



In this presentation, we will explore how pests are introduced to New York.

# PESTS AND PATHWAYS

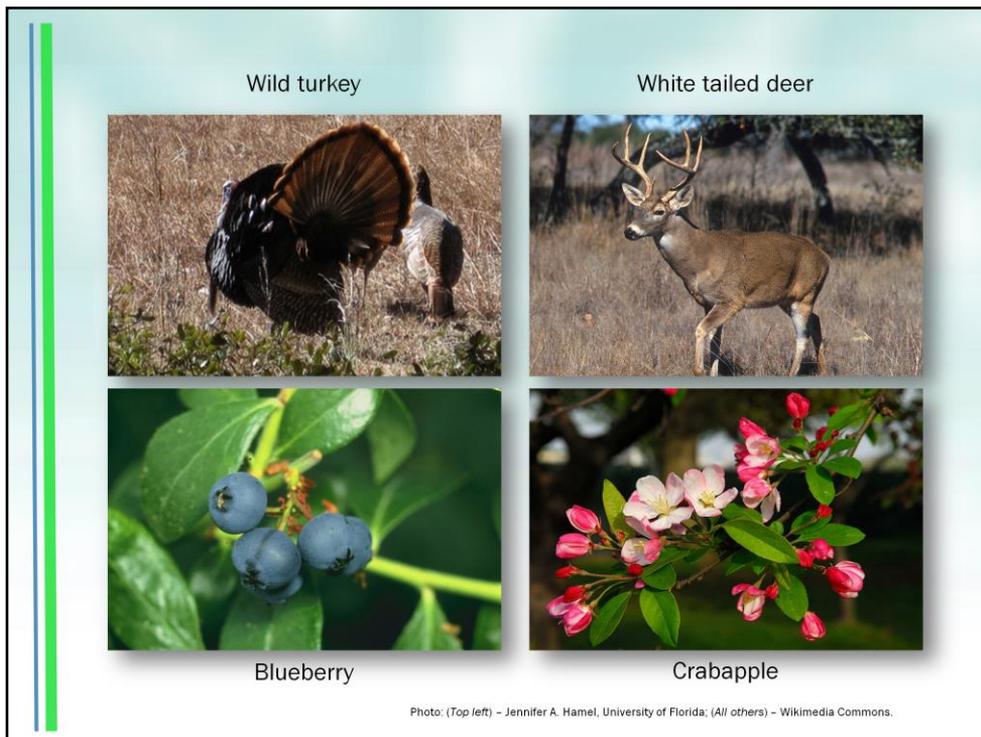
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Enhanced First Detector Training for New York State

In this presentation, we will explore how pests are introduced to New York.



We will begin by reviewing some of the vocabulary that scientists and decision-makers use when discussing plant pests. Consider the images on this slide. Would you consider the four species pictured here to be native, introduced, or invasive in the U.S.?

Each of these species (clockwise from top left: wild turkey, white tailed deer, crabapple, and blueberry) are **native** to the continental U.S.

# Native

Organisms that occur in an ecosystem as a result of only natural processes, with no human intervention.

Blueberry



Wild turkey



Photos: (Left) – Wikimedia Commons; (Right) - Jennifer A. Hamel, University of Florida.

**Native** species are organisms (e.g., plants, animals, fungi) whose presence in an ecosystem is the result of only natural processes and is not the result of human intervention.

Information source:

Hodges, Amanda and Stephanie Stocks. 2010. Overview: Invasive Species that Affect Plants. Updated December 2011.

Accessed June 21, 2013 –  
[www.protectingusnow.org](http://www.protectingusnow.org)

# Introduced

**Organisms that are introduced to a new ecosystem where they become established and survive**

- Usually introduced via human intervention
- Can have beneficial or detrimental effects on environment



Honeybee



Peaches

Photos: Wikimedia Commons

**Introduced** species are organisms that originate in one region/ecosystem, but are introduced to another region/ecosystem and become acclimated and “established” in the new region/ecosystem.

