science offers new insights from recent syntheses, models, and experiments, providing enough information to start planning now for a future that will likely include an increase in disturbances and rapid changes in forest conditions. Topics include potential climate change impacts on invasive insects and diseases, and how these in turn might affect the values of southern forests that include timber, fiber, and carbon; water quality and quantity; species and habitats; and recreation.

Climate, trees, pests, and weeds: Change, uncertainty, and biotic stressors in eastern US national park forests. The US National Park Service (NPS) manages over 8900 sq. km of forest area in the eastern United States where climate change and nonnative species are altering forest structure, composition, and processes. Understanding potential forest change in response to climate and nonnative tree pests, diseases and invasive plants are

vital for forward-looking land management. In this research, USFS researchers and their collaborators examined potential changes in tree habitat suitability using data for 121 national parks, 134 tree species, 81 nonnative tree pests, and nonnative vascular plants. The combination of rapid climate change and nonnative stressors may accelerate decline of some tree species and inhibit other species from occupying suitable habitat. Stewarding forests for continuous change is a challenge for park managers.

ISAC Recommendation: Streamline and focus agency programs

to address invasive species climate interactions effectively and efficiently by establishing:

- 1) strategic plans that anticipate climate impacts on invasives,

The **USDA Climate Change Science Plan** includes invasives as a part of Element 1: Understand the direct and indirect effects of climate change on natural and managed ecosystems, including feedbacks to the climate system, and Element 2: Develop knowledge and tools to enable adaptation to climate change and to improve the resilience of natural and managed ecosystems. ARS includes invasives as part of its Climate Change, Soils and Emissions National Program Action Plan as part of Component 3: Enable agriculture to adapt to climate change with Problem statements of: Understand the responses of agricultural systems to anticipated climate change, and Understand the impact of anticipated climate change on endemic and exotic pests, weeds and diseases.

A changing climate will cause an even longer wildfire seasons, extreme weather events, shifting crop patterns, increased costs for weed control and invasive species management, and increase insect infestations in forests.

In FY12 **all USDA agencies were asked to prepare a Climate Change Adaptation Plan and designate an agency Climate change Coordinator.** Adaptation Plans are being implemented and their accomplishments are tracked.

The **USDA has responded to the President's Executive Orders on Climate Change dated 2013 and 2014.** Reports of USDA activities are available on the department's website.

In 2014 USDA established seven regional Climate Hubs and 3 Sub Hubs to develop and deliver science-based, region-specific information and technologies, with USDA agencies and partners, to agricultural and natural resource managers that enable climate-informed decision-making, and to provide access to assistance to implement those decisions. The hubs are located in existing USDA research facilities in Colorado, Iowa, North Carolina, New Hampshire, New Mexico, Oklahoma and Oregon. They will provide outreach to farmers through existing networks such as Cooperative Extension and the USDA Service Centers and public education about the risks of climate change, perform climate risks and vulnerability assessments.

USDA increased the disaster assistance and crop insurance payments (FY12 to FY14) to farmers due to droughts, wildfires and other natural events.

APHIS-PPQ continues investigating general circulation models (GCMs) to use climate change scenarios to inform epidemiology and characterization of risks from invasive species. The current approach uses a framework that compartmentalizes climatology, GCM output, biological parameters and forecast models. This approach allows systematic incorporation of climate change drivers into all epidemiological forecasts. For example, the models that are part of the framework utilize outputs of GCMs to predict plant pest distribution and spread and assess potential pest risks. During the current calendar year, APHIS PPQ will complete development of a web-based version of its new spatial modeling framework that incorporates climate change scenarios and models in its epidemiological forecasts. PPQ scientists and cooperators have used the existing framework to inform decision-making associated with emergency programs, including forecasts for the old world bollworm and several other pests linked to trade (export) issues.

2) forward-looking environmental compliance documents (e.g., NEPA, nationwide Environmental Impact Statements on invasives prevention, management, and restoration)

ARS research projects follow the procedures described in the Code of Federal Regulations Title 7, Subtitle B, Chapter V, Part 520 for implementing the National Environmental Policy Act. These procedures assure that research and other activities of the Agricultural Research Service (ARS) comply with the intent of the National Environmental Policy Act of 1969 (NEPA) and appropriate regulations implementing this Act. These procedures incorporate and supplement, and are not a substitute for, CEQ regulations under 40 CFR parts 1500-1508, and Department of Agriculture NEPA Policies and Procedures under 7 CFR part 1b. ARS conducts and supports research as authorized by legislation to support one of the USDA goals of assuring adequate supplies of high quality food and fiber. Information generated through such research often forms the basic data needed to assess the impact of a new technology upon the environment. ARS also conducts research to reduce pollution caused by agricultural practices. Large scale projects simulating commercial practices are normally implemented in cooperation with other agencies of the Federal or State Governments.

APHIS is developing internal guidance for incorporating climate change into its NEPA documents in order to address greenhouse gases and impacts of climate change per Executive Order 13514 and draft guidance from CEQ. In December 2014, CEQ published revised draft guidance on when and how Federal agencies should consider the effects of greenhouse gas emissions and climate change in risk analysis required by NEPA. During February 2015, APHIS submitted comments on the proposed guidance noting it will be more practical, less onerous, and ultimately more informative than previously drafted versions. APHIS supported the guidance because it retains the opportunity for the meaningful climate change information to enter the public discourse. Lastly, APHIS agreed that when agency estimates of greenhouse gas (GHG) emissions are unlikely to meet the 25,000 metric ton reference value, the commensurate agency analytic burden appears reasonable. APHIS is incorporating CEQ's revised draft guidance into development of its Agency-specific guidance for addressing climate change in its NEPA documents.

APHIS has provided support for the development of the National Fish, Wildlife and Plants Climate Adaptation Strategy under the direction of CEQ, the USFWS, and NOAA. As part of this support, APHIS provided several observations and recommendations on the action of climate change as a disturbance facilitating the establishment and expansion of exotic invasive pests, pathogens and weeds. In FY 2014, APHIS joined other agencies as part of the Joint Implementation Working Group, which oversees and encourages the application of the goals and strategies of the plan into realized actions. This year, APHIS contributed to the preparation of “Taking Action, a Progress Report”. This report describes 50 representative case studies of work performed by various State, Federal, Tribal governments, in partnership with various stakeholders, to meet the seven goals of the Strategy. It can be accessed at <http://www.wildlifeadaptationstrategy.gov/pdf/Taking-Action-progress-report-2014.pdf>.

and,

3) focus awareness programs to anticipate and manage potential climate driven ecosystem changes.

ARS conducts research on the effects of anticipated climate-driven ecosystem changes. Specifically in the area of climate change, ARS is tasked with the following:

- 1) understand the impact of climate change on agricultural systems including crops, animal systems, ecosystem services, and soil, water and air resources;
- 2) develop genetic resources for crop and animal varieties for increased production quantity and quality under changing climate conditions;
- 3) develop sustainable production systems to maintain, and where possible improve, soil, water and air quality;
- 4) develop risk management tools for countering climate driven threats from pathogens, insects, weeds and
- 5) improve the efficiency of water management and use

ARS conducts research on the effects of anticipated climate-driven ecosystem changes. Laboratory, plot-level, landscape, and simulation-focused research are focused on developing risk management tools to maintain the resilience of agricultural systems

and the natural resources base (water, soil, air) needed to maintain production and ecosystem services.

