From Forest Nursery Notes, Summer 2013

94. A sentinel plant network to help address the plants for planting pest pathway. Britton, K. O. Proceedings of the 7th Meeting of IUFRO Working Party 7.03.04, p. 69-73. USDA Forest Service, Southern Region, Forest Health Protection Report 10-01-01. 2010.

A SENTINEL PLANT NETWORK TO HELP ADDRESS THE PLANTS FOR PLANTING PEST PATHWAY

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ABSTRACT

More forest pests are spread by plants for planting than any other pathway. Phytosanitary protections for many countries are based on "black lists" and inspections. These strategies rely on the assumption that we know what pests exist, yet forest pests are rarely predicted in advance. International organizations such as IUFRO should promote pest discovery and information sharing systems to inform pest prevention activities. One way to develop better pest lists would be to develop a sentinel plant network. A sentinel plant network could inform our regulatory systems by capitalizing on the experience of plants exposed 24 hours every day to pests in foreign environments. Botanic gardens and arboreta already monitor their collections and diagnose plant disease and insect pests. Diagnostic support should be provided to help them identify unknown pests. The information on what is being found needs to be made available in an organized fashion. Several countries have recently initiated various forms of monitoring for pests of expatriate plants. Nursery pest professionals are asked to help diagnose new pests, and to report pest finds to their National Plant Protection Organization. Efforts, opportunities and obstacles to developing and sharing data on pests are described.

IDENTIFYING THE PROBLEM

Many forest pests, both insects and pathogens, have entered new lands via plants for planting (i.e., nursery stock). The IUFRO Work Unit 7.03.12 on Alien Invasive Species and International Trade recently endorsed a concept paper reviewing the evidence supporting strong regulatory control of this key pathway.

The World Trade Organization's Sanitary and Phytosanitary Agreement requires that nations not limit trade except to prevent known potential pests. Therefore, science needs to do a better job of identifying pest threats before they become established in new lands. To identify pests of concern in the plants for planting pathway, a sentinel plant network is needed.

Most countries rely on a "black list" system of pest prevention. Hosts of regulated or quarantine pests are either prohibited or require some mitigation measures that reduce pest risk. Nursery plants that are not black listed are permitted to enter. This type of system assumes that we know what pests might be associated with hosts in trade, but evidence

suggests that fewer than 7% of the world's fungi are known to science (Crous and Groenewald 2005).

In the United States, inspection provides an additional safeguard. All plants for planting must enter through a port with a plant inspection station, and 75% of plant imports enter through the port of Miami. About 35 inspectors examine the 2.5 billion plants per year that enter through the Miami plant inspection station, which suggests that resources are already stretched far beyond capacity. While grapevines and fruit trees require quarantine periods under controlled conditions under the auspices of the National Clean Plant Network (http://groups.ucanr.org/ncpn/), most other plants do not. Some of the more risky species are allowed to be "quarantined" in the back corner of a grower's production field.

Australia and New Zealand are more risk-averse. These two countries use a "white list" system, where plants are not permitted to enter unless pest risk assessments judge them to be safe. While this approach is more limiting of trade, it is also more limiting of pests.

There is currently no international phytosanitary standard for nursery stock. Two expert working groups have developed drafts for the International Plant Protection Convention (IPPC), but so far neither draft has been circulated for country comments.

The North American Plant Protection Organization adopted a standard for plants for planting (RSPM-24) in October 2005, which calls for a systems approach to clean stock production, with chain of custody documentation to attest to proper handling throughout the production chain (NAPPO 2005). To date neither Canada, Mexico or the United States have implemented this standard, largely because doing so requires that they adopt the same standards for internal production as they require of their trading partners. Much work remains before this can be accomplished.

To further the implementation of RSPM-24, researchers and the nursery industry are working to develop best management practices and critical control point monitoring systems. Mitigations will be designed to reduce particular pests to acceptable levels. "Poster pests" will be tested to ensure mitigation measure efficacy. If the poster pests consist of a broad biological spectrum, one can assume that the mitigations will also greatly reduce the incidence of unknown pests as well.

IDENTIFYING PESTS OF CONCERN

Global botanical garden and arboreta collections are a unique and largely untapped asset, which expose non-native plants to native pests every day. The data from this giant ongoing "experiment" need to be collected and shared, so that countries can ensure that similar pests do not move in the plant trade. This information could inform prevention activities, as well as enhancing early detection of new pest arrivals.

Three components are needed to make an effective sentinel plant network:

1. Improved communication with, and better diagnostic support for, botanical gardens and arboreta worldwide.
2. Better pest reporting systems that include native pests.
3. Follow-through that mitigates newly discovered pests before they spread.

IMPROVING COMMUMICATION AND DIAGNOSTIC SUPPORT

Staff at botanical gardens already watch over their collections and examine any ailing plants. However, plant failure is often attributed to poor adaptation to local climate, without benefit of a professional diagnosis. The American Public Gardens Association recently received funding from the United States Department of Agriculture (USDA) to develop training materials for garden staff to help them identify pest problems, and know where to go for advice if unusual problems occur. They will also develop outreach materials for gardens to deliver to the plant-loving public about invasive pest impacts and the need for citizen monitoring.