This means the organism can survive and reproduce on its own, and maintain a stable population in the new area. Introduced species are often introduced to the new environment by humans. These introductions may be deliberate or accidental.

Introduced species can have either beneficial or detrimental effects on the environment.

Honeybees (from Europe) and peaches (from Asia) are both examples of introduced species that are considered to be beneficial.

Information source:

Hodges, Amanda and Stephanie Stocks. 2010. Overview: Invasive Species that Affect Plants. Updated December 2011.

Accessed June 21, 2013 –  
[www.protectingusnow.org](http://www.protectingusnow.org)

# Invasive

Organisms that are introduced to an ecosystem where they establish and survive, causing harm

- Usually introduced via human intervention
- Only have detrimental effects (economic, ecological, and/or human health)



Photos: (top, main) - Mark Robinson, USDA-FS, [www.bugwood.org](http://www.bugwood.org), #2912081; (top, inset) gypsy moth caterpillar, flickr; (bottom) - Thomas B. Denholm, NJDA, [www.bugwood.org](http://www.bugwood.org), #1253023; (bottom, inset) - Asian longhorned beetle, USDA-APHIS, flickr

Invasive species are introduced species that have detrimental effects on the environment or human health or crop health.

The National Invasive Species Council defines invasive species as being not native to the ecosystem (i.e. introduced) and whose introduction will likely cause economic harm or harm to human health – detrimental effects.

Invasive species are usually accidentally introduced through shipment of goods or movement of people from country to country, but sometimes they are intentionally introduced.

Can you think of an example of an invasive species which was intentionally introduced? An example in the northeast is the European gypsy moth which was brought here from France by an entomologist looking to breed hybrid silkworms to establish a silk industry here in the US.

How about one that has been accidentally introduced? (Asian longhorned beetle...)

Information source:

Hodges, Amanda and Stephanie Stocks. 2010. Overview: Invasive Species that Affect Plants. Updated December 2011.

Accessed June 21, 2013 –

[www.protectingsnow.org](http://www.protectingsnow.org)

[www.fs.fed.us/ne/morgantown/4557/gmoth/trouvelot/](http://www.fs.fed.us/ne/morgantown/4557/gmoth/trouvelot/)

# Pest

## Organisms that compete with humans for resources.

- Only have detrimental effects
- Competition includes consuming or damaging food, fiber, other resources that humans value
- Pests can be native, introduced, or invasive

Damage caused by Southern pine beetle



Ash tree damage caused by Emerald ash borer



Photos: (Left, main) - Ronald F. Billings, Texas Forest Service, [www.bugwood.org](http://www.bugwood.org), #1546017; (Left, inset) - Erich G. Vallery, USDA Forest Service - SRS-4552, [www.bugwood.org](http://www.bugwood.org), #5289035; (Right, main) - Daniel Herms, The Ohio State University, [www.bugwood.org](http://www.bugwood.org), #5171038; (Right, inset) - David Cappaert, Michigan State University, [www.bugwood.org](http://www.bugwood.org), #2106098.

**Pest** species are organisms that compete with humans for resources we value. For example, pests may consume or damage food, fiber or other materials intended for human consumption or use.

Pests can be native to an area or be introduced (and they are called invasive species). For example, The southern pine beetle (*Dendroctonus frontalis*) is a native species that attacks pine trees. The emerald ash borer (*Agrilus planipennis*) is an introduced pest (i.e. invasive species) that attacks ash trees.

Information sources:

Hodges, Amanda and Stephanie Stocks. 2010. Overview: Invasive Species that Affect Plants. Updated December 2011.

Accessed June 21, 2013 –  
[www.protectingusnow.org](http://www.protectingusnow.org)

Massachusetts Introduced Pests Outreach Project. August 23, 2006. Plum Pox Pest Alert.