ISAC Recommendation: Assess new climate driven invasion pathways and strengthen prevention programs to address invasives in ballast water, bio-fouling, interstate and international movement of materials and equipment (e.g., energy development, wildfire response, national defense), and screening of plant and animal imports taking account of climate impacts.

ARS conducts basic and applied **research on the interacting effects of climate change on endemic and exotic pests, weeds and diseases.** **Resistance to management actions** designed to control these types of species is being addressed. ARS is also working with APHIS to identify research needs to **develop risk-management technologies based on climate events for early warning of outbreaks.**

ISAC recommendation: Support monitoring and adaptive management programs for invasive species at the landscape scale so that natural resource managers can identify new threats and respond quickly and appropriately to invasive species in changing climatic conditions.

ARS is conducting **research on remote sensing and pheromone trapping technologies to enable mapping and tracking of invasive species, and the effectiveness of eradication measures.**

Emerald Ash Borer Natural Enemies Increased in the United States: USFS researchers evaluated the establishment of one **biological control agent, *Tetrastichus planipennisi***, imported and tested since 2007 for classical biological control of the invasive emerald ash borer (EAB). These natural enemies are tiny beneficial insects that eat EAB eggs and larvae. Between 2007-2010, *T. planipennisi* adults were released into each of six forest sites in southern Michigan. By the fall of 2012, 21.2% of EAB were parasitized in the parasitoid-release plots. These results demonstrate that *T. planipennisi* is established in southern Michigan and that its populations are increasing and expanding; therefore it will likely play a critical role in suppressing emerald ash borer populations in Michigan. <http://www.treesearch.fs.fed.us/pubs/43739>

USFS National Forest System has expanded its corporate record keeping system and integrated survey and inventory information with

treatment records to help provide critical information for adaptive management against invasive species. USFS policy (Forest Service Manual 2900) requires use of a structured decision making process and an adaptive resource management approach when dealing with invasive species.

ISAC Recommendation: Foster collaboration of existing networks to address the broad geographic nature and altered management of invasive species issues in a time of climate change. This will allow the national response to be coordinated, efficient, and capitalize on current capacities using a synergistic approach.

ARS, USFS, NRCS and APHIS have members in FICMNEW (Federal Interagency Committee for Management of Noxious and Exotic Weeds) and ITAP (federal Interagency Committee on Invasive Terrestrial Animals and Pathogens) to inform other Federal agencies of research activities on invasive species and to coordinate efforts among agencies.

In FY15, ARS and APHIS initiated regular discussions to identify issues related to pests/pathogens/weeds that could benefit from further collaboration between the two agencies, and as the USDA continues to develop its plans and responses to climate change.

ISAC Recommendation: Increase research and development targeted at climate change and invasive species by supporting and expanding the USDA-ARS and US Forest Service Climate Change Programs, as well as competitive research programs such as USDA's Agricultural and Food Research Initiative, the Environmental Protection Agency's Project Grants, NSF's Conservation and Biology program, and NOAA's Sea Grant program. Better understanding of the interaction of climate change and invasive species will result in more relevant prioritization and management on the ground. This includes recognizing the economic basis for invasive species management decisions and supporting work that integrates economic, ecological and biological data providing policy and management support.

ARS is continually examining its portfolio of research projects relevant to climate change and invasive species. The goal is to expand an informal working group of ARS scientists focused on climate change and invasive species for the purposes of increasing opportunities for collaboration. New funding for additional research in this area was proposed in the President's FY16 budget.

NIFA continued to offer funding opportunities to address climate change in FY15 through the Agriculture and Food Research Initiative (AFRI). This grant program Challenge Area is entitled: Agriculture and Natural Resources Science for Climate Variability and Change.

This grant program focuses on the societal challenge to adapt agro ecosystems and natural resource systems to climate variability and change and implement mitigation strategies in those systems. In the Agriculture and Natural Resources Science for Climate Variability and Change Challenge Area RFA, specific program areas are designed to achieve the long-term outcome of reducing the use of energy, nitrogen, reducing GHG emissions from practices, and water in the production of food, feed, fiber, and fuel; reduce GHG emissions from these agro ecosystems; and increase carbon sequestration. Project types supported by AFRI within this RFA included multi-function integrated research, education, and/or extension projects and Food and Agricultural Science Enhancement (FASE) Grants.

Another source of NIFA funding for work relevant to the Agriculture and Natural Resources Science for Climate Variability and Change Challenge Area is the *National Robotics Initiative* (joint with National Science Foundation, NIH, National Aeronautics and Space Administration, and Department of Defense). The total Program Funds are approximately \$5 million from AFRI. Information is available at http://nsf.gov/funding/pgm_summ.jsp?pims_id=503641

USFS Research prioritizes research according to the nature and magnitude of current and anticipated problems and information required by managers for effective national resources management now and into the future. The scale of the problems and management needs differ between and among local, State, regional, national and even global levels. Research priorities, whether long- or short-term, are decided based on the Agency's mission to provide leadership in management of natural resources, mandates from Congress, and Executive Branch priorities.

ISAC recommendation: Use climate matching and ecological niche models to prioritize management of species that are most likely to cause the greatest harm in the future as a result of climate change. This will

require the Federal response to be coordinated, empowered, and appropriately funded.

ARS co-sponsored the workshop **Advancing Pest and Disease Modeling** in Feb. 2015, Gainesville, FL. The workshop was part of the Agricultural Model Intercomparison and Improvement Project (AgMIP). The workshop brought together **researchers developing models for projections of crop yields under changing climate with those developing models for pest population dynamics.** The purpose was to identify research needs and approaches for developing models to predict the spread of invasive pests and pathogens under conditions of global climate change.

NRCS has historically been a key source of this information for ARS. **NRCS with its partners have developed tools to estimate the amount of carbon stored and GHG emissions reduced at the field and producer level.** **COMET-VR** is a web-based, interactive decision support tool that includes the effects of land-management changes and is authorized for voluntary GHG reporting under section 1605(b) of the 1992 Energy Policy Act. It is a cooperative effort between NRCS and Colorado State University. Tools like COMET-VR make it easier for producers to estimate carbon storage and GHG emissions reductions for their entire holdings. The market for carbon credits trading in the form of carbon emissions reduction is in its formative stages and agricultural producers stand to benefit. NRCS provides an Environmental Credit Trading Handbook, an Environmental Credit Trading Information Series, and Environmental Credit Training courses to better prepare its State and Field Office personnel for responding to environmental credit trading questions from landowners. NRCS provides a climate change website (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/climatechange/>) that provides valuable information about climate change and the NRCS responsibilities and opportunities.

ARS is in dialogue with APHIS concerning priorities for research and development of relevant technologies.