In the United States, National Plant Diagnostic Network (NPDN) labs are willing to help identify pests, and direct clientele to experts who can provide management strategies. If the pest is exotic, we will "catch" the next chestnut blight before it gets thoroughly established in the US. Or if the problem is endemic to the garden's region, and not known in the country of origin for the host plant, counterparts overseas will be grateful for an advance warning that such a pest exists. If hosts are moving in trade, they will take steps to ensure that such exchanges are from clean stock only.

BETTER PEST REPORTING SYSTEMS

Pest reporting is a requirement for members of the IPPC. Much pest data is available on the internet, but it is scattered, and largely not searchable by host plant. Countries wishing to assess risks and individuals trying to identify a pest problem need better access to information on what pests are already known, what they look like, their biology and impacts. Ideally a single data portal managed by the Secretariat of the IPPC or the United Nations Food and Agriculture Organization would provide free access to complete pest lists (sortable by host) for all countries. At the top level, information should be simply written, with photographs suitable for use by the general public. Links to more technical information, e.g., identification keys and molecular data resources are recommended.

Many botanic gardens and arboreta are working to place their collection catalogs on the worldwide web. For example, the "PlantSearch" database maintained by Botanic Gardens Conservation International (BGCI) currently contains 575,000 records of taxa found in botanic garden collections around the world (http://www.bgci.org/plant search.php). Most gardens retain information on the sources of plants in their collection equivalent at least to what would be found on a herbarium specimen label. The USDA recently funded BGCI to grow this database, and to encourage gardens to include information on weediness of plants

in their unique environment. This information can be used by all countries to evaluate risk from the plants themselves as pests.

MITIGATE NEWLY DISCOVERED PESTS BEFORE THEY SPREAD

In the United States, if a new pest is detected, NPDN labs have a reporting system with the United States Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) to initiate a response. A New Pest Advisory Group assesses the risk and makes a recommendation about whether or not emergency actions, such as delimitation surveys and eradication programs, are needed. Counterparts overseas are often contacted to provide information about how to best mitigate the problem.

If a domestic pest is discovered attacking an exotic plant, counterparts overseas should also be notified, so that they can assess the risk the pest poses. Because of the trade implications, there may exist some disincentive to expend resources on this, but under the IPPC agreements we have an obligation to do so. If all countries would adopt the "Golden Rule" in this regard (Do unto others as you would have them do unto you), pest prevention efforts could improve substantially. At present, this vision is just a Utopian dream.

We are witnessing the bare beginnings of a sentinel plant network of a different kind. Several countries have initiated monitoring efforts in sentinel plantings with specific trading partners. While these individual efforts are not linked, they offer good examples of different approaches to getting better pest information. INRA (Institut National de la Recherche Agronomique) has sent hundreds of seedlings of European plants to China, to establish replicated plots of sentinel plants. Kenis of CABI Switzerland is collaborating with Russian scientists to survey for insects attacking existing European plants in Russian arboreta (Kenis and others 2009). And New Zealand recently completed a comprehensive five year pilot study (Fagan and others 2008).

The botanical gardens organizations recently funded by USDA will develop training and outreach programs useful in other countries as well as in the United States. It is vital that we secure cooperation from gardens and pest specialists everywhere to reap the full benefit of this opportunity to inform the pest prevention process with scientific information on what pests exist where, and what they will eat when given the chance.

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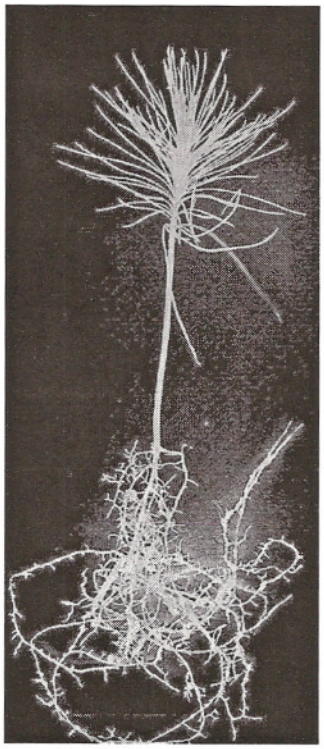
United States
Department
of Agriculture

Forest Service

Southern Region

Forest Health Protection
Report 10-01-01

Proceedings of the 7th Meeting of IUFRO Working Party 7.03.04 Diseases and Insects in Forest Nurseries



2010

Proceedings of the Seventh Meeting of IUFRO Working Party 7.03.04

Diseases and Insects in Forest Nurseries

Hilo, Hawai'i USA
July 13 to 17, 2009

Edited by
Michelle M. Cram

Forest Health Protection
United States Department of Agriculture
Forestry Service, Southern Region
Forest Health Protection Report 10-01-01

2010