Accessed June 21, 2013 –  
<http://www.massnrc.org/pests>

## How are new species introduced and why does New York seem to get so many?

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We now have good working definitions for native, introduced, invasive species and pests. But the big question is how are species introduced to new areas and why does New York seem to get so many?

This part is meant to be interactive. Please ask the audience to come up with a list of how species can be introduced into a new area. For example, commercial shipping, airplane travel, cars traveling from one area to another, trucks coming into New York carrying produce or other plant products, people bringing plants or seeds back with them when they travel, people bring fruit and vegetables in from another country, etc. Any one of these can bring in an unwanted pest.

Next, ask the audience to think about why New York gets so many invasive species.

The main answers are trade and travel/tourism. The three busiest stations in the US that handle the highest volumes of cargo and travelers are in order: Miami (airport and marine port), New York's John F. Kennedy International Airport and Los Angeles, California (airport and marine port). They are also the three highest destinations for intercepted pests.

John F. Kennedy International Airport (JFK) is a leading international air cargo center and New York Harbor is one of the busiest seaports in the world!

In addition, we have a large tourism industry which means we get many visitors from around the world traveling everyday via ships and airplanes. Pests can hitch a ride in airplanes and ships and be in New York in a short amount of time.

According to USDA data of interceptions of nonindigenous plant pests over a 17 year period, more than half of pest interceptions in the US (62%) were associated with baggage carried by travelers entering the US.

For all of these reasons and more, New York can be considered a state which is highly impacted by invasive species.

But how do invasive species get here?

Reference:

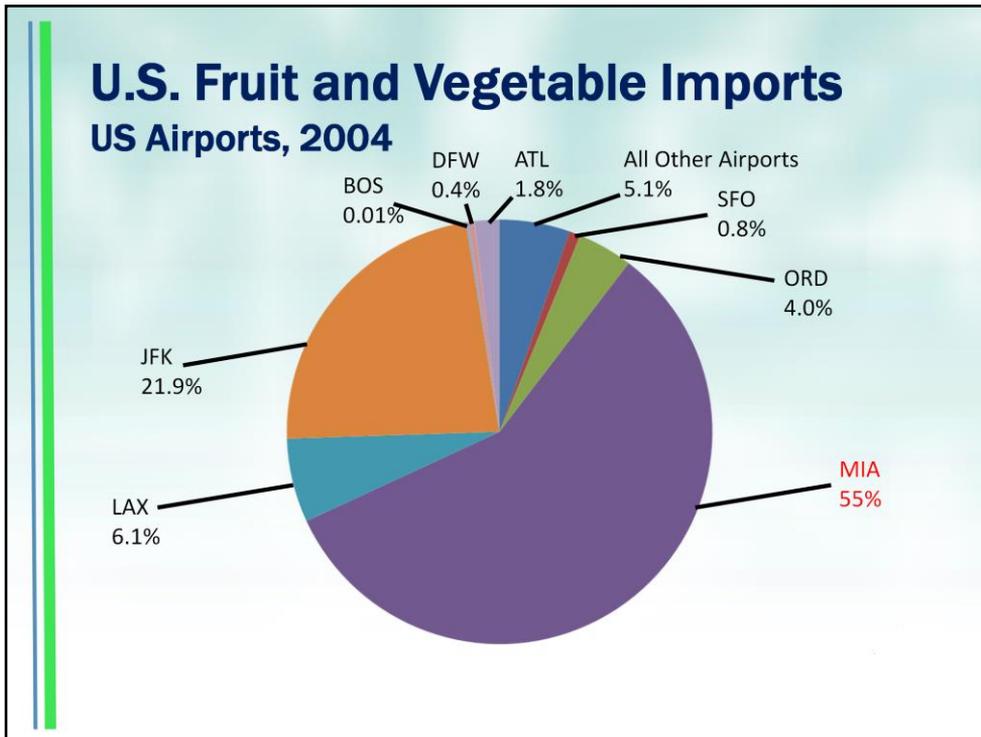
<http://www.forbes.com/sites/gcaptain/2011/10/25/the-port-of-new-york-and-new-jersey-a-critical-hub-of-global-commerce/>



New York is *especially* susceptible to species introductions. Human travel and shipment of goods are the main means by which species are introduced to New York. For example, New York has 18 international airports. At which New York airport do you think most pest introductions occur?