H. USDA Progress on ISAC recommendations from the June 2011 meeting

14. ISAC Recommendation: To enhance the effectiveness of biological control programs at their inception, ISAC recommends that NISC Departments and Agencies working on biological control of invasive organisms, plan, conduct, and evaluate their programs in the context of an Integrated Pest Management (IPM) approach. This may require integrating biological control in concert with other management options (i.e., physical, cultural, and chemical) to achieve maximum effectiveness. For example, many invasive species are susceptible to both biological control agents and competitive interactions. As a result, using these approaches in concert can provide synergy towards achieving the desired land management objectives. ISAC has previously recommended an IPM approach to invasive management strategies. While most biological control efforts often consider themselves a stand-alone, silver bullet solution, a more integrated approach should increase the probability of success.

This recommendation addresses the National Invasive Species Management Plan, Implementation Task CM.1.2:

Identify and address strategic gaps in regional invasive species control and management efforts and tools .In support of the USDA's Integrated Pest Management (IPM) goals and other IPM needs, ARS currently focuses IPM research on minimizing pesticide inputs through the development of classical and augmentation biological control, host-plant resistance, behavior modifying chemicals (e.g., pheromone mating disruptors and attracticides), sterile insect release techniques, pesticide resistance management, cultural and mechanical practices, improved pesticide application technologies, and combining these pest control tactics into sustainable ag systems. Target pests include a multitude of insects, mites, and ticks; plant pathogens and nematodes; and weeds.

NIFA supports IPM research, education and extension through a number of grant programs including the Crop Protection and Pest Management Program, the AFRI Food Security Challenge Area, the Specialty Crop Research Initiative, the Organic Transitions Program, and the Organic Agriculture Research and Extension Initiative.

In addition, ARS funds the Areawide Pest Management Program, which supports IPM projects to facilitate the implementation and adoption of ARS-developed IPM technologies to control or suppress agricultural pests over large areas through partnerships with growers, commodity groups, and State institutions, Federal and State agencies, and the private sector. In 2014, ARS funded projects to control the Asian tiger mosquito, coffee berry borer (in HI and PR), aquatic weeds in the San Joaquin river delta, and varroa mites in honey bees.

NRCS is an advocate for the use of integrated pest management, and encourages the use of methods that will successfully address the pest problem with the least negative impact upon the natural resources and the environment. Discussions by members of the State Technical Committee in each state set priorities and methods of addressing natural resource issues, including invasive species. NRCS offices across the nation are also active members of a number of Cooperative Weed Management Areas (CWMAs) that address invasive species from a regional perspective.

APHIS develops and applies biological control agents as part of an overall pest management program. There are areas infested with invasive plant pests that may not be treated with conventional pesticides or other cultural practices due to environmental sensitivity or public concern. Biological control may offer the only sustainable solution in these areas. For example, APHIS is partnering with ARS to evaluate natural enemies of the brown marmorated stink bug. Because of the broad host range of this pest, it is not possible to develop an integrated area-wide management program without incorporating biological control with other control methods.

In another example, APHIS is using a biological control organism as part of a management program for Asian citrus psyllid (ACP) which vectors the devastating disease called *Huanglongbing* (HLB, citrus greening). Citrus growers in the Lower Rio Grande Valley of Texas, in Florida and in southern California, have implemented an area-wide management program to suppress psyllid populations in commercial groves. However, this program does not reach residential citrus trees or organic groves. APHIS has worked with local residents as well as state, industry and commercial biological control producers to rear

and release a biocontrol organism to reduce psyllid populations in these areas. Additionally, biocontrol agents from California are being released in Arizona and, through APHIS International Services, biocontrol agents produced in Texas are being released along the U.S.-Mexico border.

APHIS has released a second biocontrol agent in California which attacks a different stage of the psyllid. Additionally, several projects are underway using a commercially available fungal biocontrol agent that could attack all stages of the ACP. These biocontrol agents may become established in residential, organic, and natural areas while agricultural production areas may require the use of other control tactics to maintain the pest below economically damaging levels.

APHIS IS and PPQ have worked together to set up biological control programs and to supply biocontrol organisms to countries starting their own colonies (for example, using biocontrol organisms against pink hibiscus mealybug in Haiti, Dominican Republic (DR), Jamaica, and Sri Lanka; against *Anastrepha* species in Barbados and DR; and against papaya mealybug in DR). The results have been very successful, lowering the impact of the pest to negligible levels.

USFS State and Private Forestry Program provided support to **EDDMapS** (see <http://www.eddmaps.org/>) for use nationwide by cooperators, including Cooperative Weed Management Associations, for mapping and monitoring invasive plants and pests.

15. ISAC Recommendation: To further enhance the potential effectiveness of biological control programs, **ISAC recommends federal land management agencies that oversee and conduct control operations utilizing biological control agents become more fully engaged in adaptive management by collecting and sharing post-release monitoring data.** This Integrated Pest Management (IPM) approach should **emphasize partnerships** with local controlling authorities, post-release monitoring and collaborative programs with land managers and other federal, state and university scientists in other pest management disciplines to develop principles and technical guidance and recommendations for invasive species management. As

examples, such efforts have already been established by Team Leafy Spurge and the areawide *Melaleuca* project.

This recommendation addresses the National Invasive Species Management Plan, Implementation Task CM.4.1:

Enhance ecosystem recovery decision tools and conduct ecosystem assessments.

The NRCS includes, as a requirement in conservation plans developed with private land-owners, **monitoring the results of integrated pest management efforts in order to determine the performance of various IPM methods.** Lessons learned from this monitoring assists NRCS in improving the technical assistance it provides to private landowners in addressing their specific invasive species issues.

USFS Researchers are developing tools, technologies, and methods to identify and breed for resistance to invasive species.

One of the tools used for Integrated Management of invasive pests is **resistance screening.** USFS researchers are actively searching for resistance to beech bark disease, hemlock wooly adelgid, Asian longhorned borer, emerald ash borer, and other invasive insects. **Resistance could be a useful tool for Integrated Pest Management of invasive insect pests and pathogens under natural forest conditions.**

The search for resistance commonly requires the screening of dozens of trees. Beech Bark Disease (BBD) results from injury caused by the invasive beech scale insect (*Cryptococcus fagisuga*) that creates an infection court for pathogenic fungal species in the genus, *Neonectria* spp. USFS Scientists developed a way to identify trees resistant to the beech scale by artificially infesting healthy trees found living within heavily diseased stands with eggs of the scale insect. Based on this technique, a resistance screening protocol was developed to screen for beech scale resistance in the field and nursery. In another study, USFS scientists developed a method called the “raindown technique” that enables large numbers of hemlock seedlings to be screened for resistance to HWA under controlled conditions. Resistance could be a useful tool for Integrated Pest Management (IPM) of BBD, HWA, and other invasive insect pests and pathogens under natural forest conditions.

USFS Scientists explore genetically transformed green ash to enhance resistance for use in managing EAB. Because they did not evolve with the EAB, native ash tree populations in the United States lack resistance. USFS Scientists in cooperation with Purdue University have initiated efforts to create transgenic green ash trees by incorporating the Cry genes of Bt, which produce crystalline inclusions the midgut of insects that ingest transformed tissues causing a physical damage to affected insect cells and death-causing mortality to the insects.