What types of cargo do you think contains the most pests as hitchhikers?

Map courtesy of (CAPS) program.



Let's take a look at fruit and vegetable imports. It should not be a surprise that Miami's international airport receives the most fruit and vegetable imports in the country but the second highest imports of fruits and vegetables is New York's JFK. The more plant material which enters, the greater likelihood that pests can enter. This is an enormous pathway for plant pest introductions.

Information source:  
US Department of Commerce

## Air Cargo at JFK International Airport

- Total air cargo area is 1,700 acres
- Four million square feet of warehouse/storage facilities, including climate-controlled areas and areas for inspection
- More than 100 scheduled and nonscheduled carriers with over 1,000 plane movements daily



Photo: Aircraft loading cargo at JFK airport, NYC Economic Development Corporation



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John F. Kennedy International Airport (JFK) is a leading international air cargo center.

From the 2009 International Air Cargo Trade report: the New York Custom District (NYCD) continues to rank as the largest District in the United States in terms of total tons via air traffic for the January 2009 period. The NYCD fell to number two for imports while remaining the number one U.S. Customs District for Exports.

JFK's cargo area is convenient to nine passenger terminals accommodating over 45 million passengers annually.

Reference:

<http://www.panynj.gov/air-cargo/jfk.html>

<http://www.panynj.gov/air-cargo/statistics.html> (2009 report)

## By Water

New York has 27 ports –including 14 deep water ports

- Port of New York/New Jersey ranked the third busiest port in the United States
- New York Harbor is the largest port on the Eastern Seaboard
- Supports the most densely populated metropolitan area in North America



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In addition to airports, New York also has 27 ports of which 14 are deepwater ports. They play an important role in international trade which causes introduction of exotic species into New York.

In fact, New York Harbor is one of the busiest seaports in the world! The American Association of Port Authorities ranks the Port of New York/New Jersey as the **third busiest** port in the United States, based on total imports and exports by weight (American Association of Port Authorities, 2010). New York Harbor is the largest port on the Eastern Seaboard of the United States and it supports the most densely populated metropolitan area in North America.

Reference:

[www.forbes.com/sites/gcaptain/2011/10/25/the-port-of-new-york-and-new-jersey-a-critical-hub-of-global-commerce/](http://www.forbes.com/sites/gcaptain/2011/10/25/the-port-of-new-york-and-new-jersey-a-critical-hub-of-global-commerce/)

## By Land

### New York Thruway and roadways



Photo: Interception of logs. Courtesy of Ethan Angell, New York State Department of Agriculture & Markets

Invasive pests can also come into New York through commercial shipments of agricultural, ornamental, or forestry products that originated in a different part of the United States or Canada and are brought to New York on trucks.

Consider tourism as well, the NYS Thruway\* serves approximately 271 million vehicles traveling more than 8 billion miles each year and has 27 travel plazas, as well as additional rest areas, park and rides and designated texting areas. It is an easy pathway for pests to come in from another state, Canada or to move around within the state.

## Why is New York a likely place for invasive species to establish?

- Live plant material is imported through airports, deepwater ports, and interstate travel.
- New York has a large tourism industry.



Photo: NYSDAM inspectors working with Customs and Border Protection (CBP), Courtesy of Ethan Angell, New York State Department of Agriculture & Markets



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Time to review: why is New York a likely place for invasive species to establish?

- Live plant material is imported regularly through airports, deepwater ports, and interstate travel.
- New York has a large tourism industry which promotes regular international travel and possible “hitchhikers”

This means that because New York has a higher chance of getting potentially invasive species New York is disproportionately affected by invasive species.

Once a pest is introduced it can go unnoticed for a period of years. The earlier pests are detected, the faster a response plan can begin improving the chances of eradication.

Clearly, we need your help to keep an eye on things.

# WHAT IS CAPS?

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Division of Plant Industry

New York State Department of Agriculture & Markets



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## Cooperative Agricultural Pest Survey (CAPS)

Since 2003 CAPS in New York has detected:

- 2003 Southern bacterial wilt (*Ralstonia*)
- 2003 European crane fly
- 2004 Swede midge
- 2005 *Sirex* woodwasp
- 2006 Plum pox virus



Photos: (top) Geranium with southern bacterial wilt, USDA APHIS PPQ Archive, USDA APHIS PPQ, Bugwood.org; (bottom) *Sirex noctilio* female, David R. Lance, USDA APHIS PPQ, Bugwood.org

Part of the mission of the New York Cooperative Agricultural Pest Survey (CAPS) is to inspect agricultural shipments traveling into New York from other states (e.g. via interstate highway) and from Canada. Although less than 5% of agricultural shipments can be thoroughly inspected, NY CAPS detections include Southern bacterial wilt in 2003, *Sirex noctilio* in 2005 and plum pox virus in 2006.

## What is CAPS

“The CAPS program conducts science-based national and state surveys targeted at specific exotic plant pests, diseases, and weeds identified as threats to U.S. agriculture and/or the environment. It provides a second line of defense in detection of exotic pests”.



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## Multi-faceted approach to pest detection

- A structured, transparent assessment process to identify pest threats
- Development of scientifically sound pest diagnostics and survey protocols
- Providing survey materials (traps, lures, etc.)
- Conducting the actual pest surveys
- Timely reporting of pest survey results through an approved database
- Ensuring that the data collected is valid and of high quality
- Notification of significant pest detections through established protocols.



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## Who are the players?

- USDA-APHIS
- PURDUE UNIVERSITY
- NY STATE DEPARTMENT OF AGRICULTURE
- CORNELL UNIVERSITY
- CORNELL COOPERATIVE EXTENSION
- INDUSTRY GROUPS-FORESTRY/NURSERY/GREENHOUSE



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## 2014 Exotic Pest Survey for New York State

### European Hardwood Ambrosia Beetle, *Trypoderon domesticum*

*Trypoderon  
domesticum*

Host: Primary: Alder, Birch spp., Maple spp., Cherry; Others: Oak, Apple, Ash, Beech, Chestnut, Black locust, Hawthorn, Prunus spp., Mulberry, Linden. (Of Eur-Asian origin: Caragana spp., Hornbeam, Chess-apple, English holly, European mountain ash, Goat willow, Persian walnut).

Status: Found in Washington state, 2008, and in Georgia 2002. Established on Prince Edward Island, Canada. Intercepted at US ports in hardwood crating imported from Europe. Native to Europe. High risk of introduction in the Northeastern United States.

Scope: Damage due to insect boring de-values high quality hardwood materials such as veneer, paneling and furniture. Vector of fungal disease to living trees.

Survey Type: Trap, Multi-Funnel



### Golden Twin Spot Moth, *Chrysodeixis chalcites*

*Chrysodeixis  
chalcites*



Host: Primary: Soybean, Tomato, Potato Green Bean; Other: Dill, Aster, Cauliflower, Cabbage, Brassica spp., Bell pepper, Chrysanthemum, Citrus, Cucumber, Zucchini, Artichoke, Dahlia spp., Dianthus spp., Fig, Fragaria spp., Jerusalem artichoke, Amaryllis, Lettuce, Alfalfa, Geranium, Common sage, Jamaica vervain, White clover, Wheat, Corn

Status: Found in Ontario Canada. Likely, but not proven, to be in field tomatoes in the United States. Native to N.Africa and Southern Europe.