16. ISAC Recommendation: In accordance with the National Environmental Policy Act (NEPA), ISAC recommends that NISC Departments, Agencies and their contractors assess the risk of invasiveness whenever their activities lead to the introduction of [non-native] species or their subsets (i.e. moving organisms from where they occur to where they have never occurred historically).

ARS research projects follow the procedures described in the Code of Federal Regulations Title 7, Subtitle B, Chapter V, Part 520 **for implementing the National Environmental Policy Act.** These procedures assure that research and other activities of the Agricultural Research Service (ARS) comply with the intent of the National Environmental Policy Act of 1969 (NEPA) and appropriate regulations implementing this Act. These procedures incorporate and supplement, and are not a substitute for, CEQ regulations under 40 CFR parts 1500-1508, and Department of Agriculture NEPA Policies and Procedures under 7 CFR part 1b. ARS conducts and supports research as authorized by legislation to support one of the USDA goals of assuring adequate supplies of high quality food and fiber. Information generated through such research often forms the basic data needed to assess the impact of a new technology upon the environment. Large scale projects simulating commercial practices are normally implemented in cooperation with other agencies of the Federal or State Governments.

Climate change is requiring NRCS to re-think our definition of, and preference for “native species.” Some plants considered to be “native” to specific locations may, due to climate changes, no longer be able to survive, or may become invasive. NRCS always assesses

the risk of invasiveness when restoring areas, but, due to climate changes, we, and our partners in restoration, must now consider the viability and impacts of plants whether they are historically considered to be “native” or “invasive” to the specific location and climate. NRCS considers invasive species to be a “Special Environmental Concern” and provides Evaluation Procedure Guide Sheets for its NRCS State and Field offices to implement and document how invasive species concerns have been addressed in all conservation plans developed with land owners.

NRCS provided, in October, 2013, a national webinar specifically addressing the observation and documentation requirements for addressing invasive species in writing conservation plans.

USFS-National Forest System developed new policy (Forest Service Manual and Forest Service Handbook) which includes requirements, standards, criteria, and other guidance on the use of standardized contract language and restrictions to prevent and control invasive species on National Forests and Grasslands, including activities conducted by permittees, contractors, and other cooperators.

I. **USDA Progress on ISAC recommendations from the December 2011 meeting**

See table below.

18. ISAC Recommendation: Please prepare a **special report on the budget impacts to invasive species programs** for the next ISAC meeting.

Funding Available for Invasive Species General Categories, Departmental Template – USDA (dollars in thousands)

USDA	Agency	FY 2010 Actual	FY 2011 Actual	FY 2012 Actual	FY 2013 Actual	FY 2014 Enacted	FY 2015 Enacted	FY 2016 President's Budget
Prevention	APHIS b/	\$ 62,108	\$ 58,910	\$ 60,625	\$ 56,737	\$ 60,756	\$ 63,113	\$ 71,093
Prevention	ARS	\$ 5,691	\$ 5,440	\$ 5,518	\$ 5,044	\$ 5,599	\$ 5,599	\$ 5,599
Prevention	NIFA	\$ 3,123	\$ 2,241	\$ 1,635	\$ 2,046	\$ 1,933	\$ 1,935	\$ 1,950
Prevention	ERS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Prevention	USFS	\$ 38,218	\$ 37,103	\$ 36,731	\$ 25,757	\$ 19,056	\$ 19,786	\$ 19,477
Prevention	NRCS	\$ 8,655	\$ 8,448	\$ 8,157	\$ 10,825	\$ 5,255	\$ 8,957	\$ 8,957
Prevention Total		\$ 117,795	\$ 112,142	\$ 112,666	\$ 100,409	\$ 93,019	\$ 99,390	\$107,706
EDRR	APHIS	\$ 294,242	\$ 262,102	\$ 244,512	\$ 231,138	\$ 238,859	\$ 244,788	\$242,394
EDRR	ARS	\$ 8,087	\$ 7,838	\$ 5,933	\$ 5,582	\$ 6,321	\$ 6,321	\$ 6,321
EDRR	NIFA	\$ 5,860	\$ 4,278	\$ 3,270	\$ 3,902	\$ 3,631	\$ 3,634	\$ 3,674
EDRR	ERS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
EDRR	USFS b/	\$ 700	\$ 590	9,500	\$ 10,667	\$ 10,929	\$ 10,945	\$ 12,009
EDRR	NRCS	\$ 8,655	\$ 8,448	\$ 8,157	\$ 10,825	\$ 5,225	\$ 8,957	\$ 8,957
EDRR Total		\$ 317,544	\$ 283,256	\$ 271,372	\$ 262,114	\$ 264,965	\$ 274,645	\$273,355

USDA	Agency	FY2010 Actual	FY 2011 Actual	FY 2012 Actual	FY 2013 Actual	FY 2014 Enacted	FY 2015 Enacted	FY 2016 President's Budget
Control	APHIS	\$ 358,406	\$ 339,306	\$ 333,124	\$ 267,995	\$ 310,570	\$ 307,323	\$282,327
Control	ARS	\$ 100,264	\$ 94,752	\$ 81,895	\$ 76,791	\$ 79,788	\$ 79,866	\$ 79,866
Control	NIFA c/	\$ 13,997	\$ 10,536	\$ 9,809	\$ 9,571	\$ 8,428	\$ 8,432	\$ 8,603
Control	ERS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Control	USFS	\$ 42,664	\$ 49,902	\$ 49,403	\$ 50,237	\$ 51,738	\$ 51,602	\$ 54,056
Control	NRCS	\$ 86,549	\$ 84,484	\$ 81,570	\$ 108,254	\$ 52,248	\$ 89,572	\$ 89,572
Control Total		\$ 601,880	\$ 578,980	\$ 555,801	\$ 511,848	\$ 502,772	\$ 536,795	\$514,424
Research	APHIS	\$ 54,546	\$ 56,481	\$ 60,190	\$ 55,274	\$ 59,318	\$ 61,877	\$ 61,979
Research	ARS	\$ 124,888	\$ 122,166	\$ 117,153	\$ 108,066	\$124,901	\$124,377	\$124,377
Research	NIFA	\$ 18,370	\$ 13,832	\$ 13,078	\$ 12,561	\$ 11,017	\$ 11,022	\$ 11,251
Research	ERS a/	\$ 1,000	\$ 1,000	\$ -	\$ 500	\$ 835	\$ 835	\$ 835
Research	USFS	\$ 37,463	\$ 36,004	\$ 35,800	\$ 34,010	\$ 34,010	\$ 35,106	\$ 32,451
Research	NRCS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Research Total		\$ 236,267	\$ 229,483	\$ 226,221	\$ 210,411	\$ 230,081	\$ 233,217	\$230,893
Restoration	APHIS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Restoration	ARS	\$ 296	\$ 353	\$ 442	\$ 378	\$ 383	\$ 383	\$ 383
Restoration	NIFA	\$ 2,416	\$ 1,808	\$ 1,635	\$ 1,644	\$ 1,461	\$ 1,462	\$ 1,489
Restoration	ERS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Restoration	USFS	\$ 7,222	\$ 7,580	\$ 7,504	\$ 2,220	\$ 1,114	\$ 1,111	\$ 1,128
Restoration	NRCS	\$ 25,964	\$ 25,345	\$ 24,471	\$ 32,967	\$ 16,174	\$ 27,728	\$ 27,728
Restoration Total		\$ 35,898	\$ 35,086	\$ 34,052	\$ 37,218	\$ 19,132	\$ 33,684	\$ 30,728