Scope: Considered serious pest in many countries. Feeds on foliage and fruit of its host, reducing yield. Imported frequently into Britain on chrysanthemum, and into the US on tomato and geranium.

Survey Type: Trap, Wing



### Japanese Pine Sawyer, *Monoctonus alternatus*

*Monoctonus  
alternatus*



Host: Primary: Pine spp., Japanese red pine, Luchu pine, Masson pine, Japanese black pine  
Secondary: Fir, Maple, Cedar, Beech, Ginkgo biloba, Juniper, Larch, Sweetgum, Apple, Dawn redwood,

Spruce, Jack pine, Lace bark pine, Shortleaf pin, Slash pine, Apache pine, Gregg's pine, Khasya pine, Fruit pine, Smooth leaved pine, Black pine, Lingleaf pine, Japanese white pine, Maritime pine, Ponderosa pine, Eastern white pine, Loblolly pine

Status: Not established in the US. Native to most of China, Japan, the Korean peninsula, Mongolia and Russia.

Scope: A major vector of Pine Wood Nematode which has a major role in Pine Wilt Disease.

Survey Type: Trap, Multi-Funnel



Photos: Milan Zubrik, Forest Research Institute - Slovakia, Bugwood.org

## 2014 Exotic Pest Survey for New York State

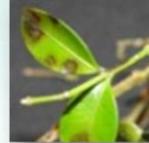
### Oak Ambrosia Beetle, *Platypus quercivorus*

Host: Primary: members of Fagaceae, mainly non-native (Japanese) species: Oak, Chestnut, Chinkapin, Sudajii. Secondary: Japanese cedar, Chinese holly, Japanese silver tree, Korean mountain ash, spicebush, Prunus sp.  
 Status: Not established in the US. Native to East and South East Asia. Devastating oak stands in Japan. Vector of the ambrosia fungus *Raffaelea quercivora* in oaks. Causal agent of oak disease. Severe economic implications.  
 Scope: Economic impacts on commercial oak products and ornamental landscaping and mortality of oak forests. High risk of establishment. Vector of Japanese oak wilt.  
 Survey Type: Trap, Multi-Funnel



### Boxwood Blight, *Cylindrocladium buxicola* (C. pseudonaviculatum)

Host: Buxus spp; English and American boxwoods are especially susceptible; Pachysandra  
 Status: Found in NY, NC, CT, and VA. Established in New Zealand, United Kingdom, and Europe.  
 Scope: Rapid disease cycle which can kill plant in two weeks. Survives as mycelium on fallen leaves for up to 5 years. Associated with pathogen for Volutella blight. Intercepted on imported commodities; Spread through movement of infected nursery stock. Spores dispersed by wind, water. Infected tools, and possibly animals. Difficult to control with fungicide. Submit sample for lab I.D.  
 Survey Type: Visual; Leaves, Stems



### Chilli Thrips, *Scirtothrips dorsalis*



Host: Rose, Geranium, Camellia, Crape myrtle, Begonia, Poinsettia, Petunia, Verbena, Viburnum, Zinnia; Gerber daisy, Chrysanthemums, Grasses, Blueberry, Strawberry, Grapevine, Sweet Basil, Tomato, Soybean, Bean, Chili Pepper (Habanero, Scotch Bonnet, Japanese), Corn, Eggplant, Onion; Peach, Cherry, Ginko, Euonymus, Holly, Japanese Privet, Jasmine, Maple  
 Status: Found in Texas and Florida, S. America; Native to Asia  
 Scope: Vector of several plant viruses. Can reduce yield or value of a crop. Serious damage to grapes in Venezuela and tea crops in its native range.  
 Survey Type: Visual; leaf curl, dark brown spots. Submit sample for lab I.D.



## 2014 Exotic Pest Survey for New York State

<p><b>Japanese Wax Scale,</b> Ceroplastes japonicus</p>	<p>Host: Major: Holly, Ivy, Mulberry, Apple, Cherry, Peach, Pear, Plum, Prune, Bay Laurel, Maple and Citrus. Others: Boxwood, Elm, Hawthorn, Jasmine, Magnolia, Willow          Status: Not currently established in the US; Native to Asia. Quarantined in Australia          Scope: Scale has an economic impact in the nursery and forestry industry affecting overall plant health and production which may affect domestic and international trade. Pest of ornamentals in Italy and Japan. (Note: Very similar to species Ceroplastes ceriferus which is known to occur in New York)          Survey Type: Visual; Fruits, Leaves, Stems. Submit sample for lab I.D.</p>
<p><b>P. ramorum Blight,</b> Phytophthora ramorum</p>	<p>Host: Priority- Camellias, Rhododendron, Pieris, Mountain Laurel, Viburnum;          Secondary priority- other Broadleaf Evergreens, Douglas Fir, Yew, Lilac, Magnolia and Red Oaks          Status: Not currently established in NY; Quarantined in California, and Oregon.          Scope: Threat to US Oak, Maple, and Walnut forests and nursery economics. Submit sample for lab I.D.          Survey Type: Visual; Leaves and Twigs</p>
<p><b>Late Blight on Tomato,</b> Phytophthora infestans</p>	<p>Host: Tomato, potato, and (rarely) petunia          Status: Worldwide distribution. Native to Mexico.          Scope: Causes severe economic loss of potato and tomato crops. Cause of the Irish Potato Famine in the 1800s.          Survey Type: Visual; leaf, stem, fruit, Submit sample for lab I.D.</p>



## 2014 Exotic Pest Survey for New York State

**Southern  
Bacterial Wilt,**  
*Ralstonia  
solanacearum  
race3 biovar2*

Host: Geraniums from vegetative cuttings. Pay particular attention to plants from South American or offshore greenhouse locations.  
Status: Not currently established in the US, however introduced in 2003 (and eradicated); Native to Peru. This is on the USDA select agent list for Quarantine.  
Scope: Potential threat to crops like potato and tomato, and to the greenhouse industry. Early detection of SBW is necessary to prevent dispersal from geraniums to other host crops. Submit sample for lab I.D.  
Survey Type: Visual; Leaves



- **FEDERAL TARGETS - FUNDED**
- **STATE TARGETS - UNFUNDED**



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# TRAPPING SURVEY



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## VISUAL SURVEY



# References

USDA APHIS – Cooperative Agricultural Pest Survey(CAPS)  
Program

Purdue University-  
[https://caps.ceris.purdue.edu/about\\_caps](https://caps.ceris.purdue.edu/about_caps)

New York State Department of Agriculture- 2014 Exotic Pest  
Survey



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## Collaborating Agencies

- U.S. Department of Agriculture Animal and Plant Health Inspection Service (USDA-APHIS)
- Cooperative Agricultural Pest Survey Program (CAPS)
- Florida Department of Agriculture and Consumer Services (FDACS)
- National Plant Diagnostic Network (NPDN)
- Sentinel Plant Network (SPN)
- Protect U.S.
- University of Florida Institute of Food and Agricultural Sciences (UF-IFAS)



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## References

- Hodges, Amanda and Stephanie Stocks. 2010. Overview: Invasive Species that Affect Plants. Updated December 2011. Accessed June 21, 2013 – [www.protectingusnow.org](http://www.protectingusnow.org)
- [www.fs.fed.us/ne/morgantown/4557/gmoth/trouvelot/](http://www.fs.fed.us/ne/morgantown/4557/gmoth/trouvelot/)
- [www.forbes.com/sites/gcaptain/2011/10/25/the-port-of-new-york-and-new-jersey-a-critical-hub-of-global-commerce/](http://www.forbes.com/sites/gcaptain/2011/10/25/the-port-of-new-york-and-new-jersey-a-critical-hub-of-global-commerce/)
- [www.panynj.gov/air-cargo/jfk.html](http://www.panynj.gov/air-cargo/jfk.html)