USDA	Agency	FY 2010 Actual	FY 2011 Actual	FY 2012 Actual	FY 2013 Actual	FY 2014 Enacted	FY 2015 Enacted	FY 2016 President's Budget
Edu & PA	APHIS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Edu & PA	ARS	\$ 46,356	\$ 44,342	\$ 39,058	\$ 36,309	\$ 38,268	\$ 38,286	\$ 38,286
Edu & PA	NIFA	\$ 4,111	\$ 2,996	\$ 1,635	\$ 2,745	\$ 2,696	\$ 2,699	\$ 2,713
Edu & PA	ERS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Edu & PA	USFS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Edu & PA	NRCS	\$ 43,275	\$ 42,242	\$ 40,785	\$ 54,127	\$ 26,124	\$ 44,786	\$ 44,786
Edu & Public Awareness Total		\$ 93,742	\$ 89,580	\$ 81,478	\$ 93,181	\$ 67,088	\$ 85,771	\$ 85,785
Lead/Intl. Coop.	APHIS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Lead/Intl. Coop.	ARS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Lead/Intl. Coop.	NIFA	\$ 3,405	\$ 2,520	\$ 1,635	\$ 2,304	\$ 2,194	\$ 2,196	\$ 2,218
Lead/Intl. Coop.	ERS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Lead/Intl. Coop.	FS	\$ 180	\$ 315	\$ 250	\$ 220	\$ 220	\$ 220	\$ 110
Lead/Intl. Coop.	NRCS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Lead/Intl. Coop. Total		\$ 3,585	\$ 2,835	\$ 1,885	\$ 2,524	\$ 2,414	\$ 2,416	\$ 2,328
USDA AGENCIES TOTAL								
APHIS		\$769,302	\$716,799	\$698,451	\$611,144	\$669,503	\$677,101	\$657,793
ARS		\$285,582	\$274,891	\$249,999	\$232,170	\$255,260	\$254,832	\$254,832
NIFA		\$ 51,282	\$ 38,211	\$ 32,697	\$ 34,773	\$ 31,360	\$ 31,380	\$ 31,898
ERS		\$ 1,000	\$ 1,000	\$ -	\$ 500	\$ 835	\$ 835	\$ 835
USFS		\$126,447	\$131,494	\$139,188	\$123,111	\$117,067	\$118,770	\$119,231
NRCS		\$173,098	\$168,967	\$163,140	\$217,007	\$105,026	\$180,000	\$180,000
Agriculture Dept. TOTAL		\$1,406,711	\$1,331,362	\$1,283,478	\$1,218,705	\$1,179,471	\$1,262,918	\$1,244,589

Notes:

a/ ERS contributes to the USDA invasive species efforts through the pesticide use and pesticide management systems economic research and analysis program, which contributes to Integrated Pest Management (IPM), Food Quality Protection Act implementation, invasive species and the areawide IPM programs.

b/ Forest Service data now captures Eradication and rapid Response expenditures, based of refinement of the workplace database tracking systems for invasive species work. FY 2012 figures revised to include NFS data.

c/ NIFA expenditures are impacted and vary from year to year due to the

availability of grant
funding.

APHIS Examples of Budget Impacts on Invasive Species Activities

APHIS in FY 2010

- In FY10, APHIS' total appropriation was approximately \$909 million, an increase of nearly \$28 million over the FY09 level.
- In FY10, APHIS received funding increases for programs that target invasive species, such as the Asian long-horned beetle (+ \$13 million for a total of \$33 million), emerald ash borer (+ \$2.5 million for a total of \$37.2 million), a variety of citrus pests and diseases (+ \$8.9 million for a total of \$44.6 million), and cattle fever ticks (+ \$3 million for a total of \$13.2 million).

APHIS in FY 2011

- In FY11, APHIS' total appropriation was nearly \$867 million.
- Congress removed all earmarked funding (a total of about \$27 million) from APHIS' budget in FY11.
- Some of the earmarks supported invasive species programs, such as efforts to prevent the introduction of the brown tree snake into Hawaii and to control it on Guam.

APHIS in FY 2012

- APHIS' FY12 appropriation is \$819.7 million, a decrease of more than \$47 million from the FY11 funding level.
- Even with the overall decrease in funding, APHIS received increases to target several invasive species, including \$7 million for the Asian long-horned beetle (ALB) (for a total of about \$40 million), \$9 million for the light brown apple moth (for a total of about \$10 million) and \$2.5 million (in total) for the European grapevine moth, both pests that damage fruit production in California.
- APHIS moved to a new budget structure that aligns funding with the commodity or resource group it protects, rather than specific pests or diseases. Examples of the new line items include Tree and Wood Pests and Cattle Health. This new structure will give APHIS flexibility to address new threats as they emerge. APHIS is using this new flexibility to devote additional funding (beyond the increase mentioned above) to ALB eradication in FY12.

- In the FY12 budget, APHIS proposed a change in its strategy and funding level for the emerald ash borer because of lack of practical control tools for the pest and received a corresponding decrease in funding of approximately \$24 million (from \$37 million to \$13 million).

APHIS in FY 2013

- APHIS' FY 13 appropriation was \$761.4 million (post-rescissions and sequester), a decrease of \$58 million from the FY12 funding level.
- APHIS tried to minimize the impact to plant and animal health activities. The Agency identified cost savings measures where possible, such as implementing hiring controls and eliminating development funding for low priority information technology investments. The Agency also identified operating efficiencies and process improvements that allow us to continue providing the same level of services but at a lower cost. These areas include switching telecommunications technology, further consolidating information technology customer service support, and streamlining business processes related to biotechnology petition review and licensing of veterinary biologics.
- APHIS initiated program planning and EIS on invasive feral swine.

APHIS in FY 2014

- APHIS' FY 2014 appropriation is \$844.896 million, including \$20 million provided for the Multi-Agency Coordination Group on Citrus Greening, a devastating, invasive disease of citrus trees. Other than this directed funding, the FY 2014 appropriation is consistent with the FY 2013 enacted level of \$825.026 (prior to rescissions and sequestration). The increased funding over FY 2013 levels will support most APHIS programs, including those targeting invasive species.
- The appropriation included a significant increase to implement a national program to manage and begin reducing the feral swine population in the United States (\$20 million). Also included was a continued funding directive (\$1 million) for invasive honey bee pests.

- The FY 2014 Farm Bill provided increased funding for the Plant Pest and Disease Management and Disaster Prevention program that enhances survey and pest and disease prevention activities for a variety of invasive species. It also provided funding for the National Clean Plant Network which provides a reliable, disease-free source of nursery stock (both are funded under Section 10007 of the FY 2014 Farm Bill).

APHIS in FY 2015

- APHIS' FY 2015 Appropriation is \$874,490,000. This is an increase of \$49.594 million above the FY 2014 appropriation, not including the \$20 million received in 2014 for Citrus Greening. The increase is primarily due to a transfer of \$42.567 million for APHIS' portion of the decentralization of the USDA General Services Administration Rental and Department of Homeland Security Payments account. These funds were previously provided to lessors directly from GSA but now are paid through APHIS accounts. It therefore does not reflect as large of an actual increase as it may appear.
- The appropriation also includes increases for:
 - the **Overseas Technical & Trade Operations** program (\$2 million) to help resolve sanitary and phytosanitary trade issues that could result in the opening of new markets and retaining and expanding existing market access for U.S. agricultural products;
 - the **Swine Health** program (\$2 million) in support of increased biosecurity and herd management efforts for porcine epidemic diarrhea virus;
 - the **Citrus Health Response Program within the Specialty Crop Pest line item** (\$4.5 million) for to help address the damaging effects of citrus greening, and
 - the **Wildlife Damage Management** program (\$2.6 million) for priority initiatives such as oral rabies vaccinations, livestock protection, predator damage management, and preventing the transport of invasive snakes and other harmful species.

- A decrease was included for the Cotton Pests program (\$1.2 million).
- In addition, the FY 2014 Appropriation Act included \$4 million for the National Clean Plant Network in the Plant Protection Methods Development line item. The FY 2014 Farm Bill also included funds for the National Clean Plant Network. Accordingly, with approval from the Appropriations Committees, \$4 million was reprogrammed from the Plant Protection Methods activities. A decrease of this amount is reflected in the FY 2015 appropriation.
- APHIS has \$57.938 million available under Section 10007 of the Plant Pest and Disease Management and Disaster Prevention Program (including \$5 million for the National Clean Plant Network).

APHIS in FY 2016

- The FY 2016 President's Proposed Budget requests \$855.016 million of funding for APHIS and proposes *increases* for:
 - **Swine Health** for \$2.55 million to continue enhancing surveillance for swine enteric coronavirus diseases and other emerging swine diseases;
 - **Anti-Microbial Resistance/Zoonotic Disease Management** for \$10 million to implement the USDA Anti-Microbial Resistance Action Plan;
 - **Agriculture Quarantine Inspection** for \$2 million to increase staffing needs at peak travel times, replace aging equipment, and increase the number of canine teams used in pre-departure inspection operations;
 - **Citrus Greening Multi-Agency Coordinating (MAC) Group** within the Specialty Crop Pests line item for \$7.5 million to continue developing tools and techniques to address huanglongbing (HLB), or citrus greening; and
 - **Lacey Act/Agriculture Import-Export (\$5.5 million)** to enhance the implementation of the Lacey Act, specifically to fully automate the current electronic and paper reporting system and maximize the number of products subject to review.

Decreases are proposed for the:

- **Cotton Pests program** (\$3.3 million);
- a net reduction in **Specialty Crops** of \$11.1 million, and
- a reduction in the **Tree and Wood Pests line**.

Economic Research Service Invasive Species Activities
Program of Research on the Economics of Invasive Species Management (PREISM): Extramural and Intramural Research

- Since FY03, \$7.5 million funded 53 extramural research projects.
- PREISM resulted in over 100 journal articles and book chapters, numerous conference papers, and close to 20 doctoral dissertations and Master's theses.
- Recipients presented results to APHIS and other Federal and State agencies; several participated in the National Academy review of the light brown apple moth program.
- ERS intramural research addressed soybean rust, integration of prevention and control strategies, and approaches to pest exclusion.
- Eight PREISM Workshops (FY03 to FY11) discussed economics of invasive species and presented results.

ERS Program Impacts Based on Reduced Funding

- ERS reduced funding to new extramural projects on the economics of invasive species management through PREISM, but continues to emphasize intramural research and the annual PREISM workshops. In FY12, FY13 and FY14, ERS' research supports intramural economic analysis of invasive species management, which addresses USDA program and policy issues, especially with respect to climate change.

ARS Examples of Budget Impacts on Invasive Species Activities

ARS Invasive Species Research FY10-15)

Please see budget table above.

ARS Systematics Funding:

Update March 2015

ARS Systematics Funding:

FY 2008 - \$19,439,000
FY 2009 - \$19,682,000
FY 2010 - \$20,455,000
FY 2011 - \$20,578,000
FY 2012 - \$20,398,000
FY 2013 - \$19,155,000
FY 2014 – \$20,572,000
FY 2015 Estimate – \$20,683,000

ARS Scientist Years

<u>Fiscal Year</u>	<u>All projects</u>	<u>Invasive Species projects</u>
FY09	2,152 scientist yrs.	347 scientist yrs.
FY10	2,130 scientist yrs.	340 scientist yrs.
FY11	2,113 scientist yrs.	339 scientist yrs.
FY12	1,990 scientist yrs.	290 scientist yrs.
FY13	1,966 scientist yrs.	283 scientist yrs.
FY 14	1,902 scientist yrs.	279 scientist yrs.

NIFA Examples of Budget Impacts on Invasive Species Activities

NIFA in FY 2010

- NIFA’s Biology of Weedy and Invasive Species in Agroecosystems Program was discontinued in AFRI in FY10, which eliminated approximately \$4 million in invasive species funding and work.

NIFA in FY 2011

- NIFA’s Crops at Risk (CAR), Risk Avoidance and Mitigation Program (RAMP), and Critical Issues Programs were eliminated in FY11. These programs funded approximately \$6 million worth of projects on invasive arthropods, weeds and plant diseases, often on a landscape or area-wide scale.
- From FY00 to FY11, IPM funding from NIFA has been cut by 36% (source: IPM Voice).

NIFA in FY 2012

- NIFA’s Crops at Risk (CAR), Risk Avoidance and Mitigation Program (RAMP), and Critical Issues Programs were again eliminated in FY12.

NIFA in FY 2013

- The failure of Congress to pass the 2012 Farm Bill resulted in major cuts in mandatory program funding for NIFA in FY13, including the loss of the Specialty Crop Research Initiative (\$47.3 million (M)), the Organic Agricultural Research and Extension Initiative (\$19 M), and the Beginning Farmers and Ranchers Program (\$19 M).
- NIFA's Crops at Risk (CAR), Risk Avoidance and Mitigation Program (RAMP), and Critical Issues Programs were again not funded in FY13.

NIFA in FY 2014

- NIFA's Crops at Risk (CAR), Risk Avoidance and Mitigation Program (RAMP), and Critical Issues Programs were again not funded in FY14.

NIFA in FY 2015

- As requested by Congress, NIFA has consolidated five different pest management budget lines into one program called the Crop Protection and Pest Management Program (CPPM). The CPPM Program is under the Section 406 authority of the Agricultural Research, Extension, and Education Reform Act of 1998 (AREERA) (7 U.S.C. 7626), as reauthorized by Section 7306 of the Food, Conservation, and Energy Act of 2008 (FCEA) (Pub. L. 110-246). Because this Authority allows the recovery of indirect costs on project awards that previously did not allow recovery of indirect costs, this will result in the loss of up to 30 percent of funds available for project activities.

NRCS Examples of Budget Impacts on Invasive Species Activities

NRCS in FY 2010

- Use of FY10 funds by NRCS State offices to address invasive species indicate a slight increase over funds used in FY09.
- There were no Conservation Innovation Grant funds awarded to proposals addressing invasive species issues.

NRCS in FY 2011

- Use of FY11 funds by NRCS State offices to address invasive species indicate some increase over funds used in FY10.

- There were no Conservation Innovation Grant funds awarded to proposals addressing invasive species issues.

NRCS in FY 2012

- Use of FY12 funds by NRCS State offices to address invasive species in FY12 were about 3% less than funds used in FY 11.
- Invasive species was not a focus area for the FY12 Conservation Innovation Grants.

NRCS in FY 2013

- Funds used by the NRCS State offices to address invasive species in FY 2013 were an increase of about 33 percent over the funds that were used in FY 2012.
This large increase in FY 2013 may be attributed to the following:
 - 506 more contracts addressing “noxious invasive weeds” were written in FY 2013 than in FY 2012
 - Funding for these 506 additional contracts required \$7,805,242 more in FY 2013 than in FY 2012
 - The NRCS new Working Lands for Wildlife partnership with the U.S. Fish and Wildlife Service used agency technical expertise combined with \$33 million in financial assistance from the Wildlife Habitat Incentive Program to combat the decline of seven specific wildlife species whose decline can be reversed. Additional funds of \$7,805,242 were required to address invasive species problems in order to provide quality habitat for the seven wildlife species, especially for the Gopher Tortoise, the Golden-Winged Warbler, the Lesser Prairie, and the New England Cottontail.
 - The partnership effort among the Natural Resources Conservation Service (NRCS), Farm Service Agency and Rural Development entitled the “Strike Force”, which was initiated by Secretary Vilsack in 2013, has reached out to underserved landowners in 137 counties in Arkansas, Georgia and Mississippi, and has provided these three States with an additional \$6 million in financial and technical assistance. The amount of these funds used to address invasive species in 2013 was approximately \$782,614 for 146 new conservation contracts
- The focus areas for the FY 2013 Conservation Innovative Grants did not specifically include invasive species.

NRCS in FY 2014

- Due to decreasing budgets, NRCS *had reduced funding available* for addressing invasive species concerns in FY 2014. The focus areas for the FY 2014 Conservation Innovation

Grants do not specifically include invasive species.

NRCS in FY 2015

- NRCS anticipates that the funds obligated for addressing invasive species concerns in 2015 will be about 70% higher than the 2014 obligations.

USFS Examples of Budget Impacts on Invasive Species

Activities

USFS in FY 2010

- 13% reduction in Sudden Oak Death research (\$2.4M).
- Funding integration and growth resulted in USFS National Forest System invasive species management activities advancing in FY10, resulting in 419,598 acres of priority infestations treated spanning multiple taxa of aquatic and terrestrial, invasive species.
- In FY10, National Forests and Grasslands restored 318,591 acres against invasive species through a national average restoration outcome of 78.6%.

USFS in FY 2011

- 5% decrease in Forest Service research budget and loss of 4% research capability on invasive species (Gypsy Moth, Emerald Ash Borer, Hemlock Woolly Adelgid, Gold Spotted Oak Borer, Laurel Wilt, Beech Bark Disease, Butternut Canker, Invasive Plants).
- 67% reduction in Sudden Oak Death research (\$2.1M).
- Agency-wide Travel Constraint: Travel to professional meetings and funding to partners reduced.
- Funding integration and growth in FY11 resulted in National Forest System invasive species management activities achieving 352,091 acres of priority infestations treated on multiple taxa of aquatic and terrestrial invasive species.
- The focus on high priority infestations resulted in a higher average unit cost per acre for many treatments against high risk species.
- In FY11, National Forests and Grasslands restored 265,751 acres against invasive species through a national average restoration outcome of 75.2%.

USFS in FY 2012

- 5% decrease in Forest Service research budget and loss of 0.5% research capability on invasive species (Emerald Ash Borer, Asian Longhorned Beetle, Hemlock Woolly Adelgid, Gypsy Moth, Gold Spotted Oak Borer, Thousand Canker Disease, Laurel Wilt, Beech Bark Disease, Oak Wilt, Butternut Canker, Invasive Plants, Terrestrial and Aquatic Invasives).
- 95% reduction in Sudden Oak Death research (\$100K).
- Elimination of lower priority lines of invasive research and funding to partners.
- Agency-wide Travel Constraint: Limited travel to professional meetings and for field work.
- In FY12, National Forest System restructured its budget around Integrated Resource Restoration, targeting restoring and improving watershed condition through a variety of integrated activities, including management of aquatic and terrestrial invasive species on national forests and grasslands.
- FY12 expenditures for integrated invasive species management activities (including prevention, early detection and rapid response, control) were estimated at \$55 million for the National Forest System.
- As per new policy (FSM 2900), the focus on high priority infestations will likely result in a higher average unit cost per acre for many treatments against high risk species.

USFS in FY 2013

- 5% decrease in Forest Service research budget and loss of 7% research capability on invasive species (Emerald Ash Borer, Asian Longhorned Beetle, Hemlock Woolly Adelgid, Gypsy Moth, Gold Spotted Oak Borer, Thousand Canker Disease, Laurel Wilt, Beech Bark Disease, Oak Wilt, Butternut Canker, Invasive Plants, Terrestrial and Aquatic Invasives).
- 98% reduction in Sudden Oak Death research (\$75K).
- Loss of insect rearing facility in California.
- Elimination of lower priority lines of invasive research and funding to partners.
- Agency-wide Travel Constraint: Limited travel to professional meetings and for field work.

USFS in FY 2014

- The FY 2014 Enacted budget included \$35,106,000 for invasive species research, an increase of \$1,096,000 from the FY 2013 Consolidated Appropriations Act. At that level, Forest Service R&D will maintain capacity to address priority research areas, including the introduction and spread of non-native species.

USFS in FY 2015

- The FY 2015 President's Budget includes \$32,389,000 for invasive species research, a decrease of \$2,717,000 from the FY 2014 Consolidated Appropriations Act. USFS R&D will maintain capacity to address priority research areas, including the introduction and spread of non-native species, by eliminating some research on established indigenous species.

I. USDA Progress on ISAC recommendations from the May 2012 meeting

19. ISAC Recommendation: ISAC recommends that NISC adopt the Invasive Species and E-Commerce White Paper.

Invasive Species and E-commerce Paper Recommendations:

ISAC concludes that relevant federal agencies need to adjust existing regulations and enforcement practices to better mitigate the risks of trade and transport of invasive species through e-commerce. ISAC offers the following recommendations to enhance our collective ability to engage in e-commerce without promoting the introduction or spread of invasive and potentially invasive species. (Only the recommendations applicable to USDA agencies are included in this Report to ISAC)

ISAC Recommendation 19-1: Department of Interior, U.S. Fish and Wildlife Service (DOI/FWS) and U.S. Department of Agriculture, Animal and Plant Health Inspection Service (USDA/APHIS): **Expedite listing process for the national importation of injurious wildlife and other animals and noxious plants under the Lacey Act, the Plant Protection Act and the Animal Health Protection Act to better assess and address emerging invasive species threats, including those associated with e-commerce.**

Please see the description of APHIS' new NAPPRA category (not authorized pending pest risk analysis) for regulating the importation of plants for planting, as described above in response to the recommendation regarding imports and border protection.

ISAC Recommendation 19-4: USDA/APHIS: Expand the scope of web crawlers and related enforcement and monitoring activities used by the Smuggling Interdiction and Trade Compliance unit to include a broader array of invasive plants and plant pests, and enhance cooperation with U.S. Fish and Wildlife Service (DOI) to address injurious wildlife.

APHIS performs web crawler analysis in the PPQ SITC unit. APHIS is committed at the highest levels to continue to develop our capacity in this area and work collaboratively with other agencies to address risks associated with e-commerce.

ISAC Recommendation 19-8: DOI/FWS, USDA/APHIS and DOC/NOAA: Promote outreach to individuals and businesses involved in the sale and exchange of species over the Internet to reduce intentional and unintentional sales or purchases of species listed as invasive in the U.S. or particular states.

APHIS IS discusses invasive species with counterparts overseas. APHIS PPQ SITC continues to monitor the sale and exchange of prohibited plants and plant products over the Internet and provides outreach to internet auction sites.

20. ISAC Recommendation: ISAC recommends that NISC adopt the Validation of PCR-Based Assays and Laboratory Accreditation for Environmental Detection of Aquatic Invasive Species (AIS) White Paper.

To encourage the development of a validation/accreditation system for AIS environmental DNA (eDNA) detection methodologies and laboratories ISAC recommends the following:

ISAC Recommendation 20-11: Utilize lessons learned in establishing a laboratory performance testing system to fully develop a validation/accreditation program(s) for other invasive species eDNA methodologies and laboratories.

ARS supports projects on the development of DNA-based technologies for accurately identifying certain invasive species, especially when there has been some reason to believe that a particular pest may be part of a species complex, rather than just one species. In these cases, DNA-based techniques may be required for proper identification.

The National Plant Diagnostic Network system (NPDN), with support from the USDA-NIFA and through the collective efforts of many individuals representing Land Grant Universities, federal agencies, state departments of agriculture, and other stakeholders, has grown into an internationally respected consortium of plant diagnostic laboratories. These diagnostic laboratories use conventional and/or molecular genetic taxonomic approaches to quickly detect high consequence pests and pathogens that have been introduced into agricultural and natural ecosystems, identify them, and immediately report them to appropriate responders and decision makers. The NPDN, with support from NIFA, is in the process of establishing an accreditation and standards system so that NPDN laboratories may reliably perform sensitive diagnostic tests with the oversight and recognition required by the regulatory authorities in APHIS.

J. USDA Progress on ISAC recommendations from the May 2014 meeting

ISAC Recommendation: ISAC recommends that NISC agencies with extramural grant programs make it clear in their grant guidance and Requests for Proposals that funding for support of systematics collections (as related to the agency mission, including management and curation) can be an allowable expense on a grant budget.

ISAC ACTION item: ISAC's Research and Information Management Subcommittee: requests that NISC agencies and departments

include in their reports to ISAC, information by fiscal year (for FY 2012 and onward) on funding for:

a) Curation and management of each biological systematics collection held by the agency;

b) research using each of these collections, numbers of researchers and support staff; and,

c) systematics collections support through extramural grant programs.

ARS has the following systematics collections that may be relevant to invasive species studies: Bacteria, Fungi, Nematodes, Plant Viruses, Specialty-Crop-Associated Plant Pathogens, Vertebrate Protozoan Parasites, Vertebrate Viruses, Arthropod Borne Viruses, Avian Viruses, Insects and Mites, Pollinating Insects, Lepidoptera and Coleoptera, Insect Biological Control Agents, Biting Midges and Mosquitoes, Herbaria (including the National Arboretum, Washington, DC), and several germplasm repositories (including the National Center for Genetic Resources Preservation, Ft. Collins, CO).

ARS has supplied data on the funding used for systematics collections, and the research conducted by the laboratories that maintain those collections. However, scientists from many institutions (private and public), and from many countries use these collections, and ARS does not have the means to assess the value of that research (items a and b above). ARS does not have grants, so item c does not apply to ARS.

NIFA grant programs do occasionally support taxonomic studies when they're relevant to the particular grant program's goals and objectives. However, they do not support systematics collections per se.

J. USDA Progress on ISAC recommendations from the November 2014 meeting

ISAC Recommendation: Recognizing the value of the Invasive Species Working Group established recently under the

United States-New Zealand Joint Commission on Science and Technology Collaboration, ISAC recommends that NISC Agencies pursue and support similar opportunities under other existing bilateral and multi-lateral science and technology collaboration agreements for research cooperation on priority invasive species issues of common interest.

USDA agencies (ARS, USFS and APHIS) identified research to do in collaboration with New Zealand researchers. Projects include work on invasive fruit flies, brown marmorated stink bugs, and various research projects on forest invasive species. All the information has been incorporated in the current US- New Zealand bilateral agreement. All projects are ongoing in FY14-15-16. To facilitate this, a high-level program leader in ARS has been identified to participate in a meeting to select future potential areas of New Zealand research collaboration with ARS and USFS.

ISAC Recommendation: Given that Asian Longhorned Beetle (ALB) is one of the most damaging invasive forest pests currently threatening North America; that it has been successfully eradicated from five sites nationwide; and that only three known localized infestations remain (MA, NY, OH), ISAC recommends that to ensure successful eradication the U.S. Forest Service, the Animal and Plant Health Inspection Service and other NISC agencies share information to perform risk-based Early Detection Surveys for ALB in high risk areas outside current quarantine zones.

APHIS informs that the Asian longhorned beetle (ALB) has been successfully eradicated from two states (IL and NJ). It has also been eradicated from Islip, Manhattan and Staten Island, New York, as well as Boston, MA. Infestations remain in New York, Massachusetts, and Ohio. The members of NISC appreciate that the range of this forest-destroying invasive insect has been significantly reduced, but it has not been eradicated and remains a significant threat. APHIS and USFS are committed to elimination of this and other invasive species that impact forest health.

The two NISC members' agencies that have primary roles in this work are USDA's APHIS and Forest Service. APHIS and the USDA

meet regularly at stakeholder meetings and through conference calls. They cooperate in many areas of operations and research for the eradication of current ALB infestations including high risk site surveys outside of the quarantine area. These agencies have developed traps for ALB and discuss how to best deploy the traps including consideration of high risk areas outside of the quarantine. APHIS works most closely with local state government agencies to survey these high risk areas; however, FS has also contributed to these surveys. During surveys, people look for ALB in trees in high risk areas. For example, FS funded a Forest Compact in the state of Massachusetts in 2014 where approximately 3,600 trees were surveyed in five states (Connecticut, Maine, New Hampshire, Nova Scotia, and Vermont). APHIS and FS are currently working together to enhance models to direct survey and eradication efforts, they agree with this ISAC recommendation and will continue to share information and collaborate on early detection outside of quarantine areas as well as within quarantine areas.

I respectfully submit this report to ISAC. If you have any questions, please do not hesitate to contact me. Thank you.

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